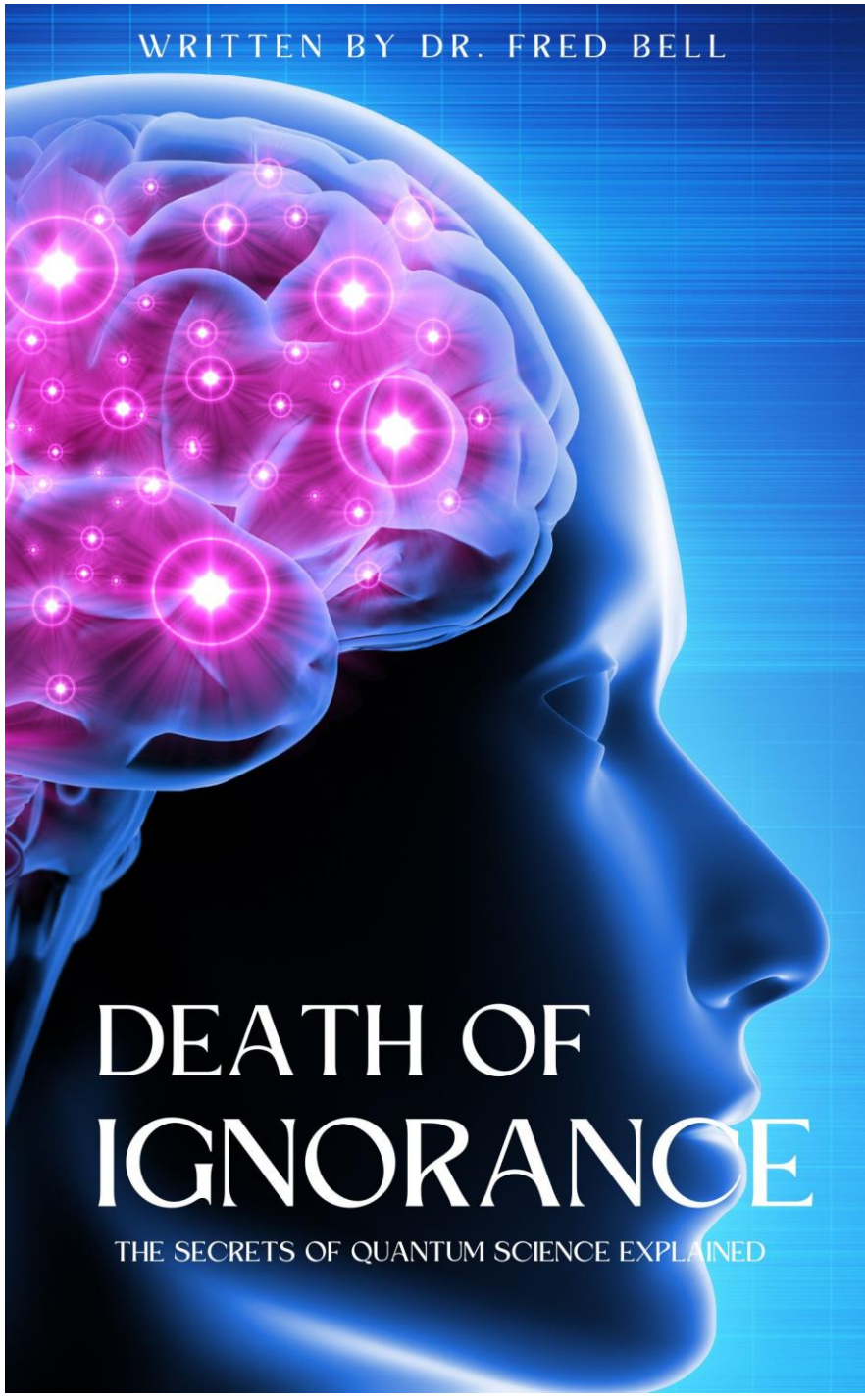
WRITTEN BY DR. FRED BELL
DEATH OF
IGNORANCE
THE SECRETS OF QUANTUM SCIENCE EXPLAINED

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Revised Edition 2023

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Live Chat 9am - 5pm MST (623) 295-9224

New Edition contains updated Scientific Timeline, color illustrations, updated Nobel Laureates list from 2009-2017, an expanded Index and spelling corrections, formatting, modern editing, and book dimensions.

Dedication

This is a book of life. Few people will ever know what it took to cover the following pages. I take no credit for its authorship. I was only an instrument of God to work through, as were the others around me. It is dedicated to Alan and Nancy, my closest friends and greatest teachers in learning the value of relationships.

Alan departed before its completion to assist from the other side. Bob and Laurie gave me courage to finish after Alan left. Betty Lee Morales was a tremendous inspiration, Louise and Bruce completed the first printing.

The book would have never even been started if I had not met my wife Kim. The glorious times we had together, me working on the manuscript, her typing it and doing much of the artwork, reaffirmed the wondrous marvels of God uniting two people with a common goal to serve mankind.

When Kim finished her part, which was even greater than mine, she left for a while. She gave so much, dear readers, to you that there was nothing left for herself. In closing, you will find our love for you in every word, every drawing, and most of all everywhere. May God Bless.

Foreword

For those searching for identity, Death of Ignorance, a new book by Fred Bell, Ph.D., unfolds man's spatial relationship from primal energy, to the stars and planets, to his personal pathway, through immortality.

Death of Ignorance is the most fascinating, illuminating reading I've discovered in 20 years! In language which is scientifically invulnerable, vividly descriptive (with lots of illustrations), Dr. Bell has succeeded in synthesizing knowledge of the ancients in all of the disciplines with space-age technology, with common sense and unmatched brilliance of understanding.

For professionals and laymen alike, Death of Ignorance brings into focus science, physics and metaphysics in a gripping style and lucidity. It's a book which appeals to youth—and to minds of all ages which have retained the curiosity and daring of youth. It's an adventure into T—I—M—E, past, present and future; it's the type of unique insight which has shaped man's destiny.

Betty Lee Morales, Ph.D. Knighted by the Queen Mother of England
Former President of Cancer Control Society – Los Angeles, CA 1979

About Betty Lee Morales:

Betty Lee Morales, Ph.D., was a contributing editor to Let's Live Magazine; the co-founder and President of the Cancer Control Society, former Secretary of The National Health Federation, and visited over 60 countries researching health and nutrition. She also served on the Board of Directors of the California Clinic of Preventive Medicine in Del Mar, California. She and her husband, John T. Clark, co-edited and published a weekly Organic Consumer Report & Seeds for Tho't, and lived on an experimental organic farm in Topanga, California. They had three children and seven grandchildren.

About Dr. Bell

Dr. Fred Bell, H.M.D., was born in Ann Arbor, Michigan on August 10, 1943. He was conducting research experiments when he was 7 years old and at 15 worked with the University of Michigan on government sponsorship, researching atomic energy.

Dr. Bell served in the U.S. Air Force and later worked with Rockwell Corporation and NASA on the Apollo and Saturn moon projects. During this time, he had the privilege of working with the late Dr. Werner von Braun.

He left the aerospace industry and for a time continued his education and studies with many Himalayan masters, returning to work with the holistic health movement.

His combined scientific/medical background allowed him to pioneer much research into the energy systems within the human body. He has made numerous TV and radio appearances on programs such as L.A. Patterns, ABC Closeup and holds a weekly radio show on BBSradio.com.

Table of Contents

CHAPTER I – ELECTRICITY & YOU

In order to understand pyramid energies and their effects on the living system, we must understand the pyramid principles within our own beings first. It is the author's wish to present simple concepts in a component manner and then to assemble the basic components into a simple system that anyone can, with a small effort on his or her part, easily understand.

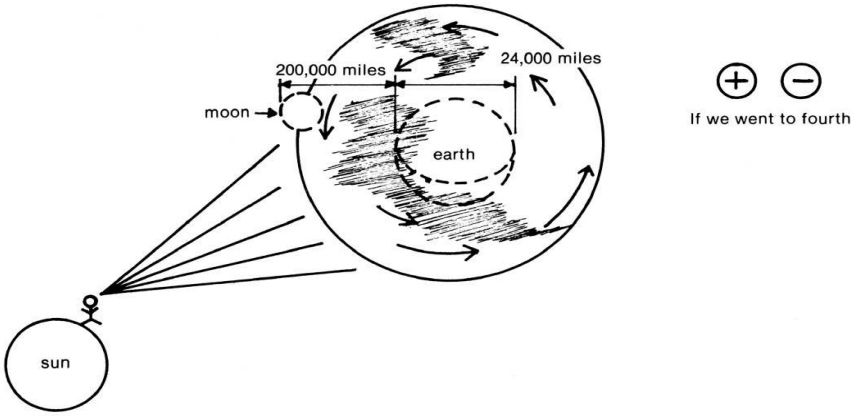
Behind the first principle of matter transformed into flesh is the existence of electricity. Electricity has been in our homes for over 50 years. It serves us daily in every facet of our lives, not only in our homes, offices and factories, but also in our cars, planes, boats, and last but not least, our physical, astral and mental bodies as well.

Since Stephan Gray's discovery in 1720, medical science has been aware that electricity is the underlying faction of all body functions. Food, when ingested, has no nutritional effect on the body until during the last phase of digestion in the alimentary canal (called the Krebs cycle) where it is converted into body heat and magnetism in the area of the small intestine. So in view of this, you could say that the body is a transformer, converting bulk into electricity which energizes the mind to direct feelings of energy into consciousness.

Electricity is composed of electrons and protons, the smallest particles of matter existing on the physical plane. It is vitally important to examine ourselves carefully on the smallest level first, as over the passage of time the smallest changes taking place in the universe have the greatest effect. Man's greatest buildings could not stand without simple foundations, as a mountain today, subject to a little wind, rain, temperature variation and time becomes a plain tomorrow.

On a macrocosmic scale, for the sake of comparison, imagine the earth as a proton and its moon as an electron. The major difference would only be that the electron moves in an orbit a bit faster than our moon. As a matter of fact, the electron moves so fast that if, by comparison, we were to stand on the sun and view our earth with a high-speed moon, the velocity of the moon would reflect the sunlight, so we would not be able to see the earth, and the moon and earth would appear to be solid.

Figure I-1



This of course is deceptive to the five senses, as man's eyes are not quick enough to observe changes of electrons and protons. In daily life, this false deception limits our progress until we realize its existence.

Once realized, we transcend the limitations of our surroundings and become masters of our own destiny. Yogis have long been aware of this facet of illusion and call it, in simple terms, maya.

Now, as we see the relationship of electrons and protons, it is easy to imagine families of them grouping together. One family unit consisting of one proton and one electron is called an atom and in this case, an atom of hydrogen. When additional units combine, we get molecules and when molecules combine, we have the functioning cell, the basic building block of the body.

An atom is the smallest unit of an element to retain the chemical characteristics of an element. But it has properties that have been discovered to be the same in every element, properties that belong to parts within the atomic unit.

The atom's parts consist of a tiny central nucleus encircled by particles called electrons. Most of the mass is concentrated in the nucleus, which for our purposes we can say is composed of particles called neutrons and protons. The electrons orbit in space around the nucleus in successive layers or shells.

All electrons are alike, and so are all protons and all neutrons. The electron has a negative electric charge. The proton, a positive one. The neutron has no charge. The distinctiveness of an atom of one element from that of another lies in the arrangement and number of electrons, protons, and neutrons, with the negative electrons surrounding the nucleus held to it and balanced by the positive protons within it.

The total number of protons within the nucleus determines the element's atomic number. And since the protons within the nucleus are balanced by the electrons around it, the atomic number is also the same as the number of electrons in the atom.

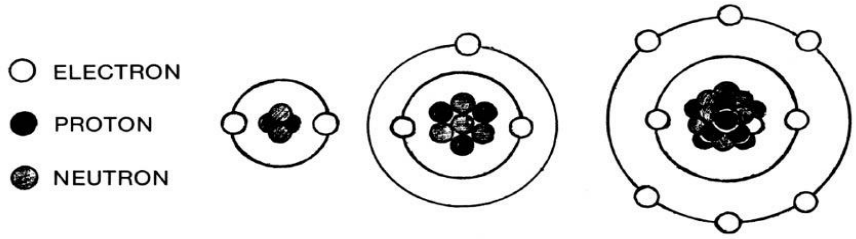
Electrons are the active participants in the formation of chemical compounds and the release of energy in the combustion process. When hydrocarbon compounds break up, reform into carbon dioxide and water vapor, and give off heat, the electrons encircling the nuclei do the combining and recombining, while the nuclei remain untouched.

THE STRUCTURE OF ATOMS

Atoms have nuclei of protons and neutrons and, around the nuclei, electrons in orbits. The number and arrangement of the electrons and protons distinguish one element from another. Shown are atoms of helium (left), lithium (center), and oxygen (right).

Atoms have different electrons rotating in groups and fixed distances from the nucleus, much like our sun has planets rotating at different distances in fixed orbits.

Figure I-2



Hydrogen consists of a nucleus, a proton and an orbiting electron, and because it has only one electron, it is electrically unbalanced, hence very

unstable. Helium on the other hand, has two electrons in its first orbit level and is very stable.

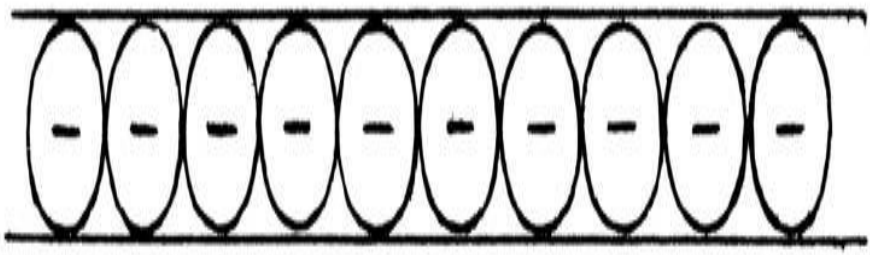
Figure I-3

MAGNETISM AND ITS RELATIONSHIP TO ELECTRICITY

In order to understand our physical and emotional nature, we must examine further some basic principles of magnetism and electricity.

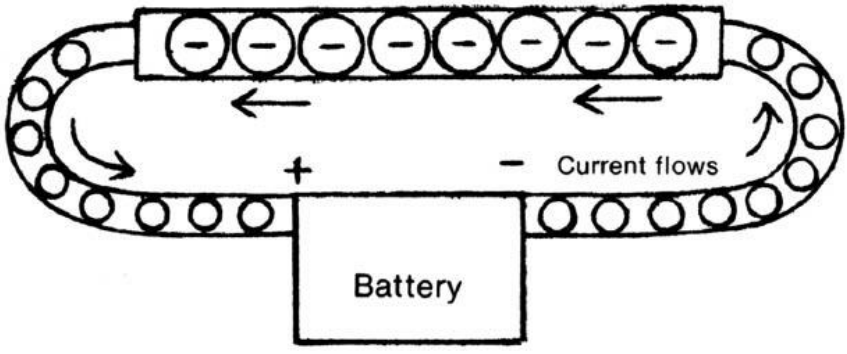
If we take a wire and connect it to a battery, the following facts present themselves.

Figure I-4



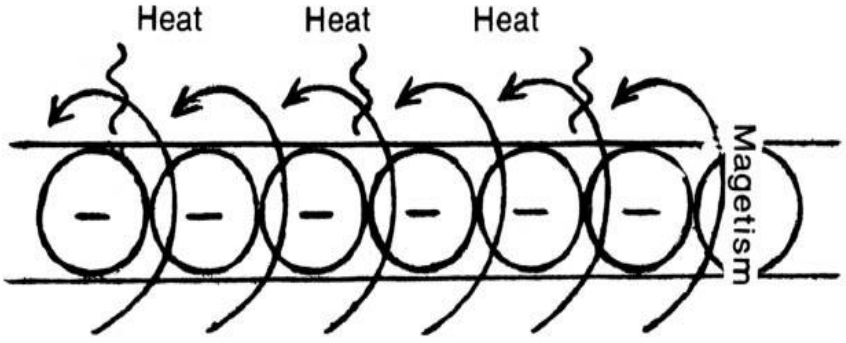
The wire contains electrons, as do all physical elements.

Figure I-5



The battery has excessive electrons ready to flow from the negative side to the positive side and neutralize the wire producing heat and magnetism.

Figure I-6



Expanded view of the wire "conducting."

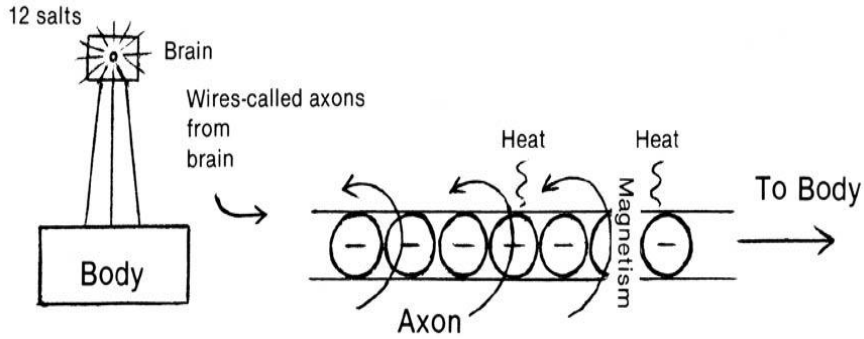
It is a rule that whenever electricity moves (current flow), magnetism will be found at right angles to this flow and the friction created by the electrons moving under electrical pressure (voltage) will produce heat. For example, a wire placed across a 12 volt battery will produce less heat than a wire placed across a 100 volt battery.

Now, let us compare this example to the body. Imagine the brain to be the battery, the digestive cycle to be the battery charger and the body the receiver of electrical energy.

When we eat, we take in minerals. The minerals are the producers of electricity in the brain through a chemical process known as electrolysis. The mineral extraction or assimilation takes place in the colon or large intestine. This is why so much attention is being placed on having a healthy colon these days. If the colon is not working efficiently, the voltage or potential on the brain is low, producing a sluggish or tired brain. This is also one of the factors with people suffering from a short attention span.

The brain then directs this electrical energy through three nervous systems to perform body functions. This will be covered in detail in later chapters, but let us look briefly at one nerve as an example for electrical distribution:

Figure I-7



As the electricity moves through the nerve's centers, magnetism and heat are produced as side effects. The principle is universal whether in a wire or a nerve wire (axon). The same thing happens. The only thing different is that the wire in a human being is alive and receives sodium, potassium, and phosphorus for maintenance and regeneration. We will elaborate on this more in later chapters.

ALTERNATING CURRENT

The electricity that we have been discussing thus far is electricity moving in one direction of direct current (DC). Now, let us examine alternating current, commonly called A/C.

If we disconnect the wire from the battery we previously had connected and bring a permanent magnet near the unconnected wire, we will be able to re-induce electricity back into the wire, clearly demonstrating the relationship of electricity and magnetism. And because the body is full of axons carrying electricity, it is easy to see that magnetism applied externally will produce a definite effect on body function.

Magnetism is found in abundance on the surface of the earth due to the electricity of the planet itself. Anyone holding a compass can observe this. At night when we sleep, our body recharges off the earth's magnetism, thus reassuring plenty of electricity for the next day's activity. That is why many people sleep to the magnetic north for best sleeping efficiency. Another fact often overlooked is that the brain uses 80% of its energy while you sleep! It is very busy directing electricity to depleted areas or "batteries" in the body.

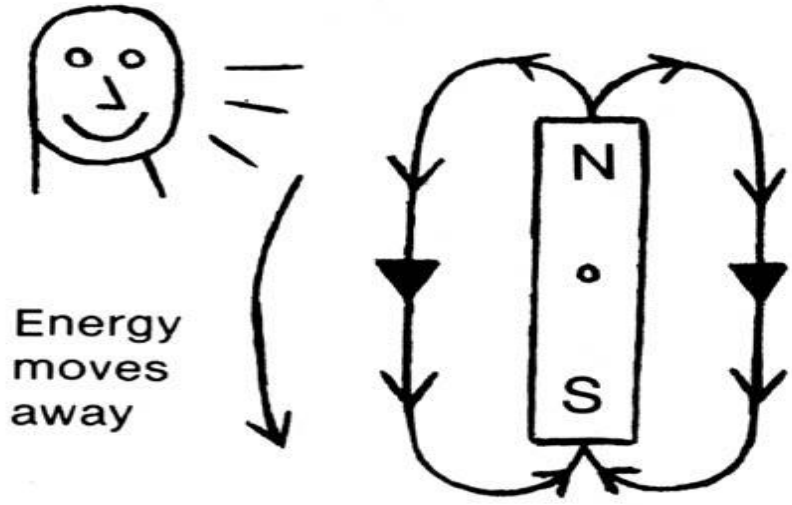
Study the illustration forthcoming for a moment.

Figure I-8

Hello! My name is Relative Observer. You will see me through this publication. I was created out of necessity. Notice a smaller version of me looking at a stalk of corn. In Position 1, I am viewing it from the top and in Position 2, the bottom. If I were two different people at two different times (two relative views from different perspectives), the same stalk of corn would appear different, but it would be the same corn. This happens when two scientists do the same experiment from different points of view. This is a common error in human judgement. People fail to compare viewpoints. So I was created. Just look at the drawing from my viewpoint and you will see the same as the artist.

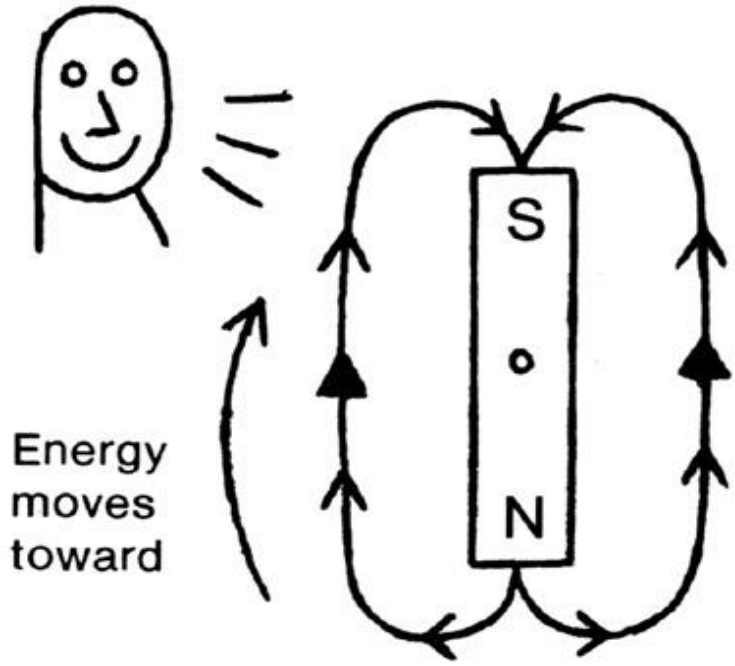
Many scientists today are realizing that the experiment and the experimenter are relative to one another, thus unlocking many hidden secrets normally missed by orthodox tradition.

Figure I-9



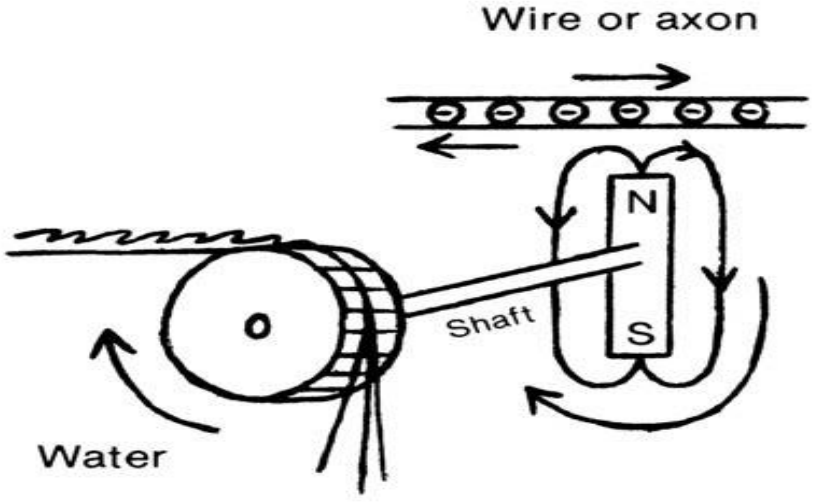
The Relative Observer sees energy flowing away. Energy in a magnet flows from the North to the South Pole. To the Relative Observer, it is moving away.

Figure I-10



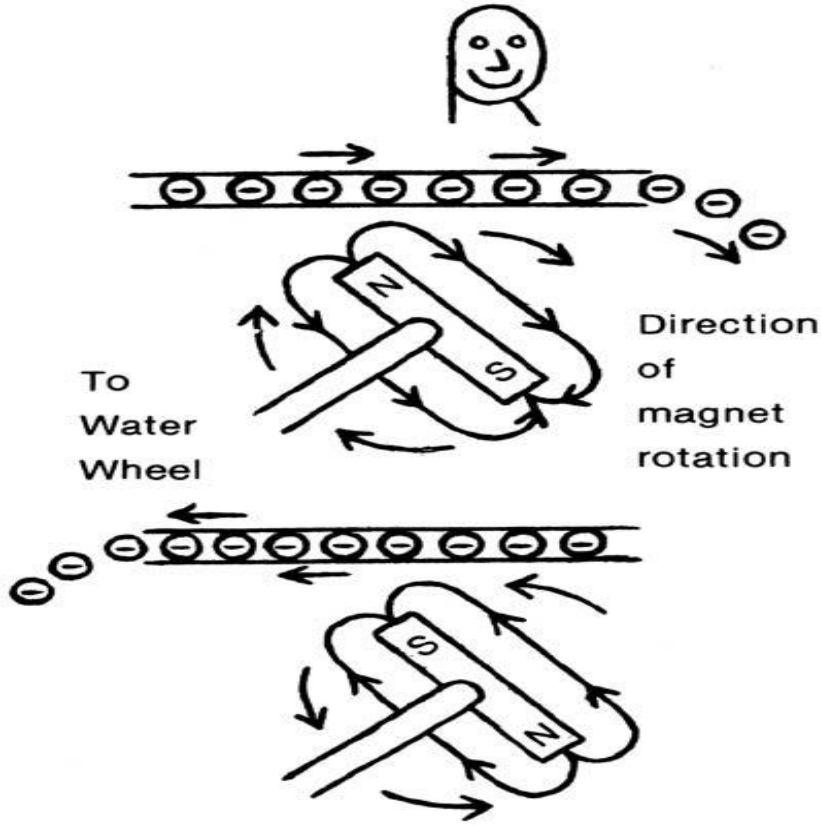
The magnet is rotated 180° or placed upside down. Energy is still flowing North to South, but to the Relative Observer, it is moving towards him.

Figure I-11



Now we are ready for another form of electricity called alternating current. Up until now, we have been studying electricity moving through a medium in one direction. In alternating electricity, the electrons move through the wire back and forth much like waves in a bath tub.

Figure I-12



Electrons move through the wire to the right. When the North Pole is up and as the North Pole moves away from the wire in a clockwise position, the movement slows down as the wires do, and the South Pole comes close to the wire reaching maximum velocity to the left as the South reaches the apex of its revolution.

Figure I-13

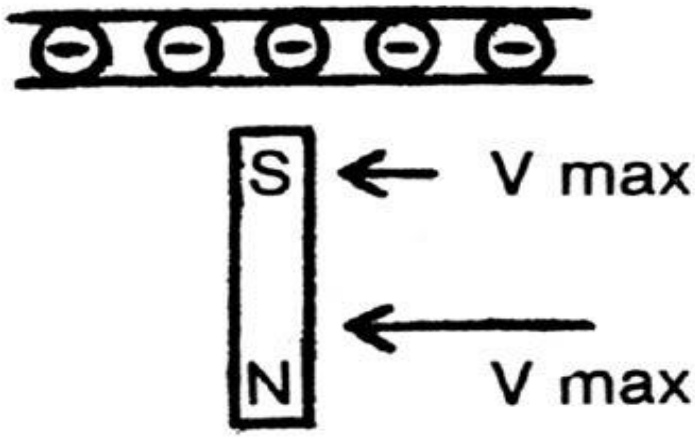
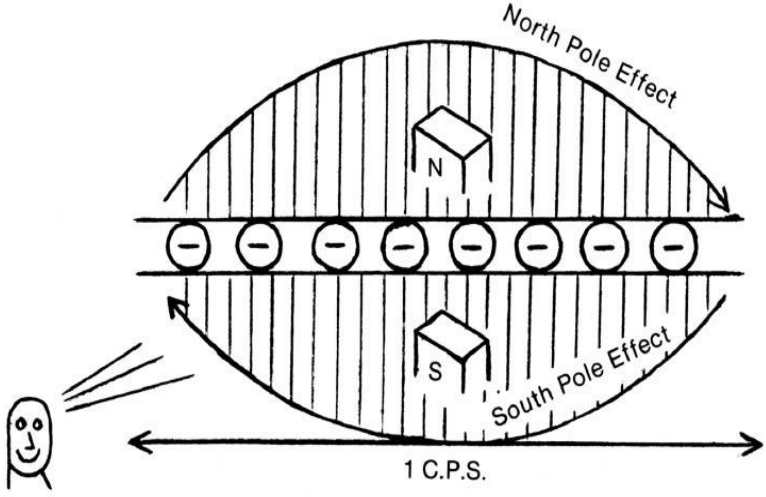


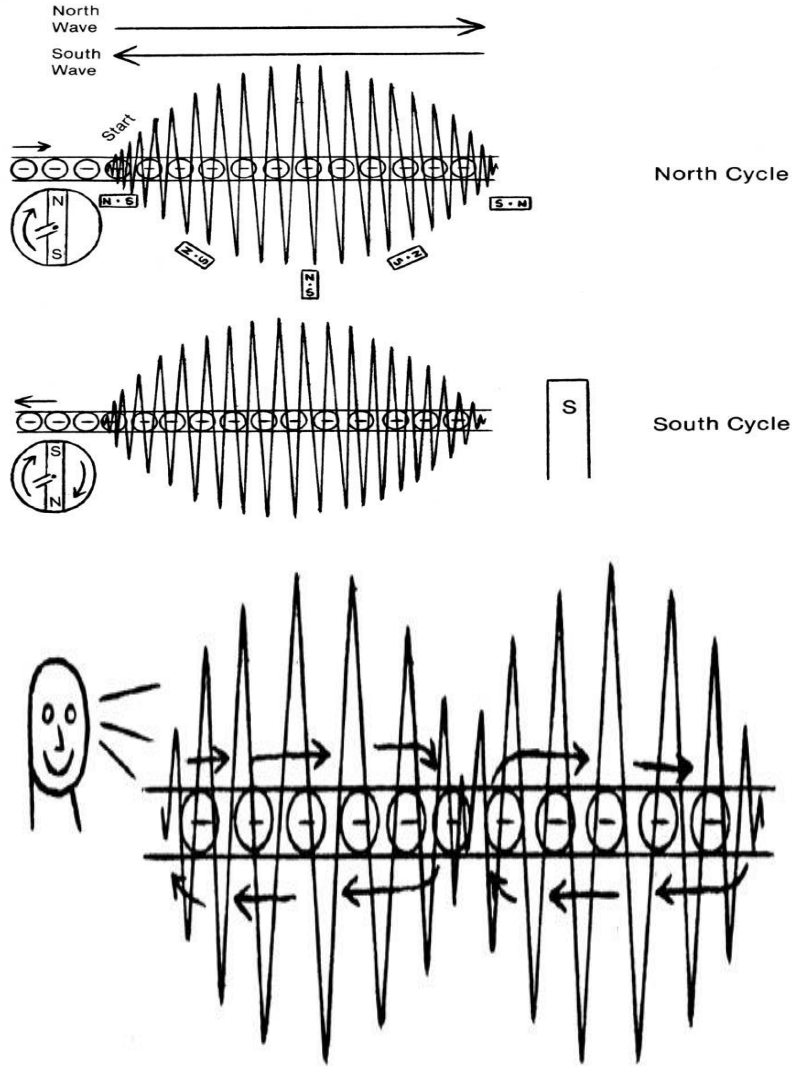
Figure I-14



This is how alternating current is produced, and in diagram 14 you can see the magnetic wave front produced by the electrons as they change directions. If the generator rotated 360° in one second, we would have a frequency of one cycle per second.

The outside portion of the wave is called the envelope. Here the North and South share the same envelope. As the magnet comes to the South, the wave reverses and goes into the other direction.

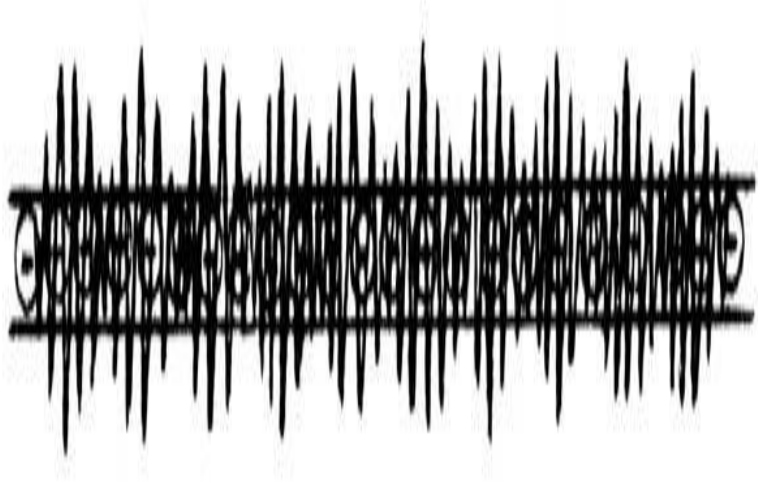
Figure I-15



Here we are doubling the generator speed and two envelopes appear where they are only half the size of the first one cycle pattern.

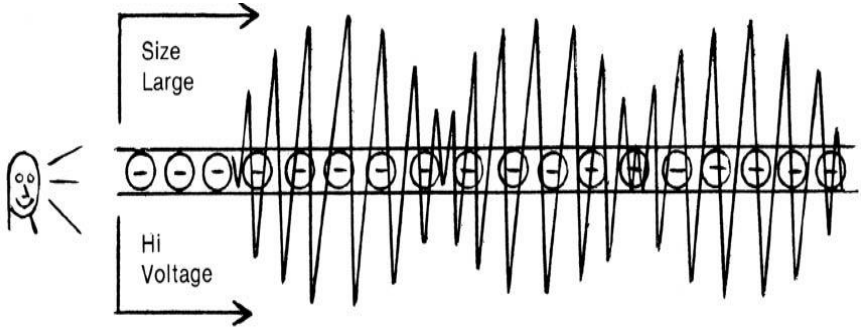
Here we are at ten cycles per second. Notice we are at one tenth the original size.

Figure I-17



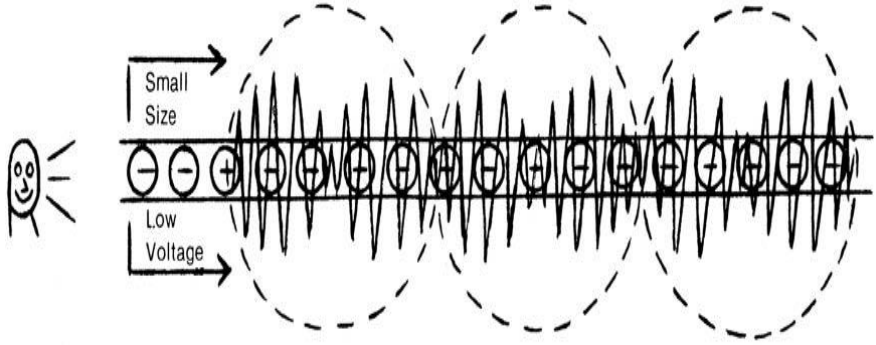
Now look at the size of the wave, not how many waves there are over a given distance.

Figure I-18



The size is determined by the voltage and the distance electricity will travel over a wire of infinite length which is a product of the voltage times the current.

Figure I-19



To sum up this part of electricity, we find that by rotating a magnet we get alternating current and the frequency measured or cycles per second is determined by the rate of rotation, and the distance the magnetism will travel is determined by the voltage and current, which are products of the strength of the magnets generating their fields.

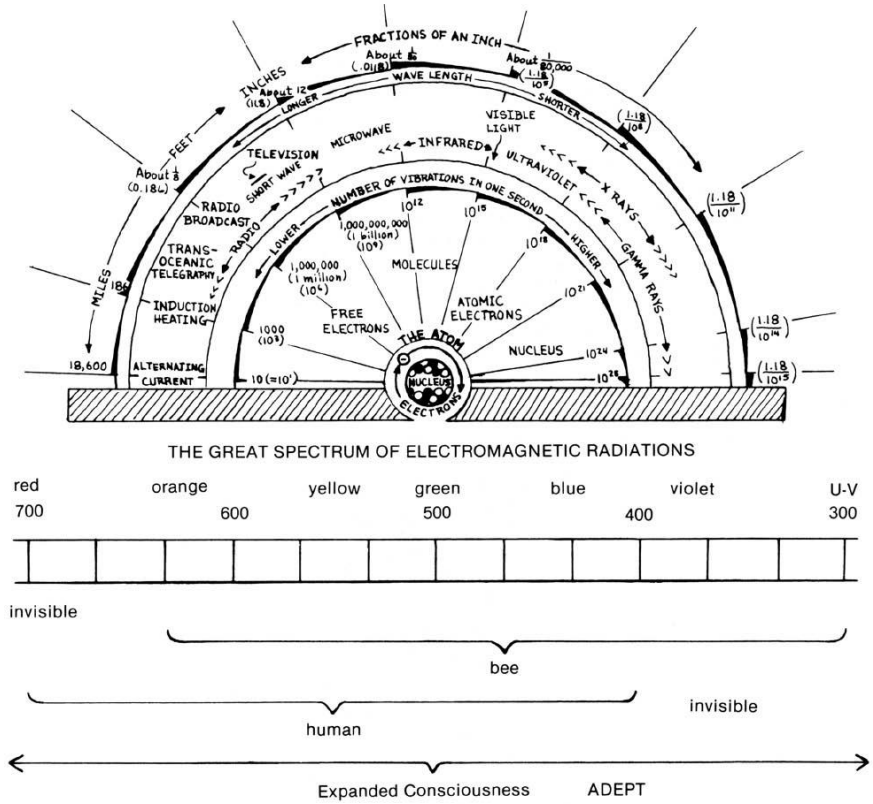
It may seem at times we are over-emphasizing these basic principles and may be over-illustrating them, but it is important to visually understand them so that they become "second nature" whenever you view a light bulb, motor, another human being or whatever. As the author in later chapters presents so many detailed universal principles, and in later books, universal complexities, you will be glad you took extra time in the early chapters.

ELECTRICITY – PART II

As previously shown, as we increase the rotation of our magnet, we increase the number of cycles of electrons and magnetic waves over a given distance. Scientists have long been aware of the different variations or speeds of AC and the entire range thus far observed is called frequency spectrum.

Below is a chart of the various observations and effects on human consciousness as we observe electricity in its various rates of vibration.

Figure I-20



Visual Perception of the Electro-magnetic Spectrum

Color	Black	Red	Orange	Yellow	Green	Blue	Indigo	Violet	White
Orthodox measurement of thresholds		380 .8 microns		520	580	690		770 .4 microns	
Anstrom, units	1538	7890	6909	5750	5170	4680	4280	3900	

If we rotate our generator from 100 cycles per second to approximately 16,000 cycles per second, this is an area perceived by the human ear and we call it the sound spectrum. This is because electrical energy, if strong enough, will displace or move air molecules, and this movement can be perceived by the diaphragm in the ear mechanism. Air molecules can be displaced at higher than 16,000 cycles per second but most people will not be sensitive to them. However, animals such as dogs have extended hearing capacity and that is why a dog often continues to howl after a siren has passed by and to you, it is no longer audible.

The area below sound, around 60 cycles per second, is the rate at which home appliances, light bulbs and motors operate, and this is called the low frequency part of the spectrum.

Going further down in frequency, we approach the area of below 1 cycle per second and an area of between 1 and 5 cycles per second. This is called the ultra-low portion. Researchers studying low forms of bacteria, the ones that cause mold, pool algae, spoilage and diseases, have noticed their vibrations to be in this area. This is the vibration that causes spoilage in foods such as apples.

If you were to take two apples, one, called a control, placed in a remote part of a room away from all pyramid devices, and place the other under a pyramid, the one under a pyramid would dry out naturally and be edible a year later, whereas the control would decay and spoil within two to three months. This demonstrates a high-frequency component of pyramid energy, and that is why in France and Italy, they are using pyramid-shaped milk containers. The milk will not go sour at room temperature but will gradually turn to cheese if not consumed in four to five weeks. Cheese is a natural state for milk to assume as the water evaporates without danger of bacteria contamination.

Now, do not assume two misdemeanors about pyramid energy: dehydration and destruction of bacteria. A few years ago, the American Food and Drug Association alleged that pyramids caused dehydration to water contained in life forms and therefore were unsafe for humans to be in. But after the federal government funded private research in twelve universities the claim was refuted.

What was shown was that the pyramid provided an environment for natural evaporation where bacteria could not interfere with the natural process of preservation. This is how seeds are prepared by nature. You can take a seed that is 1,000 years old and dry, add some water to it, it germinates, place it in the soil and it grows.

The second misinterpretation is that pyramid energy destroys bacteria. Not true. Pyramid energy, only by adding its natural hi-frequency components, raises the vibrating level of its surroundings, creating a level of energy that is uncomfortable for low forms of bacteria and they are not attracted. An apple that has been picked from a tree has been removed from its natural source of energy and gradually loses its high

rate of vibrations. As the apple continues to discharge, the vibration lowers until it loses its protective aura. This sometimes takes weeks. Then along come low-energy bacteria looking for a place to reproduce or culture, and the unprotected apple is their victim. However, if a pyramid is over the apple, the bacteria think the apple is still attached to a tree and will not harm or be attracted to the apple.

The bacteria were not destroyed, only repelled. If pyramid energy destroyed bacteria, you could say it had a negative side effect. But this has never happened. If you place a bacteria-infested apple under a pyramid, it will continue to decay. The pyramid is only a preventive measure.

Low forms of insects are often repelled by pyramid energy. Ants usually go in the other direction. So do mosquitoes, and mealy bugs leave plants when watered by pyramid-treated water. Bees, which are a high form of insect life, like pyramid energy. Without bees, flowers could not pollenate and we would not have honey. Birds also are attracted to pyramids. One of the high-energy forms of birds, the hummingbird, will dart about in the presence of a pyramid when it is not threatened by an outside disturbance.

HIGHER FREQUENCIES

As our generator speeds up in frequency to 500,000 to 1,000,000 cycles per second, we now are producing waveforms that are very short in wavelength. If the voltage potential is high enough, the resulting energy produced puts a stress or tension on our wire and the wave form can no longer be contained within the boundaries of the wires and the wave will propagate or travel across free space. This is how we transmit radio waves to your broadcast receiver. There are many different types of radio transmissions called longwave below the broadcast band and shortwave above it. Here again, we have high-frequency components in our body. and these components are affected by these propagating signals. These effects will be covered in later chapters under stress and tension.

As our generator goes faster still, the waveform continues to get shorter and shorter until we reach the spectrum where the very ethers themselves are set in motion and the phenomenon of visible light is produced. Vibrations beyond this are invisible to human eyes. Some insects and animals can see a few million cycles higher than we can and

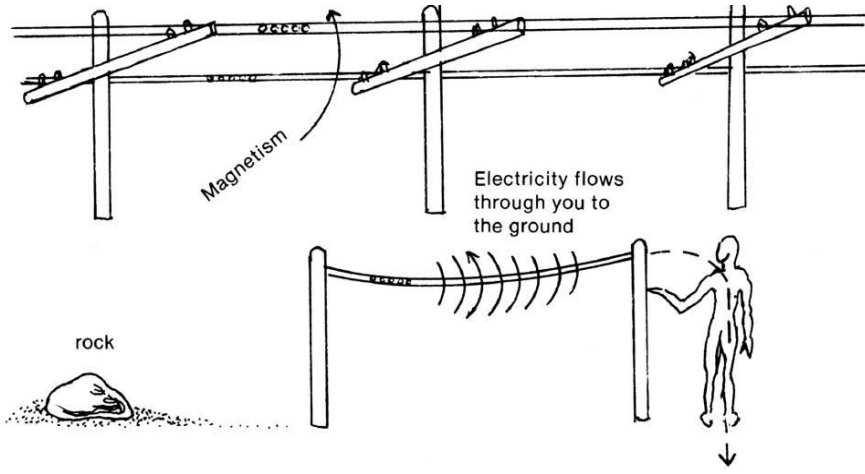
these cycles are called the region of x-rays and even shorter rays, gamma rays. These too will be dealt with later. The important thing here is to remember that all this is a product of electrons vibrating back and forth in a given medium.

MUTUAL INDUCTION AND RESONANCE

In order to see how vibrations work within our own natures, we must elaborate on two basic principles of physics and electricity.

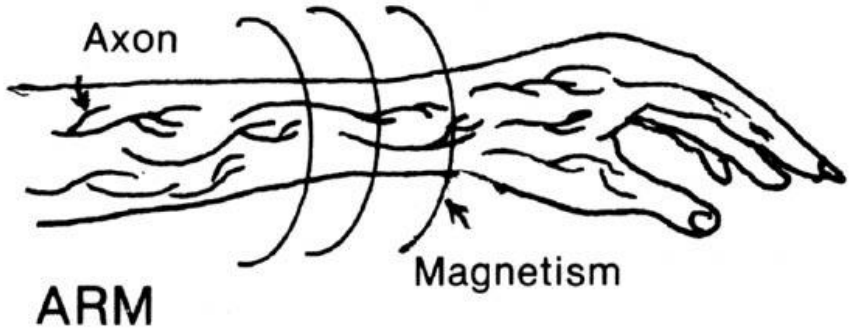
I am sure some of you reading this remember having a clothes line in your backyard and a power line parallel to it. Then remember how on a humid or rainy day you hung up some clothes after washing and while you were touching the clothesline, you received a small shock even though the clothes line was some distance from the power lines.

Figure I-21



This was because the magnetic field of the power line was so great it encompassed the clothes line which was probably damp, making the rope conductive like a wire, and when this happened, electrons began to move in the clothes line when you touched it because you were completing an electron path to the ground. This principle is called mutual induction and works the same in a living creature, as each of us has thousands of axons conducting electricity, and the resulting individual axon field couples itself to its neighbor, producing a very strong mutual inducted magnetic field.

Figure I-22



Large field produced by mutual induction

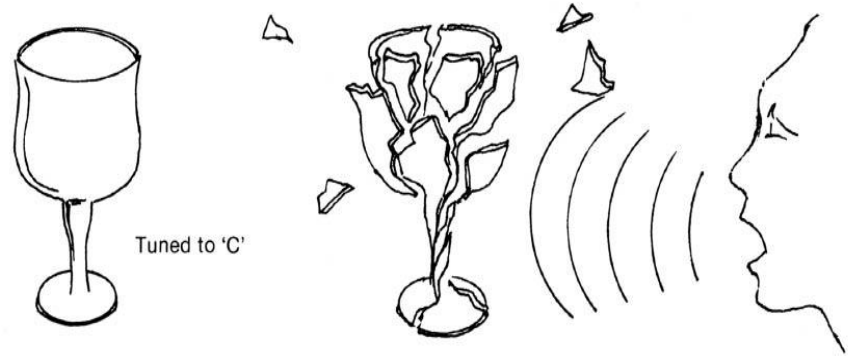
RESONANCE

Resonance is the ability of a nearby object to vibrate when something stimulates it by mutual induction. Notice in Figure I-21 that there also was a rock near the clothes line. When we touched it, we did not receive a shock. This is because it was not resonant to the frequency of the clothes line. But if we took a ruby laser which generates a strong red beam of light (and remember, light is magnetism and electrons raised to a high vibration producing light) and pointed the laser at the rock, the rock would be greatly affected because it would respond to the vibration of red light.

Another example is a singer shattering a wine glass when holding a vibratory sound on a particular note with no frequency deviation.

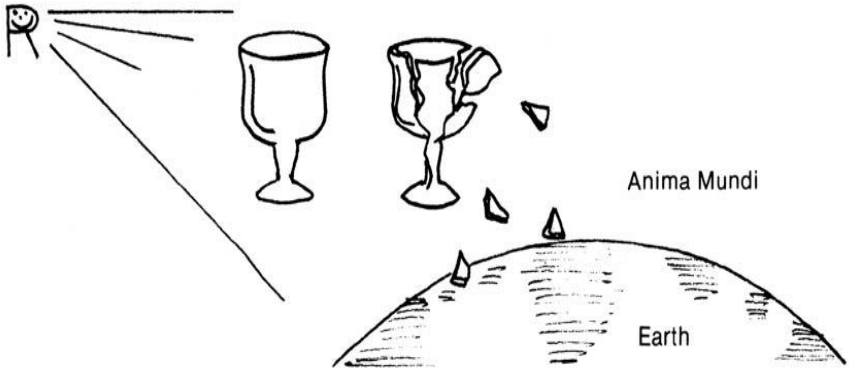
Figure I-23

Large glass shatters when a singer with a strong voice like Ella Fitzgerald sings a 'C' vibrato.



As our singer reaches the right note (resonance of the glass), the atoms within are relaxed and the magnetic form that contains the molecules in form is relaxed and are released or separated from the actual molecules of the glass. The molecules, without their magnetic family of vibrations to direct them, turn to dust, and the directing force is released and returns to a simpler vibration. In this case, it is the central source of magnetism or the earth's magnetic field, called anima mundi by Eastern people, who have a greater general knowledge than Western cultures.

Figure I-24



Coupled to the principle of resonance is the action of harmony and octaves or overtones, which produce musical chords on the level of the vibration of sound and on the level of ultra-sound (sound beyond human audio range), decomposition of matter, and on a higher level yet, the operation of the lymphatic gland system of the human body. This illustration shows briefly this effect.

Figure I-25

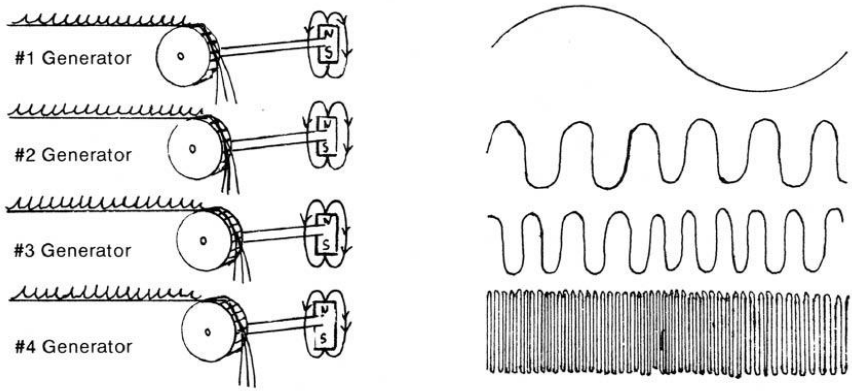
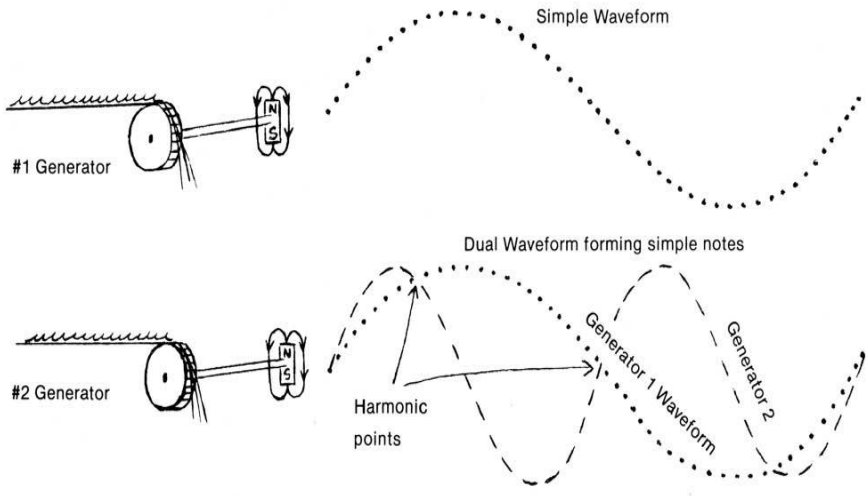
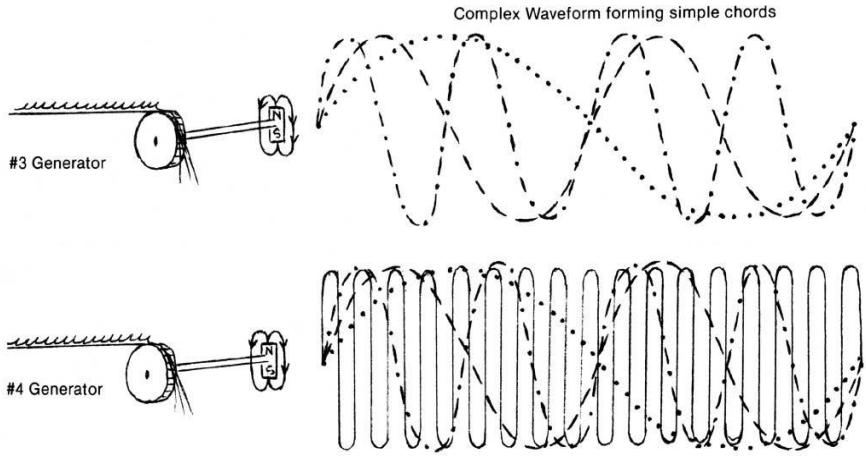


Figure I-26



Complex wave forms are shown here forming complex chords. The endocrine system in the human body responds to these wave forms by a compound action of the lymphatic system and the etheric body. This will be covered fully in later chapters.

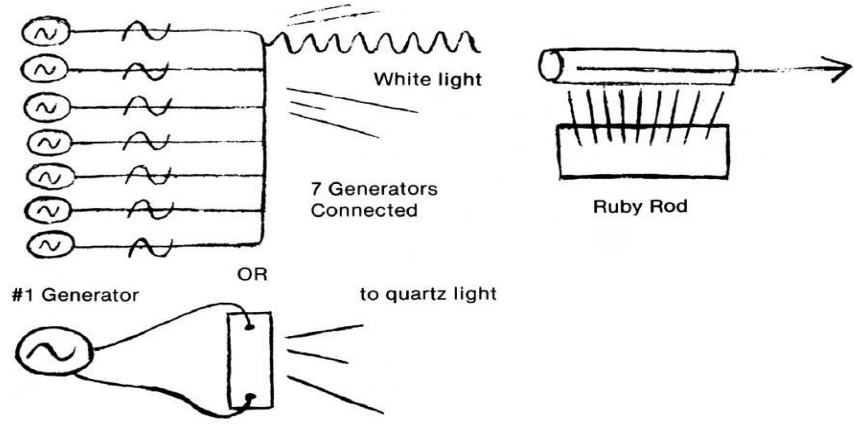
Figure I-26 (continued)



The final comment and closing fact that the author wishes to present in this book is the action or principle of the laser. This is presented here because in later books the laser action occurring in the human body will be shown, and if you meditate on the laser principle now it will make the operation easy to understand.

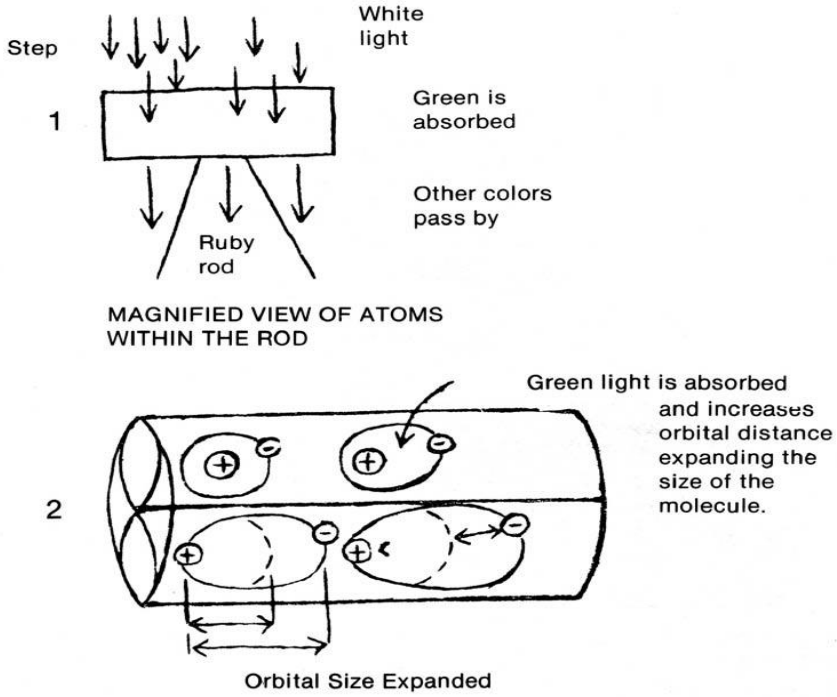
The laser works on a similar principle as the generation of electricity except that instead of a rotating magnet being the source of motion, we use random light as our source of motion. Random light would be a product of seven generators each running at a speed great enough to produce light rays in the seven basic colors, and these colors then are focused into a beam where they blend into white light.

Figure I-27



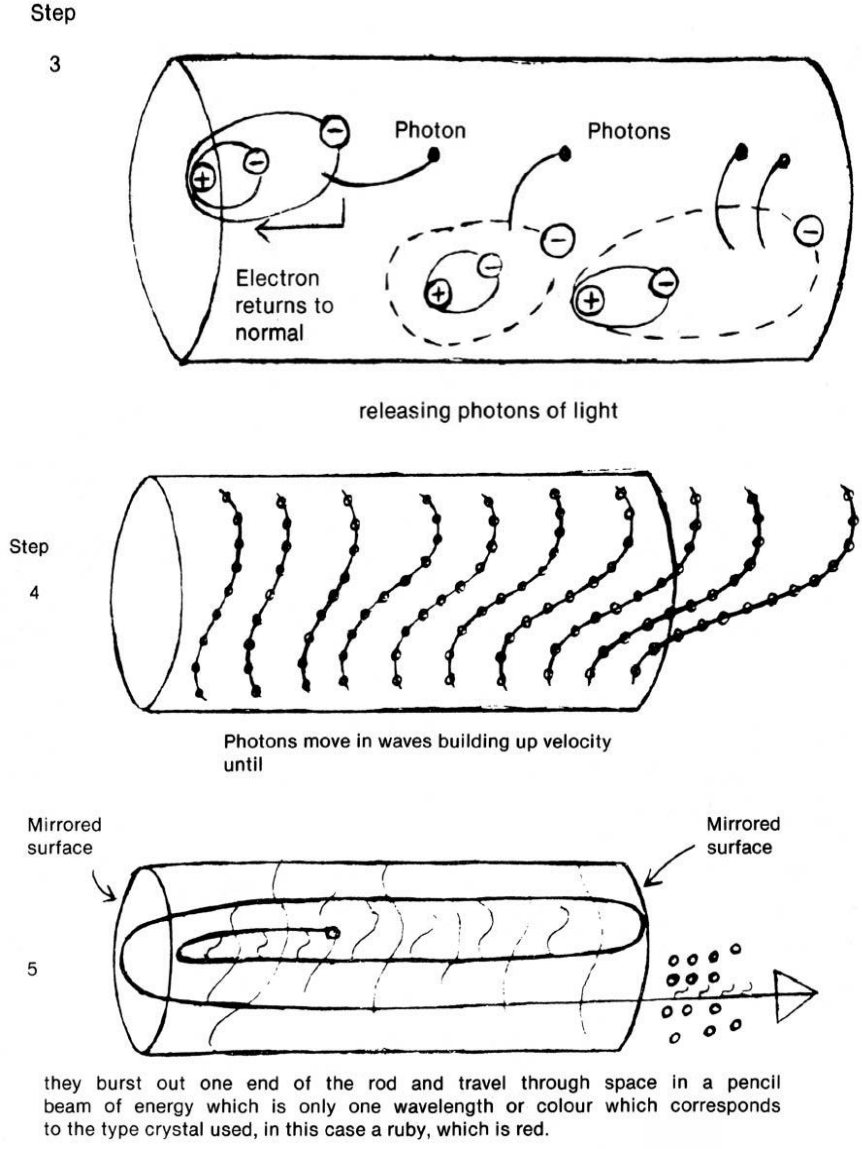
Random light, ruby rod and green portion of light is filtered out of the white light and absorbed by electrons in the crystal pushing their orbital distance away from the nucleus.

Figure I-28



After a certain amount of green light is absorbed, the expanded atoms collapse and the orbital pattern returns to normal. During this collapse time, the ruby is said to lase or release spontaneous red photons of red light from the etheric portion of the physical plane, and the particles travel in phase (together in harmony) from one end of the ruby to the other, building up energy, and each end of the rod is mirrored, making the reversals easier, until it bursts out of the weaker end in a tight beam we know so well.

Figure I-29



This principle is presented here because when we deal with the principle of clairvoyance and telekinesis, it must be understood. Take your time and review what is presented in this chapter. Do not try to absorb it all at once. Read and re-read the various commentaries and refer to other publications if necessary as referred to in the Bibliography. Your perseverance will be rewarded by a basic knowledge that will allow you to unlock almost any secret in the universe in time.

CHAPTER II – IONS AND THEIR EFFECTS ON YOU

As we have previously seen in Chapter I, the movement of electricity through a wire, or light through a crystal like a ruby, is a form of ionization. Ionization always occurs when an atom changes state, forming or reforming a molecule or another chemical or element. It takes place in the body when we breathe or digest food. Before studying this further, let us take one last look at a form of ionization.

Figure II-1

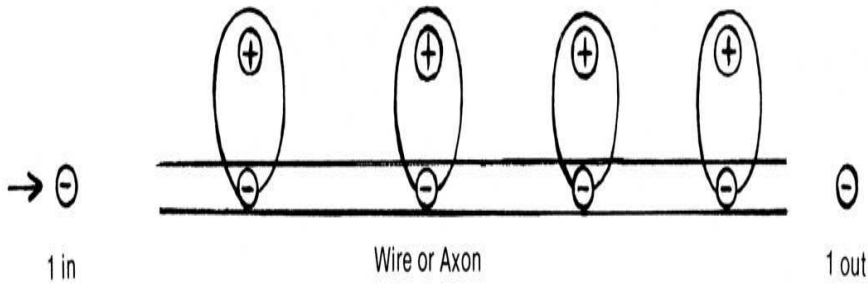
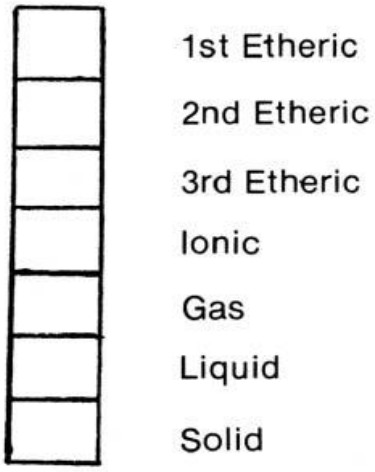


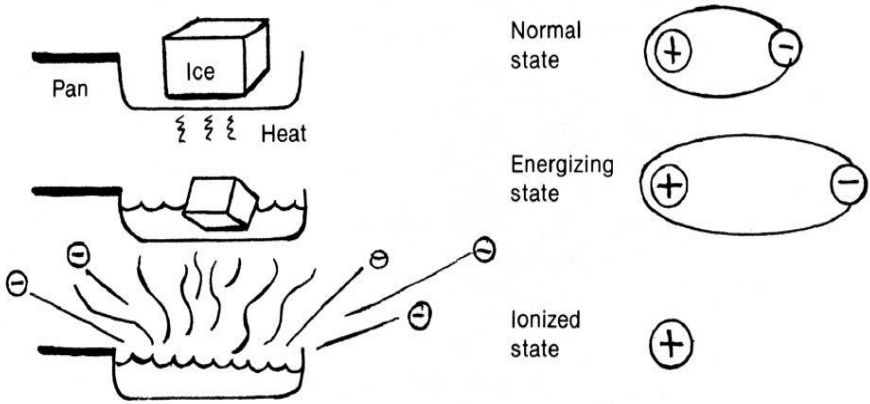
Figure II-2



The physical plane is made up of seven sublevels. The main difference from one level to another is how closely the electrons are bound or held to their nuclei or protons. As electrons are excited by heat, sound, light or thought, they move away from their nuclei. Sometimes they leave their nuclei completely. When an atom is being energized by one of the above-mentioned ways it is said to be radiated on, and this was the beginning of the phenomenon known to science as radiation. Radiation produces ionization. Ionization produces physical change. Physical change produces changes in mind, body and attitude.

Let us examine for clarity a simple way of producing ions.

Figure II-3



We take a block of ice (solid) and place it in a pan of water. Then we turn on the stove which radiates heat, causing the electron to move away from its nucleus, producing water (liquid). As the radiation continues, the super-heated water becomes steam and the ionized electrons escape into the air (gas). You are standing nearby and breathe this steam, or it condenses on a nearby window pane (ionic). The other three etheric parts of the physical plane will be explained in later chapters.

This as you can see is a simple form of ionization. Now let us study the effects of ions on you.

As early as 1754, scientists began studying the effects of air ions on the living system. This was in itself remarkable as before mentioned, electricity in the body was only discovered 34 years earlier. But now, these studies are worldwide and are gaining priority in quantum leaps!

Current reports show negative ions to be beneficial to good health and positive ions to be responsible for many of our ills. Clinical studies have shown that positive ions can aggravate sinus infection, asthma, rhinitis and pollinosis, inducing headaches, fatigue and dizziness. Negative ions have been shown to relieve the conditions as well as induce a sense of well-being. As you read these pages, ask yourself, WHAT IS BETTER THAN A GOOD FEELING?

Dr. A. P. Kruegor of UC Berkley has studied air and gaseous ions for 18 years and states that one of the major causes of poor, unstable, psychic and physical conditions of many people today is lack of balanced air ions in apartments, offices and factories in polluted cities.

Dr. Douglas Baker of Herts, England, states in his book, Esoteric Healing, "in laboratory tests, ion generators have produced startling mood swings in people. By inhaling negative ions, people become alert, refreshed and even euphoric… Positive ions on the other hand, produce headaches and stuffiness and mad-at-the-world complexes. These effects vanish when the air is restored to normal."

Negative and positive ions, as you can see, are under intense scrutiny as we progress further ahead in consciousness, and realize ourselves and our feelings, and how air charges really affect us.

Air pollution is not the only thing that produces a positive ion effect. Winds blowing across the deserts and dry lands produce the positive ion effect also. Other people and other doctors in different countries have seriously studied and compiled statistics during strong wind conditions. When the Santa Ana winds blow in from the desert in Southern California, the auto accident rate has statistically been shown to increase four times or more. Crime rate increases markedly. In Germany, when the winds come, the same things happen. The winds are called the Foehn. In Jerusalem, everyone is aware of the desert wind called the Sharav, the despair of many Israelis. In Arab lands, the wind is called the Hamsin, which, literally translated, means 50s, which indicates how many days the wind is believed to blow between spring and autumn. One ancient Turkish written law actually stipulated that if the Hamsin were blowing at the time of a crime of violence or passion, it should be considered legal grounds to deal lightly with the offender. According to some translations in the Old Testament, in the book of Isaiah, it refers to the Sharav as an evil, destructive, deceiving wind. Different armies in the world take the winds into serious consideration when they plan manoeuvers and the Israeli army considers the wind a natural enemy of their fighting forces. The Russians took preventative measures with their armies on the desert fronts and in 1973, AP Wire Services took pictures of Russian soldiers wearing pyramid-shaped helmets on the Manchurian border.

Another area often overlooked as a source of positive-ion poisoning is the micro-environment of automobiles. Just as the air moving across a desert strips off the loosely bound life give electrons, so does an automobile setting insulated from the earth by four rubber tires lose its electrons as it moves through the air at 50 and 60 miles per hour. How many times on a beautiful Sunday afternoon have you seen a husband and wife and the kids out for a peaceful drive, but instead of a peaceful drive, there is utter chaos going on inside the car until they stop and get out of the car. As soon as this happens, instantaneously, almost magically, the tension is gone and everyone is happy again. Then after a picnic or whatever, back into the car again and a few minutes later, confusion begins. This can be dangerous to say the least. What about flight 401 that mysteriously crashed in Florida taking all 100 lives on board? The plane records showed the aircraft to have had no malfunction. The pilots both had excellent safety records, yet suddenly, in good weather conditions, they flew a jet aircraft straight into the ground.

In Hungary, Volan Trust, a group of transportation and manufacturing companies, set staff psychologists and medical doctors to find out whether trucks and buses should be equipped with negative-ion generators. Two hundred professional drivers driving one hundred trucks and one hundred buses were put through a series of strenuous tests with all their vital signs being monitored by medical instrumentation for several weeks without negative ionizers. Then negative ionizers were installed and the extreme stress vanished, and at the end of the day, the driver still had a reserve of energy left. In addition, the drivers who were weather-sensitive did not react as they normally did during weather changes with the negative-ion generator units in their cabs.

Mercedes-Benz in Germany published several reports stating that their conclusions were similar in tests like the Hungarian research, and several other European automobile manufacturers make strong suggestions to open a wind wing window when driving or install a negative-ion generator of the type that plugs into the cigarette lighter for a greater measure of comfort and safety.

Just how, you may ask yourself, do positive ions affect you negatively and negative ions affect you positively?

This was on the mind of one Dr. Felix Sulman, who opened a clinic near the legendary Jaffa Gate in downtown Jerusalem to begin testing Sharav victims.

He advertised his proposed project on TV, radio and newspapers, and within a short time, he had several hundred people from all walks of life to experiment with. One thing all these people had in common was that whenever the winds blew, life was very uncomfortable for them and they would do anything to find out why. Dr. Sulman found that during the Sharav, their body chemistry was thrown out of balance and, based on urine samples taken twice daily, the average victim had 1000 times more serotonin in his or her bloodstream than at other times when the winds were still.

Becoming aware of similar work being done by Dr. Kruegor, Dr. Sulman recruited meteorologists and physicists to measure the electrical nature of the Sharav. On non-Sharav days, the total ion count in Jerusalem is about normal, between 1000-2000 ions of both polarities. Two days before the start of a Sharav, the positive ion count soars, and while the wind blows, it is about twice normal.

The conclusion was evident. The only unique characteristics of the Sharav were electrical disturbances that included massive dosages of positive ions, and that these ions affected weather-sensitive people to a degree where their bodies could not break the serotonin down to a harmless form.

By 1971, after ten years of work, Dr. Sulman had proven three distinct biochemical responses to the Sharav. The first was called serotonin irritation syndrome, because people were in effect being poisoned by their own bodies. The symptoms were migraines, hot flashes, irritability, sleeplessness, pains around the heart, difficulty in breathing, bronchial complaints, irrational tension and anxiety. There were also minor medical problems, including eye inflammation and loss of reaction time. This serotonin irritation group represented 43% of Dr. Sulman's patients.

The second response was labeled the exhaustion syndrome. Here the combination of the heat and positive ions left the body incapable of responding to the stress of the Sharav. What the wind does in masses of people is to stimulate the body to produce adrenaline and its companion

hormone noradrenaline, plus other body chemicals to generate energy and generally enable human beings to survive in a changed environment. For the first year or so this is stimulating and produces a state of euphoria, of tingling excitement in which anything seems possible. After a few years, however, the adrenals are tired of incessantly being called upon for extra adrenaline and become incapable of meeting the demands of the Sharav. Biochemically speaking, its victims become exhausted. Forty-four percent of the Sharav victims were diagnosed as suffering from this exhaustion syndrome.

The last condition was called the hyperthyroid response. That is the poisons from the Sharav throwing the thyroid gland out of balance. Since the secretion of hormones into the bloodstream by the endocrine glands regulates human behavior and feelings, the thyroid is a very critical gland, especially when aggravated by positive ions. In Dr. Sulman's experiments, the out-of-balance symptoms were migraine, tension, anxiety, sleeplessness and the overproduction of histamine, the chemical that aggravates allergies.

In America, at the University of Pennsylvania, Northeastern Hospital, the late Dr. Igho Kornblueh began researching the use of negative-ion treatment in burn victims. A person who has a serious burn over a large portion of his body is in a lot of pain, and in addition, in danger of a heart attack due to the dead skin cells getting into the bloodstream and causing complications in the delicate valves of the heart. As a standard treatment, medical doctors often administer a series of morphine shots to alleviate the pain, but this drug has side effects that can lead to cardiac arrest so the person being administered to was really being placed in double jeopardy.

From 1956 to 1966, Dr. Kornblueh began treating over 200 patients with varying degrees and intensities of burns, and the results were the same on all of them. The outpatients received five times a week one treatment of 25 to 30 minutes duration. Hospital patients were exposed two or three times daily for a total of one and a half hours. Painkillers were needed only in rare exceptions. In all cases, the healing was very fast, there was less scarring and thus a reduction of skin grafting in the more serious cases, and the burns dried out a lot faster. Patients with high blood pressure experienced lower blood pressure, and 63% of his patients suffering with hay fever or bronchial asthma experienced partial and total relief with Dr. Kornbleuh's negative-ion therapy.

The author, who during the 1960s worked in the Aerospace Industry with the space programs had several experiences with the government regarding the effects of materials and the resulting air ion balance. Rooms filled with plastic objects, nylon carpets, furniture sprayed with plastic polishes and the presence of certain metals such as aluminum all have a higher positive-ion count than the same room with the plastics removed and plants and wooden furniture substituted. Every space-manned capsule as a result of these findings had a negative-ion generator in it to ensure a balanced and proper attitude of the astronauts who pioneered America into deep space.

You should plainly see by now some of the effects and causes of what negative and positive ions in the air can do. The sad thing is that today, due to the combined effects of man's ignorance of air ion content and air pollution, he continues to make things worse rather than better. The ideal situation would be to have about 1000 negative ions per cubic centimeter of air, with a lesser number of positive ions, but according to Peirce and Whitson's reports from Stanford University in California, the positive-ion count is increasing annually and the negative-ion count decreasing. In 1973, when I began lecturing publicly about pyramid energy and air ions, the count was 1000 negative ions to 1200 positive ions per cubic centimeter. But by December 16, 1976, it had shifted overall in California to 1000 negative ions to 1800 positive ions, and by 1977, the count was around 1000 negative to 2000 positive.

This meant that the air had deteriorated another 30%. In Tokyo, Japan, the air ion count soared to 1000 negative ions to 3500 positive ions and many people died of positive-ion poisoning. As a result, in Tokyo today, there are oxygen masks installed on street corners to help people on smoggy days.

CHAPTER III – AIR POLLUTION AND ITS CAUSES & EFFECTS

Now, let us look at the effects of air pollution and positive ionization on a chemical level. Remember in the production of smog and positive ions, we have a chemical cause that later, with the addition of sunlight, fog and temperature inversions, makes the positive ion content what it is.

Air is a mixture of a number of gases. Each gas contains its own properties. Air is:

78% Nitrogen

21% Oxygen

0.03% Carbon dioxide

1% Argon – an inert gas

Air at one time may contain contaminates emitted by such natural occurrences as volcanic eruptions, forest fires and decaying vegetation.

Another fact often overlooked is that although the earth's atmosphere extends well into space, 95% of the total air mass is concentrated in a layer some 12 miles thick, and most people cannot breathe air without additional oxygen above 10,000 feet, or a distance of less than two miles. Secondly, the earth is 24,000 miles around at its equator and considerably less at its poles. Given this two-mile breathable atmosphere, you can see that with all the cities in the world producing smog, and with this smog being blown out to sea, or over a desert, it does not take long to bury ourselves in a sea of polluted air.

Next, let us look at sunlight. One of the things the sun's rays does is to warm our air. It accomplishes this life-sustaining act in three ways.

Radiation – The transfer of heat or light waves of energy is called radiation. Like electricity vibrating on a very short wavelength as discussed in Chapter 1, so does the sun send its light to earth. The atmosphere is heated after the sun's rays strike the ground and re-radiate as heat energy and absorbed by the water vapor in the air. This phenomenon is often spoken of as the greenhouse effect. The air acts

like a glass in a greenhouse allowing the light to pass through it but holding back the re-radiated heat.

Conduction – This is the transfer action of physical contact between the molecules of the air and of the warm earth. Much like the heating of water on a pan atop a stove, which is also the first stage of ionization. See the first part of Chapter 2.

Convection – This is transfer of heat by air masses. A simple example is that during the day, air in the desert is heating, pushing air upward and drawing cooler air inward from the mountains or the sea, and reversing at night as land cools faster than water and the hot desert air is drawn back to the sea. This is primarily where wind originates from.

MIXING DEPTH

The expanse in which the warm air rises and mixes with the cooler air – the stretch between the sunlit meadow and the height at which cooling air meets its equal in temperature – is known as the mixing depth. It delineates the upward boundary for pollution dispersion.

Seasons change the mixing depth. During the summer daylight hours in the United States, the depth usually extends several thousand feet. During the winter, when the sun gives less heat, it may measure as little as a few hundred feet.

The mixing depth varies with the time of day, too. At night, the air close to the earth is cooled by contact with it, while the air higher up stays relatively warm. Indeed, if the surface cooling is great enough, the unchanged higher air may be even warmer than the air near the earth. Then the colder, heavier air at the surface has no place to go, and the mixing depth is minimal.

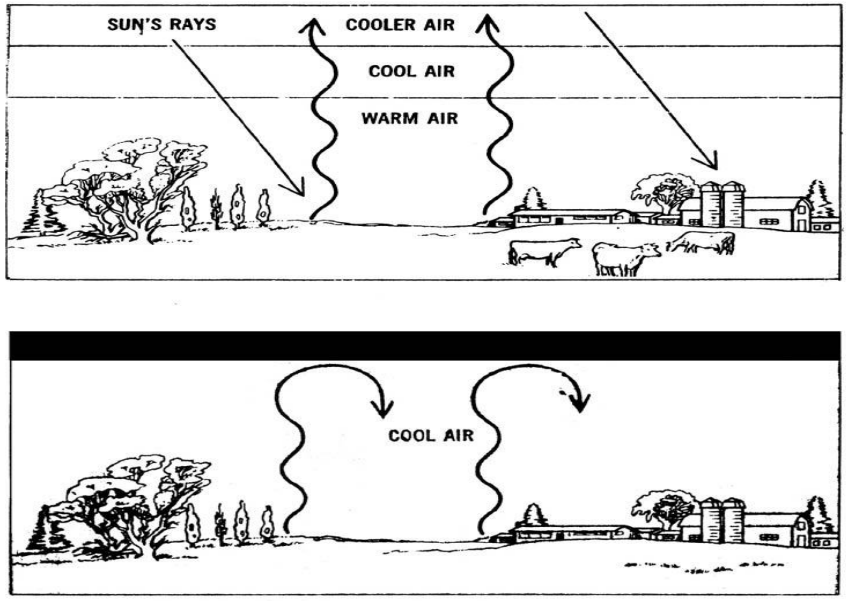
INVERSIONS

When the surface air is cooler than a layer of air above it, and it cannot rise and mix, the atmosphere is said to be particularly stable. And the phenomenon of cool surface air trapped by a layer of warmer air is known – with no little dread to modern-day city dwellers – as an inversion.

There are several kinds of inversions; the two most important are those formed by the descent of a layer of air within a high-pressure air mass and those formed by the radiation of the earth's heat into space.

The first kind, called a subsidence inversion, occurs when a layer of air within a high-pressure air mass sinks down upon an area and in so doing is compressed by the high-pressure area above and heated, while at the ground level the air is unchanged. Subsidence inversions are a common feature of the western coast of the United States for some 340 days of the year.

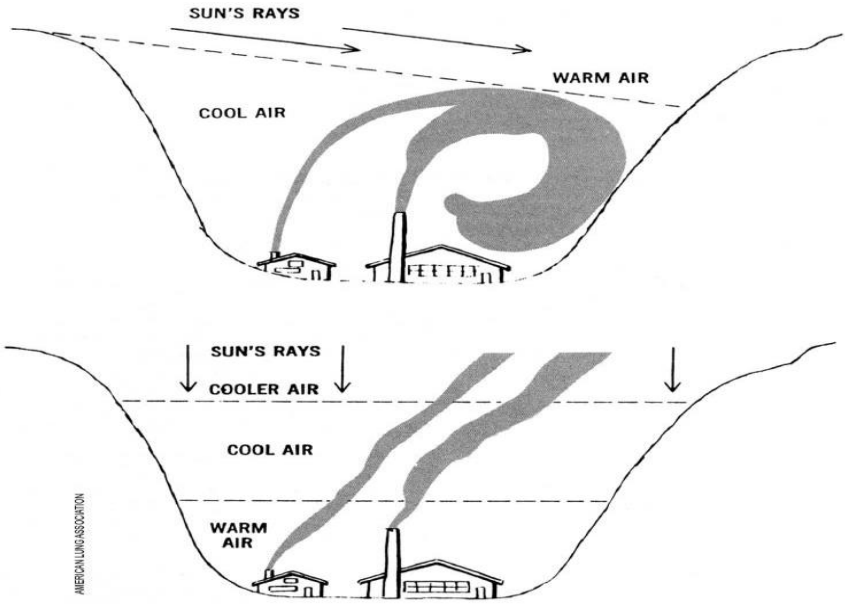
Figure III-1



EFFECT OF THERMAL TURBULENCE ON AIR CIRCULATION

At midday the sun's rays warm the earth and create an unstable condition with the warmest air at the bottom and moving freely upward (top). At night the cool earth cannot heat the surface air enough to penetrate the warm air layer above. In consequence, the surface air, with whatever pollutants it contains, remains close to the earth (bottom).

Figure III-2



EFFECT OF TOPOGRAPHY ON AIR CIRCULATION

Early in the day, the sun's rays do not reach the valley, so that the air in it remains cold and air movement is limited (top). By midday, however, heat from the sun reaches the valley, surface air is heated, and air circulation is restored (bottom).

The other important type, called a radiation inversion, is a normal night-time formation. It occurs when the ground surface radiates heat out into space and quickly cools on clear nights. In doing so, it cools the surface air. This kind of inversion breaks up as the morning sun heats the ground and reestablishes the moving currents of rising warm air.

The intensity and duration of an inversion is, like the mixing depth, affected by the season of the year. Fall and winter generally have the longest-lasting and the greatest number of inversions. The major air pollution disasters of our time – those in the Meuse Valley, Belgium; Donora, Pennsylvania; and London, England – were the outcome of inversions during fall and winter months.

Topography has its effects, too. Inversions can, indeed, be fairly constant in certain areas. In a valley, for instance, the cool air flows downward at

night along the mountains and can be trapped at the bottom by the warm air above it. And until the sun is directly overhead, the valley air may not be heated enough to break up the inversion. In Denver in the winter, for example, over half the inversions last throughout the day.

Air-trapping inversions, then, form easily. And when they form in an industrial area, they trap pollutants as well – ever-increasing quantities of pollutants.

But that's not all. In this unwelcome situation, an unbidden and undesired player may join the company. Fog may make its appearance.

FOG

It is the condensation of water vapor in the air that forms fog. Its appearance depends on both the amount of water vapor present and the temperature of the air, for it develops when the air is saturated – that is, when it can contain no more water in gaseous form.

Warm air, however, can contain more moisture than cold. So daylight 60°F air, for instance, can hold a given amount of moisture in it as water vapor; but at night, when the temperature drops to, say, 40°F, that same amount of vapor is too much for the air to contain. The vapor turns to liquid. It becomes fog. (The temperature at which a given percentage of moisture in the air turns to liquid is called the dew point.)

Fog may form in any inversion, then, if the temperature drops enough. It is especially common in river valleys. Furthermore, it accepts the presence of aerosols – the tiny suspended solid or liquid particles found in polluted air – as a personal invitation. As the aerosols cool, the moisture in the air is attracted to them; they become nuclei for fog droplets. And fog lessens the sun's ability to warm the trapped air.

Fog can do worse. It can convert harmful gases into even more harmful acids. It can transform sulfur dioxide, a by-product of burning coal or oil, into sulfuric acid. In fact, it is generally agreed that the presence of sulfur dioxide and fog was a major factor in all the famous air pollution disasters.

WIND DIRECTION AND SPEED

Inversions, of course, imply a lack of air movement. Not just the convection-caused vertical movement of air called thermal turbulence. Inversions also imply a lack of wind.

Wind, scientifically defined, is the horizontal movement of the air. Its direction and speed are determined for the most part by the character of the major winds whose formation was discussed earlier. But other influences also play a part.

The time of day, for instance. As a rule, the wind blows most lightly during the early morning hours and hardest in the early afternoon. So the morning's load of pollution – the heaviest of the day because of work-bound vehicles and freshly fired furnaces – is especially likely to linger on for hours afterward.

Wind speed changes with the seasons, too. In the Appalachians, for example, in fall and early winter, there are long periods with light or no winds. The haze is breathtakingly beautiful. But in the valleys where it hovers, a Donora, can smother.

Wind direction is also influenced by its environment. It can be affected, for one thing, by the heating ability of the terrain. An obvious example occurs at the seashore, where, in warm weather, air over the land gets hotter during the day than air over the water. The lowest layer of land air warms quickly and rises. The action induces a flow of cooler air from the sea onto the land. (This phenomenon explains the renowned sea breeze.) At night the land cools faster than the water, the air-flow pattern is reversed, and the land air moves out over the sea, under the warmer sea air.

Topography particularly affects the speed and direction of the wind. Wind passing through a gorge or over a mountain range is compressed and travels at an increased speed. Valleys or depressions have the opposite effect. Passing over them, the wind expands and decreases in speed.

Even local obstructions change the character of the wind. As the air blows over rough terrain or around buildings, it is stirred into eddies and cross-currents. It may bring a sudden faceful of dirt to a city dweller as he rounds a corner, but it reflects an aspect of nature he must cherish. For the activity, known as mechanical turbulence, scatters and thins out the pollution in the air.

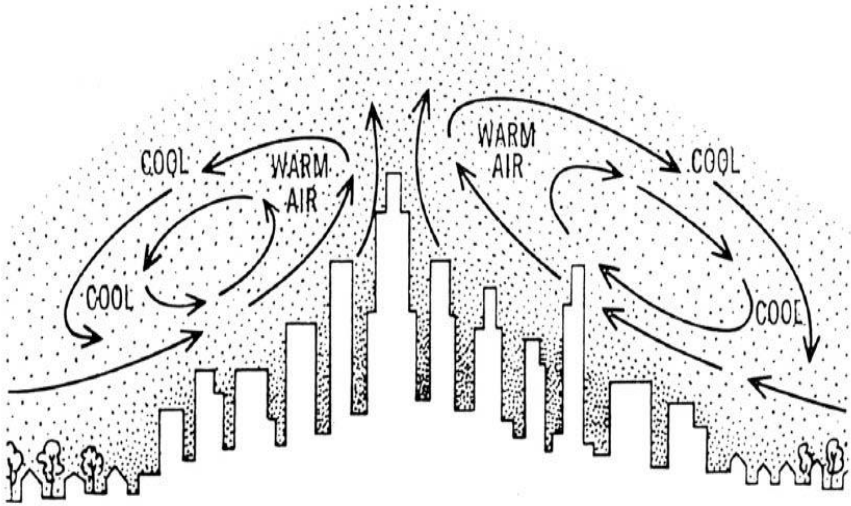
THE SPECIAL CHARACTERISTICS OF CITY WEATHER

Although mechanical turbulence is nurtured by irregular surfaces, the free flow of larger air masses, of wind, is retarded. The obstruction of wind is common to cities and, as we shall see, contributes to the dangers they engender.

The city has always lived with the atmosphere in ways different from the countryside. Because of its perpendicular buildings and its ravine-like streets, the city absorbs more energy during the day and holds onto it longer at night. The many vertical surfaces have more opportunity to collect heat, and, further, they reflect it to each other rather than back to the sky.

The resulting phenomenon is what for years meteorologists have called the heat island effect; Warm air tends to concentrate in the city's center, probably because of the mass of tall buildings. This warm air rises, carrying with it its burden of pollution; then it expands, flows outward over the edges of the city, and cooling, sinks. Cooler air from the edge of the city flows into the center to replace the rising air and is followed by the now-cooled dirty city air. A self-contained circulatory system has been set up – one that is altered only by a strong wind.

Figure III-3



AIR CIRCULATION IN A CITY, SHOWING HEAT ISLAND EFFECT

One might think that this circulatory system would assure the ventilation of a city. But it does not. Here's why:

City air contains large amounts of aerosols, tiny particles small enough to remain suspended in the air and to be moved about as the gases of the atmosphere are. As the dirty air moves up over the city, spreads out, cools, and sinks at the city's periphery, it forms a quite distinctive, recognizable ceiling known as a dust dome or haze hood.

The aerosols making up this ceiling can reflect heat back into space just as the earth does on a much larger scale. But the radiation takes place above the city. Meanwhile, the pollution-formed ceiling prevents the sun from efficiently heating the surface air. And under this ceiling, each windless day the city's air grows thicker and grimier.

NATURE'S DISPOSAL OF AIR POLLUTION

As we have seen, the dirt that man dumps into the air may be retained by natural phenomena or dispersed by them. Thermal and mechanical turbulence can mix and dilute the pollution, and the wind, if it is strong enough, can scatter it. And finally – or so it has been in the past – natural processes remove every known pollutant from the atmosphere. Some, in time, break down into harmless materials or escape into space. Rain and snow eventually wash the rest – whether in solid, liquid, or gaseous form – out of the air and into the earth's soil and water.

While nature struggles to dispose of man's aerial waste, that waste is unfortunately wreaking havoc on him and his world.

Now, let us examine some of the sources of air pollution. Air contamination of civilization falls into three main categories:

Attrition – This is the production of fine particles into the atmosphere from grinding down by friction. An example would be the wearing of tires by a car or the soles of your shoes, or grinding or sandblasting of paint off of a building.

Vaporization – Vaporization is a second source. This is the changing of a liquid to a gaseous state. Vaporization is the main cause of odors. The main menace here is exotic chemicals or gasoline that is in storage and

ventilating to balance pressure created by temperature changes through releasing toxic fumes.

Combustion – This is the main source of trouble with our air. Combustion is the process of burning, changing chemical substances mixed with oxygen for the production of energy.

Perfect combustion, which is reached only theoretically, occurs like this: A fuel is chosen that is a pure hydrocarbon – any of the many compounds of carbon and hydrogen, which are the elements that produce energy most readily. Fossil fuels are composed of hydrocarbons. (Coal, gas, and oil are called fossil fuels because they are the remains of ancient plant and animal life that have kept stored for millions of years the energy they absorbed from the sun during their lifetime.) By the application of heat, the fuel is combined with a precise amount of oxygen in the air at exactly the right temperature for a sufficient time. The result is greater heat – or energy – and the by-products are water vapor and carbon dioxide, harmless components of the air.

The body produces energy in the same fashion: The fuel is the food eaten, the oxygen comes from the air breathed in, and the by-products are water (some of which is retained in the body), carbon dioxide (which is expired), and waste materials. Imperfect combustion has taken place – the fuel was not completely usable – and the body, like a man-made furnace, has emitted polluting substances.

For, as we said, in reality, combustion is not complete or perfect, whatever the site. But different sites do produce varying emissions, and the combustion processes vary somewhat.

Furnaces, automobile engines and jet aircraft all use fossil fuels and all are not 100% efficient. An automobile engine in its most advanced state is about 28% efficient and even the most modern turbines and furnaces are less than 75% efficient. This means that whenever one of these devices is in operation it produces toxic fumes and by-products such as carbon monoxide gas and sulfur compounds. As the exhaust cools down and moves away, nitrogen dioxide is formed, which we will discuss further.

PHOTOCHEMICAL SMOG

Increasingly notorious are the multitudinous, barely understood pollution products of the photochemical process – the chemical changes due to the radiant energy of the sun – lumped together under the label of photochemical smog.

Here a differentiation should be made between two kinds of smog. The term originally referred not to photochemical reaction products but to a combination of smoke and fog such as was common in London, where coal was widely used for heating homes as well as for generating power. In Los Angeles, however, the term "smog" was adopted before the product was identified as being the result of different phenomena, and it stuck. Today, when we speak of smog, we usually mean the Los Angeles type, which results from the action of the sun on the emissions of the ever-present automobile.

The sun plays this major part because its energy can be absorbed by nitrogen dioxide in the presence of some hydrocarbons. (Carbon monoxide, incidentally, plays no part at all.) In the process, the compound separates into nitric oxide and atomic oxygen. (Oxygen is usually present in the air not as atomic oxygen, O, but as a molecule, O2.) The atomic oxygen reacts with the oxygen molecules and other constituents of auto exhausts to form a variety of products, including ozone. Ozone is harmful in itself and is also a participant in a highly complex series of continuing reactions.

Hundred of chemical transformations, thus begun, take place at different rates of speed, and continue as long as there is ozone or nitrogen dioxide and sunlight. New, equally undesirable chemicals result, including PAN – peroxyacyl nitrate – and formaldehyde. And, throughout, nitrogen dioxide is reformed and continues to function as the primary light-energy absorber.

Photochemical smog is just one – albeit a major one – of the complexities of air pollution. For although we have examined some of the processes contributing to pollution one at a time, in reality there is no such simplicity. Industrial operations and their emissions constantly combine to form a terrible tangle of dusts, mists, gases, and odors. Sorting out the individual pollutants becomes incredibly difficult – but vital.

Pollutants can exist as solid matter, liquid droplets or gas. Solid and liquid matter are called particulates. A special significance attaches to the particulate portion of air pollution. The specialness lies primarily in the size, so let us have a brief description here of particulate pollutants according to size.

It may help to know that:

– A micron is equal to 1 /1,000 of a millimeter, or 1 /25,000 of an inch.

– Viruses are between 0.01 and 0.1 micron in size.

– Bacteria are between 1 and 25 microns in size.

– Fog droplets are between 5 and 60 microns in size.

– Raindrops are between 400 and 5,000 microns in size.

– Particles over 10 microns in diameter can be seen with the naked eye.

These and the following measurements are, of course, arbitrarily simplified. Nature is more complicated, and man's categorizing is more flexible than we indicate here.

THE SIZE OF PARTICULATES

Coarse dust particles larger than 10 microns in diameter and fly ash composed of the impurities remaining after coal is burned settle out of the air quickly. They are, therefore, troublesome, for the most part, only near their source.

Fume, dust, and smoke particles, ranging in size from under 1 up to 10 microns, travel farther, the distance covered depending mainly on their size.

Particles less than 1 micron in diameter (generally referred to as aerosols because they are small enough to remain suspended in the air) move as easily and as far on wind or air currents as gases do.

Polluting particles are composed of a variety of substances from the myriad activities man undertakes. Because their size and, to a lesser degree, their state influence their behavior so greatly, they are often identified as follows, rather than by their chemical names:

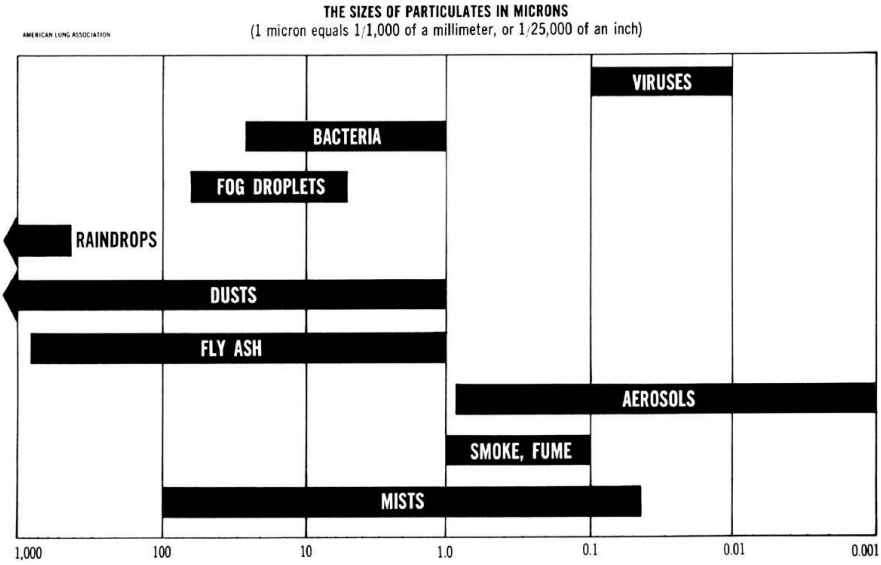
Smoke describes both solid and liquid particles under 1 micron in diameter. It can be produced during all forms of combustion and in such other processes as distillation, the removal of impurities from liquids by heating them to boiling point and then condensing the vapors. The designation "smoke" may include "fume".

Fume indicates the solid particles under 1 micron in diameter that are formed as vapors condense or as chemical reactions take place. Fumes are emitted by many industrial processes, including smelting and refining.

Dust is a more general term than fume. When solid particles are more than 1 micron in size, they are generally referred to as dust. Dust may be formed by natural attrition or in innumerable industrial and agricultural processes.

Mist is made up of liquid particles up to 100 microns in diameter. They may be released industrially in such operations as spraying and impregnating or formed by the condensation of vapor in the atmosphere or by the effect of sunlight on automobile exhaust. As mists evaporate, more concentrated liquid aerosols are formed.

Figure III-4



THE PREVALENCE OF PARTICULATES

The urban atmosphere is choked with particulates. Los Angeles estimates its aerosol emissions from gas-powered vehicles at 40 tons a day. An average winter day in New York City produces an estimated 335 tons of particulate matter. In Kansas City, dustfall in the winter measures more than 67 tons a square mile a month. In the most heavily polluted parts of heavily polluted cities, from 50 to more than 100 tons of particulates fall each month per square mile. In general, the concentration of aerosols in the air over a city is related to the size of its population.

Automobile exhaust – not confined to the city but a great contributor to its pollution nevertheless – emits especially large amounts of very fine aerosols. More than two-thirds of automobile emissions are between 0.02 and 0.06 micron in size. In the photochemical process, 100 billion particles per cubic meter of air may evolve.

THE PROPERTIES OF PARTICULATES

When a liquid or solid substance is emitted to the air as particulate matter, its properties and its effects may be changed. Secondary particulates – those created in the atmosphere by the reaction of gases to each other – may also have very different properties from the original substances. And secondary particulates are of great importance. In Los Angeles, for example, about 35% of the particulate matter is formed by the reaction of gaseous pollutants.

Whether primary or secondary, atmospheric particulates have some significant characteristics

- Very small aerosols (from 0.001 to 0.1 micron in diameter) can act as nuclei on which vapor condenses relatively easily. Fogs, ground mists, and rain may be thus increased and prolonged.
- – Particles less than 2 or 3 microns in size – about half (by weight) of the particles suspended in urban air are estimated to be that small – can reach deep into the part of the lung that is unprotected by mucus, and can attract and carry such harmful chemicals as sulfur dioxide with them. Sulfur dioxide alone would be dissolved on the mucus before it reached that vulnerable tissue.

- – Particulates can act as catalysts. (Catalysis is the process in which the chemical change of a compound is brought about or sped up by an outside substance that remains unchanged itself. The unchanged substance is known as the catalyst.) An example of this characteristic is the change of sulfur dioxide to sulfuric acid, helped on by catalytic iron oxides.

Aerosols can absorb radiant energy and conduct heat quickly to the surrounding gases of the atmosphere – gases that are incapable of absorbing radiant energy by themselves. As a result, the air in contact with the aerosols becomes much warmer. Some scientists now fear, indeed, that the increasing aerosol emissions of jet planes high in the troposphere may eventually form a heat-absorbing veil that will lessen the penetration of the sun's rays to the earth.

Particulates, it appears, do a lot more than soil our clothes.

THE SOURCES OF POLLUTANTS

The latest federal figures list the major sources of pollutions as: 1) transportation of all kinds; 2) fuel combustion in stationary sources (this category includes both fossil-fuel power plants and space heating of all building; 3) industrial processes; 4) solid waste disposal; and 5) miscellaneous (this includes controlled agricultural- and forest-burning, solvent and gasoline evaporation, and the accidental pollution of burning coal refuse piles and forest fires). These figures also give the estimated amounts of pollution from the major pollutants: carbon monoxide, particulates, sulfur oxides, hydrocarbons, and nitrogen oxides.

Figure III-5

ESTIMATED EMISSIONS OF AIR POLLUTANTS, NATIONWIDE 1971
(in millions of tons per year)

Source	Carbon Monoxide	Particulates	Sulfur Oxides	Hydrocarbons	Nitrogen Oxides	Source Total	Source Percentage
Transportation	77.5	1.0	1.0	14.7	11.2	105.4	50.6
Fuel combustion in stationary sources	1.0	6.5	26.3	.3	10.2	44.3	21.2
Industrial processes	11.4	13.6	5.1	5.6	.2	35.9	17.2
Solid waste disposal	3.8	.7	.1	1.0	.2	5.8	2.8
Miscellaneous	6.5	5.2	.1	5.0	.2	17.0	8.2
All Sources	100.2	27.0	32.6	26.6	22.0	208.4	100.0

Source: Environmental Protection Agency

Statistics of this kind are impressive, but the knowledge gained from the figures has a very limited use, especially since local figures are likely to differ from national ones. At times it is valuable to know the amounts of pollutant emissions in proportion to the amount of air – that is, the number of parts of the pollutant for each million parts of air (abbreviated as ppm) or the number of micrograms of pollutant for each cubic meter of air (abbreviated as mg/m3). This information is necessary when standards for control are being set, when the effectiveness of control methods are being assessed, or when an evaluation is being made of the danger present at any given time. For example, it is useful – and encouraging – to know that these latest figures finally show a fall in estimated total pollution from 281 million tons in 1969 to 208 million tons in 1971.

But the knowledge can have little meaning per se. For one thing, the concentration in the air at a specific time and place is as important as the total amount emitted over any lengthy period, at least for setting controls.

Moreover, comparing pollutants in terms of either parts per million or tons per day is misleading, because the undesirability of any pollutant may have little to do with the amount present in the atmosphere. This is recognized in Los Angeles County: The presence of 0.2 ppm of ozone (two-tenths of one part of the pollutant in a million parts of air) in its atmosphere at any time brings on the first alert of their air pollution warning system, but 40 ppm of carbon monoxide is necessary to elicit the same response.

The amounts of contaminating emissions, then, are details that must be ascertained and considered for each source in each community. As background, however, there is a large and complex body of knowledge concerning the processes connected with different industries. Such knowledge includes the many kinds of activities involved in each industry's production, and the various pollution problems those activities generate; the information is used as a basis for measuring and controlling unwanted emissions.

POLLUTANTS: THEIR CHEMICAL PROPERTIES

By this time the names of the grand offenders of our civilization – the major air pollutants – will have become familiar. This chapter takes a

closer look at them, however, to reveal their birth, their parentage, and their behavior.

SULFUR AND ITS COMPOUNDS

Sulfur (chemical symbol – S), whose oxides are a major reason for many cities' pollution troubles, is itself a non-metallic element found in nature either free or combined with other elements. It is almost invariably present as an impurity in the coal and fuel oil that are basic to most combustion processes.

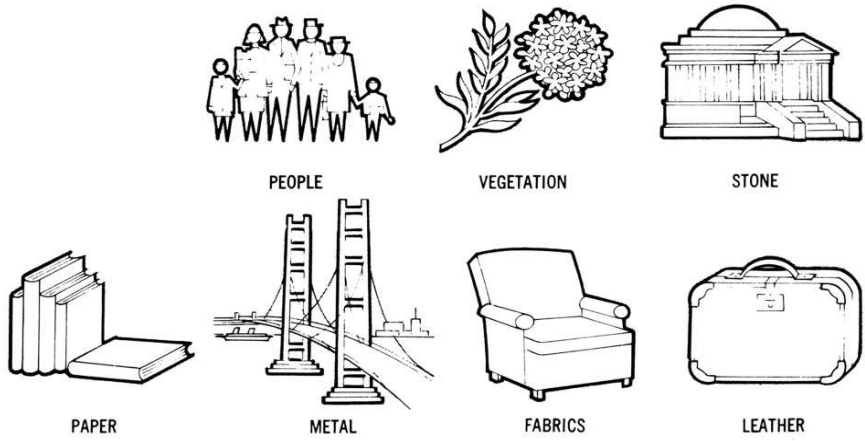
Sulfur Oxides. When fuels containing sulfur are burned, the sulfur joins with the oxygen of the air, and gaseous oxides of sulfur are by-products. Fuel combustion is the major source of the polluting sulfur oxides, although they are also produced in chemical plants and, to a lesser degree, by processing metals and burning trash.

The major oxide of sulfur that is produced in combustion is sulfur dioxide (SO2), a heavy, pungent, colorless gas that combines easily with water vapor to become sulfurous acid (H2SO3), a colorless liquid. Sulfurous acid, mildly corrosive, is used as a bleaching agent in industry; as a pollutant, it can perform that gratuitous task of adding yellow spots to the paint on your automobile. It joins easily with the oxygen in the air to become the even more corrosive, irritating mist Sulfuric acid (H2SO4).

Sulfuric acid can also be reached by a different route. Sulfur dioxide can be oxidized – that is, changed chemically by combining with oxygen – to sulfur trioxide (SO3), which can be a colorless liquid or a white solid aerosol. Sulfur trioxide is a likely product when combustion takes place with excess oxygen. The change is abetted by the catalytic action of some of the ash residue, especially the iron oxides that form on boiler tubes and walls.

Figure III-6

SULFUR OXIDES CAN HARM



As sulfur dioxide leaves the smoke stack, it is usually diffused rapidly, so that oxidation to sulfur trioxide takes place rather slowly. But with time, sulfur trioxide can build up substantially, and it reacts very quickly with water vapor and becomes…sulfuric acid.

Sulfur oxides can yellow the leaves of plants, dissolve marble, and eat away iron and steel. They can limit visibility and cut down the light from the sun. And though sulfur oxides alone may have only an irritant effect on man's breathing, sulfuric acid and particulate sulfates – compounds resulting from the reaction of sulfuric acid with a metal or an alcohol – appear able to do significant damage to the respiratory system.

Other Sulfur Compounds. There are other undesirable sulfur compounds. Hydrogen sulfide gas (H2S) carries the foul smell of rotten eggs. And a group of gases called mercaptans have such unpleasant odors as garlic, onions, skunk, or decayed garbage – even at low concentrations. These gases are familiar by-products of, among other things, petroleum refining, kraft-pulping for paper production, and various chemical processes.

In addition to giving off the noisome odor, hydrogen sulfide can tarnish the housewife's silverware and copper bowls. And by darkening the lead in paint, it can ruin the exterior of her home. But at least there is rarely enough hydrogen sulfide in the air to harm either vegetation or man.

CARBON AND CARBON OXIDES

Carbon (C) is a non-metallic element found either in its pure state or as a constituent of coal, petroleum, limestone, and other organic and inorganic compounds. (The term organic is used to describe most carbon-containing compounds.) Carbon is widely used as a fuel constituent, and the combustion process gives off a great deal of it, either as unburned or partly burned particles or as carbon monoxide or carbon dioxide.

Soot. Carbon particulate matter, a product of incomplete combustion, is known as soot. One of the most prevalent of solid pollutants, it is made up of very finely divided carbon particles clustered together into long chains. Because they are so fine, the particles have an exceptionally broad surface in proportion to their weight. It is a very active surface, too, and attracts a great variety of chemicals from the air around it.

The ability to attract other substances makes soot not only prevalent but dangerous. Certain hydrocarbons that are known to produce cancer in animals can be adsorbed on – that is, attached to the surface of – soot particles, and ride with them from the scene of combustion into the atmosphere. And many soot particles are small enough to carry their dangerous burden deep into the human lung.

Carbon Monoxide. Another product of incomplete combustion is carbon monoxide (CO), a colorless, odorless gas. Large amounts can be fatal. Lesser amounts can produce fatigue, headache, confusion, and dizziness.

The effects of this gas in urban air are uncertain. In the laboratory, an eight-hour exposure to 10-15 ppm impairs the ability to judge time intervals. At 30 ppm, vision and physical responses are affected. Under actual driving conditions it is likely that people can compensate for some of these effects by increased attention. For those with heart disease, however, even these levels can be harmful, because the blood prefers carbon monoxide to oxygen, and the heart has to pump harder to get enough oxygen to the body. A recent 15-day survey found that people in moving vehicles in heavy traffic are at times subject to sustained levels of 50 ppm of carbon monoxide.

Atmospheric levels of carbon monoxide do not appear to have any adverse effects on vegetation or materials.

Carbon Dioxide. It is when combustion is complete that carbon dioxide (CO2) – a heavy, colorless, odorless gas – is formed. It is also formed in nature by the decomposition of organic substances, and it is absorbed from the air by plant in photosynthesis.

Carbon dioxide is not normally considered an air pollutant, because it plays a necessary part in life processes. Even the rising amounts produced by man's activities are far from enough to endanger him.

But carbon dioxide does have its effects. In the presence of moisture it converts to carbonic acid and erodes stone. It is partially responsible for the corrosion of magnesium and perhaps of other structural metals as well. And it is believed that the huge amounts of carbon dioxide emitted each day are very slowly heating the earth's atmosphere. In time, some scientists fear, this scarcely perceptible rise in temperature may cause the partial melting of the polar icecaps. The ensuing floods could wipe out man's world. (Perhaps the heating from carbon dioxide will be canceled by the cooling effect of particulates from jet planes, mentioned on page 55.)

HYDROCARBONS

Hydrocarbons are a class of compounds containing carbon and hydrogen in various combinations. They are found especially in petroleum, natural gas, and coal. Some are gaseous, some liquid, some solid, and all in all they make up a vast family of chemicals. There are, in fact, over a thousand hydrocarbon compounds.

Most of these compounds, luckily for man, are harmful only in very high concentrations. A few may be very harmful indeed, however, and need to be examined with a suspicious eye.

Two groups of hydrocarbon compounds seem to be of the greatest importance in pollution – (1) the olefin of ethylene series and (2) the aromatic, benzenoid, or benzene series.

Olefins. The olefins are a group of unsaturated hydrocarbons. (Unsaturated compounds react easily with other chemicals.) Most olefins appear to have no direct effect on animal life, although some cause a general reduction in plant growth and a drying-out of orchid sepals. In addition, olefins take part in the photochemical reaction along with

nitrogen oxides and several other classes of compounds. The deleterious effects of those reactions are catalogued later in this chapter.

Aromatics. Included in the aromatics are a number of compounds believed or known to be carcinogenic (cancer-producing). The most potent of them is benzopyrene (often written benzo(a)pyrene or 3, 4 benzopyrene). A primary source of these carcinogens is the incomplete combustion of organic materials.

In fact, most polluting hydrocarbons, not just the carcinogens but other aromatics and olefins as well, are discharged into the air by incomplete combustion. And the major source of this kind of contamination is the burning of gasoline in automobiles.

Hydrocarbons can also be released into the atmosphere by evaporation. The oil industry encompasses many operations that produce hydrocarbon vapors; among them are cracking (the chemical decomposition of oil under intense heat), gasoline storage, and tank truck-filling. Nor are refineries the only villains. Alcohols, ethers, and paint and lacquer thinners are constant vapor emitters. Some hydrocarbon vapors have objectionable odors; some can probably take part in photochemical reactions; most are poisonous. But concentrations are unlikely to stay in the atmosphere long enough to be poisonous. At this point in our knowledge, combustion seems to be a greater threat than evaporation.

NITROGEN OXIDES

Nitrogen (N) itself is a colorless, tasteless, odorless gas that constitutes 78 percent of our atmosphere. In spite of its general benignancy, however, some of its oxides give us trouble.

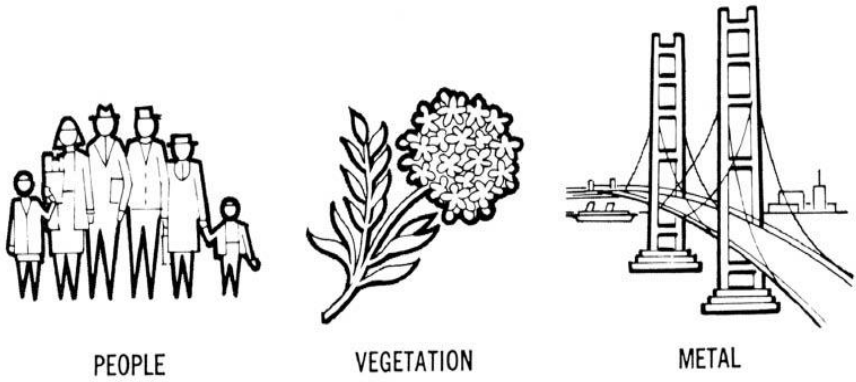
There are a number of oxides of nitrogen, but only two are considered pollutants – nitric oxide and nitrogen dioxide. These have been called status symbol or jet-age pollutants, because, ironically, only a highly advanced country is likely to suffer seriously from them.

Nitric Oxide. The colorless, somewhat toxic gas nitric oxide (NO) is formed when combustion takes place at a high-enough temperature to cause a reaction between the nitrogen and oxygen of the air. Temperatures this high are reached only in, efficient combustion processes or when combustion takes place at high pressure. So nitric

oxide is formed primarily in automobile cylinders, electric power plants, and other very large energy-conversion processes.

Figure III-7

NITROGEN OXIDES CAN HARM



In most cities, our familiar foe, the automobile, is the largest single source of this compound. The nitric oxide formed at the high temperatures of the cylinder air moves so rapidly to the cooler exhaust pipe that it is prevented from decomposing back to nitrogen and oxygen, as it would if cooling were slower.

Nitrogen Dioxide. Nitric oxide, relatively harmless, is the form generally emitted into the atmosphere. But varying amounts of nitric oxide are converted to nitrogen dioxide (NO2), which is a considerably more poisonous gas.

The oxidation of nitric oxide to nitrogen dioxide is very rapid at high concentrations in air, but it is slow at low concentrations except in the presence of hydrocarbons and sunlight. For example, though more nitric oxide is formed in Chicago than in San Francisco, the California sunlight results in San Francisco's having more nitrogen dioxide than Chicago.

Since nitrogen dioxide is formed so readily by photochemical action, it is usually thought of as a product of the photochemical process. But actually it may be formed whenever nitric oxide is a byproduct of sufficiently high burning temperatures, with or without photochemical action. And it is also a product or by-product of a number of industries, including fertilizer and explosives manufacturing.

Nitrogen dioxide is the only important and widespread pollutant gas that is colored yellow-brown. As a result, it can significantly affect visibility. In addition, it has a pungent, sweetish odor that is detectable at 1 to 3 parts per million – a level sometimes reached in polluted air.

Prolonged exposure to nitrogen dioxide, even at ordinary concentrations, is probably harmful to the lungs. A study of second-grade schoolchildren in Chattanooga showed that the breathing ability of those who lived in an area of high nitrogen dioxide – comparable to Chicago's – was significantly lower than that of children living in areas where the pollutant level was low. Tests with rabbits, furthermore, show that continuous exposure to nitrogen oxides, in concentrations equivalent to those found on Los Angeles freeways, severely diminishes the oxygen-carrying capacity of the bloodstream.

Nitrogen dioxide can also harm vegetation, both visibly and by inhibiting growth. And, with water vapor, it becomes metal-corroding nitric acid (HNO3).

FLUORIDES

Fluorine (F), a gas, is never found in its pure state in nature. Fluoride compounds, however, occur in vegetation and in most ores, clays, and soils in small or large amounts.

Fluorides may be either gaseous or solid emissions of such industrial processes as the manufacture of fertilizer and aluminum, iron-ore smelting, and ceramics production. The aluminum and fertilizer industries have been having fluoride problems since they came into being.

Airborne fluorides can damage vegetation. Furthermore, some plants can concentrate and accumulate these fluorides, and then livestock eating the plants as forage can become ill. The result is that, although there is usually not enough fluoride in the air to harm the farm animals that breathe it, continued fluoride pollution, even at low levels, can build up and poison their food.

Fluorides ingested at low levels are good for the bones and teeth of both animals and man. That is why public water supplies are often fluoridated. There is some question, however, as to whether man's total intake of fluorides from food, inhalation, and fluoridated water in unforeseeable

amounts will not have adverse effects on his health. At any rate, close to an industrial source of fluoride pollution, man may be subject to eye and skin irritation, inflammation of the respiratory tract, and breathing difficulty.

THE PRODUCTS OF PHOTOCHEMISTRY

The numerous references to photochemical reactions indicate the extent of this polluting smog. Once it was thought to concern only Los Angeles; now it is seen dimming the skies over city after city across the country.

The way the photochemical reaction works was briefly described in this chapter, and during the course of discussing nitrogen oxides and hydrocarbons, some of its drawbacks were revealed.

There are others: In general, one or more smog products, either alone or in even more potent combinations, can cause eye irritation, breathing difficulty, vegetation damage, deterioration of materials, and decreased visibility.

The contribution of every participating chemical has not yet been explained, and some chemical reactions are probably still unknown. But some of the actors in this too-frequent performance are recognized.

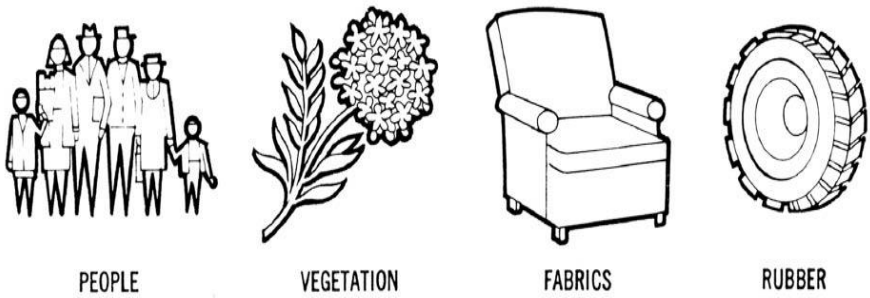
Oxidant. One actor – the star, in fact – is oxidant. This is a term used by many air pollution-control people in two ways: One describes the capacity of certain oxygen-containing substances to react chemically in polluted air to form new products. In this sense, oxidant is a measure used to determine how much smog formation is going on. The other way the term is used is to describe the chemical substances that make oxygen available for this reaction.

Rightfully, any oxygen-bearing compound – such as nitrogen dioxide – that takes part in the photochemical reaction deserves the name of oxidant. But ozone is the chemical whose name is used almost interchangeably with oxidant. This is because ozone is an early and continuing product of the photochemical smog reaction, and the presence of ozone in the air assures the continuation of the oxidizing process. For these reasons, ozone is the chemical whose presence is used to measure the oxidant level of the atmosphere at any time.

Ozone. As we said, early in the photochemical process ozone (O3) – a colorless, pungent gas – is formed. Ozone is an allotropic form of oxygen. This means that it is the same element as oxygen and will react chemically to form the same compounds, but its composition is different: A molecule of ozone consists of three atoms of oxygen instead of two as in ordinary oxygen. And, quite unlike oxygen, ozone can cause coughing, choking, headache, and severe fatigue; in animal studies, it has been shown to lower the body's resistance to infection; it can damage the leaves of plants; and it can crack rubber, deteriorate fabrics, and fade colors.

Figure III-8

OZONE CAN HARM



PAN and Aldehydes. Another smog product often mentioned is PAN – short for peroxyacyl or peroxyacetyl nitrate. Although it has been studied for only a few years, it is known to make the eyes burn and tear, it seems to have the same irritating effect on the lungs as ozone and other oxidants, and it can damage plants.

Still another group of photochemical smog products chalked up against the automobile are the aldehydes. They result from the union of some hydrocarbon compounds with oxygen. They are colorless, may be either gaseous or liquid, and have a suffocating, pungent, irritating odor. They, too, are powerful irritants of the eyes, skin, and respiratory tract.

Aldehydes, besides being produced in smog reaction, are present in the direct exhaust emissions of automobiles, for aldehydes are among the products of incomplete combustion of all fuels.

OTHER POLLUTANTS, OTHER DANGERS

Any objectionable material can become a pollutant if it escapes into the atmosphere. Many substances whose effects are either ignored or not yet proven to be dangerous are today allowed to do so.

Lead. One of these substances is lead (Pb), a metallic element. Lead occurs naturally in soil, rocks, water, and food; only a small fraction of it contaminates the air. The estimated average daily intake of lead in food is substantially greater than the intake from air pollution. But – an important point – only from 5 to 10% of the lead ingested with food is retained by the body.

As an air pollutant, on the other hand, lead is present in the form of particles so small that as much as 50% of what is inhaled may be retained. Not only is it released from smelters, from combustion of certain fuels, and from dusts and sprays, but, because of its addition to gasoline, automobile exhausts send out large amounts of it into man's daily atmosphere.

The specific harm to human beings that can be laid at the door of airborne lead is still being argued. But federal regulations now require that lead in gasoline be gradually reduced, so we will be subjected to less potential harm while argument and investigation go on.

Beryllium. Another poisonous metallic element is beryllium (Be). It is increasingly used by industry as a valuable component of alloys. Beryllium's major target is the respiratory tract. Cases of beryllium poisoning – many of them fatal – have occurred not only among workers in plants using the metal but also among people who live near beryllium-processing plants. This element is one of the first to be designated a "hazardous air pollutant", for which, under federal law, national emission standards must be set.

Arsenic. Still another exceedingly well known poison is arsenic (As), a solid element. It is suspected of causing lung cancer in workers at copper smelting plants, in people living close by such plants, and in agricultural workers who are exposed to pesticides.

The use of arsenic in agricultural sprays is increasingly restricted by safety regulations, but metal smelting remains a major source of this pollutant, and its possible chronic effects continue to be studied.

Asbestos. The commercial name asbestos is applied to several mineral compounds widely used in brake linings, roofing, insulation, and household tiles. These uses involve almost constant wear, so asbestos dust must inevitably reach the environment.

Asbestos is a recognized and serious hazard to those who work with it. It is associated with a number of lung diseases, including cancer. Asbestos workers who smoke cigarettes, incidentally, have a far greater incidence of lung cancer than those who do not. To what extent asbestos dust affects the community has not yet been determined. But it has already been officially recognized – it is another of the "hazardous air pollutants" on the first federal listing.

And Others. Still other substances – cadmium (known to be a respiratory poison), plastics (whose disposal by burning may create highly toxic by-products), mercury (the third of the substances first named "hazardous air pollutants"), vanadium, nickel, manganese, and chromium – are being investigated for their possible complicity in the air pollution of urban areas. Communities situated close to major extracting or smelting plants or large incinerators are right now exposed to air tainted by these materials.

Purposeful Poisons. Man must also concern himself with the poisons he deliberately puts into the air – the agricultural sprays and dusts, the pesticides, fungicides, herbicides. Certainly they can serve him well. Consider the increased productivity of farmland and the almost complete elimination of the malaria-bearing mosquito.

But these chemicals are toxic, both to man and to many other forms of life, and they are destroying much that was not meant to be their target, often at great distances from the intended site of application.

For once exposed to the air, these poisons are subject to the implacable rules laid down by weather and topography. If they are long-lasting, like DDT, they are washed out by rain into the earth, the rivers, and the seas, and they can continue to poison innocent fish, birds, animals, and – directly or indirectly – man. So we must add them to the list of air pollutants, study their effects, and make provision for their control.

THE HEALTH EFFECTS OF POLLUTION

What happens inside your body when we breathe in these pollutants along with the vital oxygen? Let us examine ourselves further.

THE DIFFICULTY OF FINDING ANSWERS

Some of the ill effects of air pollution have long been public knowledge. Pedestrians knowingly curse the smog as they wipe the tears from their burning eyes. Auto drivers hopefully roll up their windows when traffic fumes threaten to suffocate them. Asthmatics fearfully expect an attack when an inversion sets in.

And, from time to time, the ill effects become headlines, as in Donora, Pennsylvania, in 1948, when almost half the inhabitants were sickened. But even in disasters, the culprit is hard to pin down. Most of the people who sickened or died were already ill. It has been difficult indeed to determine whether air pollution does any lasting damage to healthy people. Or if, in the customary little doses, it does much damage to anyone at all – even to the people with heart or lung diseases who are known to be vulnerable.

To define the ill effects of air pollution, scientists would like to know what substances in the air are harmful and in what way, in what concentrations and combinations, at what times of day or season, at what length of exposure, and for which groups of people.

Yet even the basic testing of a sample of air has its difficulties. For the sample cannot be exactly the same as one taken from the next block, from a hundred feet higher, or at a different time of the day or year.

And the constantly changing air is inhaled by different people – old, young, well, sick, tense, or underfed; people with different jobs, from traffic officers who work outdoors to executives who step from air-conditioned car to air-conditioned office.

Other complicating factors are inherent in chemical reactions. Synergism, for example. Synergism is the far greater reaction of the body to a combination of chemicals than the total reaction expected from the chemicals acting independently. The effect on the lungs of sulfur dioxide carried on a benzpyrene aerosol is a synergistic one. And the effects of cigarette smoking and air pollution together may be another.

There may also be a subtractive process. One pollutant chemical may cancel out another, thereby reducing the effect each may have had alone. Such a process nay account for negative reactions in situations where positive ones were expected. For example, small amounts of sulfur dioxide in the air appear to lessen the effects of oxidant on plants.

The possibility also exists of body-built resistance to long-term pollution. One study of people who were regularly exposed to sulfur dioxide in the course of their work, for example, indicated that they experienced little or no irritation of the respiratory tract. (Another study, on the other hand, associated repeated exposure with increased sensitivity).

Despite all the uncertainties and variables, a great deal has been learned. And, although no simple cause-and-effect relationship has been found between, say, sulfur dioxide and emphysema, evidence piles up, and understanding of the effects of air pollutants on the health of human beings slowly widens and becomes more convincing.

RESEARCH METHODS

Several sources for evidence are available to the scientists; retrospective examination of industrial accidents and acute air pollution episodes, epidemiological and clinical studies – often hand in hand – and controlled laboratory investigations. But none of these methods, alone, can offer clear-cut answers. Let us see why.

Epidemiological Surveys. Epidemiology deals with the study of a disease as it affects a community rather than an individual. It concerns itself with the distribution and incidence of the disease; mortality and morbidity rates, and the relationship of climate, age, sex, race and other factors.

Epidemiological surveys can be – and have been – used to measure the relatively long-term effects of living in an area subject to air pollution. They are valuable because they are concerned with real people exposed to the variety and complexity of a real environment. But, even if carefully planned, epidemiological surveys are limited by precisely that reality. The health of an individual, after all, responds to many things. Some are the variables of the environment, such as weather, industry, and traffic; others are peculiar to him, such as his occupation, age, sex, and smoking habits. (Cigarette smoking is so important a factor in chronic respiratory disease that it may cloud or even conceal the effects of polluted air.)

Epidemiological studies alone, therefore, cannot prove a cause-and-effect relationship. An association can be inferred, however, between a given exposure and a given effect, and the inference can be backed up with corroborating facts established by other methods.

Clinical Studies. Some investigations concern themselves with the disease process in the living subject. They are known as clinical studies, and can provide backing for epidemiological surmises. Clinical studies can be especially valuable today because of precise pulmonary function measurement techniques. With the aid of such special methods, careful observations of patients can add immensely to the general impressions of the effects of pollution.

Industrial Research. The requirements of industrial hygiene have also provided data that, in the past, had a strong influence on our judgement of what chemicals were harmful. But exposure criteria based on industry's knowledge may be neither adequate nor pertinent. Much of what was discovered was based on studies made only on healthy adult males, using chemicals rarely found in the average atmosphere in the tested form or concentration. (Industrial accidents, however, did give us enough information to warrant caution in new uses of known poisons.)

Laboratory Experiments. Laboratory experiments, too, illuminate potentially damaging processes. True, they are limited because the subjects are not always human and the situation is unreal. But they do allow experimentation with what may be dangerous combinations of contaminants found in various real situations. And such investigations can support the theory of a relationship between air pollution and disease, and demonstrate the complexity of that relationship.

Accidents. Finally, lessons are learned from accidents. Industrial accidents have supplied us, willy-nilly, with much proof of the danger of polluted air. One such accident took place in Poza Rica, Mexico. There, one morning in November, 1950, an accident at the sulfur-producing factory spilled hydrogen sulfide into the atmosphere during a for-patched inversion. The lesson was swift and impressive: Within a half-hour enough hydrogen sulfide escaped and remained in the air to kill 22 people and caused 320 to be hospitalized.

Other accidents are even more infamous – and more educational. These are the disasters in which, under certain weather conditions, air pollution

caused by the ordinary activities of an industrialized area quite clearly brought illness and death to large numbers of people. But these acute episodes, too, have their shortcomings as teaching devices.

Their lessons are not applicable on a wholesale basis, since they are rare occurrences and pollution is a daily menace. Besides, the majority of them occurred before science was prepared to assess them accurately by the sophisticated techniques now available.

Epidemiological and clinical studies, laboratory experiments, industrial research, and accidents – these are the parts of knowledge. Even put together, however, these pieces of information may not be proof-positive of direct cause-and-effect relationship. For methods differ from study to study, each trying to test its own hypothesis, and, as a result, proof tends to spread out rather than pile up cumulatively.

The conclusions that follow, nevertheless, are generally accepted and are based on the totality of today's knowledge. Let us look, then, at what we know. It is impressive.

THE ACUTE EPISODES

It was probably the shock of the notorious air pollution disasters, which swept in a wave of acute illnesses and sudden deaths, that first stripped the smokestack of its glory. And turned what was a monument to progress into a gravestone for the dead.

Meuse River Valley, Belgium. The first of the tragedies to arouse worldwide concern occurred in Belgium, in the Meuse River Valley, where a heavily industrialized area extends for some 15 miles. The terrain has a valley topography, typically lending itself to inversions. In retrospect, it is no surprise that the Meuse Valley suffered exceedingly when all of Belgium was blanketed by a thick, cold fog in the first week of December, 1930. Trapped by the inversion, the pollutants gathered day after day, and stagnated. Within a few days, thousands fell ill; 60 persons died from the poisoned air. The dead were mostly the elderly and those already very ill from diseases of the heart or lungs. Those who merely sickened complained quickly of coughing and shortness of breath.

Donora, Pennsylvania. Donora was the victim of a similar situation. The town, crammed with industry, is located in the Monongahela River

Valley. In October, 1948, during an inversion that covered a wide area of the northeastern United States, Donora had its tragedy. Among a population of only 14,000, close to 6,000 fell ill. Instead of the normal two deaths for the period, the fog and pollutant-filled inversion produced 20.

Again, the elderly were hit harder and oftener; again, existing heart or lung disease was a frequent concomitant; and again, most people coughed – although they also suffered from sore throats, chest constriction, headaches, breathlessness, burning and tearing eyes, running nose, vomiting, and nausea.

London, England. The fogs of London are notorious. So is the pollution. For centuries Londoners heated their homes with soft coal in open fireplaces. The resultant smoke and fog – the old original "smog" – combined with the modern contaminants of an industrial city to leave their mark on its inhabitants during a five-day inversion in December, 1952. This time the deaths of 4,000 people were chalked up to the noxious air.

Give that special London air credit for sickening people, too. More than twice as many as usual. The normal number of weekly applications for emergency-bed service in December in London is about 1,000, but during the 1952 episode the weekly number was more than 2,500. Nor did the number of applications subside to normal for two to three weeks afterward.

And once more, both illness and death struck oftener at those with pre-existing heart and lung conditions.

London has had other incidents: Six had been recorded earlier, as far back as 1873, with deaths attributed to them totaling over 25,000. It is possible, furthermore, that only the precautions brought about by these earlier calamities kept mortality figures down in a similar inversion in December, 1962. At that time the deaths of a mere 750 people were laid at the door of polluted air.

New York City. Meuse Valley, Donora, London – these were the great and, we hope, bygone disasters. But other areas doubtless harbor their unnoted tragedies, awaiting only the probing eyes of the epidemiologists.

New York City has such probers. According to them, air pollution episodes took place in 1953, 1962, 1963, and 1966. By comparing mortality figures over a number of years, the probers concluded that in 1963, for example, during a period of heavy air pollution, Asian flu, and extreme cold, 405 people died because of air pollution alone. And in 1966, they concluded, a three-day period of inversion with air pollution caused the deaths of 168 people. What is more, the fatalities in the 1966 episode were probably much lower than they might have been because the inversion occurred during a Thanksgiving weekend, when many pollution-producing activities were not carried on, and because certain air pollution restrictions were imposed by the city.

THE LESSONS OF THE DISASTERS

Almost immediately after the Meuse Valley incident, investigators drew several conclusions that 30-some years and numerous additional tragedies have corroborated.

The conclusions: (1) The effects of the incidents were anatomically localized and limited to the respiratory tract. (2) The people most vulnerable were those who were elderly and those with pre-existing disease of the cardiorespiratory system. (3) Meteorological conditions were an important factor. (4) Not one but two or more interacting pollutants were responsible – sulfur dioxide, sulfur trioxide, particulate solids, and droplets of fog as carriers.

Using the lessons of the acute episodes, investigators have been trying to flush out their evildoer. In their efforts to identify the villain, scientists have pored over records and statistics. They have mapped the breathing of well people and sick people and animals. They have stuck needles into hamsters, sprayed bacteria at mice, and filled guinea pigs with polluted air. What have they learned?

HOW AIR POLLUTION MAY AFFECT THE RESPIRATORY TRACT

Air pollution's major effect on health appears to be the result of irritant materials acting on the respiratory tract. The most culpable substances in the matter, it is believed, are sulfur compounds (with and without particulates), nitrogen dioxide, and ozone and other oxidants.

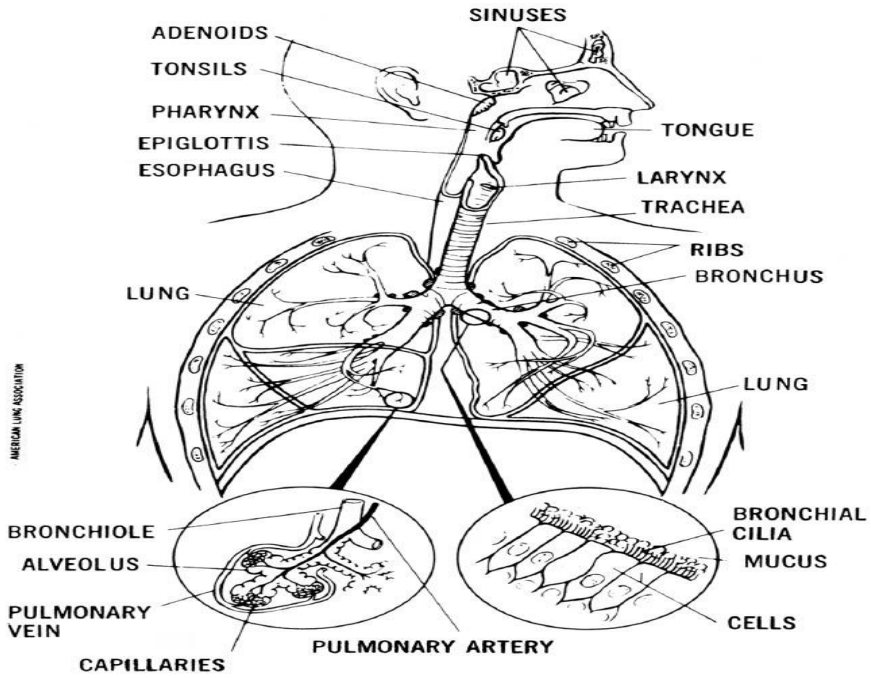
Sulfur dioxide is relatively soluble in water and dissolves rapidly in the mucus of the upper airways. (Mucous is the sticky liquid that covers the airway linings.) Nitrogen dioxide and ozone are less soluble and travel farther. And sulfuric acid and aerosols of metallic sulfur compounds can be inhaled deeply into the lungs.

Laboratory studies lead to the belief that air pollution may actually alter the body's responses to infectious disease. Over the years a number of different kinds of animals and animal tissues have been exposed to various irritants common in polluted air. The results indicate that both the structure and the function of the respiratory tract may be changed by them.

The many studies suggest these conclusions:

- Certain irritants, either gaseous or particulate, can slow down and even stop the action of the cilia, and thus leave the sensitive underlying cells without protection. (The cilia are hair-like cells that line the airways. By their sweeping movement they propel the mucus – and the germs and dirt caught in it – out of the respiratory tract.)
- The irritants can cause the production of increased or thickened mucus.
- They can cause a constriction of the airways.
- They can paralyze the bacteria-destroying cells in the respiratory system.
- They can induce swelling or excessive growth of the cells that form the lining of the airways.
- They can cause a loss of cilia or even of several layers of cells.
- Because of one or more of these reactions, breathing may become more difficult, and foreign matter, including bacteria and other micro-organisms, may not be effectively removed, so that respiratory infection can more easily result.

Figure III-9



THE RESPIRATORY SYSTEM

SURVEYS LINK POLLUTION TO RESPIRATORY DISEASE

Epidemiological studies present a good case for a link between slow and steady air pollution and respiratory disease, both chronic (long-continued) and acute (short and relatively severe). A 12-year survey, ending in 1960, of deaths in and around Nashville, Tennessee, indicated that levels of air pollution there were reflected in the death rates from respiratory disease. A study of 38,207 deaths, adjusted for differences in income and social status, revealed that more deaths from breathing ailments occurred in the sections of the city subjected to the heaviest air pollution.

Another study of the inhabitants of two Pennsylvania villages, Seward and New Florence, each with a population of about 1,000, also demonstrates a link between respiratory diseases, both chronic and acute, and air pollution. The two villages were quite similar except that Seward was subject to much higher levels of pollution than New Florence. Those inhabitants of both towns who were 30 years of age or over were given pulmonary function tests, X-rays, and questionnaires on

their medical history. The people tested in Seward, the town with heavy pollution, lapsed more often from what the investigators considered normal good health than those tested in New Florence.

Still another survey looked for and found a connection between chronic and acute respiratory disorders and pollution. This one examined hospital admissions in Los Angeles for 223 consecutive days in 1961. The investigators concluded that there was a correlation between high levels of various air pollutants and allergic disorders, acute upper respiratory infections, influenza, bronchitis, and heart, vascular, and respiratory diseases.

ACUTE RESPIRATORY DISEASES

Let us look more carefully now at acute respiratory diseases. The connection has been noted in a number of epidemiological studies. Particularly significant, with its portents for the future, is the evidence of pollution's effects on children. One British study of 3,866 children from their birth to age 15 showed a consistent relationship between the incidence of lower (but not upper) respiratory infection and high levels of air pollution. Another study dealt with a large group of schoolchildren in Tokyo. Here coughs jumped from 2% in areas of low pollution to over 13% where pollution was high.

Nonspecific Upper Respiratory Disease. Though the common cold is generally believed to be caused by any of a group of viruses, irritant air pollution appears either to increase one's susceptibility to them, or at least to produce cold symptoms. These symptoms are medically described as acute nonspecific upper respiratory disease.

In the classical episodes – in Donora, Meuse Valley, and London – those who were mildly or moderately affected displayed the symptoms of the common cold.

In a 1950 study in Cumberland, Maryland, interviews showed that there were significantly more common colds among those living in the more heavily polluted section of town.

Another study – a large-scale, continuing survey of absenteesim in industrial plants in several locations in the United States – found that high levels of sulfur oxides and solid particles correlate with increased

frequency not only of colds but also of other acute upper respiratory infections.

And investigations in Great Britain, Japan, and the Soviet Union confirm that common colds and other upper respiratory infections occur more often in areas with high pollution levels.

Other Acute Respiratory Diseases. Laboratory investigations have indicated the possible connection of air pollution with deeper, more sever lung disease. Experiments have repeatedly shown that animals forced to inhale some of the irritating gases commonly found in community atmosphere are more vulnerable to pneumonia than animals not exposed to the gaseous irritants. For instance, nitrogen oxides at levels found in urban air pollution do not appear to be directly harmful. Yet after certain strains of mice were exposed to nitrogen oxide in concentrations recorded in Los Angeles, the mice showed an increased mortality from pneumonia.

Experiments with ozone showed a similar significant increase in animals' susceptibility to pneumonia. A laboratory accident also demonstrated a relationship between pollutants and reparatory infections: Caged laboratory animals were accidentally exposed to diluted auto exhaust gas. They developed lung infections. Animals housed next to them under identical conditions, except for the accidental gassing, developed no such infections.

This does not imply that the pollutants caused the infections. All living things harbor assorted viruses and bacteria; when the body's defenses are weakened, the germs cause active illness. The weakening of these defenses appears to be the role of some air contaminants.

CHRONIC RESPIRATORY DISEASES

Evidence for a connection between air pollution and chronic respiratory disease has also been collected. In addition to the mortality and morbidity figures already cited, there is a noteworthy smaller study of Erie County, New York. Among white men from the ages of 50 to 69 who died between 1949 and 1961, the number of deaths from chronic respiratory illness – the figure was adjusted for socioeconomic influence – was twice as high in areas of high air pollution as in low ones.

The Factor of Chronic Airway Resistance. Polluting irritants in the respiratory tract do more than prepare it for infections. They produce a condition that appears to be a factor in a number of chronic respiratory diseases – a condition known as chronic airway resistance.

Airway resistance results from narrowing the air passages in response to the presence of irritating substances, thus making breathing difficult. The phenomenon is being seen not only as a temporary constriction but as a permanent effect. In the study of people over 30 in Seward and New Florence, Pennsylvania, investigators found a significant difference in the airway resistance and the lung capacity of the inhabitants of the two towns – a difference that apparently related to the differing amounts of long-term air pollution they were exposed to.

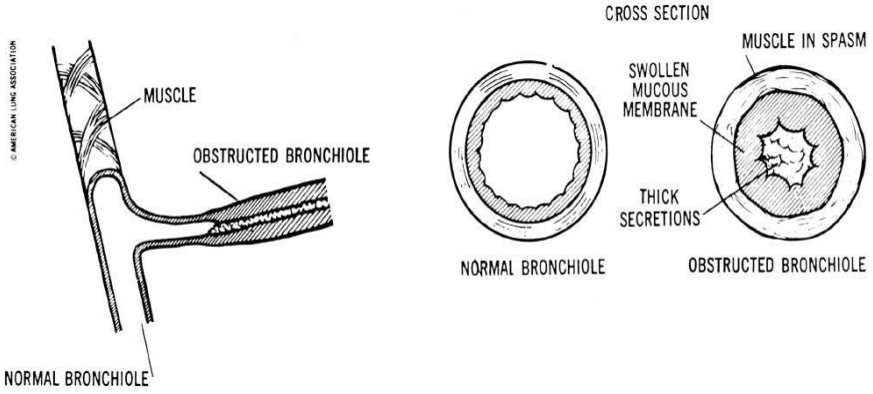
No single pollutant can be named with assurance as the cause of any chronic disease. Experiments, however, point especially to the sulfur oxides as culprits, since they produce immediate airway constriction. And studies with laboratory animals show that when sulfur oxides are carried on aerosols, especially aerosols in a size range found in urban air, the combination of the two elicits the greatest increase in resistance.

Ozone has also been shown to produce a thickening of the bronchiolar walls, at least in some animals. This reaction occurred in a study in which a number of animals of different species inhaled ozone for 400 days at concentrations slightly higher than that common in some urban areas. Other reactions in this study included inflammation of the bronchi and the bronchioles, some injury to the trachea and bronchi, and death from pneumonia for many animals that did not last through the whole experiment.

A different kind of study was conducted with guinea pigs that had somewhat higher airway resistance to begin with. (They might correspond to people with respiratory disease.) When the guinea pigs and control animals were exposed to an irritant aerosol or gas, the air passages in both groups narrowed, but the guinea pigs developed more resistance than the controls did.

Asthma. Asthma is a kind of airway resistance, too, of course, although air pollution cannot take all the credit for it.

Figure III-10



ASTHMA

Two views of a bronchiole, showing how it may be obstructed during an asthma attack.

Asthma is caused by an allergy. It is a state of abnormal responsiveness of the air passages to certain substances. An asthmatic attack consists of a widespread narrowing of the smaller airways – the bronchioles – by a muscle spasm, a swelling of the mucous membrane, or a thickening and increase of mucous secretions. But, even though chronic, the condition is temporary. Without a complicating disease, the bronchioles return to a normal state after an attack.

Physicians can recite long lists of stimuli capable of triggering asthma attacks. On those lists, at least for some people, is polluted air, for man-made community air pollution has been known to bring on asthma or asthma-like attacks. (Sulfur dioxide and ozone have both been cited as producers of allergic reactions in asthma sufferers.)

Here again, children are victims. A recently reported study in Erie County, New York, found 32.4 hospitalized asthma cases for each 100,000 children under 16 in areas of lowest air pollution; the rate jumped to 50.7 cases for each 100,000 where pollution was highest.

Clearly related to air pollution, though not so clearly definable as asthma, is what is usually referred to as Tokyo-Yokohama asthma. This disease became known in 1946, when it reached epidemic proportions in Yokohama – a highly industrialized city. The disease first appeared among American troops stationed there and then spread to their dependents living in the area. Later the same condition was found among

our military personnel in the Tokyo area. In both places, there appeared to be an obvious relationship between the asthmatic attacks and the levels of air pollution. But the illness differed from true asthma in that most of those afflicted had no history of allergy, and, when the afflicted left the area, especially if their stays were short, they usually had no further attacks.

Physicians are loath to call the condition asthma under these circumstances; the diagnosis of asthmatic bronchitis is more readily accepted. Whatever the label attached to it, the disease appears to be a reality. Studies conducted in 1960 in a pulmonary function laboratory revealed that, despite the vanished symptoms, the effects lingered. Further studies in 1962 on 244 patients who returned to the United States showed that two-thirds of them still had abnormal breathing patterns. In some, too, emphysema had developed. But almost all the 620 patients diagnosed as having Tokyo-Yokohama asthma were moderate-to-heavy smokers.

This country has its own problems. Best known, perhaps, are New Orleans' epidemic outbreaks of asthma. The source is not certain, but the link to air pollution seems clear. A study of daily admission rates for asthmatic emergencies in one hospital between 1953 and 1960 showed that rates leaped from the usual 25 or so to 200 when a gentle southwest wind prevailed. During a single week in October, 1962, more than 300 asthmatics sought treatment, and 9 asthmatic patients died.

Chronic Bronchitis. What we know about chronic bronchitis and its relationship to air pollution is muddied by disagreements over definition. In this country a diagnosis of chronic bronchitis is considered justified when an excessive amount of mucus is produced in the bronchi and a lasting or recurrent cough results, and other diseases that cause such a cough – such as lung infections, tumors, or heart disease – are absent. (Chest specialists set an arbitrary minimum for the cough of three months a year for at least two successive years.)

The British have different standards for the diagnosis of chronic bronchitis. These differences may be at least partially responsible for the proportionately higher number of chronic bronchitis patients recorded in their country. Whatever the reasons, the prevalence of the ailment there has occasioned a great many studies of it. And in Great Britain air

pollution – like cigarette smoking – is considered to be a distinct cause of chronic bronchitis.

Statistical associations of chronic bronchitis death rates with air pollution have been demonstrated in Great Britain. In clinical studies of the illness, too, the connection is consistent; Persons suffering from chronic bronchitis, kept under regular observation, show worsening symptoms on days when air pollution levels are high.

Here are some examples of the information the British have collected:

- A three-year study of men over 45 in a number of county boroughs of England and Wales showed a significant correlation between death rates from chronic bronchitis and sulfur dioxide concentrations.
- A six-year study of British postmen showed them to be absent from work more often because of chronic bronchitis when they worked outdoors in polluted areas. In the areas of heaviest pollution there were three times as many absences as in low-pollution areas.
- A five-year study of 53 county and metropolitan boroughs of England, Scotland, and Wales showed a highly significant correlation between bronchitis and the amount of acid in rain or snow (acidity that might be caused by sulfur oxide's mixing with droplets of moisture to form sulfuric acid).

In this country information on chronic bronchitis is less easily come by. Americans have been studying the disease for less time, for one thing. And cigarette smoking appears to be so overwhelmingly significant that investigators are having a hard time identifying the role of air pollution.

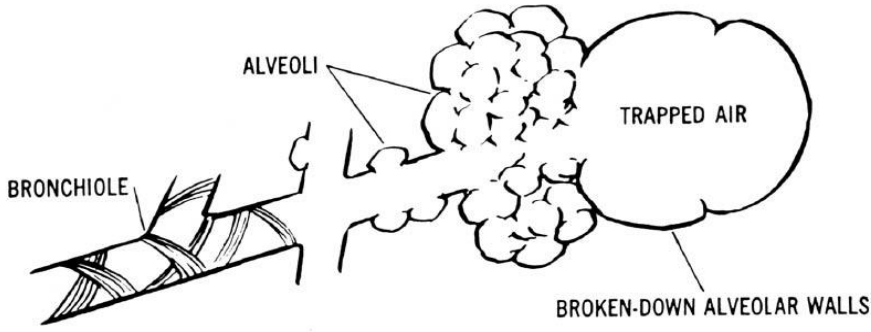
The disease rate is serious, in any case. In the 10 years ending with 1972, the death rate from chronic bronchitis increased by 37%. Nor does the 1972 figure of 5,360 deaths caused by chronic bronchitis present an accurate picture. A recent study concluded that the reported death rate for chronic bronchitis and emphysema is too low by from 25 to 50%. These diseases are listed more often as a contributing cause than as the primary cause of death.

One investigation here – using as its criterion a chronic cough that brings up phlegm (mucus) on most days for three months of two successive

years – found chronic bronchitis in 21% of a series of men 40 to 59 years of age.

The irritation of the bronchial tubes that causes the chronic bronchitis coughing is abetted by recurrent acute bronchial infections. And, at least in mice, the two major defenses of the bronchi against infection – the flow of mucus and the ability of cells to destroy bacteria – appear to be diminished or stopped by the inhalation of polluted air, thereby allowing bacteria to reach the usually sterile bronchial tree. Clinical studies of bronchitis patients, furthermore, indicate that bacterial infection within the bronchi causes lingering damage. Bacteria remain there, and the bronchi are more susceptible to infection in the future.

Figure III-11



PULMONARY EMPHYSEMA

The loss of elasticity and the deterioration of the alveoli walls deters the exhalation of carbon dioxide.

Pulmonary Emphysema. Closely linked to chronic bronchitis is pulmonary emphysema. Indeed, emphysema may be its follow-up as well as its companion.

Emphysema is an anatomic change in the lungs that shows itself in shortness of breath. It is characterized by a breakdown of the walls of the alveoli, the tiny air spaces beyond the terminal bronchioles. (The bronchioles are the smaller branches of the bronchial tree.) As the disease progresses, the alveoli become enlarged, lose their resilience, and their walls disintegrate – irreversible tissue changes.

No single factor can be said to be the original cause of emphysema. Asthma and chronic bronchitis are often found in the patient with emphysema; both can increase the severity of the disease. The symptoms of all these diseases are aggravated by air pollution. What is known of the action of air-polluting irritants on the respiratory system in general, therefore, justifies the search for a casual connection between air pollution and emphysema.

Because this disease has so recently gained national attention, little work has yet been done to determine the possibility or strength of the association between it and polluted air. However, exposure to continuous low concentrations of nitrogen dioxide was found to produce emphysema-like changes in rats' lungs. And a recent epidemiological study certainly indicates that a strong relationship exists. (The relationship is even stronger when cigarette smoking is a factor.) This is a study of autopsies of the lungs of 300 inhabitants of heavily polluted St. Louis and an equal number from relatively unpolluted Winnipeg, Canada. Investigators found four times as much severe emphysema among cigarette smokers in St. Louis as among smokers in Winnipeg. And even among non-smokers, in whose lungs no severe emphysema existed, there was three times as much mild to moderate emphysema among St. Louis inhabitants as among those from Winnipeg. In general, the investigators concluded, emphysema appeared to be more prevalent in St. Louis than Winnipeg, to develop much earlier, and to progress more rapidly.

There are other less direct links between emphysema and air pollution. A review of the case histories of more than 50,000 emphysema patients indicated that, although cigarette smoking was of major importance, air pollution could also have been a factor in the patient's illness.

We also know that people with emphysema – and other chronic respiratory diseases – feel worse during periods of severe air pollution. A clinical study of emphysema patients, for example, showed that they felt better and were able to breathe more easily after they were removed from Los Angeles smog and placed in a purified atmosphere for a period of 24 hours.

Emphysema is unquestionably a modern problem. There were 21,310 deaths from it in 1972 – reflecting an 11-fold increase since 1952. And, as previously noted, emphysema is more often listed as a contributory

rather than the primary cause of death. In recent years, an average of more than 1,500 workers a month have been forced to retire prematurely because of this disease. Nearly 5% of those who receive monthly Social Security disability payments suffer from it.

Lung Cancer. Lung cancer is characterized by an abnormal, disorderly new cell growth originating in the bronchial mucous membrane. It is usually fatal.

Lung cancer, like emphysema, cannot be attributed to any single sauce. But it seems very likely that atmospheric contaminants, together with other factors – especially cigarette smoking – contribute to the development of this disease.

Agents that produce cancer in laboratory animals have been found wherever they have been sought in polluted city air. Many scientists believe, further, that those atmospheric pollutants which paralyze ciliary action in the respiratory tract may play a role in the development of cancer, even though they are not carcinogens themselves. The paralysis of the cilia would permit cancer-causing substances to remain in contact with the sensitive bronchial cells over a longer period of time.

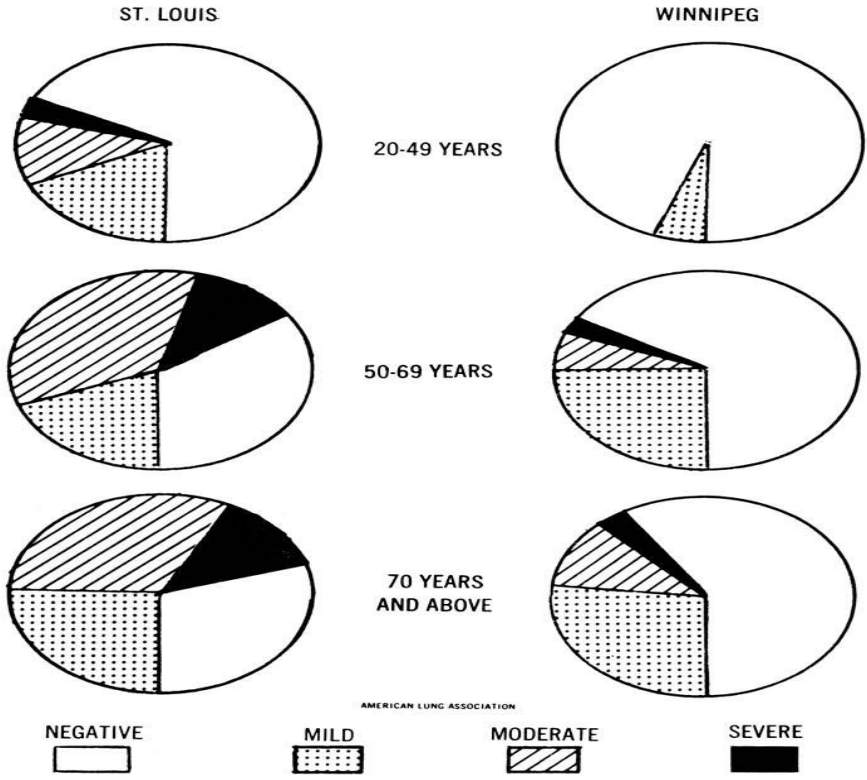
Mortality statistics are persuasive. Deaths from cancer of the lungs, especially among males, have been increasing rapidly in recent years. In the largest metropolitan areas in the United States, the death rate is twice that of rural sections. Significantly, the rate is generally in direct proportion to city population size, as, in general, is the degree of air pollution. Even when cancer death rates are adjusted to take smoking habits and age into consideration, they are still a third higher in large cities than in rural areas.

Many epidemiological studies contribute to the theorized relationship.

- A 1956 report showed that British immigrants to New Zealand had a higher incidence of lung cancer than New Zealand-born persons of the same stock. Britain has far more pollution than New Zealand, and those who lived part of their lives in Britain would naturally have been exposed to more pollution than people born and raised in New Zealand.
- A 1959 study indicated that deaths due to lung cancer among 45- to 64-year-old male British immigrants to South Africa (South

Africa too, has less air pollution than Britain) were 44% higher than among native-born South Africans of the same sex and age range – this in spite of the fact that South Africans have long been considered the world's heaviest cigarette smokers. Still another epidemiological study showed that the incidence of lung cancer varied with the amount of air pollution: Among Norwegians living in Norway, where the air pollution is low, the lung cancer rate is low. Among American living in America, where air pollution is heavy, the rate was twice as high. Among Norwegians who migrated to the United States, the rate was halfway between.

Figure III-12



PREVALENCE OF EMPHYSEMA IN TWO CITIES WITH CONTRASTING LEVELS OF AIR POLLUTION

Prevalence of emphysema, as found in a 1960-66 post-mortem examination of the lungs of 300 residents of heavily industrialized St. Louis, Missouri, and an equal number from relatively unpolluted Winnipeg, Canada. The subjects were well-matched by sex, occupation, socio-economic status, length of residence, smoking habits, and age at death. The findings clearly suggest a link between air pollution and pulmonary emphysema.

In all these studies, the conclusion was that the contrast in cancer incidence between countries could be laid at the door of pollution.

The rising incidence of lung cancer has been associated with a number of factors. One is influenza. To investigate this hypothesis, researchers infected mice with flu virus. Survivors had only a slightly higher cancer rate than mice used for controls. Then the experiment continued by exposing these same survivors of the flu to artificial smog (ozonized gasoline) – and the cancer incidence increased manyfold.

Further evidence of pollution's possible role in lung cancer has been unearthed in the laboratory. Mice were painted with carcinogenic hydrocarbons, and tumors resulted. Other mice were exposed to artificially produced photochemical smog, and both skin and lung cancer appeared. Mice and rats had certain hydrocarbons implanted in their lungs, and they developed lung cancers. Hamsters had benzpyrene inserted with iron oxide into their tracheas, and they too developed lung cancers. None of these experiments duplicate the conditions in which human beings confront air pollution. But they do demonstrate the potential link between cancer and pollution.

OTHER EFFECTS

The case against air pollution appears to rest heavily upon effects on the respiratory system. But that may be because these are the most obvious effects and, therefore, the first to be investigated. We must also note the testimony of further assaults on human health for which polluted air may be responsible.

Heart disease, for instance. All chronic respiratory disease involves the heart, for stress on the heart and blood vessels is an inevitable result of the constricted or otherwise obstructed and injured respiratory tract. The cardiorespiratory system functions as a unit, one part making up for the occasional failure of the other. The heart must work harder to pump

enough blood to compensate for any loss of oxygen due to respiratory disease. As a result, the heart may show significant changes – sometimes doubling in size – as a secondary effect of lung affliction.

The heart's burden is also increased by carbon monoxide, which can reduce the oxygen content of the blood. We do not know how much of a hazard is presented by small quantities of this gas, but such amounts may have a deleterious effect on the hearts of those already suffering from anemia or a cardiorespiratory disease.

Air pollution's effect on the heart was demonstrated during the well-known disasters by the high rates of sickness and death for people with chronic heart disease. The Los Angeles study of hospital admissions mentioned on page 64, correlating high air pollution levels with heart and other disorders, reinforces the conclusion.

Another Los Angeles study, involving 10 men suffering from the heart condition angina pectoris, offers further verification. On two separate occasions, the men were taken for 90-minute drives on the Los Angeles freeway during peak morning traffic. On one of the occasions, they rode with the windows open, breathing the highway air; on the other, they wore masks and breathed pure air. Both before and after each trip, they exercised and their heart, blood, and lungs were tested. After breathing the pure air, the men showed no change in their condition. But after breathing the polluted air, they showed raised blood levels of carbon monoxide, slower heart rates, lower blood pressures, and decreased lung function; and chest pains came on more quickly when they exercised.

Air pollution is implicated in other symptoms, too. The effects of air pollution on the human eye are well known. Burning, tearing eyes are an immediate reaction to both photochemical smog and sulfur dioxide. Three-fourths of the people surveyed in the metropolitan area of southern California said they were affected by eye irritation. Fortunately, though, studies by eye specialists do not indicate any permanent injury, even from repeated irritation.

Dizziness, headaches, blurred vision, and slowed-down responses are well-known laboratory reactions to certain concentrations of carbon monoxide in the air, although these reactions have not been verified in actual atmospheric conditions.

A study of Buffalo, New York, residents between 50 and 69 is the latest to connect air pollution with stomach cancer. Mortality from this disease was found to be nearly twice as high for those living where particulates were greatest than for residents living where particulate matter was least.

And, once again, the children! The Erie County study mentioned on pages 89-90 found that there were 2.9 hospitalized eczema cases for each 100,000 children in the lowest pollution areas and 10.2 for those in the highest. Furthermore, the researchers point out that about 50% of children who, as infants, have eczema develop some sort of respiratory allergy in later life.

Perhaps even worse are accumulating clinical studies which suggest that air pollution may be having bad effects on children's growth and development.

Less obvious effects of air pollution – carrying inferences for human health – are also coming to light through investigations of various sorts.

- An experiment in California showed that long-continued exposure to artificial smog reduced the fertility of parent mice and the survival rate of their newborn.
- Another experiment showed that mice exposed to artificial smog were less active than mice breathing filtered air.
- Still another experiment indicated that chicks exposed to simulated smog began laying eggs at an earlier age than unexposed chicks. Time has yet to tell if this is a sign of premature aging. Tomorrow, improved techniques of detection and more precise studies will add to what we now know of the role of air pollution on human health. In the meantime, the tocsin rightly tolls.

POLLUTION'S OTHER EFFECTS

Although the effects of air pollution on people are difficult to pin down, the situation is rather different with non-human subjects. Scientists know quite well what damage contaminated air can do to metals and stone; fabrics, leather, and rubber; fruits, vegetables, flowers, and trees; and several kinds of animals outside the laboratory. Before moving on to how we can combat these effects, let us take a last look at the environmental effects.

EFFECTS ON ANIMALS

The already-noted pollution disasters demonstrated that extreme urban pollution was no better for animals than for people. In Donora, one out of five canaries and one out of six dogs were sickened. Cattle, sheep, horses, and swine were not – at least, not significantly. Less detailed information exists about the Meuse Valley incident, but it is known that cattle became sick and that some had to be slaughtered. In London, during its 1952 episode, a cattle show happened to be in progress, and of the 350 cattle being exhibited there, 52 became seriously ill. Five died, and nine had to be killed. The sheep and swine that were also on display were not evidently affected. Nor was any special illness noted in the horses stationed at barracks or used by the British Railways. At the zoo, on the other hand, cases of bronchitis and pneumonia climbed.

There are grim rewards, too, for grazing near certain of civilization's servants. During the accident at Poza Rica, Mexico, involving the escape of hydrogen sulfide gas, unknown numbers of canaries, chickens, geese, ducks, cattle, pigs, and dogs were made ill. All the canaries and many other birds and animals died.

Through the years, animals have paid for men's advances. In Montana, in 1902, the copper smelter at Anaconda provided a fatal meal of arsenic on grass to large numbers of cattle, horses, and sheep. Fifteen miles from the smelter, where 3,500 sheep grazed, 625 of them died. And too far away from the smelter to be directly affected, horses met death from the tainted hay.

In Sweden, in 1954, a steel plant spread molybdenum poisoning to many of the cattle grazing half a mile away. And in Germany, in 1955, cattle and horses grazed within three miles of two lead and zinc foundries; many of the animals grew so lame that they had to be slaughtered.

In addition to smelters and foundries of copper, lead, and zinc, many other industries, like aluminum and fertilizer factories, can poison the grasses that farm animals graze upon.

Fluorine is an ever-present danger, mostly to cattle and sheep. In fact, it was about the time that the fluoride-producing fertilizer and aluminum industries were developing in this country that livestock fluorosis first displayed itself.

Most of the original contaminators are controlled now, but the number of possible sources has increased, so violations and accidents remain part of the perilous life that livestock leads. As late as 1967, the federal government had to step in to make a Montana phosphate producer control the fluoride emissions that were endangering not only livestock but human health, plants, and other property.

Fluorides are a special menace to livestock, even when they are not to people, because certain of the plants used for fodder have the ability to store the fluorides they take in. Thus, the plants build up far greater concentrations than would remain deposited on their surfaces, and they accomplish this without harm to themselves and with no external indications of their contents. When these plants become a meal for forage-consuming animals, the enormous overdose of fluoride can be devastating. First, the animal's teeth become mottled. Then, as they feed further on this insidious food, they lose weight, give less milk, and grow more slowly. Eventually, spurs grow on their bones, and they become so crippled that they have to be killed.

Partly because of the food animals eat, partly because air pollution's effects on them are easier to verify in the laboratory, we know that contaminated air not only can cripple and kill animals of various kinds but can produce other more subtle consequences. It can cause some to yield a smaller amount of eggs, others to beget fewer young or produce less milk, and still others to grow a thinner coat of wool.

Progress demands unexpected tolls of the agricultural way of life.

EFFECTS ON VEGETATION

Even more rapidly than livestock, vegetation can announce the presence of pollution. Indeed, so clear is the message that many industries now use ornamental greenery on their premises to aid in controlling their own emissions. Since the shrubbery evinces effects more readily than people do, it is conceivable that people may be spared at least some injury.

On the other hand, such hopes could be idle. In many an area where crops have been destroyed by pollution, the farmers have thrown up their hands and sold out to real estate developers. Now children, instead of spinach, take their chances with the poisonous air.

Vegetation can respond with enormous sensitivity to pollution in the air. It is possible to tell by examining certain plants which noxious materials were present, when, and in what concentration.

From Sulfur Dioxide. Several pollutants stand out for the ferocity of their attack. One is sulfur dioxide. In fact, until the recent proliferation of industries, serious foliage destruction was due primarily to this gas. Early in the century, around copper smelters at Anaconda, Montana, and Ducktown, Tennessee, sulfur dioxide fumes used to drift for miles and leave in their wake barren, gullied deserts.

Controls have pared down somewhat the force of sulfur dioxide. But many large ore smelters – of copper, iron, zinc, and other metals – still send out huge amounts of the gas, since its major source, fossil-fuel combustion, remains part of the smelting process.

Sulfur dioxide enters a growing plant through the stomata, the tiny openings on the underside of the leaf, as carbon dioxide does. The injury it causes may show up as markings along the edges or between the veins of the leaf. The damaged area usually appears dried and bleached white or ivory color.

Sulfur dioxide seems to undergo swift chemical change in the leaf, and if the exposure is low and brief, plant development may be only temporarily inhibited. On the other hand, a long period of sublethal concentrations may result in chronically injured areas that never recover. And at higher concentrations the plant cells die, the tissues between the veins collapse, and the leaf slowly takes on the typical scars of sulfur dioxide.

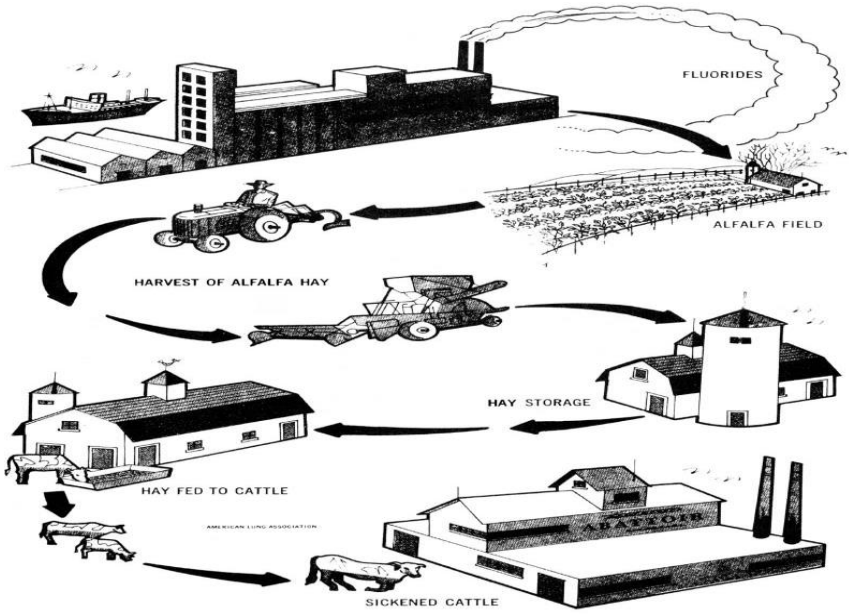
Different species and varieties within a species may vary considerably in their susceptibility to sulfur dioxide, primarily because of their differing rates of absorption. Plants with thin leaves, such as alfalfa, barley, cotton, and grapes, usually suffer most. Plants with fleshy leaves or needles, such as citrus and pine, tend to be resistant except when the leaves are newly formed.

Even more damage has been laid at sulfur dioxide's door. It has been found that low concentrations of this compound can interfere with the growth and functioning of a plant without leaving any visible injury. One result can be a reduced yield in grain crops.

Sulfur dioxide's synergistic talents are on view here, too. Combined with dew, mist, or light rain, the damage it inflicts is substantially increased. And it can turn what would otherwise be a harmless concentration of ozone into a toxic one.

Figure III-13

FLUORIDE CAN CRIPPLE CATTLE BY POISONING THEIR FOOD



From Fluorides. Fluoride is another deadly enemy of vegetable life. Aluminum, brick, ceramic, chemical, and fertilizer industries, as well as glassworks, smelters, and steel mills may all release fluorides.

Fluoride, too, enters the leaf through the hospitable stomata. From there it moves to the edges and tip of the leaf. The body of the leaf, although it may continue to absorb low concentrations of fluoride, remains relatively unharmed, while lethal amounts of the substance pile up at the edges. Continued exposure spreads the killing inward from the edge and tip. Leaves exposed to fluoride generally have burnt, dried-out edges, with a narrow, reddish-brown line of dead tissue distinctly marking off the healthy part of the plant.

Though all farming soils contain appreciable amounts of fluoride, plants take up little from the soil. When plants contain more than a few parts per million of fluoride, it can be assumed that polluted air supplied it.

Hydrofluoric acid, not surprisingly, follows a different pattern from fluoride gases. Minute amounts of the acid can spot corn leaves and make gladioli tips turn white or yellow.

Gladiolus, plum, apricot, and peach plants are so sensitive to fluorides that they are injured by extremely low concentrations. Other plants less sensitive but still susceptible to fluoride damage include sweet potato, corn, and conifers. (Conifers are shrubs and trees that bear cones – pines, for example.)

From Photochemical Smog. Smog is a relatively recent hazard to vegetation, but hazard it most certainly is, producing both visible and invisible injury. When a sensitive plant confronts this unholy mixture, the plant's leaves react. The stomata, the leaf openings through which a plant must draw life-giving carbon dioxide, close up. Even when concentrations do not cause irreversible outward damage, chronic exposure to smog appears to slow down the growth of many plants. Seedlings are especially susceptible.

Two different injury syndromes have been identified as smog damage. One, caused by ozone, affects the upper surface of the leaf; the other, probably caused by PAN, damages the lower.

Ozone's damage is called grape stipple or weather fleck. The gas makes the upper surface of the leaf appear splotched or stippled. The tissues of some of the spots collapse if the concentrations of ozone are high enough.

Ozone is probably also responsible for the streaks on the leaves of cereal crops, the burning of the tips of white pine seedlings (known as emergence tipburn), and the milk-white spots of various sizes on many vegetables.

PAN – or perhaps an unidentified component of smog – makes the underside of leaves of susceptible plants – citrus trees in particular – turn silver or bronze. Doses too low to cause irreversible damage will make the underside of the leaf seem temporarily water-soaked.

From Nitrogen Dioxide. In addition to its role in the production of smog, nitrogen dioxide causes direct vegetation damage. Only a few parts per million cause irregular white patches to appear on the leaves of tomato, bean, and tobacco seedlings, and continuous exposure even to less than 0.5 ppm can inhibit plant growth.

From Ethylene. Another plant-damaging product of automotive exhaust is the gaseous hydrocarbon ethylene, one of the olefin series. (Actually ethylene is a common by-product of many of industry's chemical processes, but the major source is the automobile.) Not only does ethylene take part in the photochemical smog process, it is a villain in its own right. In concentrations as small as a few part per billion, it causes orchid sepals (the green, surrounding leaves of the blossom) to wither. It harms other flowers, too. It interferes with the opening of carnation blossoms and causes snapdragon flowers to drop off. Furthermore, only slightly higher concentrations of ethylene retard growth of tomatoes.

Extent of the Damage. Research into vegetation damage has given us much information – almost all of it discouraging. Not the least disheartening are surveys of the extent of the damage. Smog injury has been found in at least 27 states as well as the District of Columbia. And other surveys indicate that specific pollutants may injure vegetation as much as 100 miles away.

We know that air pollution affects the growth and yield of plants. We are still to discover the extent of its effect on nutritional quality and, indeed, on the survival itself of crops we now depend on for our food and our pleasure.

EFFECTS ON MATERIALS

We are accustomed to corrosion and erosion – iron has rusted before our eyes all of our lives. We may even enjoy it, as when the edges of a less than first-rate statue have been smoothed over by time. But air pollution's whirlwind destruction of the products of this and earlier civilizations leaves us breathless and bereft.

Steel, iron, zinc, brass, copper, nickel, lead, and tin all corrode faster in urban industrial areas. Studies have shown that copper and aluminum corrode five times as fast in a polluted atmosphere as in clear air, iron corrodes six times as fast, brass eight times as fast, zinc 15 times as fast, nickel 25 times as fast, steel 30 times as fast!

And not surprisingly, the degree of deterioration is roughly proportional to the amount of pollutant present.

Pollution's effects on stone are no happier than those on metals. New York City, for example, is being eaten away by its atmosphere. Its brownstone townhouses are flaking, its marble ornamentation is crumbling. Cleopatra's Needle has suffered more in the time – less than 100 years – it has spent behind the Metropolitan Museum than it did in 3,000 years in the Egyptian desert.

Every guardian of our cultural heritage has been forcibly made aware of the hostility of the inheriting present. Books are particularly vulnerable. Sulfur dioxide is absorbed by the paper of their pages, and then, when moisture is present, this compound turns to sulfuric acid and makes the paper brittle. Nor are books' covers invulnerable. Sulfuric acid also saps the strength of leather so that it eventually disintegrates. It is no wonder that New York's Metropolitan Museum library must budget $12,000 a year for air filters.

Sulfur oxides also attack marble and other limestones, roofing slate, and mortar, changing them to substances that can be leached away by rain. Carbon dioxide has a similar effect.

Oxides of nitrogen and ozone contribute to the business of destruction as well. Nitrogen oxides can destroy paint pigments and bleach-dyed fabrics. Ozone, too, can fade and weaken fabrics. It also dries out rubber and makes it so brittle that the slightest stretching cracks it.

In addition to harming paper and leather, sulfuric acid aerosols weaken both natural and synthetic fibers, so that silk, cotton, and wool deteriorate and nylon stockings spring runs. Furthermore, house exteriors covered with lead-based paints can be badly discolored from a single exposure to hydrogen sulfide. Indeed, experts point out that any sulfur oxide control at all would lessen the damage to metals, stone statuary, buildings, paper, leather, textiles, and paint.

EFFECTS ON VISIBILITY

With so many dramatic effects to worry about, it is no surprise that reduced visibility arouses little indignation. Lethargy abounds on the part of private citizens as well as officials while a shroud of pollution draws closer and the sun becomes a pale blob in a gray sky.

Whether one notes or ignores it, however, a problem exists.

The major cause for the shutting out of the visible world is particulate matter, especially the small particles, the aerosols. Besides directly dimming the view, aerosols increase the frequency and density of fog, encourage cloud formation, and can bring on showers in urban areas.

But nitrogen dioxide also contributes to lowering visibility distance. For two reasons: (1) it is a yellow-brown gas, and substantial concentrations of it can, all by themselves, reduce visibility; and (2) it contributes to the photochemical smog reaction and the formation of aerosols wherever hydrocarbons are oxidized by sunlight.

Even back in 1946 a survey showed that on almost half the days of the year reduced visibility was a problem for Newark Airport – which is surrounded by a profusion of industrial plants. The number of hours during which visibility was cut to six miles or less from smoke – with or without other obstructions – totaled 4,359.

Flying is the most obvious victim of reduced visibility. But modern high-speed highways hold perils from the same cause. Air pollution with fog blacked out the New Jersey Turnpike 23 times in the single year of 1965.

Dense smoke close to the road can bring on a sudden, startled braking by a motorist and pile up a string of accordion-pleated cars behind him. A burning dump caused this to happen in Los Angeles, and a similar pile-up occurred recently in Pennsylvania because of a smoldering culm pile. (Culm piles consist of unusable coal screenings. A chance match or spontaneous combustion often initiates a slow, flameless burning that is close to impossible to put out.)

ECONOMIC EFFECTS

It is obvious that our nation suffers profound economic losses from dirty air. But no study has attempted to compute them all in any detail. It is difficult – and expensive – to ascertain the amount in dollars, even for destruction that is visible to the eye, and for which repairs lighten the pocketbook.

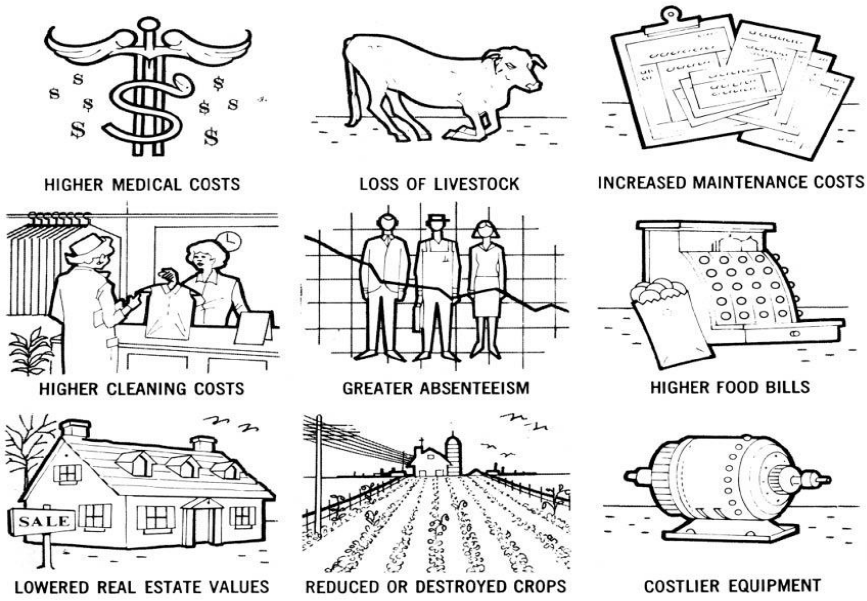
National per capita figures, furthermore, covering such disparate conditions as are found in this country, present a distorted picture. Some people live in quite pure air, and air pollution may cost them less than

that amount; for others, it costs more. Nevertheless, the price of pollution is paid by everyone, directly or indirectly. Even those people who live in mountain areas buy products that are produced elsewhere and affected by contaminated air. Eventually, any losses by a producer of consumer goods are passed on to the consumer.

Higher costs of plants for the windowsill and meat for the table reflect the farmer's decreased productivity. The Environmental Protection Agency estimates the nation's annual agricultural loss to be $500 million – about $325 million in crop damage and $175 million in livestock.

Figure III-14

THE ECONOMICS OF POLLUTED AIR



Delicate instruments to explore space or to advance communications – many of which we pay for with our taxes – mirror in their price the increased cost of more expensive, corrosion-resistant materials and the research to develop them. So do telephone bills and automobile prices.

The people who live in polluted areas, of course, bear not only these burdens but others as well. They must keep clean and in good repair their bodies, clothes, homes, and commercial establishments. The additional costs of pollution for them include the maintenance and more frequent

replacement of masonry, house furnishings, clothing, automobiles, and the painted and metal surfaces of buildings. They pay in extra beauty care, higher medical bills, and lowered property values. The annual national loss in property values alone because of air pollution is estimated to be $200 million.

A 1960 study gives a good idea of some of the air pollution costs to a family.

The investigators chose Steubenville, Ohio, a heavily industrialized town, and Uniontown, Pennsylvania, where the inhabitants breathe relatively clean air. Both towns were otherwise similar.

The surveyors questioned a representative sample from each town on specific expenditures that might differ with local conditions. Because the items questioned were limited, the per capita annual cost can be only a small part of the total cost of air pollution to urban-based individuals. Nevertheless, it is startlingly high.

The researchers subtracted the amounts spent in clean Uniontown from what was spent in dirty Steubenville, within the four general categories of their inquiry, and arrived at a total per capita cost of $84 for the privilege of living in a badly polluted community. (In 1973 dollars, that cost would be about $126.)

Figure III-15

ACTIVITY	Per capita annual cost (the difference in amounts between highly polluted Steubenville and relatively clean Uniontown)
Outside maintenance of house	$17
Inside maintenance of house of apartment	32
Laundry and dry cleaning	25
Hair and facial care	10
TOTAL	$84 (1960 Dollars)

An idea of what we pay for health damage is offered by an estimate of the costs of environmentally-induced disease, made by the director of the National Institute of Environmental Health Sciences. In a 1970 talk, he suggested that health services cost $7 billion a year, lost wages $25 billion, and compensation and rehabilitation $3.3 billion. The total annual health costs to the nation for a deteriorated environment, he

estimated, were over $35 billion! That is for one year, in 1970 dollars, for health costs alone.

A shocking figure, is it not? Control is costly, too. The federal Council on Environmental Quality estimated in its 1973 annual report that, for the 10-year period ending with 1981, the total costs to the nation for air pollution control would amount to $105.6 billion. Far less than air pollution itself, but a lot of money.

Whatever the cost, today legal control provisions-are being made.

Present laws require that the federal government set national standards for the quality of the air and emission limitations for motor vehicles. It may also limit emissions for certain stationary sources. Both air quality standards and emission limitations are set in terms of specific pollutants.

Control means more than federal standard-setting. The states are responsible for developing plans to attain and enforce these standards. (The states may also adopt stricter standards than those demanded at the national level.) How enforcement, also required by 1976, is carried out will depend on the laws the states write. No doubt much of the policing and its detailing will be done on a regional or local level.

This will cost money, too. Of the $105.6 billion total air pollution control costs mentioned above, the Council on Environmental Quality estimates that federal, state, and local governmental expenditures will be $8.4 billion.

THE PURSUIT OF HAPPINESS

Dollars are important, of course. So are buildings and clothing and crops. But let us not be caught in the trap of weighing the dollar cost of control against the dollar cost of pollution.

For air pollution threatens more than man's wallet. And not only his health. Air pollution erodes his soul. Every mountain blacked out by pollution, every flower withered by smog, every sweet-smelling countryside poisoned by foul gases destroys a bit of man's vital union with nature. Time is making it increasingly clear that man is damaged by these spiritual losses as surely as by the sulfur dioxide in his lungs. "The quality of life" is no idle phrase.

Let us get on with control, then, shall we?

In the next chapter, I journey inward.

CHAPTER IV – IN THE BEGINNING

We have seen enough of pragmatics. Let us now begin studying energies as they are in the universe, as they are in you and as they work together in us. All master souls are tested by other master souls when they are in the mental plane (medium, if you are realized) but only become real when demonstrable on the physical plane in everyday life – and these truths must be understood by others. As many gather a truth brought on by a master, a new level of consciousness is said to be brought on. An example of this was in 1861 when Babaji gave Kriya Yoga to Lahiri Lahasaya to demonstrate its results to others, and today millions of people worldwide greatly expand their horizons in very short time periods with this technique known by only two men 120 years ago.

In order to teach life principles from an unbroken lineage of masters, (of which Christ and his disciples are a part) there existed esoteric schools of thought way before Christ's time. Most true esoteric schools test their Initiates to a stress test, whereby the Initiate can show others he has conquered the greatest lie of the universe: death. The American Indians did this with their finest braves when they went to the top of a sacred mountain, got within a semi-circle of rocks and allowed the rattlesnake to strike them again and again. The amount of Kiari released from one bite would destroy the form of the average person in about one hour by paralyzing the central nervous system, thus driving the consciousness out of the form onto what is called the astral plane. Once the central nervous system is paralyzed, circulation stops and oxygen cannot circulate to carry the grounding energies that are vital for the conscious mind and material body to manifest in balance with the material world. So you lose form, and uneducated beings in the material world view this as death but a free soul knows that the consciousness of the deceased has moved onto a higher plane. Most braves, however, survived the ordeal, as they had wise teachers. A teacher's wisdom may be gazed upon by the progress and achievement of his students.

In Egyptian mystery schools, the same test was administered in the bottom of the Great Pyramid in a place called the Chamber of the Ordeal. The Initiate entered into the Pyramid from an underground passageway located between it and the Sphinx. Before the Initiate could be admitted into the upper section of the Pyramid, he was given a poisonous extract from a mushroom and spent seven days and nights

with the ordeal of the soul on the lower astral planes. These are bands of energy in physical existence under the earth's surface where a consciousness manifests itself. Modern theology is very much aware of this space and terms it Hades, Hell, Purgatory, home of the unrested soul, etc. These names have been coined to express a lower feeling brought on by misuse of the life force.

Then, when the Initiate had conquered the passions of life by realizing the penalties involved and realizing further that God is all-forgiving, he began to rise into the Pyramid itself, into the Queen's Chamber. Here, he experienced his second birth, or realized life in greater abundance. The time spent in this part of the Pyramid was only three days and then he moved upward into the King's Chamber. Before entering into the sarcophagus in the King's Chamber, he went through the outer room called the room of the Triple Veils, where he realized the lesson of maya, the false deception of the illusion which traps us by our five senses until our sixth sense opens and frees us. Before the Initiate can realize his quest for freedom (resurrection into spirit) he has to crawl on his hands and knees through a small passageway that leads into the King's Chamber. Here he learns that you must humble yourself before you become exalted and "one who exalts himself first shall be humbled." Upon reaching the King's Chamber, he has spent nine days in the Pyramid, seven days underground, two in the Pyramid itself and in his third day, he reaches the King's Chamber and understands what Christ meant when he said, "In three days, I shall build again this temple."

The total time the Initiate spent was ten days. The first seven days signified God building creation and man attempting to destroy it through ignorance, and the last three days signified rebuilding of the temple (mind, body and spirit) so that he shall dwell in the house of the Lord forever.

Christ himself was the last of the great Initiates to be initiated in the Great Pyramid. The teacher or master of ceremonies or keeper of the Pyramid was called the hierophant and it was he who handed down to the master Jesus that title of "The Christ." This great hierophant was called in the Bible, the "Ancient of Days."

The Pyramid in those days was part of the magic city of Heliopolis, which was the last mystery school Christ attended before taking up his ministry when he was 29 years old. Strangely enough, just as this was

Christ's last school, so it was that he was the last Initiate to take initiation in the Pyramid. When Jesus left for Israel, the Pyramid was sealed off with the passageways blocked and the entrance to the Sphinx hidden away. Theologists of that time called it a "Bible sealed in stone, to be opened again only by divine appointment."

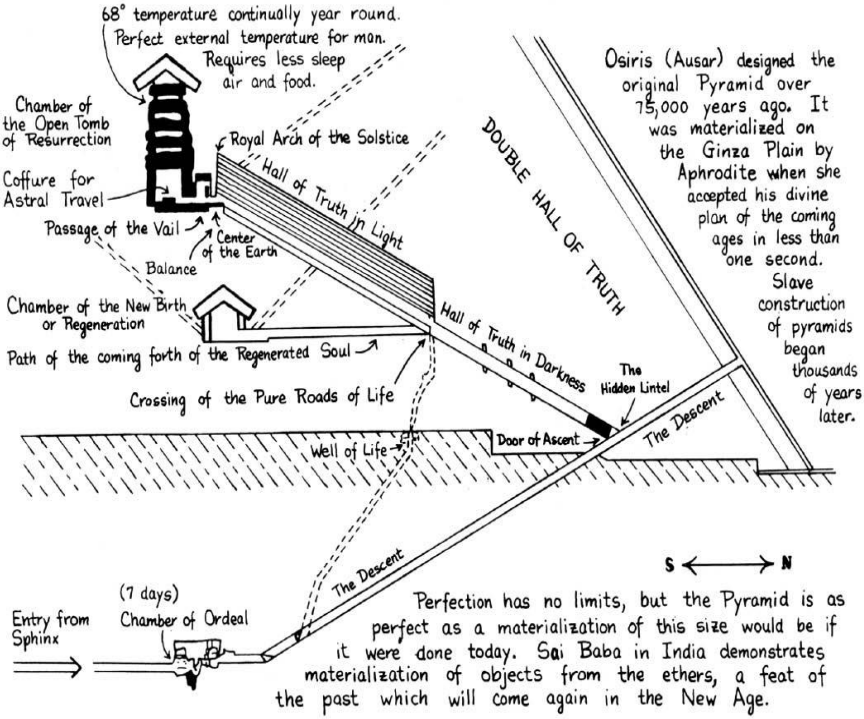
Today, two thousand years later, we are beginning to realize that Christ Principle within our own nature, and take initiation not in a chamber inside a Pyramid but face the ordeal in life itself, taking responsibility for our actions and forgiving the irresponsible actions of others who are ignorant by showing them a better way. Thus begins the birth of Christ within the hearts of all of us.

A few years ago, when I was active in my studies with the Tibetans, they asked me to go through the sacred ritual in the desert, as had the American Indians a century before me. The poison they selected was strychnine, and I agreed, with a little apprehension, to do this in the upper Mojave Desert in a very sacred place. After seven days of preparation for the experience, I was ready for the ordeal, which lasted three days. During that time, I had to use every bit of knowledge and wisdom I had accumulated to survive and return. Sometimes I ran, sometimes I prayed and sometimes I did intensive yoga and breathing exercises. My entire life ran before me. Past lives ran by and future experiences here and on other worlds of consciousness became apparent. Late into the second day, I knew I was winning the battle for the return to civilization in my present form and I began to experience a tremendous "high" and also began to realize this entire existence is all energy moving from one place to another, and God gave us total freedom to move this energy any way we desired.

When I returned from the desert, I knew I had conquered fear, and was and will be eternally thankful to all my beautiful teachers for those divine moments of truth. To show my gratitude, I vowed to serve God by educating others not so fortunate as to have had a direct experience like I did. As you move on through this book, I will present the energies as I experienced them and the metaphors for connecting them to the modern school of thought that worked for me. Each of you, dear readers, may see things differently, and that is fine, because beauty gains its essence in individual experience and reality becomes more real when we share our different viewpoints.

Figure IV-1

INTERIOR FEATURES OF THE GREAT PYRAMID AS ALLUDED TO IN THE ANCIENT EGYPTIAN TEXTS



FROM THE ONE

In our study of energy, we will begin with the Godhead and reduce it to the simplest cell in our bodies. I have constructed some metaphors which will allow you to see a train of continuity from the microcosm to the macrocosm.

Creations have no beginning or ending. They are infinite. This is a hard fact for the human mind to conceive, living in a world of so-called true values. There are, however, cycles of time, form, manifestial light and darkness. Throughout, the life or God force is ever-present.

The successful study of the subject of the Angelic Hosts restores to its essential monotheism every apparently polytheistic religion. At the heart of every great World Faith is the concept of an Absolute, Unknowable,

Infinite and Unchanging Source and Foundation. From this, at regular intervals, emanates the potentiality of divine Ideation as the purest abstraction. This is the reality behind the One God, however formalized, of all religions, and especially of the esotericism of the Ancient Mysteries. At this stage in the process of emanation from the Absolute, unity alone exists. No later changes, no series of successive emanations from this ONE ALONE alter the fact that the manifested Source is a Monad.1

By reflection of Itself in the eternal, pre-cosmic, virginal Space, the ONE is said thereupon to establish a dyad2 which is positive-negative, male-female, potential father-mother in one Existence. It should be noted that not an actual but a reflected "Second Person" has now come into existence, or rather is conceived, after which numerical law assumes supreme rule of the process of emergence or emanation and objective appearance of creative Gods in multiplicity.

The positive and negative aspects of the ONE interact interiorly, as an androgyne, to produce an objective Third. This Third is not regarded as a self-separate unit, an independent existence. Monad, dyad, triad, remain as a tri-functioning unit, a three-in-one, behind and yet within the veil of pre-cosmic Substance.

An irresistible process has now been initiated. An omnipotent force has begun to emanate from Absolute Existence. The Three-in-one is propelled, as it were, towards objectivity and finiteness. The Triple God awakes and opens Its single eye. The triangle of light emits rays. These are inevitably seven in number. Sub-rays shine from them, each an intelligent Power, each a creative Logos, each an Archangel of spiritual light.

Universal, divine Ideation becomes focused creative thought. The single, all-inclusive Idea passes through the phases of duality, triplicity and sevenfold expression into the almost infinite diversity potentially present in primordial thought. The purely spiritual has thus become manifest as the purely mental, which is formative and, by the ceaseless action of the propellent force, projects its Ideations as the Archetypes of Cosmoi, Solar Systems and all that they ever produce.

Numerical law, time in succession, involutionary and evolutionary processes, replace spaceless eternity. Divine thought sets up time-space conditions and in them produces material forms which increase in

density until a limit has been reached. Thereafter, the whole process is reversed until limited time and space disappear into eternity, thus bringing the great cycle to a close.

Let us study the creation or emergence of a universe from nothing (the infolute) as it emanates from the all-containing sourceless source. This source is regarded as a triune, consisting of pre-cosmic spirit, pre-cosmic matter and eternal motion.

The beginning and ending of universes occurs in cycles called by the eastern people periods of Manvantara (motion) and Prayalaya (rest). This pattern can be viewed as a waveform of motion, just like the wave in electricity or sound.

Figure IV-2

This cycle repeats itself again and again, changing its rate of vibration like a cosmic musician changing chords in a concerto. The song of creation is the song of Shiva and the motion that follows is the dance of Shakti. All of these forms of energy are in the likeness of God. What is God? The way I answer that question to myself is that when looking into a mirror I say I see God to the level of my understanding. He is in me as he is in all life. Maybe next time I look, I will see him more clearly!

In order to become the many, the One must first become the three. The possible combinations of three are seven. Continuance of advance from unity to diversity inevitably involves passage through seven modes of the manifestation and expression of that which essentially is one. Thus divisions arise in the One Alone. Thus beings arise within the One Life and intelligences appear within Universal Mind, all inherent within the Whole.

Of the Trinity, the point is the highest because it is the Source. Of the Seven, the Trinity is the highest because it is the parent. Thus hierarchy exists when manifestation occurs. Parent hierarchies give birth to offspring in a descending scale of nearness to the original Source.

Emanated beings in hierarchical order inevitably come into existence when movement first occurs in THAT which of Itself is still.

Absolute stillness implies absolute motion, the two terms being synonymous. The Absolute, therefore, can be both still and in motion whilst retaining absoluteness. The finite is therefore contained within the Absolute, which in its turn enfolds and permeates the finite. Because of this, finite beings have regarded the Absolute as divine and have named it God.

The worship of the all-enfolding and all-permeating Source of all is true religion. To reverence the omnipresent Source and to conform to its laws of manifestation is true religious practice. To conceive the Source of all as a person, however exalted, and to give it human attributes, is not true religion. To reverence that false conception and live in fear of its vengeance is not true religious practice.

Absolute existence and absolute law – these are the highest existences, and therefore are worthy of man's study and reverence. Finite existence and finite law are not the highest existences and therefore are not worthy of the title "God". They are offspring and not parent, secondary and not primary, and their elevation to primary rank can only lead to confusion and dismay.

Modern man needs to emancipate himself from the delusion and worship of a personal, and therefore finite, God, and to substitute therefore an impersonal and infinite Deific Power and Law, with Deific Life as the essential Third.

Deific Life is the vehicle of Deific Power, and Deific Law rules their combined expression. By the instrumentation of Life, therefore, all things truly were made. Life is the Creator, Sustainer and Transformer of the Cosmos. Life should be reverenced in all its manifestations, and such reverence of omnipresent, ever-active Life is true religion.

What, then, is Life to the human intellect? How may Deific Life be conceived, perceived and worshipped? That is the supreme problem. Life may be conceived as the soul of form, its relationship to which is comparable to that of the sun to the solar system. The difference between the two relationships is that Life is omnipresent and the sun has a fixed location, even though its rays pervade the universe. Life does not

send forth rays; for, as the interior source of existence, Life is all-pervading and all-penetrating.

Life is beneficent in that by it all things are sustained. Without it, nothing can exist that does exist. It is the Thought-Soul, the Spirit-Intelligence, of all Creation. Vehicle for Power imbued with ideative thought, Life is the one essential to existence, to evolution and to transfiguration. Life, then, is God and God is Life.

The term "God" thus implies all Nature, physical and super-physical, the evolutionary impulse imparted to it and the irresistible creative force which bestows the attribute of self-reproduction and the capacity to express it indefinitely. This concept of Deity includes the creative Intelligences – the Elohim – which direct the manifestations and the operations of the one creative force, the divine thought or Ideation of the whole Cosmos from its beginning to its end and the "sound" of the Creative "Voice" by which that Ideation is impressed upon the matter of the Cosmos. All these, together with all seeds and all beings, forces and laws, including the one parent law of harmony, constitute that totality of existence to which in this work is given the title "God."

If so vast a synthesis may be designated a Being, then that Being is so complex, so all-inclusive as to be beyond the comprehension of the human mind and beyond the possibility of restriction to any single form; for the idea of God includes Everlasting Law, Everlasting Will, Everlasting Life, Everlasting Mind.

In manifestation, "God" is objectively active. In non-manifestation, "God" is quiescent. Behind both activity and Quiescence is THAT which is eternal and unchanging, the Absolute, Self-Existent Self. The Creative Agent referred to by various names in the world's cosmogonies is the active expression of that eternal, incomprehensible One Alone.

The names "God" and "Logos" are thus used in this book to connote a Divine Being, omnipresent as the Universal Energizing Power, Indwelling Life and Directing Intelligence within all substance, all beings and all things, separate from none. This being is manifest throughout the Solar System as Divine Law, Power, Wisdom, Love and Truth, as Beauty, Justice and Order.

The Solar Logos is regarded as both immanent within and transcendent beyond His System, of which He is the threefold "Creator", Sustainer and Regenerator of all worlds and the Spiritual Parent of all beings.

Whether as Principle or Being, God has been conceived in many aspects and as playing many roles. Ancient Egyptian, Hellenic, Hebrew, Hindu and Christian Cosmogonies represent Him as bringing His worlds into existence by means of the creative power of sound. In Christianity we are told: In the beginning was the Word, and the Word was with God, and the Word was God."3 Then God spake and in six creative epochs or "days," each followed by a period of quiescence or "night," all worlds, all kingdoms of Nature and all beings came into existence. As a result of this outpouring of creative energy as sound, forms appeared expressive of the divine creative Intent, embodiments of divine Life and vehicles for divine Intelligence. Thus God may be conceived as Celestial Composer, Divine Musician, perpetually composing and performing His creative symphony, with its central theme and myriad variations. This concept of creation by the Voice, known as the Logos doctrine, important in the study of the subject of the gods, is developed in later chapters of this book.

God has also been poetically and mystically described as Divine Dancer. Nature – with all its varied rhythmic motions, including the cyclic swing of planets around the sun, terrestrial changes, the flow of river, waterfall and stream, the ceaseless movement of the ocean waves, the swaying of the trees and flowers, the ever-changing forms of fire and flame, the motions of electrons around their nuclei – is conceived, notably in Hinduism, as part of the great dance of the Supreme by which all things are created and sustained.

"A man's idea of God is that image of blinding light that he sees reflected in the concave mirror of his own soul, and yet this is not in very truth God, but only His reflection. His glory is there, but it is the light of his own Spirit that man sees, and it is all he can bear to look upon. The clearer the mirror, the brighter will be the divine image. But the external world cannot be witnessed in it at the same moment. In the ecstatic Yogis, in the illuminated Seer, the spirit will shine like the noonday sun; in the debased victim of earthly attraction, the radiance has disappeared, for the mirror is obscured with the stains of matter."

From these concepts of the Deity there emerges inevitably the idea of a divine purpose, a great plan. That plan is assumed throughout this book to be evolution, but not of form alone. The word "evolution" is herein used to connote a process which is dual in its operation, spiritual as well as material, and directed rather than purely natural or "blind." This process is understood to consist of a continuous development of form accompanied by a complementary and parallel unfolding of consciousness within the form.

Although man cannot completely know the evolutionary plan, from his Superiors, Sages and Spiritual Teachers throughout the ages he learns that the motive is to awaken and bring to fulfillment that which is latent, seed-like, germinal. Divine Will, divine Wisdom, divine Intellect and divine Beauty – these are latent in all seeds, Macrocosmic and microcosmic. The apparent purpose for which the universe comes into existence is to change the potentialities into actively manifested powers.

On Earth, for example, for each of the kingdoms of Nature there is a standard or ideal which is dual, as is the evolutionary process. The ideal for consciousness in the mineral kingdom is physical awareness, and for form, hardness and beauty. For plant consciousness the ideal is sensitivity, capacity to feel, and for the plant form, beauty. For animal consciousness, it is self-consciousness of feeling and thought, and for animal form it is beauty. For man the evolutionary goal is the complete unfoldment and expression of his inherent divine powers – will to omnipotence, wisdom to omnipresence and intellect to omniscience. In the "perfect" man or Adept, these powers are expressed in fully conscious unity, and therefore perfect co-operation, with the Creator of all in the fulfillment of His plan.

If we consider the Logos as Musician and the continuous process of creation as the performance of a great symphony, then this, the "Great Work," He conceived and developed in earlier creative "Days",4 and perchance perfected in the silence and darkness of intermediate, creative "Night". When once more there is to be light, He "speaks", and by the power of His "Word" brings all things into being. This first expression of the "motif" of the new universe is "heard" or responded to by virgin matter, and the planes of Nature with their forms and inhabitants gradually appear. Into these the Logos pours forth perpetually His Life that they may live, this being His continuous sacrifice, His everlasting oblation.

The Logos or Verbum is, in reality, no word or voice of any Being. It is pure Will, expressive of the presumed purpose or intent of the divine Father-Mother in bringing forth the Universe. It is the irresistible, all-pervasive, inherent impulse to self-expression, expansion (hence the name of Brahma, from the Sanskrit word brith, to expand and grow) and fullness which reigns at the heart of all Nature and all Creation from the highest to the lowest. It is the will to fullness which "sounds forth" at that Cosmic moment when divine Ideation is first emanated as Will-Light from the Absolute.

Throughout the Cosmic Days and Years which follow, that Will-Light calls into existence suns, planets, beings, in obedience to law. Level after level and plane after plane of increasing density come into existence and gradually embody and show forth the Will-Light. Monads flash forth their Rays. Beings are emanated and inhabit the planes. Deeper and deeper penetrates the Cosmic Will-Thought-Word, awakening the sleeping substance, forcing its atoms to answer, to embody and echo, or resound, the Cosmic Word. The Light shines forth from the Center to illumine the darkness and render visible the hitherto invisible robes in which the All-Mother is enwrapped.

The Will becomes more potent. The Sound of the Word becomes louder and the Light becomes brighter as the Aeons pass. The Monads become more radiant and their forth-flashed Monadic Rays wider and more brilliant. The denser regions assume the intended forms. The outer darknesses give way to Light, and where once there was Chaos, divine Order rules.

In each and every being thus called into existence as dweller and toiler in the created worlds, the Cosmic processes are, microcosmically, reproduced and fulfilled in parallel. As the whole responds, so does every part. In man, as one such dweller and toiler in the worlds, the inertia and silence inherent in matter give place to rhythmic motion and to the "heard" and "answered" creative Voice. In man, as in universe, darkness is displaced by light.

The universal "Word" when uttered becomes manifest as myriads of chords, each a coherent, self-existent sound with its force and light manifestations. Each chord appears as a relatively changeless, abstract form, Archetype or divine idea, in the higher worlds of each of the planets. These Archetypes in their turn sound their "word", "relaying"

into the lower worlds the primal Word-force. Magnetic fields are set up therein, matter is drawn into them and, with the aid of the Gods, is molded into evolving forms. These forms, vivified by divine Life, become the abode of intelligences (the Monads) at the mineral, plant, animal, human and superhuman phases of development. As a result of experience in the forms, these intelligences, assisted by the Gods, gradually unfold their innate faculties and powers until the degree of development set both for them and for the forms has been attained. The Gods are thus conceived both as builders of form and assistants in the evolution of consciousness.

When this standard has been reached by all beings and, in obedience to the law of cycles, the time limit of objective manifestation has been attained, the whole Solar System is withdrawn into the subjective state. In this condition it remains until under the same cyclic law it reappears and the process of development or ascent is continued from the point reached at the close of the preceding period of objective manifestation. Occult philosophy sees this process as continuing indefinitely, there being no limit to the evolutionary possibilities. This orderly progression has no conceivable beginning and no imaginable end.

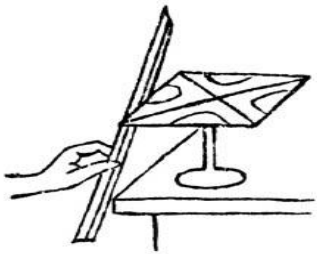
CREATIVE HIERARCHIES

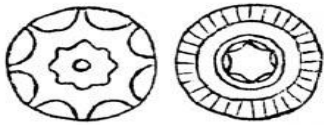
The creative energies of which all forms are the product, first emitted as sound by the utterance of the "Word", may be thought of as arising from a central, spiritual Source, represented physically by the sun. At their source these energies have tremendous potency. The whole race of the Gods from the Solar Archangels to the planetary angels serve somewhat as electrical transformers. They receive into themselves the primordial, creative power, and as if by resistance to its flow reduce its "voltage". From the Solar Gods it passes through their lesser brethren, rank upon rank, until it reaches the physical worlds. There, with the assistance of the nature spirits, it throws matter into shapes conceived by the Creative Mind.

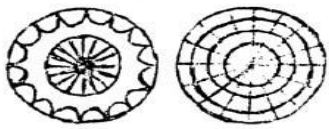
The capacity of sound to produce forms may perhaps find support from sonorous figures which can be formed by the vibrations of substance emitting a musical tone. Geometrical figures are, for example, formed by sand on a plate of glass or metal when the bow of a violin is drawn along the edge. Ernst Florens Friedrich Chladni (1756-1827), a German physicist, produced geometrical acoustic figures which were formed by

the nodal lines in a vibrating plate, made visible by sprinkling sand on a plate, where it settles on the lines of least resistance. Jules A. Lissajous, a French scientist (1882-1880), produced figures formed by curves due to the combination of two simple harmonic motions. They are commonly exhibited by the successive reflections of a beam of light from the prongs of two tuning forks or by the mechanical tracing of the resultant motion of two pendulums as in a harmonograph, or by means of Wheatstone's rods. Lissajous also produced figures given by a horizontal and a vertical tuning fork vibrating simultaneously. The figures differ when the forks are either in unison or at varying differences of phase and of notes apart. If the capacity of physical sound to produce forms may also be attributed to sonorous creative energy or Word-force emitted at super-physical levels, then the Logos Doctrine finds some scientific support.

Figure IV-3







In order to relate the discussion so far, let us begin to imagine different energies working together in unison. As energy moves through the cosmos forming universes, very definite patterns begin to form and repeat themselves. Once you have a solid overview of the basics of all form, you can apply that viewpoint and understand the flow of energy in everything you see, whether it is a human being, a shining gem stone or a shell on the seashore.

Read the next few pages and then take some time to meditate on the drawings of explanation.

Close your eyes and imagine we are at the end of Manavantara or an involute cycle. All is Black.

Gradually an indigo mass of moving lines are slightly visible and they twist and turn like a thousand dark serpents in the night. This is the plane of mind ever-present, the foundation of all

life as we know it, called Agni by the Tibetans. The lines slowly form a shape of the cosmic word Aum.

Silence – all is still. The word begins to vibrate and out of the word, the form of one bright light appears. This we call the essence of the Father. The light shines out in darkness to the far corners of Creation where the Father's will sends it no farther. Then it reflects back toward its first cause and the reflection is the Son. The essence of the One light, the Father, and reflecting back, the Son, is the Divine Mother, the Holy Ghost. Many people have been baffled by this fact, not realizing that the moment the Father shines from the infolute, the material of the light itself is the Holy Ghost. So the Holy Ghost is ever-present in the instance of Creation. Thus the One becomes the Three. All material form is made up of Deva (Angel) substance, and this principle is the feminine principle of the universe, personified in the form of Aphrodite, the Godhead of Woman. The corresponding planet is Venus, the alter-ego of Earth.

Christ is the Godhead of all Men, and the Father is the love principle of union predominant in both Men and Women.

The greatest schism which has ever occurred in the Christian Church was that between the Eastern and Western branches, the Greek Church and the Roman. The doctrinal reason alleged for it was the supposed corruption of the truth, by the introduction into the Creed of the word filioque at the Council of Toledo in the year 589.

The question at issue was whether the Holy Ghost proceeded from the Father alone, or from the Father and the Son. This explanation helps us see what was the point at issue; and furthermore, it shows us, curiously enough, that both parties were right, and that if they had only clearly understood the matter there need have been no schism at all.

As the reflections begin to become apparent in the one light, picture a forming of shadowing and the subsequent separation of the one light into three colors, red, blue and green representing the manifesting of the Father, Son and Holy Ghost into light. They in turn vibrate and set up four lower vibrations of yellow, orange, purple and violet. These emanations are ever present everywhere.

As the energies take on form, they are moving in definite patterns and have definite intelligence behind and in them. These energies can be

called Angelic Hosts. The totality of the Angelic Hosts and nature spirits of a Solar System is a manifestation of one Solar Archangel of unimaginable splendor, within whom all angels live, move and have their being. From this center and source of their existence, all have emanated, and into it all will ultimately return.

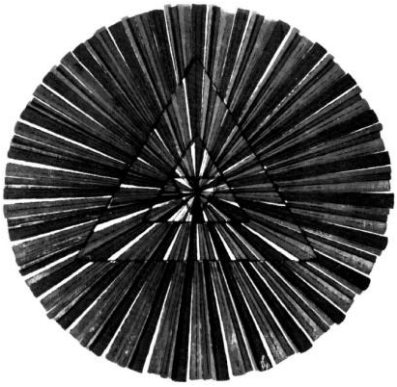
In order to manifest, the One Supreme Being becomes expressed in three modes of activity, Three Aspects, each of which may be presumed to find expression as an archangel only slightly less great than the One Alone. These Three are creative, preserving and transforming Aspects, masculine, androgyne and feminine creative potencies, and in their representative and presiding Archangels one of those forces will predominate. Although three mighty Beings, they are also projections and expressions of the Primordial One. These three Emanations in their turn unite in every possible combination to produce a sevenfold self-expression of the Divine Monad. Each such expression is represented in the Angelic Kingdom by a lofty Archangel, and all these together are referred to in Christianity as the Seven Mighty Spirits before the Throne, and elsewhere as the Seven Archangels of the Face, the Cosmocratores, the Sephiroth.

Figure IV-4

(The Sacred Word Sounded by the Logos.) AUM

The beginning of the ancient knowledge — the PRIMAL SOUND of creation upholding manifestation in the eternal moment of existence by the indestructible presence of Conscious Being in the form of Vibrations (of the Primal Sound of Creation) in the perpetual evolution within the destructive silence of ETERNITY of time.

Figure IV-5



RE EVOLUTION

The journey that never was made

Amid hopes and perils the trail was laid

Through adventures that never took place.

Mission lost in passion transient

Seeking pleasures always in pain

Desire – moments fettered time thru' space

Path blazed by desire in flame

Journey awakes to its joyous game

Guided in darkness, now in light

Motion becomes its own delight

The end is ever in the source inscribed

Around the circle never described

Time and space and Motion sublime

Rhythm of Stillness signs the hymn

All is yet an intense Reality

A moment in Conscious luminosity.

The creative impulse shines forth as light from the One, through the Three and the Seven to produce, at the highest spiritual levels and under the laws of number and harmony, the ideal forms, the archetypes of every living thing in all kingdoms of Nature, including the human and the angelic. An Archangel presides over each stage of the projection of the Archetype. At every degree of densification, in each successively denser plane of Nature, angels of appropriate Orders embody the power and intent of the Creative Will-Thought and assist in its expression as evolving forms. This hierarchical system obtains throughout all levels, each of the lower groups being an expression of a single higher Intelligence.

On the astral and etheric planes[5], non-individualized nature spirits are the lowest Order in the hierarchy of the Angelic Hosts. In their purely instinctive response to the will-thought of their seniors, and in their apparently aimless, though unconsciously purposeful, play, they correspond somewhat to the various shades and colors moving in the beam of the cinema projector, the visible universe coming into existence as the result of their creative activity.

This hierarchical method of self-expression by the primordial, deific Principle, is also in operation through Orders of angelic directors of the evolution of life and form in areas of differing dimensions. A single Archangel thus presides over the Solar System as a whole. Each of its major parts is also under the direction of an Intelligence of appropriate evolutionary stature. Our Earth, for example, as a physical unit composed of earth, water, air, fire and ether and its super-physical planes and life, is a vehicle for the Archangel of the planet. For this Being, each of the physical and super-physical planes or spheres – seven in all – which together constitute the whole Earth, is a vehicle of consciousness. The vast company of Solar and Planetary angelic beings is sometimes referred to as the Army of the Light and the Hosts of the Logos.

PLANETARY ARCHANGELS

The Archangels or Spiritual Regents of the planets, each of whom maintains an Ambassador and and an "Embassy" on Earth, have been referred to somewhat graphically as Heavenly Snails[6] who move with apparent slowness on their orbits around the sun, each carrying their physical planet on their back like a house or shell. The astrological

attributes and psychological, mental and spiritual influences of heavenly bodies emanate in large measure from these ensouling Intelligences.

The Archangel of a planet may be regarded as a synthesis of all other Archangels, angels and nature spirits within the planetary field. Immediately below the planetary Archangel may perhaps be placed the Archangels of each of the seven planes or spheres, all the substance of each of which is a vehicle for the Archangel of the plane. From this it follows that each of the apparently individual angels of a plane is, in reality, an expression of the power, the life and the consciousness of that plane as a whole, and of its Archangel. Comprehension of this fundamental unity is all-important in achieving contact, communion and collaboration with the greater and lesser Gods.

Magic, it is said, is the process of producing visible, physical results determined upon by the trained will-thought of the magician who has found the way to communicate with the appropriate angelic Intelligences and win their collaboration. Magic has therefore been described as the power to address the Gods in their own tongues.

THE CHERUBIM

The One Law also finds expression in great Archangels of Light and is administered by them. These are said to be four in number, each with innumerable subordinates in hierarchical order fulfilling the Law according to the twofold principle of equilibrium and cause and effect. These Four are sometimes called the Lipika[7], or Recorders, and sometimes the Devarajas of the four quarters of the compass, the Rulers of the North, the South, the East and the West. They are personified in the Egyptian religion by the great law-giver and chronologer, Tehuti and the four Sons of Horus, Mestha, Hapi, Tuamutef and Qebhsennuf; in Judaism[8] by the Four Holy Living Creatures, the Cherubim, or sometimes as a single Cherub with four faces – of a man, an eagle, a lion and an ox – and by various three or four-headed beings in other systems of angelology. In Christianity the Lipika – assigned to the Order of angels known as the Watchers – are personified as the Recording Angel who writes in a great book men's deeds, by which they are judged.

Babaji, who is fast becoming popular to America through the book, Autobiography of a Yogi, is a personification of one of these mighty Recorders. His sister, Mataji, is his divine reflection or polar opposite.

Now continue on, close your eyes and realize the universe is self-limiting for the purposes of manifestation.

THE FIERY CROSS

Now the energies flow to and from the four directions of space, and an Archangel is stationed at each quarter as Director of that energy. In further explanation it may therefore be said that the Creative Fire is conceived as descending vertically from zenith to nadir to penetrate hitherto virginal, pre-cosmic substance or space, regarded diagrammatically as horizontal. A cross is thus formed, the point of penetration being at the intersection of the arms. This point in space denotes the center from which the creative and constructive process arises to transform chaos into Cosmos. Here is the central sun. Here, the Logos as Creative Intelligence and Power establishes the Cosmic Archetype or Ideation from which all develops under the rule of Time, or throughout successive cycles.

The thought-imbued, descending Creative Fire radiates horizontally from the point of intersection chiefly in the four lateral directions, or to the North, the South, the East and the West, which is again self-limited for purposes of manifestation. With the existing vertical rays, the six-armed cross is thus formed, which is the fiery core of the resultant Cosmos. The Cosmic Christos is symbolically crucified upon this cross and this is mirrored in the Crucifixion of the historical Christ.

Each of the six creative rays of six arms of the cross is conceived as possessing distinctive characteristics, which find expression in an Order of Intelligences. Thus to each quarter is attributed a special influence and an Archangel with its associated Angelic Hosts, one hierarchy being stationed at each corner of the Universe, as it were. Each Archangel is also a Lord of one of the four elements, the fifth, aether, being associated with the center of the cross. As previously stated, these Intelligences are the Sacred Four of World Religions, the Mind-born Sons of Brahma and the Four Devarajas of Hinduism, the Cherubim and the four-faced Archangels of Kabbalism and Judaism, including the four symbolic animals of the vision of Ezekiel and associated with the four Evangelists.

Time begins as the cosmic, fiery cross which revolves around its vertical axis, as does the physical Cosmos round its Central Sun. This gyratory motion is reproduced throughout Nature as the axial revolutions of suns,

planets and spinning chemical atoms, in which electrons and other particles follow planetary paths round their nuclei. Solar Systems, both in groups and individually, and their component planets, also move through space on orbital paths round central suns.

These axial and orbital motions of stellar, solar, planetary and atomic bodies are physical manifestations of the revolutions round the central Spiritual Sun at the nave or hub, of the six-armed cosmic, fiery cross of three dimensions of which the swastika is a two-dimensional symbol. The swastika is an equal-armed cross with short secondary arms at right angles to the primary ones. These hooks, as they are sometimes called, represent the flames and sparks which stream backwards as the fiery, fohatic9 cross revolves continuously throughout creative Day.

Vortices – cosmic, nebular, stellar, solar, planetary and atomic whirlwinds in space, maelstroms in matter, and perhaps the chakras of animals and men – are produced by this vast circumgyration of the cosmic cross of Creative Fire. "Fohat", it is said, "digs through space seven holes."10 Fohat, however, is not electrical energy alone. It is endowed with intelligence. It is, in fact, a Being, though inconceivable as such by man, an Archangel of Fire, a veritable God. The vertical descent of fiery power, of horizontal radiations into the four quarters of the spherical field, the revolution of the resultant cross, the formation of vortical centers at the heart and along the arms, and the creation and densification of universes and their components according to cruciform and vortical designs – all this is directed by the so-called Seven Sons (and Brothers) of Fohat, the great Gods of the six directions of space, the Cosmocratores, the Archangels of the Face, the Sephiroth.

–

1 Monad, Greek. The one indivisible self – the Unity: the eternal, immortal and indestructible human spirit.

2 Sometimes incorrectly written, duad.

3 John 1:1

4 According to Occult philosophy, Solar Systems, in obedience to a universal, cyclic law emerge, pass into obscuration and reemerge perpetually. (Each new creation continues the evolutionary process from the stage attained at the close of the preceding era Manavantara). These

periods of obscuration and manifestation are known as "nights and days" – in Sanskrit, Pralayas and Manavantaras.

5 The universe consists of seven worlds or planes, each composed of matter of seven degrees of density; the physical and etheric combines to form the densest followed in order by the astral, mental, intuitional, spiritual and two others as yet beyond the range of human consciousness.

6 Vide The Secret Doctrine, H.P. Blavatsky, Vol. IV p. 269, Adyar Edition.

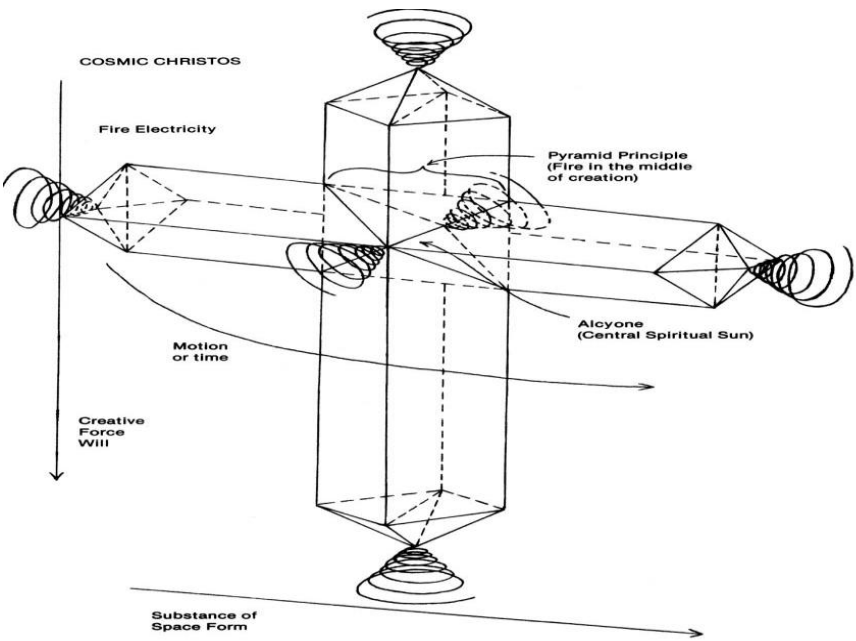
7 Lofty intelligences who, as Officials of the Inner Government of the Solar System administer the Karmic law.

8 Ezekiel 1: 5, 6.

9 Fohat, Tibetan. The constructive Force of Cosmic Electricity polarized into positive and negative electricity.

10 Vide The Secret Doctrine, H.P. Blavatsky, Vol. 1 p. 203.

Figure IV-6



Energies feeding the Christos of manifestation come from within (Godhead). The process whereby they externalize Into the Absolute is called Fohat, the primal force of Creation. The swastika was the representative symbol used by the Ancients to represent this fact.

THE INVERSE LAW AND THE PROBLEM OF EVIL

SATAN AND ARMAGEDDON

In occult philosophy, Deity is Eternal Life, manifested in form according to numerical law in Manvantara, and unmanifest in any form conceivable by the human mind in Pralaya. In one aspect, Satan is Eternal Substance, resistingly shaped into forms by the One Life during Manvantara, and remaining formless during Pralaya.

The Archangels and angels in their ten Orders make manifest Eternal Life according to the "Word". In one of their many aspects, the Inverse Sephiras are expressions of Eternal Substance and its inherent spirit of resistance to Life. In man these two meet, and his Herculean task is to bring them to perfect equipoise. As Adept, he achieves this in his own nature. As Logos, he establishes it in a Solar System of his own emanation. Since man is the only being in whom spirit and matter are equally present, he becomes the battleground of the universe. Armageddon is waged within him. The spirit in him suffers continual "defeat" until the day of the development of the Higher Mind. From that time onwards, the "defeat" of matter is assured. When the light of intuition begins to shine within man, victory is in his hands. As a race he then establishes brotherhood on his planetary home. As an individual he "enters the Stream", becoming an Initiate of the Greater Mysteries, and later an Adept.11

As manifested powers, both spirit and matter are septenates, and find expression in and through seven principles. Those of Deity are the modifications in Divine consciousness of which the seven states of matter are the material product. The seven principles of Satan, in the occult sense, are those seven planes of matter and their seven sub-planes. Neither Satan as a personal devil, an isolated embodiment of infamy, nor God as an extra-Cosmic, almighty, infinite yet personal, moral Governor, whose laws can be abrogated or modified by personal persuasion or bargaining, as assumed in the popular imagination or the theological mind, has any place in occult philosophy. There is truth in

the concept of a Cosmic pair of opposites, spirit and matter, activity and inertia, construction and destruction, I-am-ness and I-am-all-ness, but their man-made images are a delusion.

Nevertheless, in their exoteric aspects, almost all religions have promulgated the idea of an Evil Being in perpetual opposition to the Supreme Deity. Popular Christianity is no exception, though, as is the case with so many of its doctrines, the Satanic form has changed with the passage of time. Dante described the Devil as a giant with three heads, colored red, yellow and black. Milton and Goethe presented a tragic, yet heroic and even reasonable, man of the world. The Devil has also been made to wear a one-piece suit of red and to be armed with a pitchfork. Behind these popular images is a concept of Satan as a fallen angel, a once-pure spirit, continually tempting man to sin. Since evil is a negative quality, being merely the lack of good in man, and Satan is the embodiment of that evil, he cannot be regarded as a positive, existing principle. Rather does he represent the absence of the good, empty spaces in the omnipresent web of the universe, interstices, perhaps, in the warp and weft upon which the great Weaver perpetually weaves, or manifest outwardly, Divine ideas.

The existence of both Devil and evil is intimately associated with the attribute of free will in man. Within the structure of cosmic law, and apart from the irresistible evolutionary thrust, man possesses the freedom to think, plan, speak and act either in accordance with Nature's purpose or against it. When, whether consciously or unconsciously, he operates against it, he becomes an antagonist of cosmic purpose. In consequence, he generates for himself adverse or "evil" experiences and conditions of life. If he continues, he tends to become cut off from the currents of the universal Life-force, isolated, a being of death rather than of life. Some men have thus continued to exercise their freedom of action. They are the so-called black magicians, the Dark Powers, the followers of the Left-Hand Path, the Lords of the Dark Face, the dread Brothers of the Shadow. Their destiny is not to be annihilated, but to sink into the condition known as Avichi, the "wave-less", the opposite pole to Nirvana, which the Adepts of the Right-Hand Path attain. Ultimately, in a later cycle of manifestation, these who become highly developed embodiments of self-separateness re-embark upon the involutionary and evolutionary journey. Satan himself, if regarded as an

existent being, would seem to have exercised this freedom; self-separative motive and action.

Thus, in one aspect, Satan is a personification of Ahamkara, the I-making impulse from which arises the delusion of self-separateness within omnipresent Spirit-Life. All evil, and in consequence, all human sorrow, is said to spring from this heresy of "separateness". In another aspect, the fabulous monster which is the Satan of popular theology may be regarded as an excuse, a scapegoat, someone to take the blame for the errors into which humanity falls whilst passing through the purely emotional and mental (especially) phases of its evolution.

THE NATURE OF EVIL

Pneumatology apart, Satan as the personification and incarnation of pure evil has, in occult philosophy, no existence by himself. Evil is but the absence of good. It exists only for him or her who is made its victim. Demon Deus inversus est. The Devil is the shadow of himself which a man sees when he turns his back to the light. Nature is neither good nor evil, and manifestation follows only unchanging and impersonal law.

The existence and human experience of the duality of spirit and matter, light and darkness, motion and inertia, expansion and contraction, cause man to think of these as good and evil respectively. If resistance provides a fulcrum, then it is regarded as good. If it frustrates – as by the all-too-familiar "malice of the object" – or harms man, then it is evil in his eyes. The analogy of the searchlight partly illustrates this. Outside the beam and, as it were, pressing upon it from every side, is darkness. Light and darkness are perceived as a pair of opposites. The light-giving effects of the beam ceases at the limit of its range. There darkness begins. Thereafter darkness reigns. The instant the current is switched off, darkness reigns everywhere. If light is good, then the searchlight might be classed by man as good and the darkness as evil. But what, in fact, is that darkness which man calls evil? It is matter not subjected to light. Darkness is unlighted matter. Man calls it evil, and for him the Devil personifies this state.

Plotinus, in his Tractate on The Nature and Source of Evil, translated by Stephen McKenna and B. S. Page, says:

"Evil is from the Ancient Kind, which we read is the underlying Matter not yet brought to order by the Ideal Form.

"Given that The Good is not the only existent thing, it is inevitable that by the outgoing from it or, if the phrase be preferred, the continuous down-going, or away-going from it, there should be produced a Last something after which nothing more can be produced; this will be evil.

"As necessarily as there is Something after the First, so necessarily there is a Last; this Last is Matter, the thing that has no residue of good in it; here is the necessity of evil."

To this, whilst concurring, the occultist would doubtless add "according to the mind and values of man". For in their essential existence, spirit and matter are neither moral nor unmoral, neither good nor bad. They exist as apparent opposites; that is all. Matter appears to resist spirit. But so does the fulcrum of lever, yet without a fulcrum, leverage is impossible. So, apart from human values and human experience, evil as an actual creation does not exist. The origin of evil is in the mind of man. All things can appear as either evil or good, according to human experience and human use of them. Shakespeare echoes this teaching in his words: "Nothing is either good or bad, but thinking made it so."

In closing this chapter, I would like to share with you something I wrote a few years ago. This is part of a Seven Level Discourse. If you write me, I will send you the complete discourse.

Evil and Error

Error is the penalty of imperfection. The qualities of imperfection or facts of misadaption are disclosed on the material Level by critical observation and by scientific analysis; on the moral Level, by human experience. The presence of evil constitutes proof of inaccuracies of mind and the immaturity of the evolving self. Evil is, therefore, also a measure of imperfection in universe interpretation. The possibility of making mistakes is inherent in the acquisition of wisdom, which is the scheme of progressing from the partial and temporal to the complete and eternal, from the relative and imperfect to the final and perfected. Evil is not an actual universe quality; it is simply the observation of a relativity in the relatedness of the Supreme and Ultimate. Evil is a relativity concept. It arises out of the observation of the imperfections which appear in the shadow cast by a finite universe of things and beings, as such a cosmos obscures the living light of the universal expression of the eternal realities of the Infinite one.

Evil therefore exists only in the minds of men, and is felt as discord, which dies in the fires of wisdom and is consumed by the breath of harmony.

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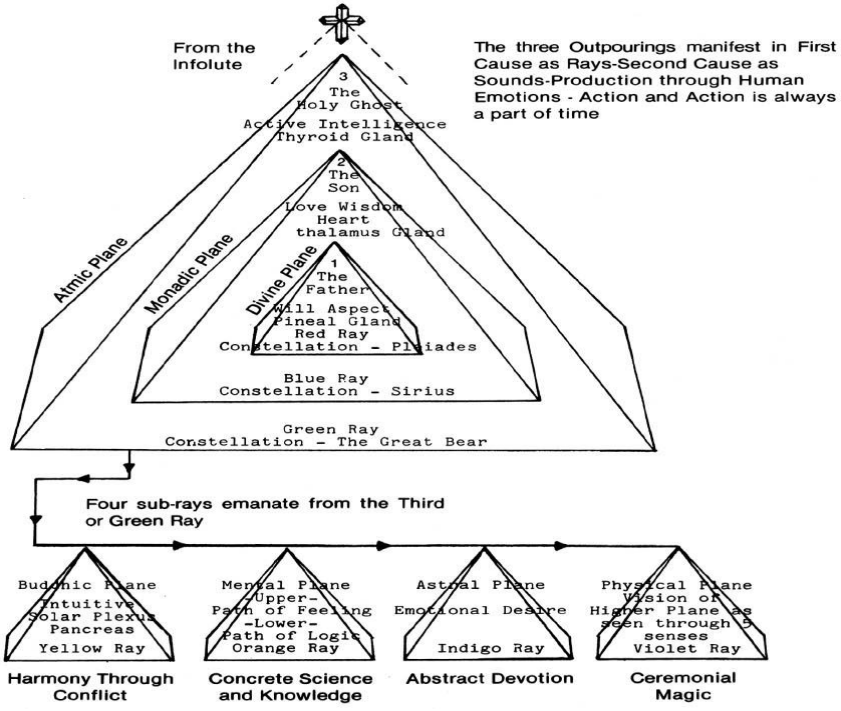
11 A free soul: One who has completed his Karmic obligation to God on earth, and returned to help others reach his state. Vide Initiation and the Perfecting of man, A. Besant, T.P.H. Adyar.

CHAPTER V – THE ONE BECOMES THE THREE OR THE SECRET OF THE PLEIADES

Now that we have seen the origin of energy, let us see how it affects us and how we can better understand ourselves on an energy basis.

The triple nature of God's creative work is really the greatest of the mysteries which were taught in the esoteric religious schools under the symbolic names given to the Deity. The great Drama of Life is played in three acts, and after the play is well underway, all three of them occupy the stage at the same time. These are the three activities which are known as the "Three Outpourings" – three ways of creative action that emanate from the Divine Trinity; one from each of its aspects. Each of these three outpourings is dual in its effects.

Figure V-1



As you can see here, from the Three Outpourings come four sub-activities, of which the Physical Plane is the lowest in vibration. Thus, the One becomes the Three becomes the Seven.

The first of them creates "Energy-Matter". This we studied in the previous Section. It produces the seven basic orders of matter and gives rise to material evolution. The keynote of the second outpouring is the production of "Life-Form," living beings that are vehicles of consciousness of continually increasing measure. This gives rise to biological evolution, the evolution of living forms. The third brings "Spirit-Soul" into manifestation and also the "Seven Rays," a subject we shall consider later. It results in spiritual evolution. To keep these three clearly differentiated within our minds will avoid many pitfalls. Not that they are separate streams of evolution – for the plan is one and they freely intermingle – but they have different functions to perform and often these are confused. Energy is a particular phenomenon that is always associated with matter. As matter is energy-ensouled, so no biological form can exist without "life". When life withdraws itself from the form, the form disintegrates and resolves itself back into its constituent parts. Chemically, it remains the same. But actually, there is a fundamental change, for it no longer has the powers of consciousness it previously possessed. Theosophy states that the life has merely withdrawn to occupy a form of subtler matter. To the scientist, life is a puzzle, for as yet he does not know about the subtler regions of matter, so he cannot explain what happens when life deserts a material form. Life and death, to science, are equally impenetrable mysteries for, unfortunately, it does not yet possess the one key that can open the door to understanding. But, with the rapid development of instruments which are penetrating into the unseen, it would seem that this discovery cannot now be long delayed.

Spirit, too, must have its material vesture, and this we have seen is the soul, a subtly fashioned vehicle of the spiritual worlds, especially responsive to spiritual forces. Energy-Matter, Life-Form, Spirit-Soul: these are the primary differentiations out of which all sentient existence arises.

Now as the energies move through space, they are influenced and affected by different stars and constellations. The constellations that affect us the most, and condition the energies, are the Pleiades, the Great

Bear and Sirius. Corresponding to this, the energies are directed to the planets of Neptune, Uranus and Saturn.

URANUS AND THE GREAT BEAR

In the Secret Doctrine, H. P. Blavatsky had this to say of the Great Bear:

"In Egypt, the Great Bear was the constellation...called the Mother of Revolutions..."

and indeed, Uranus is traditionally regarded as the planet of Revolutions and Cycles. It is related to the Head chakra and to the pineal gland, that endocrine gland which, more than any other, has been shown by scientific research to be responsible for the setting of the body's clocks, the determinator of circadian rhythm, the monitoring of physiological cycles, etc. In the esoteric sciences, Uranus is related to the First Ray of Will and Power and thus to the Creation, Maintenance and Destruction of all life forms. The planet expresses the First Logos and the Third Outpouring. Energies from the Great Bear reach the Central Spiritual Sun of our solar system and thence administer their synthesizing attraction via the planet Uranus. It will be this planet which will "accept" the energies and qualities of all solar planets (chakras) in the final act of our solar system, when, at His great initiation, the Logos will focus, what has been synthesized by Uranus in the central spiritual core of the sun, which is the Jewel in His Lotus and the whole solar system will blaze into a supernova as He achieves.

Further comments by H. P. Blavatsky:

1. "The seven Rishis are the Regents of the seven stars of the Great Bear, and, therefore, of the same nature as the Angels of the Planets or the seven great planetary Spirits." (S.D. II 332. Note.)
2. "It is the seven Rishis who mark the time and the duration of events in our septenary life cycle. They are as mysterious as their supposed wives, the Pleiades." (S.D. II 579.)

SATURN AND THE PLEIADES

The three energies of synthesis which act through the unfolding Solar Lotus are extra-systemic. The energy of the third aspect of the trinity, acting through the third aspect of the Sun, the visible part of which is that fiery disc, derives from the Pleiades. It promotes the forces of Active

Intelligence and uses, as its ultimate agent, the planet Saturn. In Man, the gentle prod of the Third Force mediates through the Throat chakra and the overlying thyroid gland.

No group of stars has received more acclaim, by poets and astrologers alike, in all the great cultures that were concerned with the heavens, than the Pleiades:–

"The group of sister stars, which mothers love

To show their wandering babes, the gentle Seven."

- Bryant's THE CONSTELLATIONS

In Milton's description of the Creation it is said of the sun that:

the gray Dawn and the Pleiades before him danc'd,

Shedding sweet influence, –

the original of these last words being taken by the poet from the Book of Job, xxxviii, 31, in the Authorized Version, which some have thought an astrological reference to the Pleiades as influencing the fortunes of mankind.

Amr al Kais' contribution to the Mu allakat, translated by Sir William Jones:

It was the hour when the Pleiades appeared in the firmament

like the folds of a silken sash variously decked with gems.

Von Herder gave Job's verse as:

Canst thou not arrange together the rosette of diamonds of the Pleiades?

and Hafiz wrote to a friend:

To thy poems Heaven affixes the Pearl Rosette of the

Pleiades as a seal of immortality.

An opening rose also was a frequent Eastern simile; while in Sadi's Gulistan, the Rose-garden, we read:

The ground was as if strewn with pieces of enamel, and rows of Pleiades seemed to hang on the branches of the trees;

or in Graf's translation:

as though the tops of the trees were encircled by the necklace of the Pleiades.

William Rosco Thayer repeated the Persian thought in his Halid:

slowly the Pleiades dropt like dew from bough to bough of the cinnamon trees. *

*Richard Hinckley Allen, STAR NAMES, Their Lore and Meaning.

The stars of the Pleiades are said to be the polar opposites of the seven stars of the Great Bear, which are themselves the outward manifestations of the head centers of THE ONE ABOUT WHOM NAUGHT MAY BE SAID. They are thus described as the wives of the seven Rishis of the Great Bear in THE SECRET DOCTRINE.

There is a strong interplay between the energies of the Seven Sacred Planets of our solar system and the Seven Sisters. Whilst our planets receive their gentle influence, ultimately, the energies of our own solar septenary will find their way to the Pleiades in "heavenly intercourse". In the case of the Earth, this transfer must wait until this planet becomes "sacred" or spiritualized.

If the solar system is seen as a cell in its most active and productive stage of mitosis, then the seven Sacred Planets which nurture and disseminate the divine characteristics of the Seven Rays may be regarded as divine chromosomes in metaphase lining up in the equatorial plate (see illustration SOLAR MITOSIS). After this stage would come migration of genetic characteristics to opposite poles as a prelude to final cell division and the creation of two new entities. The attracting polar forces may be symbolized by the constellations of the Pleiades and the Great Bear, and the three creative outpourings of the Life Waves of the Solar Logos are mediated by these two and through forces associated with Sirius:

First Outpouring Pleiades

Second Outpouring Sirius

Third Outpouring Great Bear

Following the energies again from the Three Outpourings, we come to our Solar System.

THE CONSTRUCTION OF OUR SOLAR SYSTEM

Our solar system is being constructed through the impulses of three great waves of life energy under the conscious control of the Solar Logos Himself, He Whom the ancients were wont to call, The Grand Man of the Heavens. The purposes of these three lifestreams are:

1. The fashioning of the atoms and their supply with the necessary forces to maintain their functions,
2. The combining of the atomic material into forms capable of holding increasing intensities of solar consciousness as they evolve, and
3. The abstraction of that consciousness with its newly won qualities arising from experience within the diversity and complexity of forms evolved.

The mechanism by which these three streams of life force operate and co-operate is that of FIRE.

The close relationship between Fire and the energies which produce mentation in living forms is well understood by the Adepts of the inner government of this planet. That Fire is living essence and responsive to the same basic laws that control mental processes in Man's mind. This is used extensively by those who know these laws and apply them in healing, teaching, dowsing, radionics, etc. The three Fires used in the manifestation of a solar system and its entire contents are aspects of the trinity, Father, Son and Holy Ghost or Siva, Vishnu and Brahma. They are:

1. Electric Fire – Father – Spirit
2. Solar Fire – Son – Constellations
3. Fire by Friction – Holy Ghost – Matter

FIRE BY FRICTION

This constitutes the energy of the first life wave to pour out from the Logos, and is related to the Third aspect of the trinity. It brought about

the construction of undifferentiated matter into the differentiated materials which we call the atomic elements today. This occupied a vast period of time and the manifestation of the last solar system. Our present solar system has evolved subsequently from this material which flared up into a supernova prior to dispersal in the pralaya between solar systems. The planet Saturn still acts as a focal point of this energy, and the rings of Saturn are constituted almost entirely of materials deriving from the last solar system. The visible disc of the sun demonstrates, before our normal vision, the action of Fire by Friction at a Cosmic level or Fire in the Macrocosm. On the planet earth, we have the same fire in microcosm, as essence in many phenomena and in full manifestation in other phenomena.

Figure V-2

THE PLEIADES. (Painted by Elihu Vedder. From the Rubaiyat of Omar Khayyam)

FIRE IN ESSENCE

In essence it produces the Fire of Kundalini in Man. This is an important statement. It helps to clarify the whole subject of the arousal of Kundalini. Many so-called authorities on the subject of yoga rate kundalini fire as the highest possible manifestation of spirit. It is nothing of the sort. It is the response of Fire in Essence to Electric Fire, of a negative energy to a positive influx. Of this same order are the internal fires of the body cells and the atoms themselves, and it may therefore be said with truth that the release of the energy of nuclear fission represents arousal of planetary kundalini. To take this further, we could say that for the first time in the history of this planet, its kundalini is being released consciously and under control of a higher center. That higher chakra or force center in the planet, which we call the human kingdom, is stimulating that center at the "base of the spine" of the planetary Logos (the mineral kingdom) and in the production of atomic energy from bombs or from power stations we have the flow of planetary kundalini to higher force centers which is Yoga on a planetary scale and under control. Pray God that it remains so!

In the phenomenon of lightning we have a manifestation of Fire by Friction on a planetary scale and in the fires on our hearths we witness the action of Fire elementals and feel the warmth of fire spirits, which are latent wherever there are focal points of heat. We all feel the warmth of the internal vitalizing heat in our bodies. Some of us have even witnessed higher grades of fire spirits at work over volcanoes and infernos such as that created by the bombings of cities like Hamburg, London and Dresden.

Of great concern to the disciple is the fiery essence of prana, energy associated with the first sub-planes of all planes. These elementals flood the surface of the planet in close association with sunlight and, through breathing and direct penetration, they are able to enter the tissues of Man and permeate the substance of animals and plants. Again the reader should be reminded that though this fiery essence is essential to the processes of spiritual evolution, it cannot, of its own accord, even through hatha yoga, produce spiritual growth. It needs to be combined with energies of a higher order linked to the practice of mental disciplines to be effective. Obsession with the purely physical elements of the total Man is a trap that many an unwary neophyte falls into.

Similarly, there is essence of Fire by Friction in many of the light rays which flood our planet and Who are Themselves the embodiment of the

Lords of the Seven Rays. The selective use of certain wavelengths appropriate to the purpose can be effective. The use of green and violet light can assist in the healing of related tissues. This was what Fred Hart and Thomas Colson were doing in 1947 with a machine called the Oscilloclast.

The Fires of Man's Mind are not produced solely out of Fire by Friction. They are the product of a blending of Solar Fire with the latter, and, therefore, did not come into interplay until the second solar system.

Fire by Friction, as the first outpouring of the Solar Logos, constructed the undifferentiated matter appropriated by the Logos for his manifestation into differentiated substance, beginning first with hydrogen and oxygen, then the metals and finally the carbons, organic and inorganic. The highest products of the mineral kingdom are the precious and semi-precious stones. These are the "Masters" of the mineral kingdom and their "Ray" qualities are very pure but they had to await the second outpouring for the growth of their rare gifts.

It was the first outpouring which produced the seven planes of substance. The last of these to be produced was the physical plane with its seven sub-planes. Of these last sub-planes, we easily recognize Gas, Liquid and Solid as being the fifth, sixth and seventh sub-planes of the physical. We are also aware of the ionic states of matter which constitute the material of the fourth sub-plane and we are sensing sub-atomic particles of the first three sub-planes. These four are the etheric planes usually invisible to the naked eye. All the seven planes have sub-planes corresponding to those of the physical in degrees of subtlety.

The plane next in subtlety to the physical is the astral (kama), a plane of matter which is emotional in quality. Emotion is matter and we have an emotional or astral body made of the matter of that plane but its construction had to await the Second outpouring. Similarly there is a mental plane constructed before the last two mentioned. Beyond these, and subtler still, and interpenetrating all others are spiritual planes known as atma, buddhi and manas.

THE SECOND OUTPOURING – SOLAR FIRE

This outpouring stems from the Manadic plane and, indeed, on this plane are to be found the human monads whose origin, nature and future, form the whole basis of this work. From this plane issues forth

the Second Outpouring. It stems from the Heart of the Sun, as Solar Fire, and is responsible for the grouping of the atoms of the various planes into forms more and more capable of expressing the nature of the life of the Logos. This is the Second force of the Trinity, and it is a resistless flood that pours down through the various planes, molding out of them, Kingdom and Hierarchies of nature which, though very much in existence to this day, are still beyond the sensory perception of most humans. This Second wave of the Life force of the Logos is responsible for evolution and the constant changes and diversities of form. In those forms which are found in the plant, animal and human Kingdoms on this planet, changes are brought about mainly through the mutation of genes at the level of their etheric matrices.

The Second Outpouring operates under the Law of Attraction, a magnetic force which reaches, successively, the planes fashioned in the First outpouring and brings together the atoms of those planes into the various forms capable of ensoulment by the Life of the Logos. Because the stream is directed towards matter of ever-increasing density or "grossness", this part of the process is rather one of INVOLUTION and we speak of "involving" rather that evolving forms of life. The same diagram shows how some involving entities, as high in spirituality as one of our own Masters of the Wisdom, manifest in the substance of the plane known as the Higher Mental or Manasic. Thereafter, grosser forms appear in the Lower Mental regions and the involving forms become more diversified and less spiritual.

In the planes known as the Astral or Emotional, the number of forms becomes immense and there are many grades of elementals and devas (the names given to these invisible hosts pertaining to the qualities of those planes. Thus we find expressions of deva and elemental forms related to what we know as Fire, Air, Ether, Earth and Water. Their names and diversity are indicated on the same diagram.

Eventually, the Life wave enters the dense substance of the purely physical plane and reaches its deepest penetration in Mineral and Elemental life. Then the Wave swings upwards and the EVOLUTIONARY part of evolution commences. It is as if the outbreathing of the Logos now becomes an "inbreathing" which ultimately produces, progressively, Plant, Animal and Human life, somewhat along the lines of the Darwinian concept, but with many exceptions and always recognizing that the upward sweep is initiated at

Causal levels on planes higher than the physical, and which are the main cause of the emergence and withdrawal of species with the concepts of Natural Selection and "survival of the fittest" playing comparatively unimportant roles.

Between the involutionary and evolutionary streams lie hierarchies of life such as birds, reptiles, bees, insects, cereals and grasses, which are intermediate. They act as bridges, even at levels as high as the Human and Superhuman kingdoms. The poet, P. B. Shelley, is said to be an example of such types but, in general, the intermediate forms have winged structures in their forms or the remnants of them. Taking this quality to the highest levels, we can understand why the angelic hosts described by Emanuel Swedenborg in the excursions he made into "Heaven and Hell" possess wings.

It is important, for a variety of reasons which will emerge later, to draw the attention of the reader to the seven sub-divisions of the Mental plane. These are divided into two. The three upper sub-planes are called "Higher Mental" and their qualities are attuned more to the action of spirit, and are responsible for a spontaneous action and movement of all things. This is symbolic when we allow ourselves to "flow" with the trend of things.

The lower sub-planes are the more orderly manner of Universal manifestation such as the Fibonacci series spoken of in later chapters. The order of colors in the rainbow or the number of arms and legs and fingers and toes on a man, animal, etc. The thinking process we use to correspond to this is "Logic".

The film encasing the lower Triad is ruptured by the pressure of attraction between the Manasic and the lower mental units and re-forms about the former as its Causal Body. The lower triad, via its mental unit, remains attached to the higher triad not only by the sutratma but by a "self-created" bridgehead of light called the "antakarana". The egoic lotus begins to open its tiers of petals. Soul growth is rapid.

THE THIRD OUTPOURING

The action of the First Logos, as he pours out his Third wave of Lifeforce produces Divine Alchemy. The materials have been assembled; vehicles have been constructed of these and all is ready for the great synthesis. The qualities of the Third Wave are essentially ones of the

Creator (of new forms), the Maintenance of them and, finally, their Destruction, with the removal of their essence. The Monads begin to play the central role on the stage of evolution, for They are part of the First Logos, in Whom They live and move and have Their Being. His will to manifest is also Theirs.

The Monads channeling the energy of ELECTRIC FIRE (Fohat) construct, with it, the Higher Triads, the purpose of which is to abstract the qualities won from the interactions of their lower Triads with matter. They are to garner the fruits of the experience of human personalities in their interaction with their environments. This will build into Them the new faculty of dominating matter as it is found in our solar system (atoms with electron orbits packed 2n2).

The Third Outpouring via the Monads "chooses" the permanent atoms on the various planes during the descent of its mechanisms. It is Electric Fire that operates from "on high" to rupture the group soul and draw its materials into the construction of the Causal Body referred to in later chapters.

After the Third Initiation, the personality and the Soul become quickly one and from that time, the initiate recognizes and reacts to the Monad directly: "Not my will but Thy Will be done, 0 Lord". The Monad begins to vivify the aura and passes great gushes of fohat to its "beloved Son", and soul-infused personality, especially when the latter is, through meditation, extending the umbilicus of his antakarana, the rainbow bridgehead for the passage of higher energies into the personality.

Seen from the viewpoint of the Logos, He is practicing Yoga. He is directing energy from a lower chakra (the Earth system) to a higher, the Earth's alter ego (said to be Venus, a sacred planet).

Before dwelling further on the consideration of our solar system, notice in drawing, the path and nature of energy as it reaches man. In the previous chapter, we discussed the First Cause and brought the energies through the universe, conditioned by the Great constellations, to our solar system, conditioned even further by the planets and finally to man. A brief mention has been made as to the planes and sub-divisions of energy as it manifests. Let us make a very clear presentation now of the seven states of energy-matter called "planes".

It is sometimes convenient to imagine the planes as one above another, according to the different degrees of density of the matter of which they are composed. It will be seen that in the accompanying diagram they are drawn in this way; but it must be very carefully borne in mind that this arrangement is merely adopted FOR CONVENIENCE AND AS A SYMBOL, AND THAT IT IN NO WAY REPRESENTS THE ACTUAL RELATIONS OF THESE VARIOUS PLANES. THEY MUST NOT BE IMAGINED AS LYING ABOVE ONE ANOTHER LIKE THE SHELVES OF A BOOKCASE, BUT RATHER AS FILLING THE SAME SPACE AND INTERPENETRATING ONE ANOTHER. IT IS A FACT WELL KNOWN TO SCIENCE THAT EVEN IN THE HARDEST SUBSTANCES NO TWO ATOMS EVER TOUCH ONE ANOTHER; ALWAYS EACH ATOM HAS ITS FIELD OF ACTION AND VIBRATION, AND EVERY MOLECULE IN TURN HAS ITS LARGER FIELD; SO THAT THERE IS ALWAYS SPACE BETWEEN THEM UNDER MOST POSSIBLE CIRCUMSTANCES.

Every physical atom is floating in an astral sea – a sea of astral matter which surrounds it and fills every interstice in this physical matter. The mental matter in its turn interpenetrates the astral in precisely the same manner; so that all these different realms of nature are not in any way separated in space, but are existing around us and about us here and now, so that to see them and to investigate them it is not necessary for us to make any movement in space, but only to open within ourselves the senses by means of which they can be perceived. Pyramid Energy is one way of doing this as we shall see later.

Figure V-3

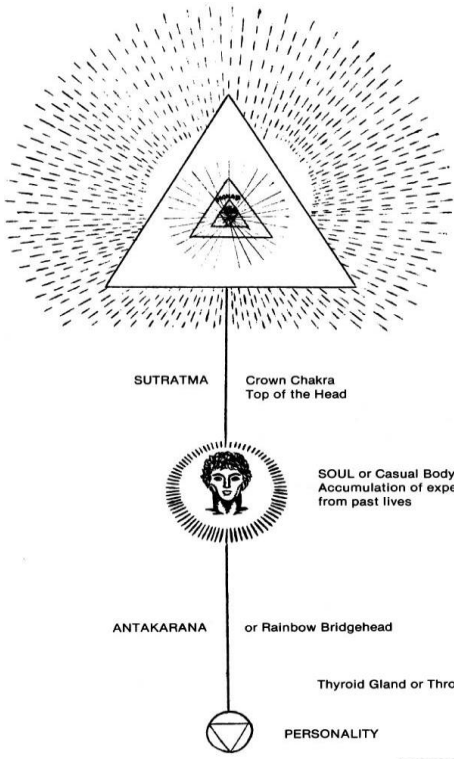
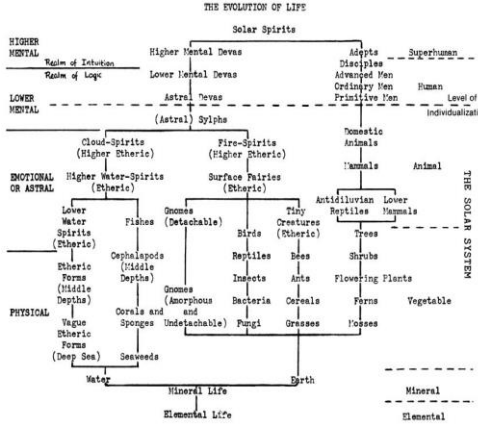
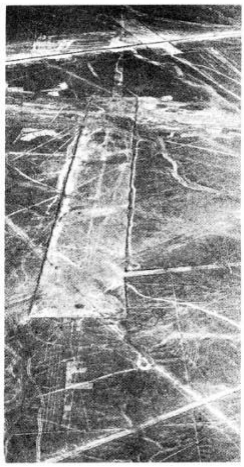


Figure V-4

THE THREE OUTPOURINGS AND THE SEVEN PLANES

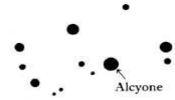
DIVINE OR LOGOIC PLANE		First Logos	
MONADIC		Second Logos	
	Second Life-Wave - Evolution of Form Under Law of Attraction and Solar Fire		Third Life-Wave - Outpouring of Spirit Under Law of Synthesis and Electric Fire
ATMIC		Third Logos	
BUDDHIC	First Life-Wave - Evolution of Matter Under Law of Economy and Fire by Friction		

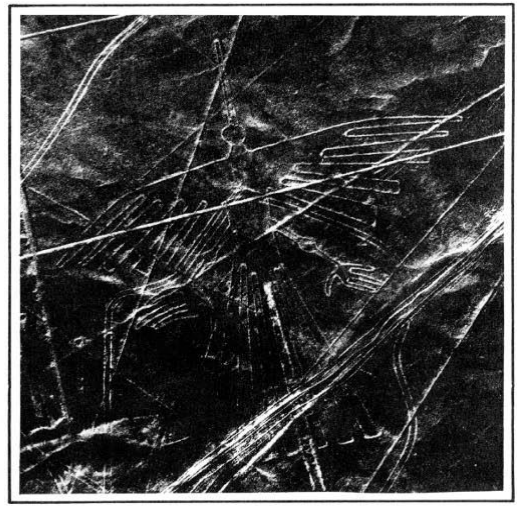




An eastern extension of the Great Rectangle on the Pampa de San José aligns with the point where the Pleiades rose in 610 ± 30 years.

The Pleiades, the seven daughters of Atlas and Pleione in Greek mythology. This open cluster of several hundred stars in the zodiacal constellation Taurus was recognised by the people of ancient Peru.





Towards Orion.

This drawing of a spider on the Pampa de San José is over 140 feet long and close to the northern edge of the Great Rectangle.

The constellation Orion rising over the Andes.

Even the Ancients in Peru knew of the significance of the Pleiades, the Great Bear and Sirius. The grid lines on the mountaintop drawing were in alignment with these Great Bodies at different times through the ages, but because of precession, the alignment is always shifting.

As we look into space, there is an apparent surface of the heavens on which the stars appear to be fixed. For convenience this is named "the celestial sphere". Precession is the apparent movement of constellations – about one degree per century – that is produced by a gradual change in the direction of the earth's axis of rotation. A period of precession is

completed every 26,000 years when the stars regain the position on the sphere that they held at the beginning of the period.

These mountain-top air maps could easily have been used for orientation by airships arriving from deep space. Many authorities suggest that there are airships buried under the animal markings. This could have been done for the same reasons that we have when we bury scientific time capsules every quarter of a century.

CHAPTER VI – COSMOGENESIS

It is not the author's intent to repeat himself, only to thoroughly impress upon you the different aspects of the arrangement and order of the prime laws and orders of Nature. The Divine Aspect is being covered now so that you can see the missing link in science covered in later chapters.

There are seven different levels of energy each with their own characteristics. Since energy cannot be created or destroyed, it has to exist somewhere at all times. The Tibetans in their science have names for the places where energy exists when it is not in use. The smallest particle of energy that exists which can be transported from one plane to another is called the Anu. There are thousands of tiny Anu spiraled and coiled inside of every electron, proton, atom, molecule and cell in our bodies. They are the directive force that commands the universe to form the patterns of which man is the divine archetype. When Western science acknowledges their existence, the alchemical secret of transmuting base metals into gold will be no secret any more. When this happens, however, it will not affect our economy, as it will be based on equality and love rather than the gold standard which is presently of worldwide acceptance.

The direct form that commands these Anu is mind itself. There are two types of mind, lower and higher. Primitive man is trapped in his desires and has no conscious control over his Anu patterns, so his subconscious mind directs his body functions and he is open to many diseases, both mental and physical, as the collective unconsciousness (mass lower mind) is subject and open to outside influences which will put undue stress on the lower mind. Man's entrapment in his lower mind gave birth to the sciences of psychiatry and psychology, which are administered by men and women trained in observed disorders brought on by individuals trying to process each and every action of their lower mind.

All of the energies on the seven levels produce a specific psychological reaction when the Anu are directed by the mind through Astral, Etheric and Physical bodies, and the final manifesting action is an endocrine gland or chakra secreting a physical hormone into the bloodstream, which conscious mind immediately interprets as a feeling.

As experience relates necessity for balance, man begins to meditate and thus achieve harmony with the true rhythm of God within the universe. Each man through his own personal experiences in life will interpret these universal energies differently, and this is man's right to individuality, and thus the higher mind begins to unfold to conscious individual (lower) mind. Here man's personality eventually will form seven different individual traits which are called archetypes, each a definite image of the Godhead or universal pattern, and thus consciousness shifts to the higher mind. Then disease is eliminated and man can begin his true course of action, and his kundalini is said to be open and the universe acknowledges man to be a God man (God) or God woman (Goddess).

When we move from the unmanifest to the manifest, motion begins. As we have seen, a Great Being in whom we all exist and have our Being is somewhere deeply interpenetrated in all atoms, all molecules, everywhere in Creation.

A physical atom, in its normal state, is electrically neutral, for the positive charge within its nucleus is balanced by the negative charge in its electrons. When this state is disturbed by the gain or loss of an electron, then we have set up either a positive or negative electrical condition and electrical phenomena may be produced. That which was non-manifest becomes manifest.

Let us refer to Drawing V-1 once more. There we see portrayed the fact that, when the Solar Logos emerges from the condition of non-manifestation within the consciousness of what we have termed the "First Outpouring", He finds at hand both differentiated spirit and differentiated matter, but each of them in such a state that it would be incognizable by our consciousness. It is, so far as we are concerned, the root-spirit and root-matter on which the Deity will act to bring His system into being. In other words, it is the root substance into which He will introduce His own "creative" processes by disturbing its balance, thus causing what we call "manifestation". He will "breathe" into it the breath of His Creative energies.

In the Ancient records it is said that this basic substance existed as "bubbles in Koilon" and these so-called bubbles are the atoms of the Divine world. Combinations of these atoms, in different concentrations, produce the sub-divisions of the Divine world, and also the atoms and

their molecules, of the lower, denser worlds. Reference is now made to Drawing VI-3 (stage 1). Acting on these bubbles, the Solar Deity saturates each one with His Divine energy and they become vitalized with an indescribable power. In Drawing I-27 the forces of the five worlds in which man is evolving were symbolized by various well-known pieces of electrical equipment, which he could use, all of which were powered from the same electrical supply, coming from the same source. Following this same analogy, we could place in the Divine world a huge electrical generator, such as is used to supply electrical energy to a city to provide light and to operate machinery. From that center the wires carry current into thousands of homes and factories to be used for many purposes. So in the Divine world we find the central source of all the power of all kinds which are distributed throughout the whole system of worlds. But, as with the city electrical supply, the voltage is transformed down to various levels according to their needs, in the same way, atoms of each of the worlds step down the strength, or voltage, from that of the world above, which is more subtle than itself.

In the Divine world the atoms are "free". In stage 2 of Figure VI-2, we see that 49 of the ultimate atoms have combined together to make one atom of the Monadic world. It will be noted that these are coiled together in spiral formations, each spirilla having seven of the ultimate Divine atoms within it. To describe the atom of this world in such a manner is merely to quote a formula or as though we wrote down a mathematical equation. If scientists find it impossible to describe the actual conditions or configuration of the physical atom, how shall we possibly expect to gain more than a fragmentary glimpse of the actualities of these regions so far removed from our daily experience! But we can gain that glimpse and it can help us so long as we do not try to reduce it to the materialistic level of the physical world. In stage 3 of Figure VI-2, the atom of the Atmic world is shown formed by a similar process; but each spirilla is formed of coils of Monadic atoms as was shown in stage 2. One spirilla in stage 3 is shown to illustrate the process, and it should be kept in mind that this process is continued, each spirilla of one world being made up of seven spirillae of the world shown above it in the drawing. Thus the number of bubbles of Divine energy in the atom of each denser world increases by powers of 49: i.e., 49; 2,401; 117,649; 5,764,801, etc.

All this preliminary to a study of the physical atom which perhaps, more than any other thing, will show the real illusion of size, that is, of space

considered as dimensions. For if we can appreciate the wonder of that structure, as seen by the student of Theosophy, and actually observed by some who have developed the extra-sensory powers that have been referred to, we shall have gained a truly revealing glimpse of the manner is which the whole Being of God in His manifold expressions is actually within – not merely symbolized by or reflected in – every atom in this great Solar System. In the physical atom not only is each spirilla made up of seven spirillae of the Astral world, but ten spirals are wound together side by side in a figure roughly representing a heart, as shown in Figure VI-2. There are three major spirals. These are shown as dark lines in the diagram. They whirl around the atom and return to their starting point inside the core of the structure. They are energized by forces coming from the Deity directly through His three aspects, the Divine Trinity. There are seven minor spirals. They are shown in lighter lines, circling around the outer portion of the atom and returning through the center. Each of these is animated by force coming from one of the Seven Planetary Chain Logoi. The number of bubbles, so charged with Divine energy, in the physical atom is more than 138,000,000,000! No wonder, therefore, that when scientists began probing into the structure of the atom, they found it to be such a marvelous thing. And does it not fully agree with the declaration of science that the atom they study is not really matter at all, as we have though of matter in the past, solid and indestructible; but is more correctly to be considered as a tremendously powerful center of potentiality, which can exhibit states of mass or energy under the appropriate circumstances?

The physical atom shown in Figure VI-2, however, is not the atom of the physicist. We also are showing the various sub-states of physical matter. The highest, the atomic, is the region of the atom we have been considering from the Theosophical viewpoint. The atom of the physicist, from the point of view of Theosophy, is not a true atom. It is a unit of matter formed of various combinations of the true ultimate atom (called the Anu) making up the hundred or more "elements".

I know that many physicists who will read this will mentally block certain aspects of what is being presented, but the principles are clear. Remember in 1902 in the progress of ordinary research, Madame Curie put a new face on the subject of electrons. She found that the beta particles emanating from radium were the same particles as the electron in the cathode ray tubes. Then followed the discovery of the gas, helium,

previously treated as a separate element, which evolved itself as one consequence of the disintegration of radium. Transmutation until then was laughed at as superstition of the Alchemist, but is passed quietly into the region of accepted natural phenomena, and the chemical elements were seen to be bodies built up of electrons in varying number and probably in varying arrangements. So at last ordinary science had reached one important result of the occult research carried on seven years earlier. It has not yet reached the finer results of the occult research – the structure of the hydrogen atom with its eighteen etheric atoms and the way in which the atomic weights of all elements are explained by the number of etheric atoms entering into their constitution.

The ether of space, though defying instrumental examination, comes within scope of the clairvoyant faculty, and profoundly interesting discoveries were made during what I have called the early research in connection with that branch of the inquiry. Etheric atoms combine to form molecules in many different ways, but combinations involving fewer atoms than the eighteen which give rise to hydrogen make no impression on the physical senses nor on physical instruments of research. They give rise to varieties of molecular ether, the comprehension of which begins to illuminate realms of natural mystery as yet entirely untrodden by the ordinary physicist. Combinations below 18 in number give rise to three varieties of molecular ether, the functions of which when they come to be more fully studied will constitute a department of natural knowledge on the threshold of which we already stand.

Notice in the right hand lower corner of Figure VI-2, I show the seven sub-divisions of the Physical Plane. As vibrations lower themselves, coming down from the Astral Plane, the Anus begin to combine and form different atoms, and in this chapter I show the combinations of Hydrogen, Oxygen, Nitrogen and Carbon because these are "Archetypes" of the four lower rays, and re-combine among themselves forming all elements as we know them. In formulating different metals for the layering the Pyradomes I have presented, I use the knowledge presented because, as you can see, the metals have energies stored in them from the higher planes and these energies greatly influence human consciousness. When consciousness is influenced, behavior patterns result. Behavior patterns interweave, and divine alchemy in human

action is the result. We feel better, we act better, we are better and we move forward in harmony with the Universe.

Figure VI-1

Element	Number of Ultimate Physical Atoms (ANU)	Weight Compared With Hydrogen Taken as 18	Atomic Weight (1974)
Hydrogen	18	1	1.0080
Oxygen	290	16.11	15.9994
Nitrogen	261	14.50	14.0067
Carbon	216	12	12.011
Gold	3546	197	196.9665
Copper	1139	63.277	63.546
Silver	1945	108.055	107.868
Iron	1008	56	55.847
Titanium	864	48	47.90

Hydrogen

Atomic Weight = 1.0080

Number Weight = 1

Oxygen

Atomic Weight = 15.9994

Number Weight = $\frac{290}{18}$ = 16.11

Nitrogen

Atomic Weight = 14.0067

Number Weight = $\frac{261}{18}$ = 14.50

Carbon

Atomic Weight = 12.011

Number Weight = $\frac{216}{18}$ = 12

In our first chapter, we show the universal energies combining one outside the other forming the Aum, the heaviest of the energies which combines in the Physical Plane tables, forming an atom of Hydrogen, Oxygen, Nitrogen or Carbon. Science has for years given atomic numbers to different elements. The atomic number is determined by the number of protons in the nucleus of an atom with the corresponding number of electrons in the orbits or shells around the nucleus. Hydrogen is the simplest having a single electron-proton pair and is given the weight of 1. Helium is 2, Oxygen is 6 and Carbon is 12. In the atomic tables, Hydrogen is always 1. When the studies were made around the turn of the 20th century and it was noted that there were 18 Anu in each Hydrogen atom, 190 in each Oxygen atom, 261 in each Nitrogen atom and 216 in each Carbon atom, it was found that if the Hydrogen number of 18 Anu were divided into the number of Anu found in other elements, the atomic number as known by orthodox science always appeared. This, a missing link, was brought into our reality.

The seven levels of energy are called planes, starting with the top or highest plane, the Logoic or Divine, next the Monadic, the Atmic, the

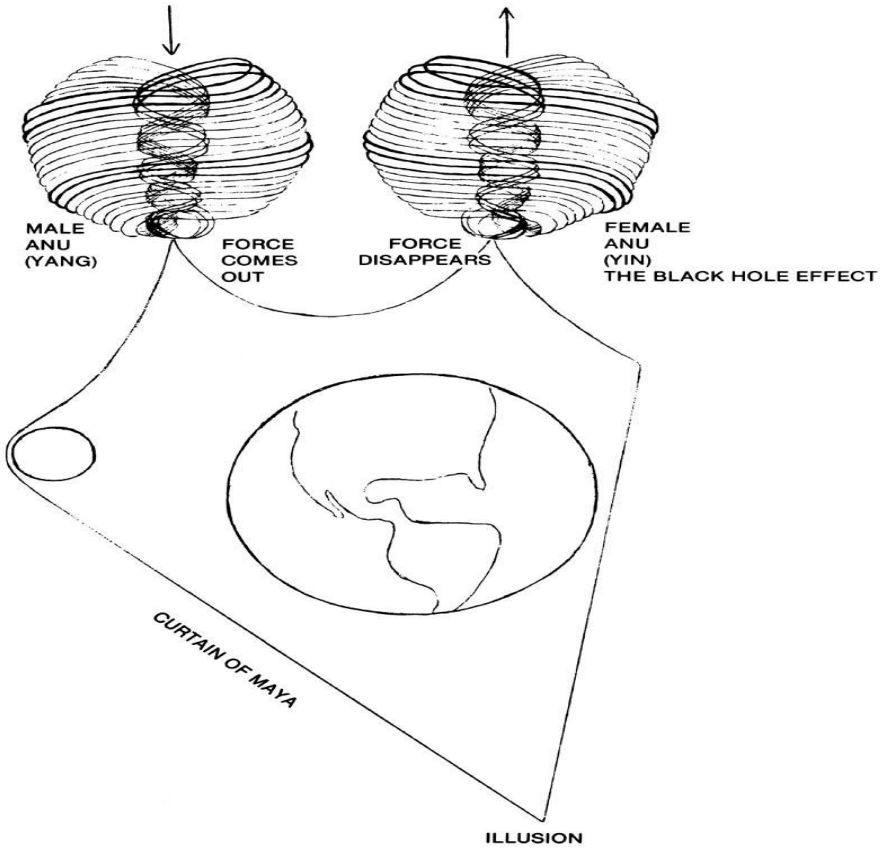
Buddhic, the Mental, the Astral and the Physical. Each plane has 7 sub-planes or sub-levels, giving a total of 49 in all. The Egyptians called this network, the ladder of the souls, the Tibetans call the energies represented the 49 fires of Agni.

As the words "ultimate physical atom" must frequently occur, it is necessary to state what I mean by the phrase. Any gaseous chemical atom may be dissociated into less complicated bodies; these, again, into still less complicated; these, again into yet still less complicated. These will be dealt with presently. After the third dissociation but one more is possible; the fourth dissociation gives the ultimate physical atom.12 This may vanish from the physical plane, but it can undergo no further dissociation on it. In this ultimate state of physical matter two types of atoms have been observed; they are alike in everything save the direction of their whorls and of the force which pours through them. In the one case force pours in from the "outside", from fourth-dimensional space,13 and passing through the atom, pours into the physical world. In the second, it pours in from the physical world, and out through the atom into the "outside" again,14 i.e., vanishes from the physical world. The one is like a spring, from which water bubbles out; the other is like a hole, into which water disappears. We call the atoms from which force comes out positive or male; those through which it disappears, negative or female. All atoms, so far as it will be seen that the atom is a sphere, slightly flattened, and there is a depression at the point where the force flows in, causing a heart-like form. Each atom is surrounded by a field, formed of the atoms of the four higher planes, which surround and interpenetrate it.

The atom can scarcely be said to be a "thing", though it is the material out of which all things physical are composed. It is formed by the flow of the life-force15 and vanishes with its ebb.

When this force arises in "space"16 – the apparent void which must be filled with substance of some kind, of inconceivable tenuity – atoms appear; if this be artificially stopped for a single atom, the atom disappears; there is nothing left. Presumably, were that flow checked but for an instant, the whole physical world would vanish, as a cloud melts away in the empyrean. It is only the persistence of the flow17 which maintains the physical basis of the universe.18

Figure VI-2



12 The atomic sub-plane.

13 The astral plane.

14 The astral plane.

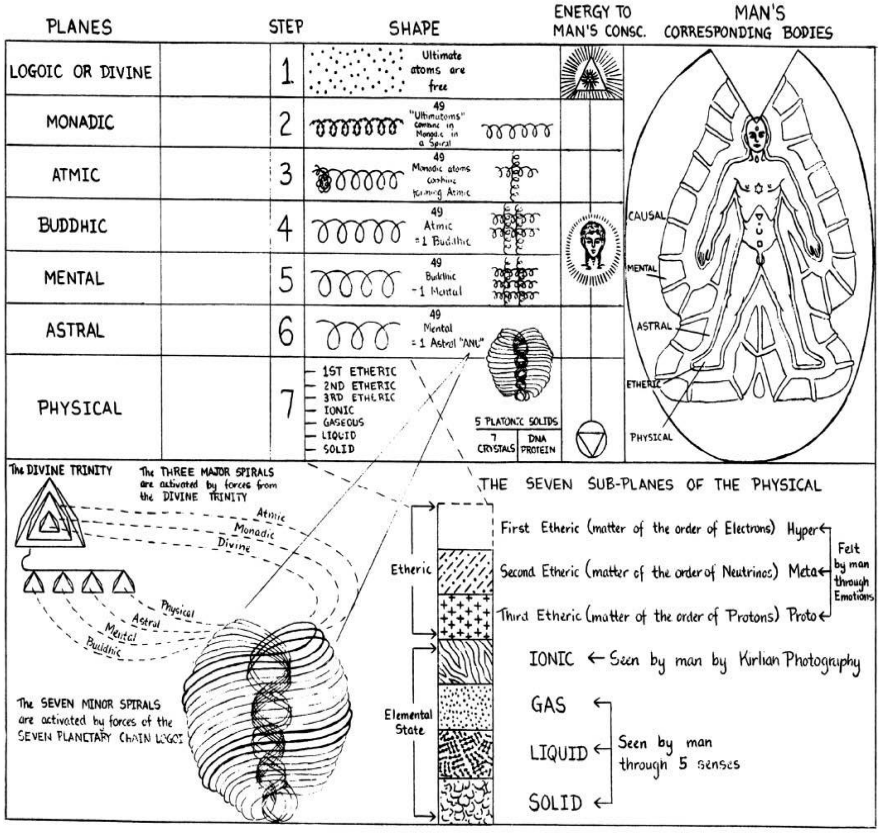
15 Known to Theosophists as Fohat, the force of which all the physical plane forces — electricity's — are differentiations.

16 When Fohat "digs holes in space".

17 The first life-wave the work of the third Logos.

18 A maya, truly.

Figure VI-3



In order to examine the construction of the atom, a space is artificially made[19]; then, if an opening be made in the wall thus constructed, the surrounding force flows in, and three whorls immediately appear, surrounding the "hole" with their triple spiral of two and a half coils, and returning to their origin by a spiral within the atom; these are at once followed by seven finer whorls, which following the spiral of the first three on the outer surface, and returning to their origin by a spiral within that, flowing in the opposite direction – form a caduceus with the first three. Each of the three coarser whorls, flattened out, makes a closed circle; each of the seven finer ones, similarly flattened out, makes a closed circle. The forces which flow in them, again, come from "outside", from a fourth-dimensional space.[20] Each of the finer whorls is formed of

seven yet finer ones, set successively at right angles to each other, each finer than its predecessor; these we call spirillae.21

It will be understood from the foregoing that the atom cannot be said to have a wall of its own, unless these whorls of force can be so designated; its "wall" presses back "space". As said in 1895 of the chemical atom, the force "clears itself a space, pressing back the undifferentiated matter of the plane, and making to itself a whirling wall of this matter". The wall belongs to space, not to the atom.

In the three whorls flow currents of different electricities previously mentioned in earlier chapters; the seven vibrate in response to etheric waves of all kinds – to sound, light, heat, etc.; they show the seven colors of the spectrum; give out the seven sounds of the natural scale (music of the spheres); respond in a variety of ways to physical vibration – flashing, singing, pulsing bodies, they move incessantly, inconceivably beautiful and brilliant.22

The atom has – as observed so far – three proper motions, i.e., motions of its own, independent of any imposed upon it from outside. It turns incessantly upon its own axis, spinning like a top; it describes a small circle with its axis, as though the axis of the spinning top moved in a small circle; it has a regular pulsation, a contraction and expansion, like the pulsation of the heart. When a force is brought to bear upon it, it dances up and down, flings itself wildly from side to side, performs the most astonishing and rapid gyrations, but the three fundamental motions incessantly persist. If it be made to vibrate, as a whole, at the rate which gives any one of the seven colors, the whorl belonging to that color glows out brilliantly.

An electric current brought to bear upon the atoms checks their proper motions, i.e. renders them slower; the atoms exposed to it arrange themselves in parallel lines, and in each line the heart-shaped depression receives the flow, which passes out through the apex into the depression of the next, and so on. The atoms always set themselves to the current. The well-known division of diamagnetic and paramagnetic depends generally on this fact, or on an analogous action on molecules, as may be seen in the accompanying diagrams.23

Two atoms, positive and negative, brought near to each other, attract each other, and then commence to revolve round each other, forming a

relatively stable duality; such a molecule is neutral. Combinations of three or more atoms are positive, negative or neutral, according to the internal molecular arrangement; the neutral are relatively stable, the positive and negative are continually in search of their respective opposites, with a view to establishing a relatively permanent union.

Three states of matter exist between the atomic state and the gaseous – the state in which the chemical atoms are found, the recognized chemical elements; for our purposes we may ignore the liquid and solid states. For the sake of clearness and brevity in description, we have been obliged to name these states; we call the atomic state of the chemist elemental; the state which results from breaking up chemical elements, proto-elemental; the next higher, meta-pro-elemental; the next higher, hyper-metaproto-elemental; then comes the atomic state. These are briefly marked as E1., Proto., Meta, and Hyper.24

The simplest unions of atoms, never, apparently, consisting of more than seven, form the first molecular state of physical matter.

In the next Drawing, we show comparisons of Hydrogen, Oxygen, Nitrogen and Carbon lowering in vibration and becoming the elements as we know them on the Physical Plane.

Also shown are the geometric shapes, as they, too, change. There are five earlier or Platonic States that finally, on the solid level, form the seven basic shapes of matter. The Carbon atom as shown is a Pyramid. But it combines many times with itself, forming again a larger Pyramid, as in the case of Gold. The Human Body responds to these different shapes, as it is composed of them. Gold always presents a good feeling when held because it is a prime shape.

-

19 By a certain action of the will, known to students, it is possible to make such a space by pressing back and willing off the matter of space.

20 Again, the astral world.

21 Each spirilla is animated by the life-force of a plane and four are at present normally active, one for each round. Their activity in an individual may be prematurely forced by yoga practice.

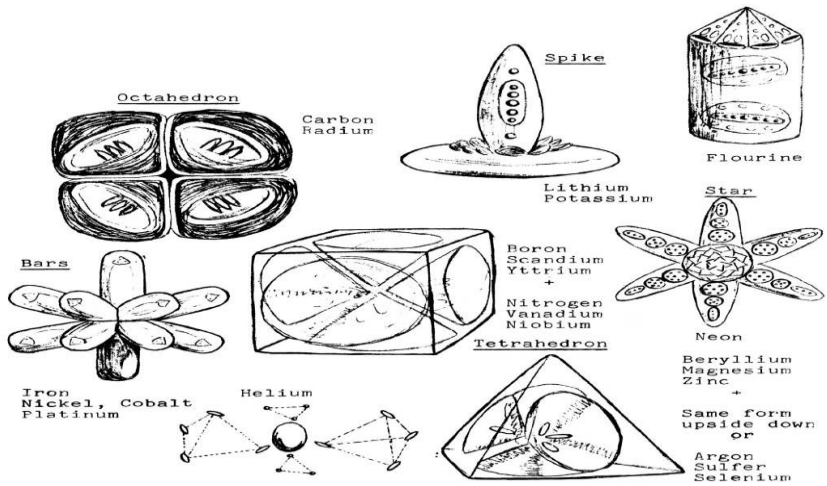
22 The ten numbers of the sun. These are called Dis — in reality space — the forces spread in space, three of which are contained in the Sun's Atman, or seventh principle, and seven are the rays shot out by the Sun." The atom is a sun in miniature in its own universe of the inconceivably minute. Each of the seven whorls is connected with one of the Planetary Logoi, so that each Planetary Logos has a direct influence playing on the very matter of which all things are constructed. It may be supposed that the three, conveying electricity, a differentiation of Fohat, are related to the Solar Logoi.

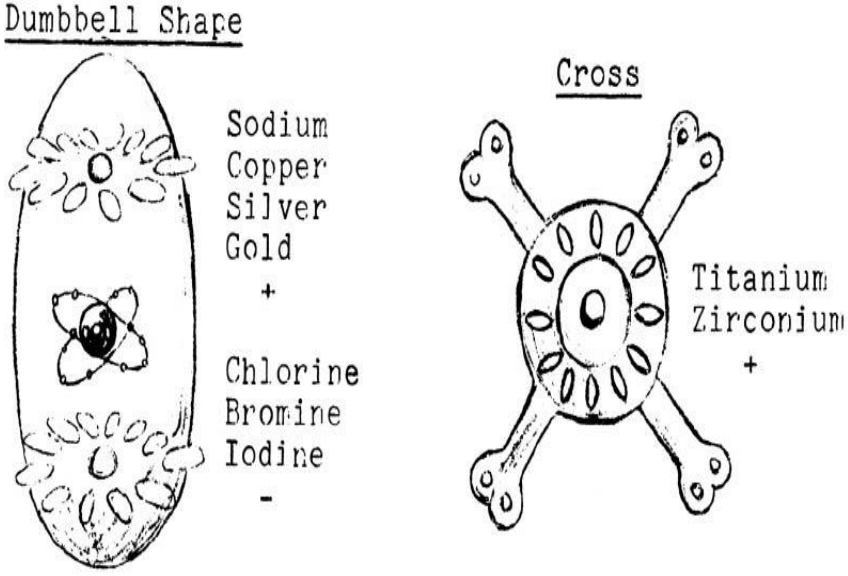
23 The action of electricity opens up ground of large extent, and cannot be dealt with here. Does it act on the atoms themselves, or on molecules, or sometimes on one and sometimes on the other? In soft iron, for instance, are the internal arrangements of the chemical atom forcibly distorted, and do they elastically return to their original relations when released? And in steel is the distortion permanent? In all the diagrams the heart-shaped body, exaggerated to show the depression caused by the inflow and the point caused by the outflow, is a single atom.

24 These sub-planes are familiar to theosophists as gases, etheric, super-etheric sub-atomic, atomic; or as Gas Ether 4, Ether 3, Ether 2, Ether1.

Figure VI-4

"Proto" or 3rd Etheric State of some elements. The shapes have positive and negative attributes. This causes them to combine in still larger shapes called Platonic Solids.





Silver stimulates the mental centers and is a tetrahedron shape. Titanium is a cross shape. Titanium is a wonder metal, and has a healing effect on the body. If you hold a piece of raw titanium in your hand, you will feel. a pleasant rubber-like sensation. Mass mind is also familiar with titanium, and the Aerospace Industry is replacing aluminum (which is toxic and wears out and fatigues, developing hair-like fractures under continuous usage) with titanium which is non-toxic and does not react to stress. In our Pyradome Series of headgear, we developed the Powerdome, which is made of pure titanium with less than .1% impurities. It had such a dramatic positive effect on people that we never printed a brochure on it because we are constantly learning new things about the Powerdome. We know it produces peristaltic wave movements on the colon, which will cause mineral assimilation to increase and consequently vitamin absorption will be higher. We know it detoxifies the cerebellum by emitting high octave vibrations and we know it electrically balances the hypothalamus, which in one application in a mental institution calmed down some patients with serious mental disturbances. In people who are in a normal mental state but slightly overweight, we have found it to cause them to lose their appetites until their weight is brought to normal. It was not designed for weight control, this just happens to be one of the many pleasant side effects. So you can see why we have not written

a brochure on this dome. There are too many things to learn yet. Now let us look for a moment at the science of Radionics and titanium.

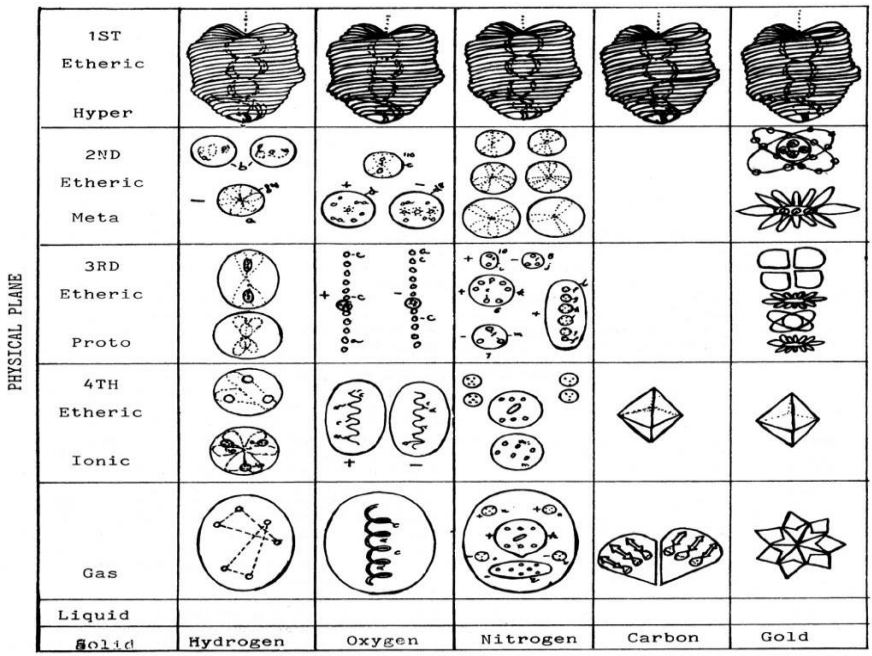
This book is emphasizing that energy is transmitted at levels of consciousness and in realms of matter far subtler than anything yet measured by science. The Wisdom of All Ages has taught that everything (and we have noted in postulate one that all things live) is vibration and has its own note . . . an atom, a man, a planet, etc. Matter and energy are interchangeable. Luther Burbank and Albert Einstein both said it and initiated its demonstration in two kingdoms.

In the Vegetable Kingdom, Burbank wrung from his plants such growth that the word "magic" was frequently used by scientists to describe his accomplishments, when all that was being used was the element of loving consideration. In Findhorn, Scotland, the application of "love energies" to plants has brought about a revolution in agriculture which we shall hear more of through the years. In England this summer a man in Eastbourne grew a tomato weighing more than four pounds with no extra effort than what is involved in talking to and loving the plant.

The tremendous work of the Delawarr Laboratories at Oxford in this field of "pre-physical" matter and energy, as George de la Warr termed it, should not be overlooked now that a plethora of discoveries is being made elsewhere. De la Warr's camera showed energy transmissions at "invisible" levels between men and plants and, what is far more important, reciprocal action between man and his own body parts.

There flourishes a whole science of "Radionics" around this knowledge. There is reciprocal action between a man and his blood. Thus, a spot of blood may be placed on a piece of absorbent paper and sent across the Atlantic for "radionic analysis". Efficiently performed, this analysis will determine the pre-physical condition of the tissues of the host of the blood spot, and his treatment can be initiated by applying corrective energies to the spot of blood though the patient may be six thousand miles away!

Figure VI-5



This drawing shows the pattern of energy becoming form as the Anu, shown, composed of ultimate atoms coming from higher planes combining in five plutonic shapes to eventually become the seven crystal shapes as we know them. The Anu are called ultimate physical atoms and the final products of their combinations are oxygen, hydrogen, carbon and gold. They ultimately form all the elements as we know them. The elements combine again and form our bodies and our environment.

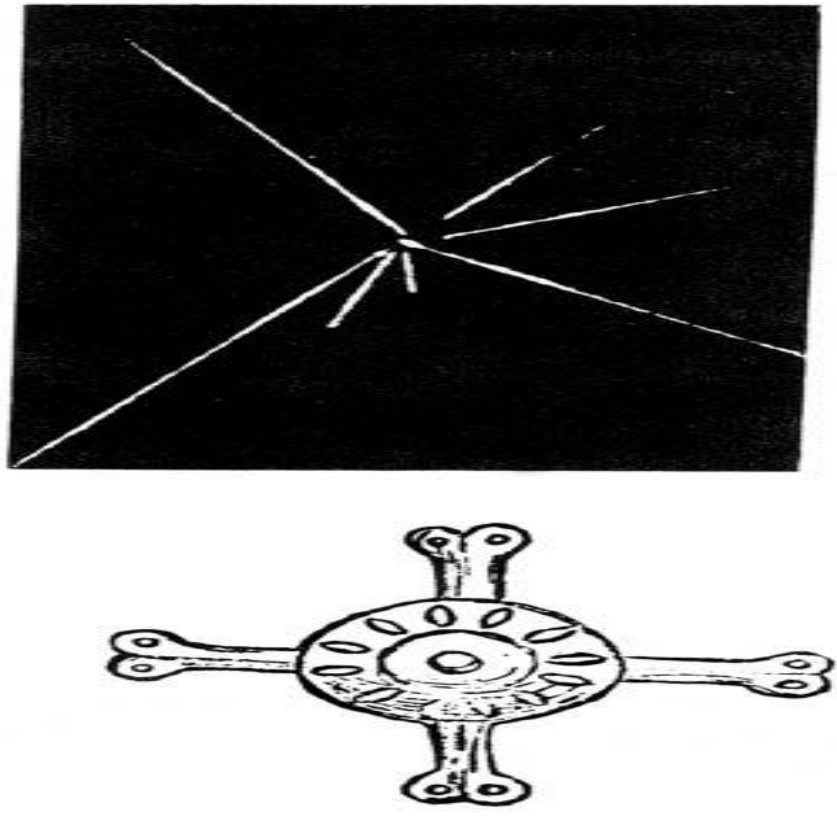
A bar magnet, brought into proximity with the blood specimen and rotated to a "critical" point of relationship with it, emphasizes the whole procedure of analysis and treatment. In the 1950s, it was demonstrated also, under certain conditions, that a photograph of the patient's condition (e.g. cancer of the esophagus) could be obtained from the radiative qualities of the blood or of any specimen submitted, like the patient's hair, saliva, semen, etc. The nearest psychic phenomenon to this would be psychometry, the ability of certain sensitives to assess the history of an object submitted to them for psychometrizing.

The photograph, Figure VI-6, was taken by a radionic camera at the Delawarr Laboratories many years ago. Some tap water was photographed and revealed normal radiatory patterns shown on Figure

VI-6. The water was then taken to a church nearby where it was blessed. It was again photographed and revealed energy patterns in the form of a crucifix, which the reverend minister of the church said was the visual image he held in his mind when he blessed anything. The phenomena associated with the continuum are all related to two factors. The first is magnetism, in some form and degree of subtlety, and the second is the energy source which comes from the higher sub-planes of all planes of what is called "etheric" matter.

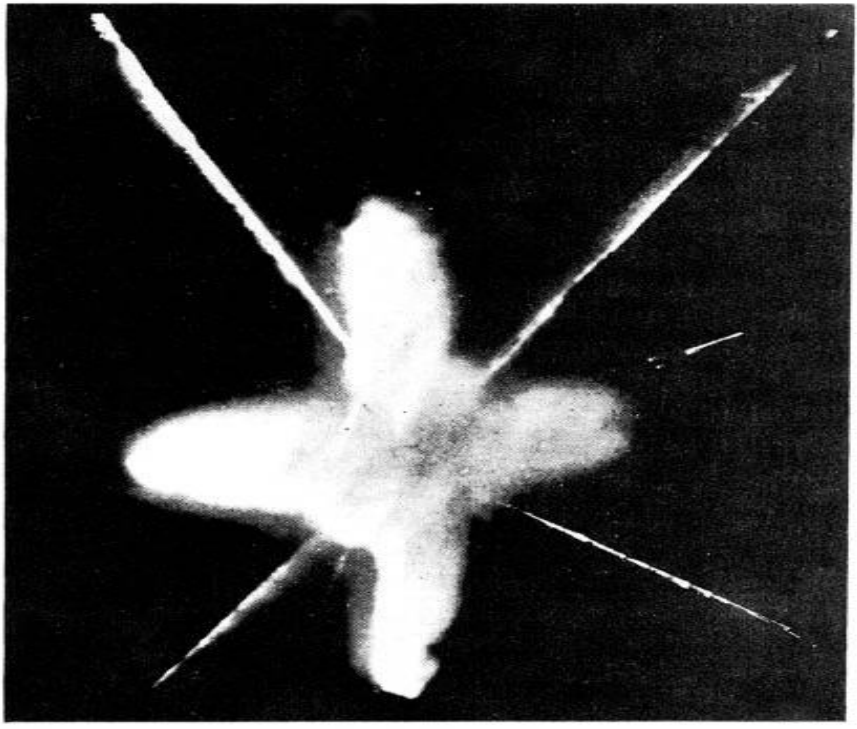
Now notice the shape of titanium as clairvoyantly drawn at the turn of the century by Dr. Leadbeater. It is almost the same shape as the water molecule blessed by Reverend Eardley at Oxford. Is it any wonder that titanium is called the wonder metal?

Figure VI-6



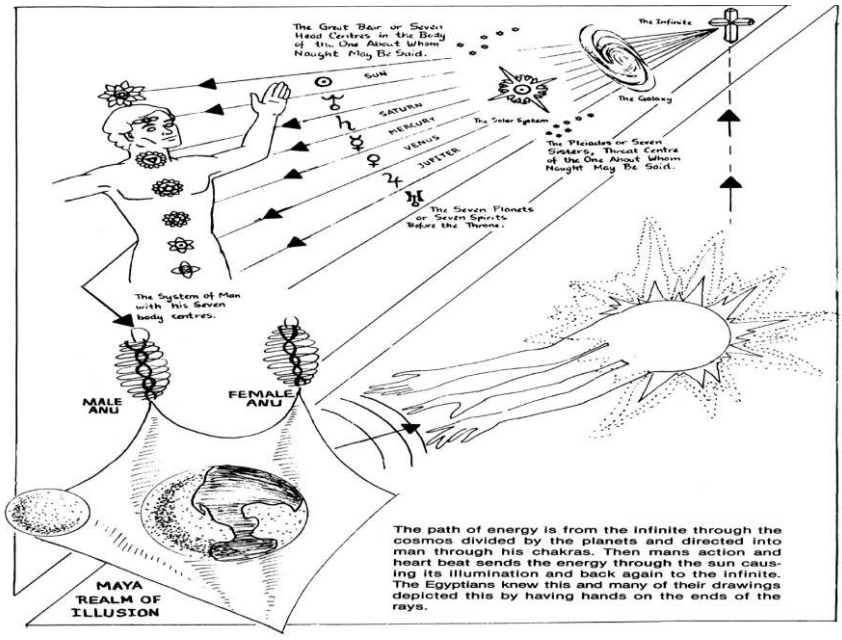
Titanium viewed clairvoyantly in 1895.

Figure VI-7



RADIATIONS FROM SAMPLE OF OXFORD TAP WATER after ceremonial blessing by Rev. P.W. Eardley at Oxford.

Figure VI-8



CHAPTER VII – EVOLUTION, INVOLUTION – WHICH IS FIRST?

The previous chapters show shape energies descending through the Physical Plane. Finally, in a sub-solid state, they form the five Platonic Solids. These form again in combinations and crystallize as the seven forms of crystals, or they combine into protein and become the DNA which begins building living tissue as we know it.

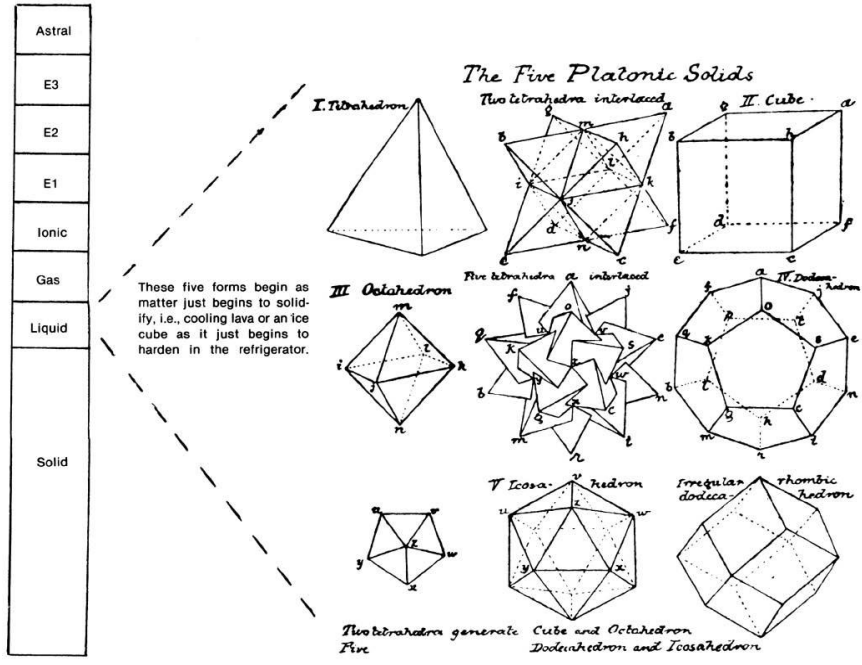
Some of our readers may be glad to have a drawing of the Platonic solids, since they play so large a part in the building up of elements. The regular solids are five, and five only; in each:

(1) The lines are equal.

(2) The angles are equal.

93) The surfaces are equal.

Figure VII-1



The five Platonic Solids are a natural by-product of matter in its pre-dense form state. The reason nature chose these forms, and only these forms, will be further understood when we realize the effect of magnetism, consciousness and divine will when they are brought to interplay on one another. A good experiment for further meditation on this is to fill a clear glass bowl or dish half full of water and put it in the freezer. Watch it carefully, remembering that you are thinking about it (experiment and experimentor are relative to one another), the Earth's magnetic field is interpenetrating it, and both are going to affect its crystal formation. Then, just when the ice begins to crystallize, remove the dish and examine the ice crystal with a magnifying glass or microscope. Later, meditate, holding a firm image in your mind of what you saw. This will align your mental processes and you will perceive certain truths concerning the formation of matter. Such is the action of the Spirit returning (by Karmic Law) the information which you seek. Remember, He helps those who help themselves, and that is a Universal Law common to all.

Speaking before a meeting of the British Association at Belfast in 1874, Professor Tyndall, the president of that organization, said: "We see in matter, hitherto covered with opprobrium, the promise and potency of every form and quality of life." Within a few decades, one of his successors, Sir William Crookes, reversed that dictum and stated before the same body: "We see in life the promise and potency of all kinds of form." These two statements represent opposing viewpoints around which many a lengthy battle has raged. One school of thought points to the forces which are known to reside within the atom, to its ability to join with other atoms and hold together in the geometrically designed structures of molecule and crystal, to the manner in which molecules combine to create the living cell, and cells the many complex aggregations which build the bodies of conscious beings. Matter, they declare, has within it the power to do all these things and still greater in time to come. But the opposing school insists that life is the Reality and matter is the vehicle for its power; the thing that it moves. And they advance exactly the same arguments to support their case!

It should be clear, in the light of our studies so far, that both of these viewpoints are right – and wrong! Each contains a large element of truth and yet is incomplete. Energy and matter are not two separate things; that can now be demonstrated as a fact. They are as the two sides of a

sheet of paper, or the two opposite poles of electricity. This also applies to life and form. Furthermore, both viewpoints fail to differentiate between Life-Form and Energy-Matter. The latter results in motion. The former builds living bodies, vehicles of consciousness, and motion is one of the basic requirements for consciousness to function.

We will now go on to consider another pair of opposites, an understanding of which will resolve the difficulties existing between the two viewpoints just mentioned. We hear a great deal about evolution; but little about its opposite, involution. Yet it should be clear that, since powers of seemingly limitless quantitative and qualitative expansion can be observed within matter itself, those powers must have had their origin somewhere, sometime. That is, when matter began its evolutionary climb, those powers must have been there, latent within it, needing only the time and proper conditions to draw them forth.

In the last chapter we saw the successive stages of densification as the materials of the interpenetrating worlds were developed. The forces of the Deity, we saw, were being impressed stage by stage into the atomic structure of each world until the densest of all, the physical, was reached. This process was the involution of the Divine powers into matter. It is little wonder, therefore, that our scientists, as they probe into the heart of the physical atom, find in it marvelous powers. But matter did not create those powers; the power and its material vesture came into existence at the same time, for neither one could exist without the other.

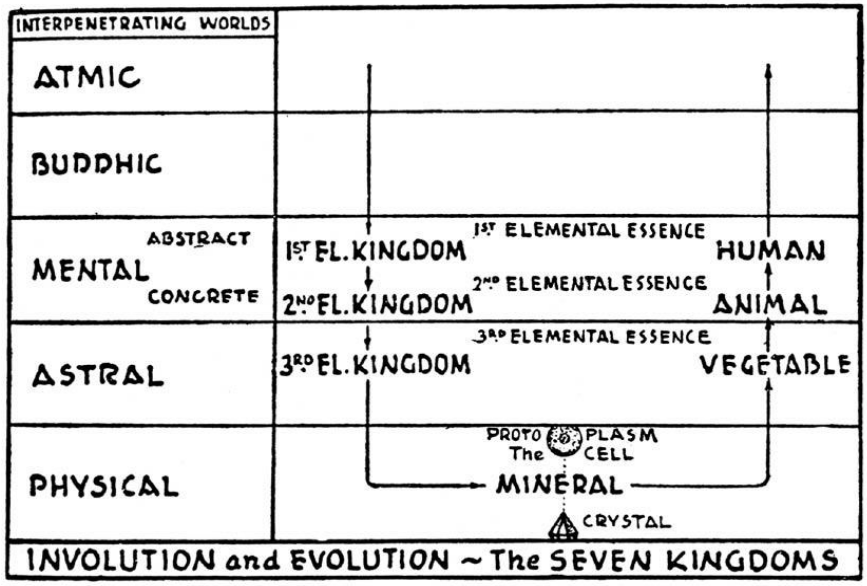
So also with life and form. They are not two, but one. They came into existence together, and involution preceded evolution.

The interpenetrating worlds of Physical, Astral and Mental matter are shown in Figure VII-2. Little can be said about form-building activities in the spiritual worlds: they are too far removed from any of our present experiences. We can only begin as life emerges into the Higher (abstract) Mental world. The purpose of the initial stages of this, the second, outpouring is to impart "qualities" to matter of each of the worlds, that is, to flood it with that phase of Divine creativeness which will enable it, later, to be built into living, responsive forms. Matter of the Mental and Astral worlds so acted upon is known as the Elemental Essence (Figure VII-2). This is the original material created during the first outpouring, but now drawn into molecular combinations of such a nature that they can be saturated with the "life" aspect of God and become the material

out of which conscious forms can be built. In these forms there will be not only "Energy-Matter" but also "Life-Form".

Following the initial development of the elemental essence of each of the three worlds, as shown in Figure VII-2, there arises a second phase of activity in which further combinations of the essences in each world are built into larger organized forms, which are called the Elemental Kingdoms: in the Higher Mental world they are known as the First Elemental Kingdom; in the Lower Mental and Astral worlds as the Second and Third, respectively. They have only a transient existence, forming vehicles of consciousness without any individual continuity. They form and re-form in constant succession, as though the waves on the sea shore were to become living things, or the clouds that constantly shape and re-form themselves into newer contours as they drift across the sky, blown by high winds, were to come to life. In the higher regions, especially that of the Higher Mental world, a more apt illustration might be found in the many manifestations of fire in the physical world, as it varies in color with its temperature, sometimes glowing with friendly warmth, sometimes consuming with power and purpose, while, at other times, in almost overpowering majesty, leaping upward into a thousand changing, fantastic forms of living light.

Figure VII-2



This subject may appear to be rather involved and technical and of little practical interest or value to one who feels that living a good life is the most important need for men. So it is. But the facts we have just been studying are of great importance too, for they affect us intimately and continually, inasmuch as our higher bodies are built from this matter, and through a knowledge of its nature we can create responsive instruments for our use. To understand the functions of the elemental essence is of practical help in acquiring self-control and has a definite bearing upon the health of the physical body, as we shall see.

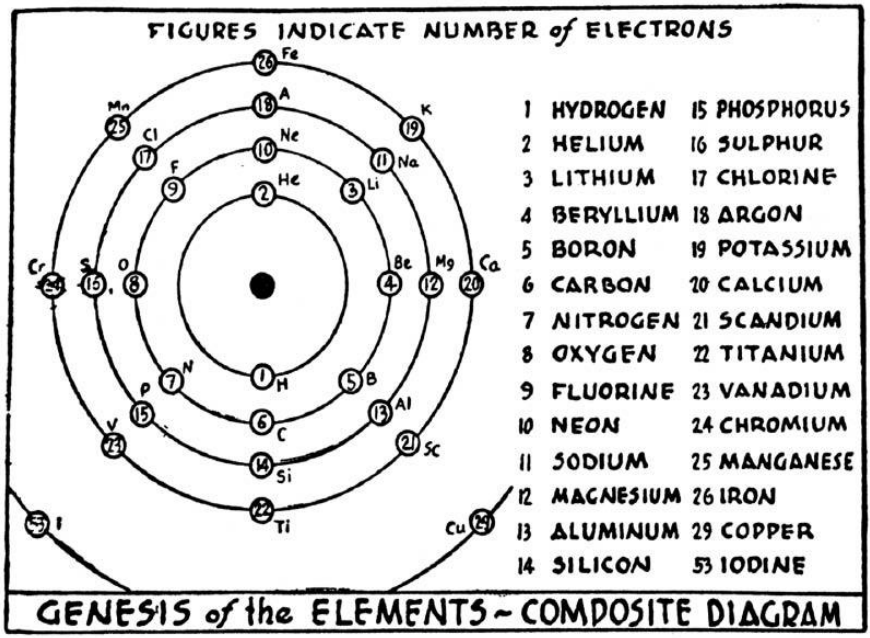
Reference to Figure VII-2 once more will show that, from the Astral world, the life wave passes to the Physical, where it becomes involved in still denser areas of activity. Also, we note that a dual stream of action is indicated: one of which culminates in the cells, basic bricks out of which all living things are made, the other in the crystals. It seems apparent that there is no precise point at which the second outpouring suddenly enters; but rather that it gradually overshadows the first outpouring and, by degrees, becomes the major factor.

We have previously referred to the fact that all substances are built from atoms. In Figure VI-4 we have an illustration of the atoms according to occult research. The atom of the chemist, however, is more correctly described, from the occult viewpoint, as belonging to the molecular subdivisions of the physical world. In Figure I-2 a simplified diagram of the hydrogen and oxygen atoms is shown; also the manner in which these combine to form a barely visible spot of water, many millions of which would make a raindrop! The hydrogen atom is the simplest of them all, having only one electron.

In Figure VII-3 we have a composite drawing showing how differences arise between the chemical atoms. To the left of the diagram and at its center, a small black circle will be noted, which represents the nucleus of the atom. Immediately below it is a small white circle with a figure "1" inside and the letter "H" outside. This represents the hydrogen atom with only one electron. On the right side of the drawing, No. 1 is identified as Hydrogen. Immediately above the nucleus, we see a small white circle with a figure "2" inside it and "He" on the outside. Reference to the table indicates that No. 2 is Helium. Helium has two electrons. Beginning then in the "northeast" of the next outer circle and moving clockwise, the numbers in sequence indicate the number of electrons possessed by the atom, the designation of which may be found by

referring to the table. In each atom, the rings would contain one electron for the circle of its identifying number and also for each numbered space preceding it. So we see, by adding electrons one by one (and a similar increase in the protons within the nucleus to maintain its electrical balance) all the different atoms are produced. Carbon, a normally solid substance, has six electrons, but when only one more is added, nitrogen gas is the result. About one hundred such elements are now known.

Figure VII-3



We now come to the next stage, in which these two outpourings may be seen in action, and that is the process of combining atoms into molecules and the many elements and compounds which we see around us in daily life. Theoretically, we might say that the second outpouring enters the physical scene at this time, although there is considerable overlapping and no doubt it has been overshadowing activities in the atomic regions as temperature changes have given the conditions necessary for the various elements to form. Here, again, slight changes in the physical constituents cause great differences in the outer and visible characteristics of the substances produced. The problem before the Solar Deity – and we must remember that even He, at His great height of attainment, must have His problems – was to combine these atomic

creations into larger aggregations, which would become more responsive to environment and express "life" more fully. There is a mystical saying ascribed to Jesus in the Christian Gospels, "Where two or three are gathered together in My Name, there am I in the midst of them." That statement is true in all phases of existence. We know it is true mentally and spiritually. Jesus is identified with the Second Person of the Christian Trinity, as shown in Figure V-I . That is the aspect of love, consciousness, life. When two or three good friends meet together in a spirit of good fellowship and harmony, to exchange their thoughts on worthwhile topics, something happens. A strong bond of harmony and understanding is set up between them and it becomes an experience of pleasure and profit. Few things can bring greater joy than such human companionship. When even a few can meet together in spiritual aspiration "in His name" it can become a truly inspiring experience, for He is there in their midst. And even in the minute recesses of the atom and the molecule, when two or three of the elements combine together with a bond between them which causes them, from that time on, to work as one, something happens – really happens! Life appears; consciousness can be observed; the manifestation of the second outpouring becomes obvious.

Figure VII-4 tells the story in simple outline. We have seen that the union of hydrogen and oxygen produces water. If one more atom of sulphur and three of oxygen are added, we have a deadly poison – sulphuric acid. With two atoms of carbon, six of hydrogen and one of oxygen, working together as a unit, alcohol is the result. With different proportions of the same atoms in combination, we have sugar.

Dr. Annie Besant made an interesting comparison, and stated in her work A Study in Consciousness:

"For chemical elements exhibit distinct mutual attractions, and chemical marital relationships are continually disorganized by the intrusion of couples, one or other of which has a stronger affinity for one of the partners in the earlier marriage than the original mate. Thus a hitherto mutually faithful couple, forming a silver salt, will suddenly prove faithless to each other if another couple, hydrochloric acid, enters their peaceful household: and the silver will pounce upon the chlorine and take her to wife, preferring her to his former mate, and set up a new household as silver chloride, leaving the deserted hydrogen to mate with his own forsaken partner."

Consciousness of the elements themselves is a true fact.

The water molecule has two atoms of hydrogen and one atom of oxygen, hence H2O. When water molecules are abundant, hydrogen atoms move from one molecule to another because water is a weak acid at the same time that it is a weak base. Since the kidneys and the lungs both function to maintain an acid-base equilibrium within our bodies, a knowledge of the characteristics of acids and bases is also an important prerequisite to covering this subject further. The tendency for an acid molecule to react with a basic molecule is an example of consciousness on a molecular level.

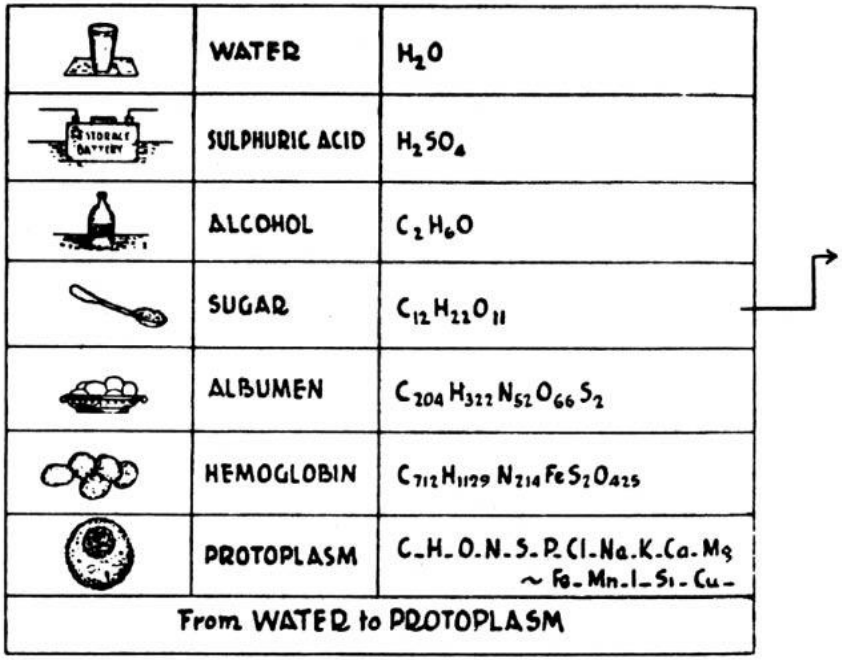
Now let us look at some other molecules. Methane, ammonia, and carbon dioxide, constituents of earth's beginning atmosphere, when exposed to a discharge of electrical energy, produce glycine, the simplest amino acid. An amino acid is a molecule which contains an amino group -NH2, with the properties of a base, and an acid group -COOH, with the properties of an acid. We know that the consciousness of an acid molecule guides its reaction to a base and vice-versa. Hence, the consciousness of amino acids is such that they like to link themselves up into long chains, called polypeptides. Millions of years ago this process was the beginning of life on our planet.

When polypeptides grow into larger molecules like enzymes, we see that the lower molecular consciousness of the component amino acids has fused into a higher molecular consciousness as the enzyme molecule pursues a more specific and vital function. The fusion and enlargement of consciousness persists so that a collection of enzymes and other molecules works together to produce the consciousness of an organelle, organelles work together to produce the consciousness of a cell, cells work together to produce the consciousness of an organ, and organs work together to produce the consciousness of a form.

The overall consciousness of the form or the sum total of elemental units working in unison creates a body of energy commonly called low self. Low self is an entity unto itself, and often traps the lower mind into desires of the flesh. A good example is when we have just eaten and are basically satisfied but then someone offers us a candy bar or some junk food. Our intuitive or higher self (Upper Mental Plane) tells us to refuse the offer, but low self takes over and we greedily eat the candy bar or junk food. Later, when we come to our senses, usually brought on in this

case by indigestion, we remind ourselves of that one fleeting moment whereby we could have avoided this self embarrassment which could even have accentuated itself with an occasional flatulence here and there.

Figure VII-4



Shown in the drawing is compound sugar with 12 carbon atoms called Sucrose. The body only utilizes simple sugars of five carbon atoms. The closest sugar is Fructose, a natural sugar, found in fruit with six carbon atoms.

Alcohol is nine carbon atoms. When you eat foods with sucrose (12 carbon atoms) and the body breaks them down for five carbon atom consumption, it passes through a nine-carbon atom stage. Thus the toxic effects of consuming alcohol is felt by the body even though no alcohol was consumed. Is it not interesting to note that alcoholics and sugar addicts have the same withdrawal symptoms and that children raised on large amounts of sugar have natural alcoholic tendencies when they grow into adolescence?

Let us go back and look at the following drawing. The information in this table could be expanded forever but the drawing itself clearly indicates gradual growth in complexity until we come to Hemoglobin, the red coloring matter of the blood, in which 712 atoms of carbon, 1,129 of hydrogen, 214 of nitrogen, one of iron, two of sulphur and 425 of oxygen have been combined together to act as one unit. Then, most complex of all, we find protoplasm, the primary substance out of which all living things are made. The development of protoplasm and the beginning of cell-life marked an entirely new era in the history of the planet, and life definitely began its lengthy climb, the goal of which still lies far away in the dim and distant future. Protoplasm, as the diagram shows, is a combination of 16 elements which, combined, work as a unit. Numbers for the atomic proportions cannot be given, for as yet there are no really accurate means by which such measurements can be made. Furthermore, there are many kinds of protoplasm which are specialized for various purposes. When we realize that in both hemoglobin and protoplasm thousands of minute parts in the correct proportions must work together as one, we can get some idea of the immensity of the problem of producing such creations.

Before pursuing the subject of "organic" substances further, we should take note of the development of crystals. It is known now that practically all solids have a crystal structure, though in many it can only be recognized by the use of X-rays. From the elemental kingdoms, it has been said, life passes to the mineral kingdom, where rigidity finds its climax. Of all the forms of matter, metals are the most dense and heavy. And yet, even in metals, life can be detected, and there is clear evidence of the early stages of consciousness. This fact was well demonstrated by an Indian scientist Prof. Jagadish Chandra Bose of Calcutta more than 100 years ago.

He made a series of brilliant experiments, which were reported to the Royal Institution in 1901. Using especially constructed apparatus, he recorded on a revolving drum electrical responses to mechanical stimuli administered to metals. He then repeated the experiment, using muscle in place of the metal. In every case, the response of tin was almost identical with that obtained from muscle. With other metals, it was similar, but there was some variation in the period needed for recovery.

Then, after he found that electricity produced similar patterns in muscle tissue and tin, he used poisons on the muscle and tin. With the poisons

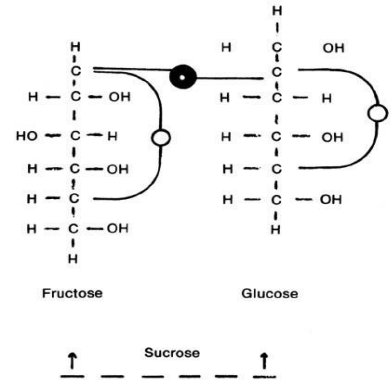
administered, he used the electricity again and recorded the result. The tin showed fatigue waveforms and the muscle showed stress waveforms and they appeared almost the same. The induced state was termed tetanus (shock). Then Dr. Bose administered the antidote to the tin and muscle and they both recovered simultaneously. An interesting thing I noted in this experiment was the tendency for the tetanus condition of the muscle during electrical stimulation with the administration of a poison. Is that not the same condition we place on ourselves when we overwork ourselves, building up toxins in our bodies (poison) and then continue to operate without a balance of meditation and rest? No wonder we suffer in stress. Advanced tetanus literally destroys the body and it showed itself here as a pre-stress condition.

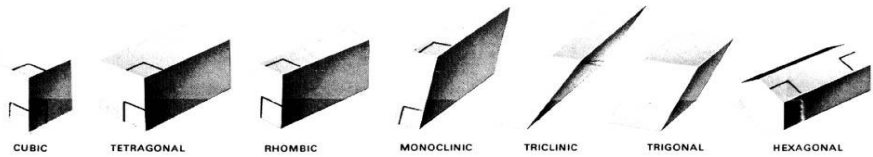
Now let us look at the shape and division between form and protein.

As the second outpouring, that of "Life-Form", appears in the physical world, scientists can use their microscopes, test tubes and other equipment actually to observe it in action. The details of that story, only touched upon here in fragmentary outline, are indeed fascinating.

In the mineral kingdom (Figure VII-2) we see that the nadir of progression is reached: involution and evolution are balances. But even in the dense material of the crystal we can see evidence of the workings of the master Mind of the Creator, for every crystal has a definitely patterned geometrical structure. We have seen that, according to the occultist, the physical atom has within its seven spirals the specialized forces of all the seven Planetary Chain Logoi. Since one of these is always predominant in each atom, there are actually seven basic types of atoms, their combinations and degrees of development producing innumerable sub-types. So it is of great interest to note that there are actually seven basic types in the densely aggregated combinations of crystals, each again with innumerable sub-types. This septenary division arises from a classification of crystals according to their geometrical configurations, the number of their axes, with their angular and linear relationships, as shown in Figure VII-5. They are the Cubic, Tetragonal, Orthorhombic, Monoclinic, Anorthic, Trigonal and Hexagonal. The drawings merely give one illustration of the many variations which can be found of each basic structure. But, once more, it gives us a tiny glimpse of the deep inner truths of Nature, working from the invisible into visible manifestation. The crystal holds its form for long periods of time, but, like all other things, it has its periods of growth, maturity and decay.

Figure VII-5





NATURE'S OWN SOLID GEOMETRY

Any crystal found on earth, whatever its size, belongs to one of the seven basic types (below), whose geometrical-sounding names derive from the properties of their sides and angles. Cubic crystals have all right angles and all sides equal. The tetragonal family has all right angles and two of three sides equal. The rhombic type has all right angles but three different side lengths. Monoclinic crystals are like rhombic but "squashed" in one direction, so that eight of their angles are not right angles. Triclinic crystals are squashed in two directions: they have no right angles and three unequal sides. Trigonal is like triclinic, but with all sides equal. Hexagonal is like tetragonal, but two faces have six equal sides.

The involutionary arc of the second life wave is now complete. Life has been occupying bodies of progressively denser materials and is now within the densest substance which it will normally occupy. It is in this kingdom that physical consciousness begins. Physical atoms within the mineral forms must be awakened into responsiveness, so that they may

begin to create links between spirit and matter, which will give rise to consciousness. So the material of the mineral kingdom is subjected to the most terrific impacts. In the nebular and pre-nebular conditions, as the Solar System was in process of formation, the smaller atomic particles were submitted to heat and other conditions of a kind entirely outside human comprehension. Now, in larger masses, physical matter will experience, either in or on the earth, pressures, heat, cold, volcanic eruptions, earthquakes; all the fierce furies of Nature, as well as her tenderness of warmth and gentle breezes and cooling waters. All these things will slowly awaken physical matter into a greater awareness of environment, and the life within it will vaguely respond. Man, no doubt unwittingly, is helping too. He takes the minerals from the ground. He throws them into his blast furnaces. He heats them to white heat and plunges them into cold water. He cuts them and drills them and hammers and rivets. He submits them to stresses and strains, so that they will hold his large buildings rigidly together and keep them in the needed shapes. They must resist, in his engines, the pressures of steam and the sudden expansion of gases. In a multitude of ways he is impinging his activities upon the mineral kingdom for his own benefit, and in that way is helping Nature to provide the heavy impacts which are needed to give life, imprisoned in its densest forms, the stimuli necessary to start it on its lengthy climb upward, and to make physical matter a more responsive instrument for its use.

CHAPTER VIII – THE COMMON ENERGIES AND THE COMMON SHAPES

Due to continued influence of a very subtle effect of the Third Outpouring on mineral atomic structures and covering a period of millions of years, the individual atoms of minerals possessing consciousness are subject to tremendous stress, in the form of volcanoes, heat, cold, radioactivity and a variety of other causes of nature. Finally, they then complete their evolution through the mineral state and are guided by the action of the will aspect of the First Outpouring, back onto the first ether of the Physical Plane. Here by the action of the Second Outpouring, "Divine Order", they are crucified25 (balanced) and returned back to the lower orders of the Physical Plane. This rebounding action is called a Life Wave and when an atom gains the momentum to sustain its part in a Life Wave it reincarnates back into form, only this time as a living form – usually a cell in a plant. The atom in the mineral kingdom learned stress, and now, in the vegetable kingdom, it is again subject to stress – and also a new sensation: feeling. Plants are very sensitive to people. People have feelings and emotions. Emotions are a product of the Astral Plane. Thus, if plants can feel people and people feel from the Astral Plane, then the obvious conclusion would be that plants gain access to the Astral Plane through people in return for sacrificing themselves to people because people could not exist on the Physical Plane without the consumption and digestion of plants, i.e., the Plant Kingdom. The same holds true for the Animal Kingdom. Once freed after each incarnation, mineral-plant atoms continue gaining consciousness and rising on higher Life Waves and Planes from the First Etheric during mineral-plant conversion, Astral on plant conversion, Lower Mental on animal conversion and finally these atoms are conditioned on the Upper Mental Plane to become cells in man, the human being. This accumulation of energy conditioning through atomic structuring has to have a presiding intelligence to guide it so well, and this intelligence obviously has to have consciousness, and this consciousness can now be called low self or our animal nature. You do not have to believe in reincarnation to understand and believe this explanation. For many years, I did not, and as a scientist, I found this answer in orthodox science studying the behavior patterns of atomic structures at Randolph Laboratory on the University of Michigan campus when I was 15 years old.

In Figure VIII-1, it shows two divisions of form, each starting with a simple electron pair, each multiplying into carbon, oxygen, hydrogen and nitrogen, each at the molecular level forming Octahedron triangles (double Pyramid) and each building again, producing large-scale form. The exception is that one form of mineral seems lifeless and the other alive. Actually, both are alive but one possesses the consciousness gained from evolving from the other and can reproduce itself by mitosis once to multiply, cell to cell duplication, twice to group itself, three times to form a molecular compound, four times to form – in this case the four main elements in DNA – adenine, thymine, cytosine and guanine – or the compound called deoxyribonucleic acid. This again unites with itself, forms a ladder, repeats, divides in two, breaks into three parts of RNA and sends RNA out to capture and reform the ladder, which eventually contains 10,000 rungs and all of the physical characteristics of the human being.

Now let us return again to the Pyramid Structure and examine its part in life more closely. Also, let us examine another element of vibration that is constantly presiding over growth and form – light. White light is the sum total of several electromagnetic vibrations, vibrating in harmony or octaves (See Chapter I) with each other. Color is present in all light, in fact, although sunlight ordinarily seems white, in passing through the atmosphere it sometimes reveals its many colors spread out in a spectrum, or rainbow. By the same token, white light can be made by mixing colored lights together, as shown in Figure VIII-2.

Light consists of radiations, or electromagnetic waves, of various wavelengths. But the eye responds to these radiations by converting each wavelength into a specific color. In addition, the eye turns mixtures of radiations into new blends of color. In this way we perceive the floor in Figure VIII-2 to be decorated in more colors than the three actually shining on it.

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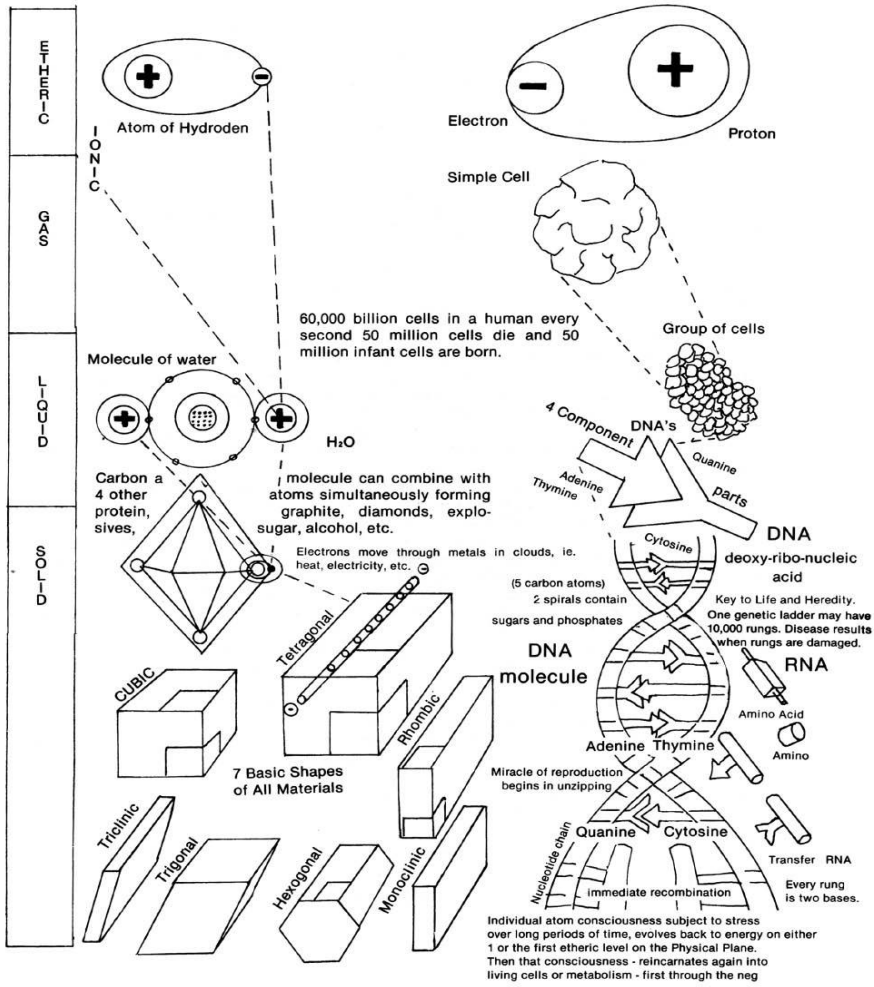
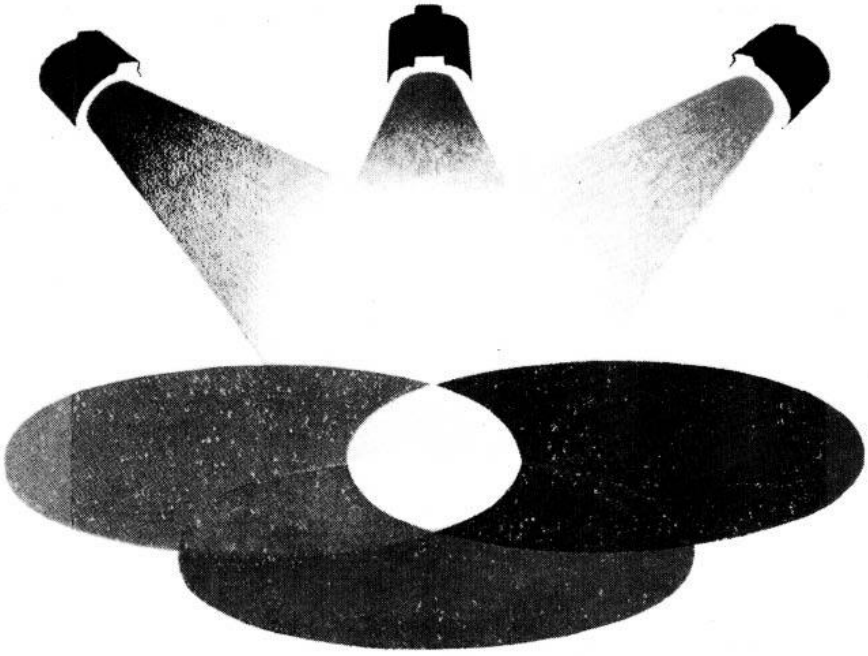
25 Author's Note: To be crucified is to surrender your will totally to God, the Father, and let Spirit become the result. But during Crucifixion, individual consciousness is not lost, only balanced with Spirit, in this case, Atomic Balance.

Figure VIII-1



Besides coloring our perceptions, the hues that we see everywhere around us can shape our moods and affect our tastes. A bizarre dinner party once proved this: when the guests were served under lights that made steak look gray, celery pink, peas black and coffee yellow, most could not eat and, though the food was superb, those who did try it became violently ill.[26]

Figure VIII-2



The diagram above shows how a pattern of colors looks when spread on a flat surface. Where all three light beams are equally mixed, the "total color" of white is the result. Because red, green and blue light, besides adding up to white, can produce all other colors, physicists have named them the primary colors of light. There is another triad of colors – seen where the primary colors overlap above – which also can produce all other colors. To the physicist, these are the complementary colors of light, for each can be formed be mixing two of light's three primaries.

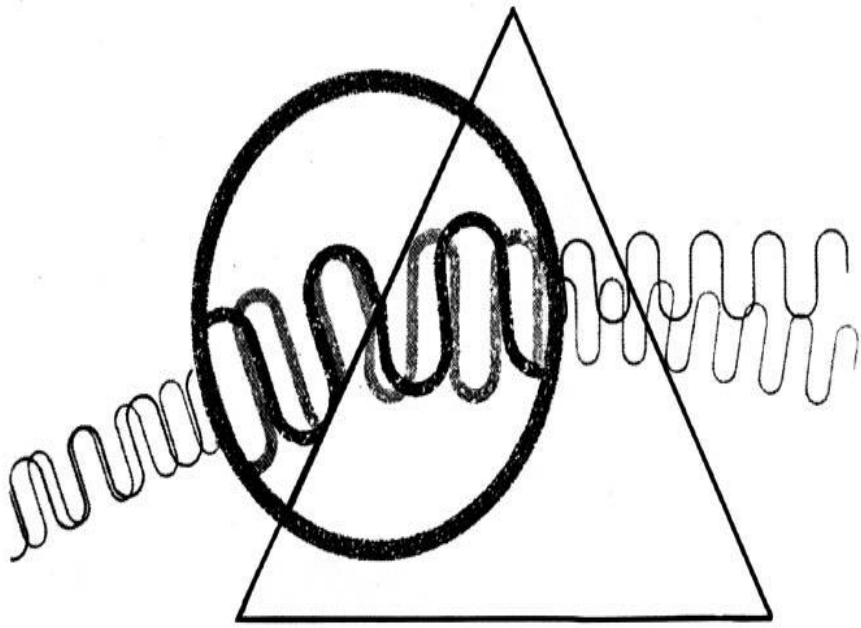
BY SUBTRACTION

The colors of almost everything we see are products of pigment, but pigments are not the source of colors. They are merely agents that screen out or "subtract" all but specific colors of light: green pigment, for instance, is green because in effect it absorbs all the colors of white light except green, reflecting the green wavelength that we see. The same is true of any other pigment. Thus black pigment looks black because it absorbs almost all light, while white pigment reflects light, absorbing very little color at all.

Most people may know from a high-school art class that the artist's names for the primary colors are red, blue and yellow. To the physicist, however, these are neither primaries nor properly named: the artist's primaries ought to be named magenta, cyan and yellow — for they are actually the complements of light's true primaries.

When white light is brought into the presence of a solid clear triangle or a Pyramidical shape made of glass, they are slowed down and separated into the separate clear colors of the spectrum.

Figure VIII-3



SCHISM IN A PRISM

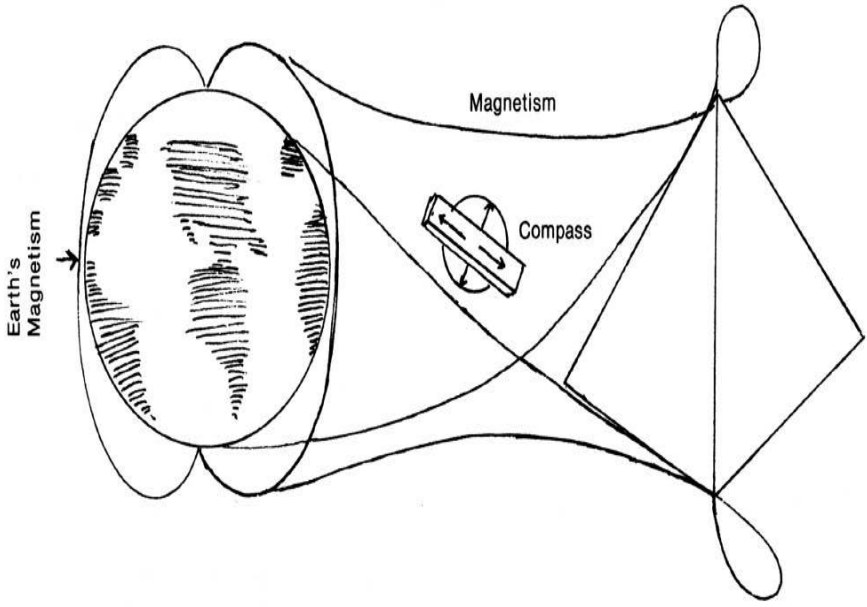
Light's passage through a prism is illustrated in Figure VIII-3. To simplify matters, only the wavelengths at each end of the spectrum are represented. At the far left, red and blue waves of light are shown moving in the same path toward the prism. The distance from crest to crest is greater for red than blue, because red light is of a longer wavelength than blue. What happens when light enters the prism is shown enlarged within the black circle. Light waves move more slowly in glass than in air, and so are bent when they hit the prism. The blue

wave is bent more than the red, making the two diverge. The waves are bent again on leaving the prism to produce the separation of colors in a spectrum.

A five-sided open-frame pyramid will not visibly affect light as it would if it were solid but it has an even greater effect on magnetism because it is raised into a higher vibration, separated into seven primary forms of energy of which color is only a subtle representation.

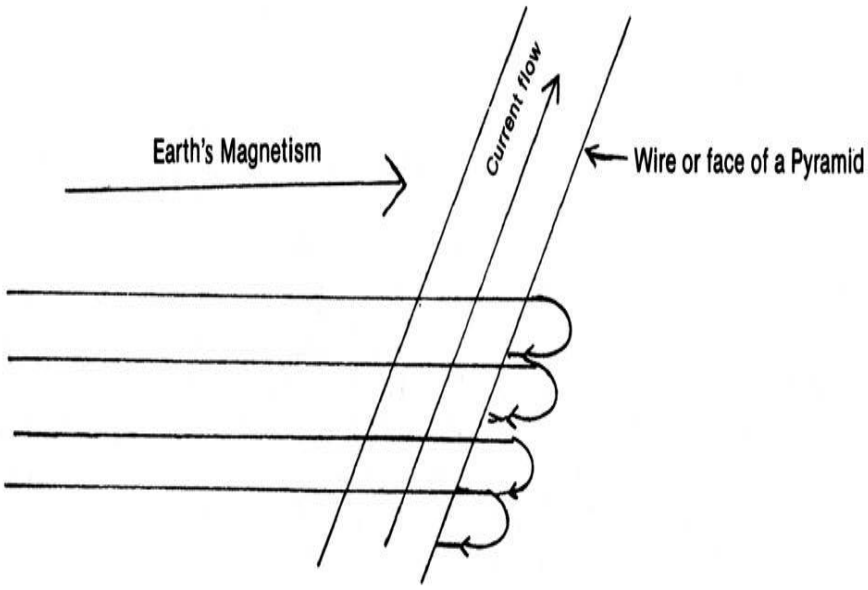
Now imagine a pyramid as a magnetic crystal separating the earth's magnetism into seven basic vibrations of energy and, if used properly, capable of directing that energy directly into a living life form which has receiving antennas, each antenna resonantly attuned to receive the octave of energy it needs. In the case of the human form, these receiving points are called chakras or endocrine glands. When the endocrines are thus stimulated, they secrete a hormone into the bloodstream. Once entering the bloodstream, the hormone enters the brain and is transferred into consciousness by the mind. The mind acts or reacts to that stimulation called feeling, driving the body into action, and this produces motion on the Physical Plane.

Figure VIII-4



Now, look back at the conversion process whereby the earth's magnetism actually strikes the side or face of a pyramid. Remember in Chapter I we discussed the fact that whenever electricity is present, so is magnetism, or vice versa? You can now see how, as the earth's magnetism is present and strikes a pyramid, it will cause small amounts of electricity also to be present. If electricity is present, so will be electrons, and thus comes into being the negative ion effect as a side effect of the continual process.

Figure VIII-5

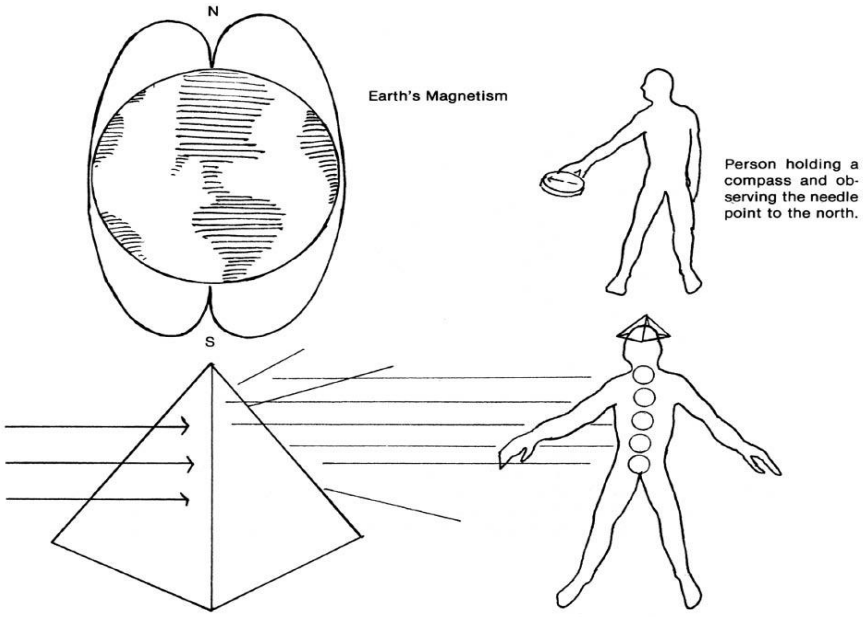


You may witness the abundance of the earth's magnetism by holding a compass and watching it point to the north. Magnetism enters a Pyramid and is split into seven lower vibrations or octaves. These vibrate at a rate detectable by the body in the endocrine region.

Plants and animals are affected this way too, and in animals, the endocrine system is simpler than that of human beings. Plants have another form of energy conversion which usually works through the stoma in the leaves.

26 Author's note: Because people can be made violently ill in almost no time at all, as has been demonstrated by experiment, might it not be possible to make the violently ill, well, just as fast? The author, who experienced the miracles of faith healing, has developed a device that incorporates color, sound, electromagnetic radiation and pyramid principles, and is truly the state of the art at this time. It was built from concepts presented in this book.

Figure VIII-6



Pyramid Energy is slowed down or attuned to man especially when he wears one. Instead of using glass as a medium, as in the case of a prism separating light into color, the Pyradome was designed to separate magnetism into motion utilizing the human body as a prism. The output is good feelings and high energy because the Pyramid produces balance, and balance is resonance, and resonance is maximum potential output with minimum potential input. This manner of motion produced in this way sets up the God force, not from within the Pyramid (the Pyramid is only a catalyst) but within the person utilizing it, as consciousness is elevated in vibration. The person having the experience will

consequently have gained expanded consciousness. In the forthcoming chapters, I will show in a component form how this is possible.

The negative-ion effect of pyramids has baffled orthodox science for years because orthodox scientists do not understand the energy-conversion process from the highest planes to the lower via the etheric levels. Instead, the orthodox scientist tries to relate the energy-conversion process to his five senses, and in so doing, designs his measuring apparatus to be interpreted by these limited facilities, and is always mystified when he gets no readings directly from pyramids yet he gets results from pyramid experiments when a living life form such as a plant or human form is involved. Let me give you an example. A few years ago, we were at the National Health Federation Show in Pasadena, California, demonstrating the negative-ion effect of Pyramid Energy. Some of the experiments we were using were changing not only the taste of grapefruit juice but also the color, because the juice we were using had a pink coloring agent that was artificial. The Pyramid, of course, through negative ionization, immediately neutralized the color to a slight whitish yellow which is the natural color, and in addition to this, the taste was changed from a bitter one to sweet. On one side was a control group who had no Pyramids, and hundreds of people who came by experienced the obvious changes. In the back of the booth was Dr. Lawrence Kennedy doing muscle testing, Kirlian Photography and biofeedback using the new Accumeter. Anyone with an open mind could easily identify with one or more of these demonstrations. Then along came a scientist with a small device that reads the amount of negatively charged particles that are airborne or moving through the air. He stuck his device into the base of a nine-inch Pyramid and could not get a reading.

"See", he said, "No negative ions – I don't believe in Pyramids." I tried to explain to him that Pyramids work by absorption or change directly in the metabolism, which in this case, on a living system, is very important.[27] The Pyramid does not work by emission, which is the way a negative-ion meter works, so his instrument could measure the change in transition. But by pH testing, he could demonstrate the same result because a pH meter indicates what happens when an acid, in this case, grapefruit juice, is subjected to negative ionization. It goes through a transition and is then a completed experiment. Or, he could go with his ion meter to the seashore, where everyone knows there is an abundance

of negative ions, and he would get the same reading he gets in a Pyramid – nothing.

This was too much for this scientist. His orthodox, confused ways covered him up to the simple truth thus explained, and he walked away confused. Do not think all scientists are like this. The true scientist understands. Once, at the McCulloch Corporation, a multi-millionaire, the late Robert P. McCulloch, father of the chainsaw and a man who was a great enough achiever that with the help of my father, Allen Bell, he disassembled the London Bridge and brought it to America, introduced me to his top staff scientist, Steve Smith. Now Steve is someone that I consider to be a high-level scientist. Before he was in the employ of McCulloch, he did some amazing things for Howard Hughes and I think we can all agree that Hughes was also an achiever. Anyway, to make a long story short, once Steve and I were introduced and alone where we could talk in private, I told him about Pyramid Energy. His answer was, "Let me tell you about my Astral Travel experiences." I am sure you get the picture, a true scientist is a being with unlimited potential and a willingness to experience it. One point I am bringing out here is also this. AN ION GENERATOR PRODUCES FREE ELECTRONS BY PLACING HI-VOLTAGE DIRECT CURRENT ON A POINTED SURFACE IN NORMAL ATMOSPHERIC CONDITIONS. THIS ION IS NOT LIKE THE ION EFFECT OF PYRAMID ENERGY, AND IS VERY INCOMPLETE IN ITS FULFILLMENT OF ELECTRICAL BODY PROCESSES.

THE NEGATIVE ION EFFECT IS FOUND AT THE SEASHORE AND IS LIKE THE PYRAMID-PRODUCED ION EFFECT, WHICH IS COMPLETE, BECAUSE BOTH CONTAIN THE VITALITY GLOBULE FOUND ON THE SURFACE OF THE SUN.

A simple experiment you can try is to get a couple of plants that require sunlight. I did this and placed a control plant outside during the summer months and a test plant in a dark closet, inside a box with a pyramid over the plant. The Pyramid used was a Pyradome and was "not" aligned to magnetic North. When you try this, use small plants and measure and record the height of both plants, control and test.

After eight days had passed, we compared the control with the test plant and found that the test plant had grown 3/4 of an inch over the control

plant. This was a significant discovery in that the plants were only 1½ inches tall to begin with and the test plant was in total darkness. I will cover the "why" of this in later chapters.

In Figure VIII-7, you will see a drawing showing the concept initially used to produce the first Pyradome. A year later, ten thousand units were in the field, and time had proven the concept valid. This is not the total concept, however, only the first stage.

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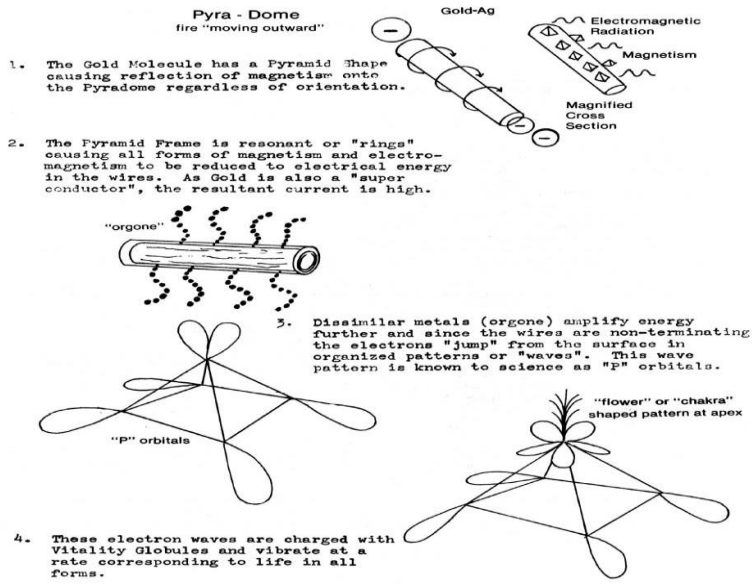
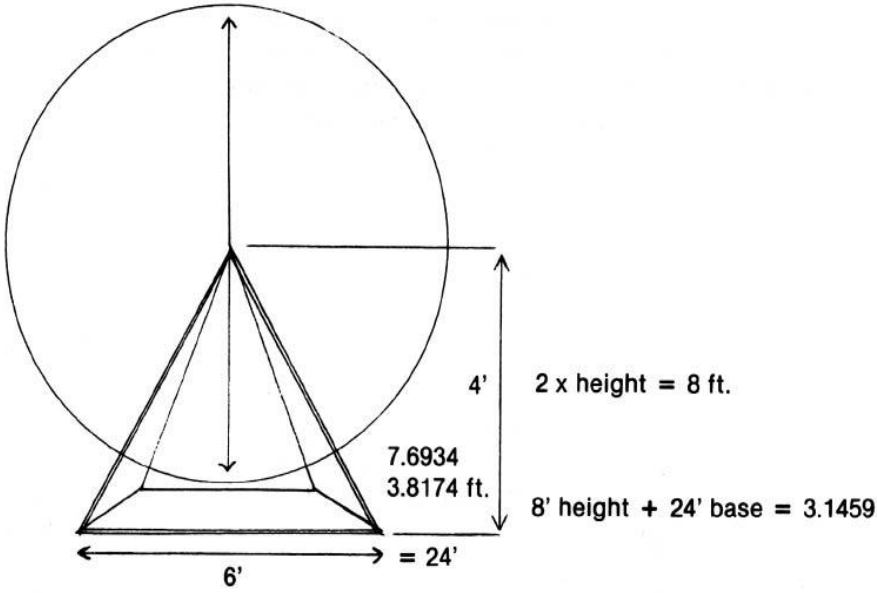
27 By assimilation directly into the metabolism, the body is assured of realizing full potential. An ion "shot" through the air often never makes it to the lungs and bloodstream. Absorption is often overlooked by Negative Ion Manufacturers.

Figure VIII-7



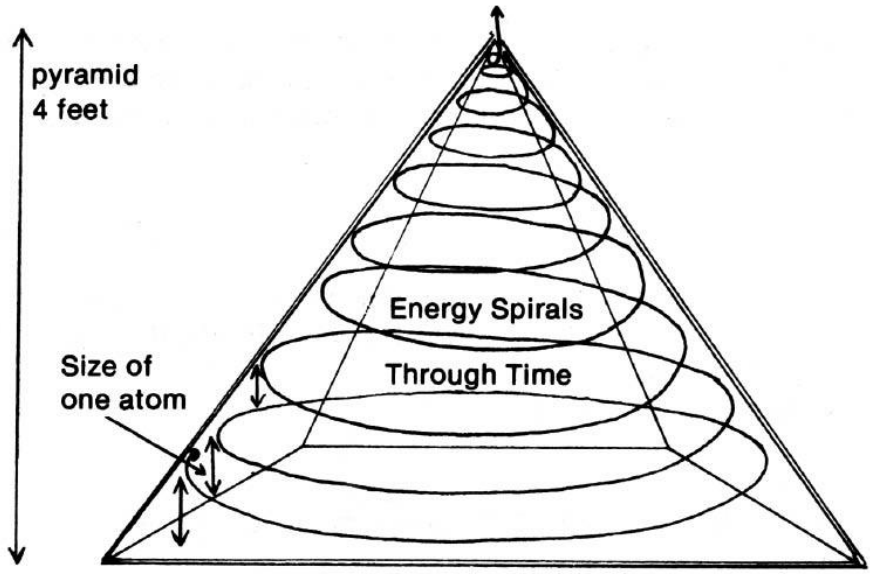
MAPPING THE CARBON ATOM

Figure VIII-8



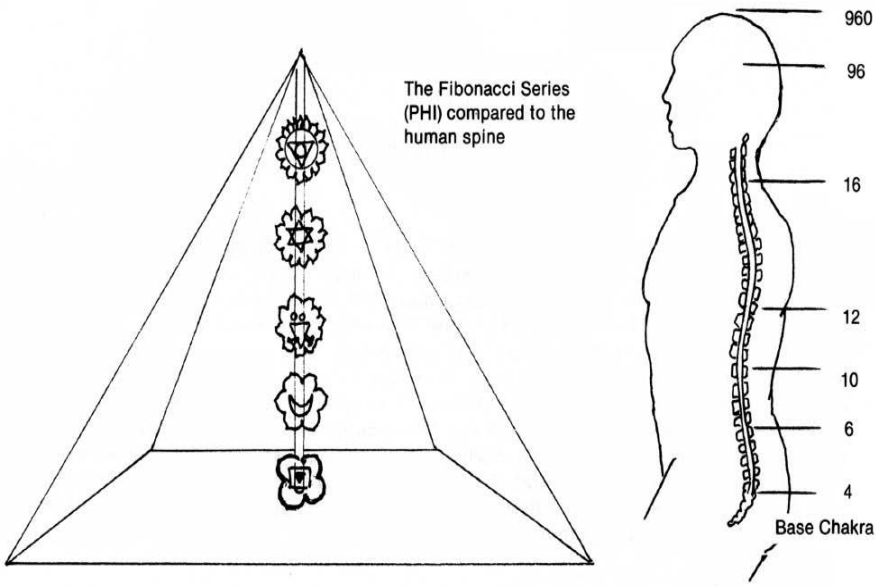
If you have a six-foot base Pyramid, the apex will be two thirds the base length above the surface of ground plane of the Pyramid. And if you multiply this height by two and divide the answer into the entire base circumference, you will reach the mathematical unit called π. This is used to compute the diameter of a circle. The number is always 3.1415926 and can never be rounded out. This means a true circle cannot exist on one plane of energy or consciousness. This holds true down to the smallest atom in the universe. A circle appears to the eye to be complete but as we have previously studied, man is limited in his perception of the physical universe. Going back further into our studies, we find all matter to be composed of smaller units of matter getting smaller in size but higher in energy down to infinity because energy is infinite, i.e., the smallest size has the greatest energy. This fact allows us to see that the smaller the diameter, the larger the pressure, and matter is always spiraling upward or downward from plane to plane. This interdimensional transaction occurs geometrically at the rate of spirit and matter (vibration). The next drawing (Figure VIII-9) shows this.

Figure VIII-9



In Figure VIII-9, the energy never crosses over itself. It appears to but rises to the next octave whose wavelength is slightly shorter than the previous wavelength of the lower vibration. The rate at which energy rises is not constant, however. Human will power can speed up or slow down the ascension rate. The more tuned in to the Divine Plan or harmonious action (synthesis) is the person using a Pyramid, the faster the vibratory rate. To achieve perfect balance with a Pyramid, one can look at the human spine and compare the location of the chakras with imaginary chakras or points of resonance in a corresponding Pyramid with a height equal to that of the spine being composed of 28 vertebrae.

Figure VIII-10



The ratio of the distance starting at the base of the spine is calculable, and the order is known as the Fibonacci Series. This distance shows the exchange point of the seven levels of energies in the spine and in the Pyramid. The Great Pyramid depicts this by the location of the various chambers.

THE FIBONACCI SERIES

There is a number system used in botany to determine the basic plant leaf distribution in trees and other plants. This series of numbers is called the Fibonacci Series after its discoverer. It is unique in that by its use, the value of PHI can be determined.

Mathematics texts state a formula for PHI as

$$\text{PHI} = \tfrac{1}{2} + \frac{\sqrt{5}}{2}$$

Calculated on this basis, PHI = 1.618033989 to nine decimals. We use this value in evaluating the Fibonacci Series that follows.

The Fibonacci Series of numbers is determined in the following manner: Each succeeding number is determined by the sum of the two preceding

numbers, beginning with the lowest whole number. Thus: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, 987, 1597, 2584, . . . are all succeeding terms in the series. I will explain later how this series is used to determine the distribution of leaves, pine cones, pineapple buds, and sunflower seeds.

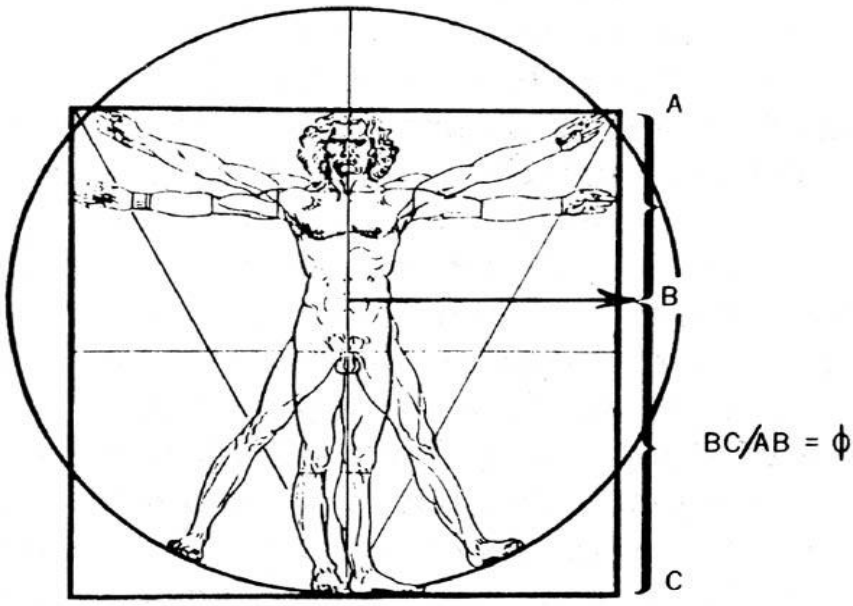
If any number is divided into its successor, we get a ratio that approaches PHI as the numbers get higher and higher:

#	Ratio		Percentage Error to 0
1	2/1	= 2	+23.6%
2	3/2	= 1.5	7.3%
3	5/3	= 1.666+...	3.0%
8	8/5	= 1.6	1.1%
13	13/8	= 1.625	0.43%
21	21/13	= 1.6153846	0.1637%
34	34/21	= 1.6190476	0.06%
55	55/34	= 1.61766471	0.025%
89	89/55	= 1.6181818	0.009%
144	144/89	= 1.6179775	0.0034%
233	233/144	= 1.6180555	0.0013%
377	377/233	= 1.61800257	0.0005%
610	610/377	= 1.6180371	0.0002%
987	987/610	= 1.6180327	0.00007%

The last ratio is accurate to the value of PHI by 70/1,000,000ths of 1%.

If we examine any leafy plant, the distribution of kernels on a pine cone, the distribution of buds on a pineapple, we find there are two things occurring: the leaves, kernels, buds, etc., all rotate around a central axis in clockwise and counter clockwise direction; and the number of leaves etc., in one direction is always different from the distribution in the other direction. This difference is always according to the Fibonacci number system! For example, in one pine cone examined, there were 21 kernels in a clockwise direction and 34 on the counter clockwise direction. In a sunflower examined, there were 21 kernels in a clockwise direction and 55 in the counter direction. These ratios are also incorporated as a PHI ration in the dimensions of living things. For example, in the body of man:

Figure VIII-11



The above study in human proportion by Leonardo da Vinci shows the Golden Section as a basis for measurement of the human body. This sacred proportion appears throughout nature, and is the governing ration in the Great Pyramid.

The famous painting of the Last Supper by Da Vinci is based on the PHI ration. PHI is also known as the SACRED CUT. This is represented by the fact that it is the exact ratio in which we can divide a line AC by B in such a manner that AC/AB = 1.618..., is the same as AB/BC = 1.618... This magic ratio was used in the Renaissance by all the great masters, and is considered to be the most aesthetic proportion. The body of man is divided by this ratio. The sacred five-pointed star's diagonals divide each other by this ration. These proportions occur throughout nature.

Since the pyramid is the exact same proportions as a carbon atom, and since the carbon atom is, to man, a solid building block in the physical human form, meditation on this principle will allow you complete freedom from one plane of consciousness to the next plane of consciousness.

Christ knew this and used it to render himself invisible from time to time. The first incidence of this occurring was recorded when he disappeared from the Christians when they tried to stone him for not demonstrating his miraculous powers. (The Great Pyramid is made of stone – This record is also symbolized by the word stone.)

This fact will be demonstrated soon by science, when we build propulsion systems that are capable of space-time warps, or moving as does thought – instantaneously, rather than at a limited velocity of light. Light speed is infinite but man's consciousness cannot cognize faster than 186,273 miles per second. Einstein proved this when he showed that as a person approached light-speed volocity, his relative time was slower.

In the Jewish religion, there is a scientific rule describing the universe called the Kabala. In the Kabala, there are several words called mantrams. When these mantrams are called, this allows the modulation of the voice of the caller to set in motion energies in the exact pattern of herein-described force locations of the Pyramid, and if the caller is in balance physically, mentally and spiritually, he will harness great universal powers. The combined mantrams were called by the Tibetans, "omific words". These words were never spoken verbally but Christ taught them to his disciples for healing purposes. One example of their usage was when Christ took mud, and put it in the eye of a blind man. When the blind man washed his eyes, he could see.

Much of what I am saying here about Pyramid energy was recorded in the libraries of Alexandria in the archives of the Pyramids. When the Romans burned the library about 320 A.D., history states that these records were destroyed by fire. This is not true. The White Brotherhood knew of Alexandria's impending doom, and removed the records and transferred them to Tibet only hours before the fires were set. Madame Blavatsky personally saw these records and recorded them in her volumes called the Secret Doctrine at the close of the nineteenth century.

THE GOLDEN RATIO OR PHI, (0)

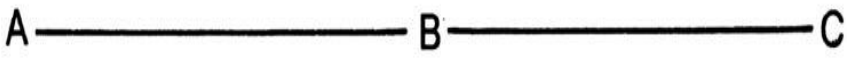
The Great Pyramid is the only structure known that incorporates the rations of PI and PHI into one building. What makes this all the more remarkable is that the ration of PHI and PI are not supposed to have been known when the pyramid is supposed to have been constructed.

PHI is the magical, mystical unending number 1.618033989+ ...This number so fascinated artists during the Renaissance that they spent most of their time exploring its endless possibilities in utilizing its ratios in their paintings and sculptures. Modern architects use it in building design, as it has been found to be the most pleasing ratio. At one point in history, the ratio for PHI was so carefully guarded that to reveal it to a non-initiate was a crime punishable by a death of slow torture.

Why is PHI so important? It is the mystical number that is present in the design of all living organisms. It seems to recur over and over in all forms of life. The logarithmic spiral found in the Chambered Nautilus, the shape of the growing fetus, the ancient Yin-yang symbol of life from the Orient, the daisy, the sunflower, the pine cone, pineapple, elephants' tusks, the human body, canaries' claws, and the human ear are but a few examples of organic structures that incorporate PHI.

PHI is closely associated with the mathematics of life. It has been proposed that all living structures are closely related to the invisible etheric field surrounding them. This aura is said to shape all life forms. It is interesting then that PHI may be a mirror of the basic mathematics of life energy. It is no wonder that the pyramid shape incorporates PHI into its structure. The pyramid greatly affects life energy processes.

Figure VIII-12



PI expressed in terms of PHI is as follows:

$\varnothing^2 = \varnothing + 1$ $\quad 1.618033989^2 = 2.6180339 \times 1.2 =$

$\pi = \varnothing^2 \times 6/5$ $\quad 3.141640788$

TRUE

$\pi = 3.141592654$ % error = 0.0015%

The PI and PHI factors in the mathematics of the Great Pyramid are substantiated by the following facts. The original alabaster covering on

the pyramid has been destroyed by vandals. The result of this destruction is that accurate measurements cannot be made on the present pyramid. However, a casing stone was found at the base of the pyramid and the angle of this stone was measured. It was found that its base angle was 51° 51' 14.3". This angle has been called the PI angle because of the following relationship:

Figure VIII-13

$$\text{Arc Tan } \frac{4}{\pi} = 51° 51' 14.3''$$

The arris angle of the pyramid, the angle formed by the ground and the rising edge of the pyramid is:

Figure VIII-14

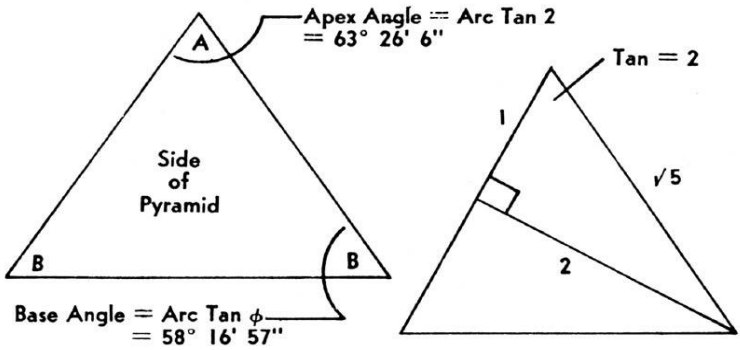
$$\text{Arris Angle} = \frac{(\sqrt{2})^3}{\pi}$$

$$= 41° 59' 50''$$

We can see that the PI ratio plays a significant part in the pyramid architecture.

If we examine the face or side triangles of the pyramid, further validation of the part played by PHI, becomes apparent:

Figure VIII-15



We can see from the above diagrams, that the angle of the apex of the face of the pyramid is equal to the Arc Tangent of 2, or 63° 26' 6". The base angles of the pyramid face are then 58° 16' 57" or the Arc Tangent of PHI.

Another interesting feature that can be used in the accurate construction of a pyramid is the use of the fact that the apex angle is the arc tan of 2.

When we developed a Pyramid Therapy Table a few years ago, we found that the apex energy of a Pyramid could be directed through high-tension wires strung from apex to apex of each pyramid. Now, many people have tried to say that there are different types of energies, some good, some bad, located in and around the Pyramid. This is an untrue statement, but a logical deduction coming from an inexperienced mind still making decisions based on deductive reasoning.

If the Pyramid is a universal shape and one of the building blocks of nature, the carbon atom; and one of the universal combinations of all molecular and cellular structures, how can it have good and bad energy? Energy exists at all levels harmoniously and only an uneducated mind can misdirect its energies and get negative results. Remember, energy is moved by will and governed by mind, and if the two are not united in Spirit, disease, disharmony or confusion can only be the result. One classic example was that a negative "green" energy existed below the apex of a Pyramid that is supposedly harmful and a positive green above the apex that is beneficial. My first observation of that statement was that someone coined new terms to explain what they knew little about. You will note in this publication that I use only orthodox terms accepted by the establishment, and in my bringing in new terms, these new terms will be found to be orthodox in Brahmin science, or what is considered orthodox in another land or nation. It is my intent to bring the science of the East and the West together – two old ways of man with a mixture of truth and lies – and let you the reader decide from your own experiences.

My experience with Pyramid Energy thus far as a graduated physicist and qualified Doctor of Homeopathy and Naturopathic medicine has but scratched the surface of truth in its totality and science in its originality, but I have had personal experiences with over 40,000 people, worldwide, wearing Pyramids of our design, for a time period of almost six years of this writing, and I can honestly say that we have not had one person –

and I repeat, not one person – experience a negative side effect from wearing a Pyradome Series Pyramid. These experiences also include the author's, who has been wearing one continually daily and sleeping in one nightly since 1974. The detoxifying experience that people have when wearing a detoxifier are mild experiences spoken about in later chapters. I have not met another person whom I know to have had this much experience with people and Pyramids.

Getting back, however, to the subject of a negative green effect, to me, it sounds like what happens is that the people professing such a statement as this are either using plastic or aluminum Pyramids, which are both toxic to the body; plastic gives off positive ions, and aluminum deposits subtly in the central nervous system, much like asbestos or mercury, which the body has no enzymes to chelate or discharge, causing a short-circuit of the body's delicate electrical nature over the passage of time. Both of these effects can be looked on by the casual observer as negative effects of a positive-ion poisoning, but in effect they are two separate damaging phenomena of two toxic substances, not of the Pyramid structure. The statement of positive and negative green is erroneous, but the people who made this claim, though not well-versed in Pyramid Energy, are beautiful people who know the science of Radionics like I know Pyramid Energy, and in my opinion, their publications and experiences in Radiesthesia are second to no other group in the world, and their contributions should bring them a Nobel Peace Prize in the near future.

Pyramids convert magnetic currents into solar and cosmic fire. Remember that in fire by friction the third aspect has as a by-product normal electricity and magnetism. When it is spent on the physical plane, i.e., a battery discharged through a load, the energy has to go somewhere, and as electricity and magnetism are synonymous, a Pyramid reconverts them electrically back to solar and cosmic fire. Because of the Spirit aspect of mass mind – translated into simple terms, eight billion people on the earth either know about the great Pyramid or Pyramid Energy in some fashion – that thought form held in their minds and conditioned while they ponder on it and released when they forget it for some other experience in the moment, has tremendous energy, as energy follows thought. The entire embodiment of all these thought forms is the Spirit aspect of mass mind, called by the Egyptians, the "KA". It causes the pyramid to have polarity, positive or negative, depending on its position

in relationship to the earth's magnetism. If the point or apex is pointed toward the sky and the base at the ground, the pyramid is said to be at a positive potential and its effect on matter are to balance its vibration, pH or electricity. This is because its energies create a balanced wake and the energies within objects affected – grapefruit juice, people or plants – go to equal potential. This allows the second aspect of Pyramid energy to direct vitality globules to people and plants, creating the negative-ion effect, and thusly accelerate physical growth in plants and spiritual-physical growth in people. A still simpler explanation is to imagine a river with strong currents such that when you throw a stick into the river, it is swept along in the direction of the current. A Pyramid is a current of life force and the object affected is swept into a greater life current, sometimes called Christ Consciousness.

At this point, let me clarify and point out two basic Divine Laws of Nature.

The first is called the Pyramid Principle. It is the principle whereby all matter can be changed into flesh by energy crystallization into amino acids and proteins utilizing the carbon atom (pyramid) as the key building block. Remember, oxygen, hydrogen and nitrogen are gases, and we are talking about solids (form).

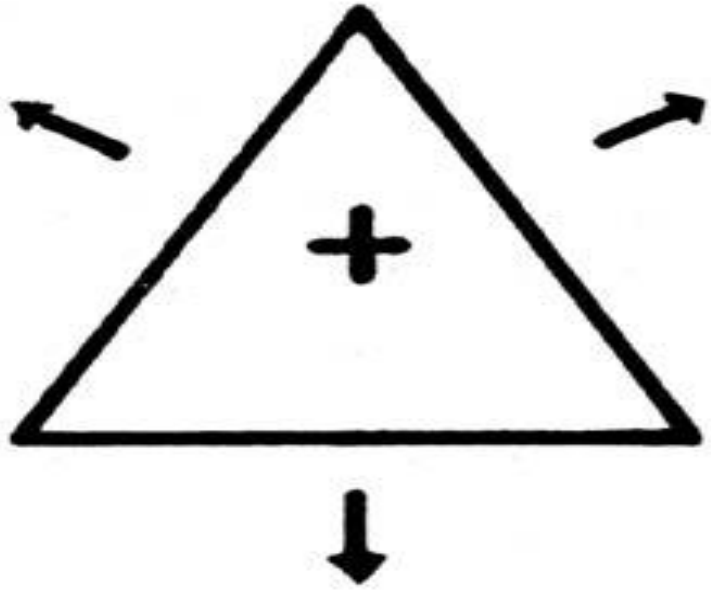
The second Divine Principle (order based on mind going back to spirit) is called the Christ Principle. It is the principle whereby flesh, conditioned by action, through time and experience, becomes spirit. Thus, when matter became flesh and flesh became man, man through Christ became God-man. Meditate on these two principles and separate them carefully. Great revelation will come to those who do. Do not make the mistake of seeing Christ as an external principle. The Pyramid is that. See the Christ Principle as an internal principle.

Now that we have these two principles in mind, let us turn a Pyramid upside down. When the base is pointed toward the sky, the energy at the apex is of negative polarity. This creates a wake in the direction of spirit or transcending action. If we were muscle-testing with a Pyramid on the head, in the positive position, a person would have more man strength, and if they were connected to an electromyograph (EMG), their electricity would be higher than normal and their vitality would be at peak. But if we removed the Pyramid and held it over the head upside down or in the negative position, the person may often test physically

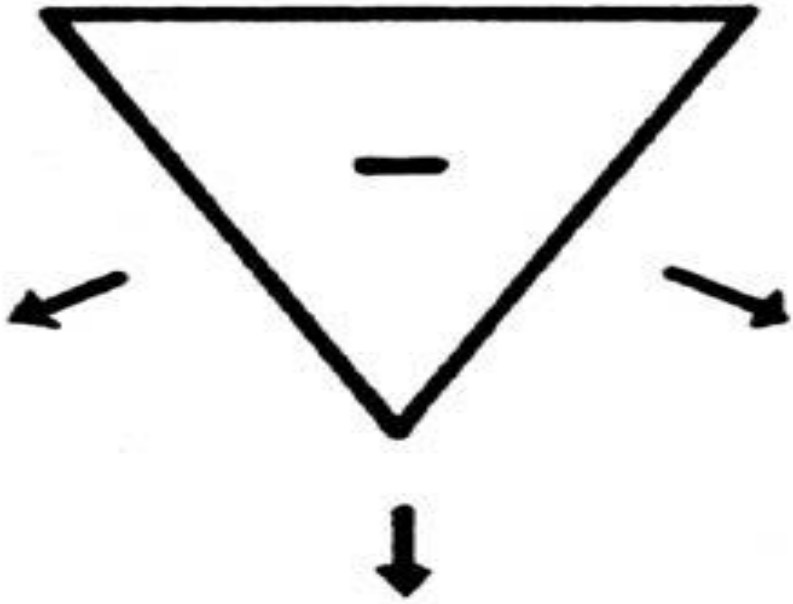
weaker than normal. At first guess someone might say it was robbing or tapping your strength in the negative position, but this is not true. What is happening is that it is shifting consciousness to a higher mode of vibration, or producing the beginning of an out-of-body experience. The Tibetans called this direction of consciousness, Venusian consciousness. It is the opposite polarity of Christ consciousness, the feminine aspect of the universe symbolized by the Goddess, Aphrodite.

Out-of-body experiences are not recommended, but at night during sleep, it is a natural phenomenon. Conscious mind moves out of the physical and into the dream (Astral body). By using the negative aspect of Pyramid Energy correctly, I developed a unit of inverted Pyramids in a vertical column called the Irradiator. It balances conscious mind in the Astral body during sleep (which is the proper time for astral experience) and the result is that most people are able to have immediate and total dream recall. Let us look at Pyramid Energy symbolically for a moment.

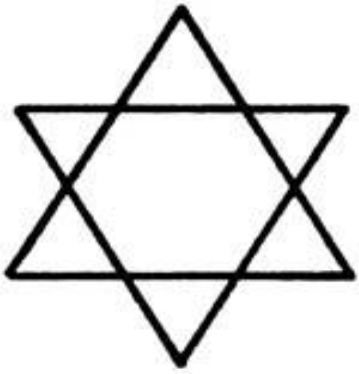
Figure VIII-16



In the positive (male) position it balances. Energy moves toward physical plane. Physical Growth.



In the negative position it attracts balanced mind back in the direction of Spirit Ascention towards the father or higher levels of consciousness.



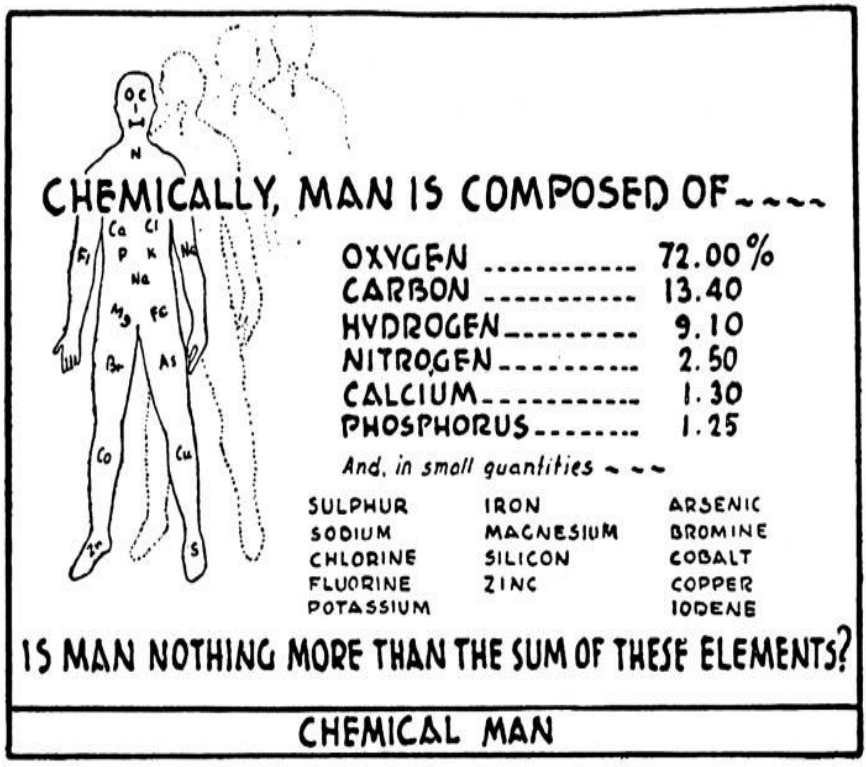
If you overlay the positive on top of the negative, you create a flux and flow in both directions which is exactly what manifestation and life are about. The Jewish religion takes this into account and releases the secret of the star of David. I was well aware of this fact when I designed the Star Orb, a physical mathematically and geometrically correct grid of alternating positive and negative Pyramid Energies.

CHAPTER IX – BODIES OF MAN OR MAN OF BODIES?

The idea that man may possess more than one – and, in reality, many – bodies may seem at first strange or unbelievable. In today's material world with its strongly influential mental atmosphere, the existence of these bodies is fast surfacing to those who throw down the bonds of the limitations of the five senses and seriously examine the why of our body functions. Thus a nebulous dreamworld idea becomes an intense reality, as we feel the repercussion of the spiritual values when we understand that energy follows thought. Even as man realizes the existence of his bodies, they are still insufficient for his needs, for as we know well, the gnat advances of the modern world have been brought about because he has made a host of supplementary devices which have extended the usefulness of his hands, increased the fleetness of his feet and enabled his eyes to see into space and to peer into the smaller things far beyond the limits of his normal vision. He cannot change the workings of his physical frame, but he can use the inventiveness of his mind to extend his powers and break down many of the limits that Nature has placed upon him. From a few simple, yet highly significant, facts we can draw deductions which will be of great assistance in this study.

First: what is man's body? From the point of view of the chemist, it is an aggregation of chemicals which are combined together in a certain highly specialized manner. It has been taken in the laboratory and analyzed. Taken apart and reduced to its primary fragments, it is found to consist of some twenty different elements, principally oxygen. This is followed by carbon, hydrogen, nitrogen, calcium and phosphorus in the proportions given. In very small quantities sulphur, sodium, chlorine, fluorine, potassium, iron, magnesium, silicon, zinc, arsenic, bromine, cobalt, copper and iodine, are also found (Figure IX-1).

Figure IX-1



This same list has been expressed in a slightly different manner – less scientific perhaps, and yet essentially true:

Sugar enough to sweeten a hundred cups of coffee.

Lime enough to whitewash a small hen house.

Iron enough for a one-inch nail.

Magnesium enough for half a dozen flash pictures.

Potassium enough to explode a toy cannon.

Sulphur enough to rid a dog of fleas.

Phosphorus enough to make twenty boxes of matches.

Fat enough to make a dozen bars of soap.

Copper enough to match a well-worn copper cent.

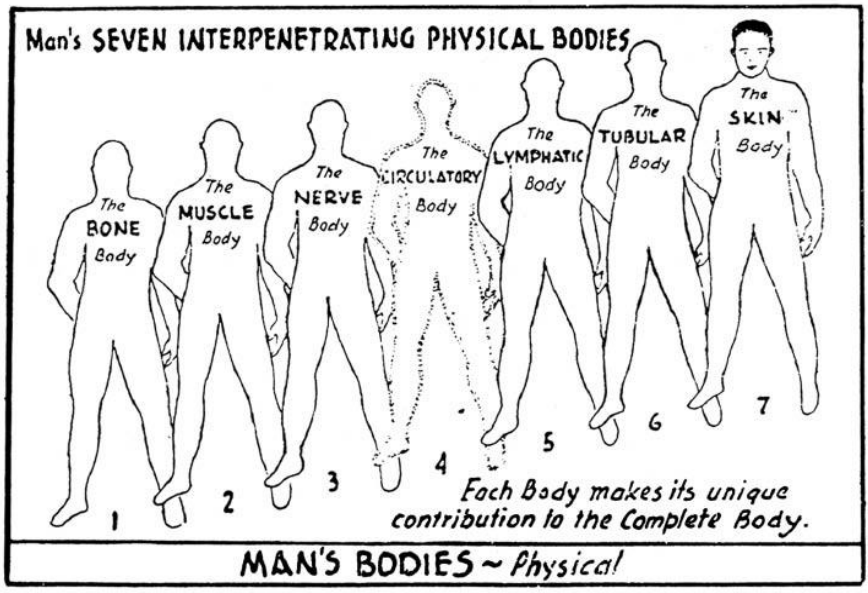
Water enough for junior's bath.

Commercially, the whole collection would be valued at about one dollar! Suppose we take these chemicals and mix them together, trying a thousand different ways, should we find ideas growing out of them? We should not. Fashion them into the form of a man; trunk, limbs, head. Do we find that it thinks and moves and aspires to greater things? We know it would not. But we can take glass and copper and iron and assemble them into the complex structure we call a television receiving set. Does it then talk and sing and act? It does not. But, properly constructed it will respond to invisible waves and will reproduce sound and action on the screen. In this same manner, much higher in the scale, God has assembled the human form, after millions of years of effort. It cannot give rise to the qualities of the subtler worlds, the material of which is specialized for the higher expressions of Life, but it can and does respond to the invisible Spiritual Man, and so shows forth his higher qualities and expressions in the Physical world. How can a group of chemical elements, which in themselves hide nothing more than energy, suddenly develop the power to think and love when they are assembled together, unless it be that, so assembled, they become a vehicle through which such higher aspects can find expression?

When from the chemist we turn to the anatomist and physiologist we find that they have an entrancing story to tell. Though many ponderous tomes have been produced on the subject of the human body, and our knowledge grows richer as each day passes, yet still there are unfathomed mysteries which have defied elucidation. But amid the mass of knowledge that has been gained regarding it, there is one outstanding fact the significance of which has not been generally appreciated, but which should be self-evident to all. It is that man's physical body is not one, but several bodies.

In Figure IX-2, this fact is shown symbolically. From a maze of many parts, at least seven distinct bodies are clearly seen to emerge. They are the Bone body (1), the Muscle body (2), the Nerve body (3), the Circulatory body (4), the 'Lymphatic body (5), the Tubular body (6), and the Skin body (7). Others might be shown by deeper study, but these are sufficient to show the principle involved, and to indicate clearly that the thing we call our physical body is actually a number of bodies, each one interpenetrating the others and making its own specific contribution to the welfare of the group.

Figure IX-2



Let us first examine the Bone body which is made up of 206 parts, an engineering marvel giving rigidity combined with the essential joints and connections to permit freedom of movement. The skeleton of no other creature has such long legs relative to the arm length, a foot with such a high arch or detailed and manipulative hands with opposing thumbs. Human infants are born with straight spines, but after learning to walk they acquire another unique skeletal characteristic – the swayback that is the price of upright stance.

Weight for weight, the bones are stronger than the finest steel. The skull provides a strong protecting box for the brain which it encloses. The spine consists of twenty-six vertebral segments, with shock-absorbing pads placed between them, and it contains the vital nerve channel which is called the spinal cord. The ingeniously designed structure of the ribs protects the heart, lungs and other organs within it with a strength that gives safety and yet permits the expansion and contraction of the lungs necessary for breathing. So strong is this body that each part could support many times the weight placed upon it. The shin bone, for example, can support a weight of 3,600 pounds, nearly thirty times the strength needed for a person of normal proportions. An athlete such as a pole vaulter may take as much as 20,000 pounds per square inch of

pressure when he lands from his vault, more than the skin pressure of a jet aircraft in full flight! The marrow within the bones manufactures no less than 180,000,000 red blood cells every minute, or 260,000,000,000 every day! While the surface of the bones appears to be smooth at first glance, yet it is pierced by many tiny holes, through which arteries, veins, lymphatics, and nerves penetrate to its soft interior. This, briefly, is the Bone body, which gives support to all the other bodies, for without it they would be limp and useless. And into it, let it be noted, parts of the other bodies penetrate. But, by itself, it is inert and useless.

We shall now glance at the next, the Muscle body (2), the main purpose of which is to give movement to the bones, but also to other parts of the corporate assembly. It is a dual body, for it has two major types of muscles — the voluntary and the involuntary. The first, as its designation would indicate, gives rise to movements which are under the direction of the mind; the other controls the internal commerce of the total body, such as the beating of the heart, the movements of the lungs, the propulsion of food substances through the avenues of digestion and a host of other duties.

There are over 600 odd different muscles in the body. The greatest combination of muscles is in the facial structure. There is a holy science of the facial muscles called Physiognomy. A tremendous work on Physiognomy was published by a medical doctor named Joseph Simms in 1889, and from these works, several diseases can be diagnosed and corrected in their infancy, especially spine-related diseases. Great artists are also attuned to Physiognomy.

THE PORTRAIT OF MOSES[28]

The whole world was shaken and enthralled by the miracle of the Exodus. The name of Moses was on everyone's lips. Tidings of the great miracle reached also the wise king of Arabistan. The king summoned to him his best painter and bade him go to Moses, to paint his portrait and bring it back to him. When the painter returned the king gathered together all his sages, wise in the science of physiognomics, and asked them to define, by the portrait, the character of Moses, his qualities, inclinations, habits and the source of his miraculous power.

"King," answered the sages, "this is the portrait of a man cruel, haughty, greedy of gain, possessed by desire for power and by all the vices which exist in the world."

These words roused the king's indignation.

"How can it be possible," he exclaimed, "that a man whose marvelous deeds ring through the whole world should be of such a kind?"

A dispute began between the painter and the sages. The painter affirmed that the portrait of Moses had been painted by him quite accurately, while the sages maintained that Moses' character had been unerringly determined by them according to the portrait.

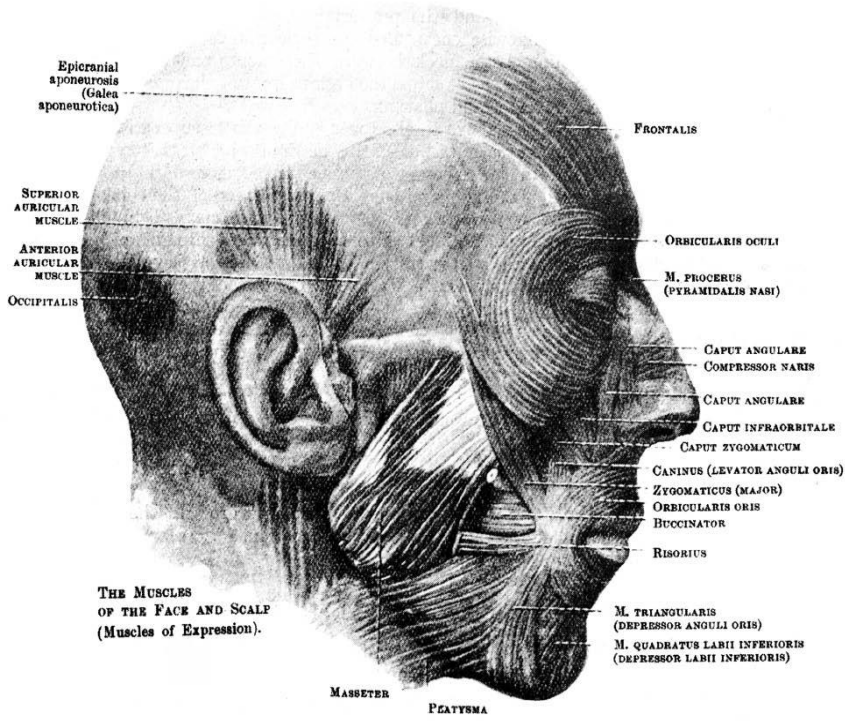
The wise king of Arabistan decided to verify which of the disputing parties was right, and he himself set off for the camp of Israel.

At first glance the king became convinced that the face of Moses had been faultlessly portrayed by the painter. On entering the tent of the man of God he knelt down, bowed to the ground and told Moses of the dispute between the artist and the sages.

"At first, until I saw thy face," said the king, "I thought it must be that the artist had painted thy image badly, for my sages are men very much experienced in the science of physiognomy. Now I am convinced that they are quite worthless men and that their wisdom is vain and worthless."

"No," answered Moses, "it is not so; both the painter and the physiognomists are men highly skilled, and both parties are right. Be it known to thee that all the vices of which the sages spoke have indeed been assigned to me by nature and perhaps to an even higher degree than was found by them from my portrait. But I struggled with my vices by long and intense efforts of the will and gradually overcame and suppressed them in myself until all opposed to them became my second nature.29 And in this lies my greatest pride."

Figure IX-3



The Muscles of the Face and Scalp (Muscles of Expression).

The muscles that make motion possible work in pairs. One muscle pulls forward flexors, and one muscle pulls the joint back again extensors. Now let us assume that these two bodies, the bones and the muscles are placed together, every joint is made secure and every muscle is anchored in its appropriate place. We have now the mechanism for movement, but no movement takes place. We need telephone wires to dispatch the controlling messages to every point of the body from head to foot.

We now come to consider the Nerve body (3) and again we find a twin system; in fact there are several minor divisions also. The two major nerve systems are the Central (or Cerebro-Spinal) and the Sympathetic, the former controlling the conscious functions and the latter the sub-conscious or bodily activities. Perhaps of all bodies this is the most important, if indeed one can be singled out for that designation. It is essentially the specialized vehicle of consciousness. Through it all sense impressions are received. We might feel awed if we were to inspect the hundreds of wires that enter a large telephone exchange and are sorted out and lead to an orderly arrangement of sensitive instruments. But the

telephone system within our own body is almost infinitely more complex than the largest telephone exchange ever built. There are as many as 20,000 transistors in a modern computer or electronic "brain". In the human brain there are more than 12,000,000,000 nerve cells. The total length of nerves in the body would stretch for thousands of miles.

Let us join all these together, link them with the proper areas of action, ready to carry the messages with lightning speed to every corner of the bodies. But while we now have all the mechanism for action and the wires to carry the messages, no action takes place. Neither would there be any action in a telephone exchange until the electric current was flowing over the wires. Our man is still far from complete. Bones, muscles, nerves; but we must find the power to flood the nerves before messages can be dispatched. Before doing this, however, we should consider the fact that these bodies must at all times be carefully and effectively maintained.

Therefore we will now learn something about the Circulatory body (4), which carries the blood stream throughout the entire physical body, taking food to the cells and carrying waste matter away. It consists of the arteries which carry fresh blood from the heart, and the veins which carry the impurities back into the lungs. Between these two, linking them together, are the capillaries, little tubes so astonishingly tiny that the greater part of them is not visible to the naked eye. It is said that the entire length of the whole circulatory system is not less than 60,000 miles, which is about two and a half times around the world! This system must take care of the needs of billions of cells, providing each one with its exact requirements. The central pumping station — the heart— pumps a total of 4,000 gallons of blood around the body every day. And in a normal life span it will beat two and a half thousand million times without stopping until the final beat marks the end of its activities.

But a point of outstanding interest is mentioned by Dr. E.H. Pratt, in his book, The Composite Man. He draws attention to the fact that if the circulatory system could be isolated from the rest of the composite man, since part of it would be visible and part would become gradually finer until it disappeared into the invisible, the body would have the appearance of being surrounded by a halo! Because of the electromagnetic characteristics of hemoglobin, one of the main ingredients of blood, when subjected to high-voltage electricity, we can take accurate photographs of that halo and analyze the interaction of

spirit and matter as they interpenetrate the seven gross and seven subtle bodies. This is a new science and will be expounded on in later chapters.

Another body, not so well known, but of equal importance to the others, is the Lymphatic body (5). It is closely associated with the Circulatory body, its larger members following the course of the arteries and veins, and the smaller ones, the capillaries. Like the Circulatory body, it penetrates every portion of the collection of material shapes; however, unlike it, this body carries lymph. It might be called the "drainage system" of the body. It collects lymph, which has exuded from the capillaries in all parts of the body into the tissues, providing a cleansing action and carrying it back again into the venous blood stream near to the heart or alimentary canal.

Diets of excessive protein cause blockage of the Lymphatic system, and this blockage, being trapped toxins, can lead to rapid degeneration. Foot massage therapy can be very beneficial, as well as other massage therapies, in releasing stored toxins in the Lymphatic system. Dr. Samuel West, N.D., located in Mesa, Arizona, is pioneering the science of the Lymphatic system.

The next body is called, for convenience, the Tubular body (6), for it consists of the long tube that starts from the mouth, continues along to the stomach and then through the small and the large intestines. Also the breath tube should be included: the larynx, trachea and bronchial tree. While these tubes are not as extensive as the other bodies, their ramifications and effects are felt everywhere. In the first-mentioned, food is absorbed and prepared for assimilation and in the second, of course, is the ever-active breathing device which oxygenates the blood and expels waste matter into the air. This will be elaborated upon during the conclusion of this book.

The last of the physical bodies is also the largest organ in the body, the Skin body (7), for we are now ready to enclose the collection in the one which will unite them and trace the outer limits of the group. Needless to say, this body is highly necessary in order to protect the others from invasion by foreign substances and also from interference with their many and varied functions. It keeps the moisture within the total body from excessive evaporation and assists in regulating its temperature. It well illustrates the instability of the physical body, for though it has many layers, they are constantly being renewed and the old material is being

pushed upward to the outer layers, where it appears as a microscopic scale which is dissipated into space. It is estimated that the whole of the Skin body with all its layers is entirely renewed every two years. The skin also stops large amounts of hazardous radiation from reaching delicate inner parts of the body. Scripture relates skin thus: "Unto Adam and his wife did the Lord God make coats of skin and clothed them." (Genesis 3:2). Physiology declares that "There is a skin without and a skin within, a covering skin and a lining skin: but the skin within is the skin without doubled inward, and carried completely throughout."

The embryonic dense body cell consists of three layers: ectoderm (outside), mesoderm (middle) and entoderm (inside). Of these three primary cell substances the entire physical body is composed.

The outer skin layer, the ectoderm, is allied to the masculine or Father principle, and correlates with the work of the First Creative Day (Saturn Period). From the ectoderm is formed a highly differentiated epithelial tissue which composes the lining of all sense organs and all glands opening into the mouth and nasal passages.

The inner skin layer, the entoderm, is allied to the feminine or the Mother principle, and correlates to the Second Creative Day (Sun Period). It forms the lining of the alimentary canal from the back of the mouth to the end of the large intestine; also of the glands which open into this part of the tube.

The middle layer or mesoderm, made up of both the ectoderm and entoderm, is allied to the third or offspring principle. It correlates to the Third Creative Day (Moon Period) and the building of the connective body tissues.

The skin covers the external body and forms the lining for all internal cavities. Its renewal is effected by processes from within the body. The outer layer, the epidermis or cuticle, is thickest in the palms of the hands and the soles of the feet. Between the epidermis and the derma, or cutis vera (true skin), the inner layer, are little papillae containing nerves and blood vessels. The epidermis has three parts: the outer, the soft, moist middle cells, and the inner cells which contain the skin pigmentation.

The derma is thicker and tougher than the epidermis. It is semitransparent. The derma varies in thickness from one-fiftieth to about one-sixtieth of an inch, being thickest in the small of the back. It

contains the sweat and oil glands, fat cells, nerves and absorbent vessels and blood vessels. Sweat glands are most numerous in forehead, palms of hands, and soles of the feet. They number some 2,500,000. United in length they would stretch out about 2.5 miles.

The elementary sensations of the skin are touch, warmth, cold, and pain. The sense of touch is most delicate at the tips of the fingers and tip of the tongue, and least sensitive at thighs and buttocks.

Maintaining proper temperature rests with sweat glands of the skin and its blood vessels. The feeling of hot or cold is not due to a drop in temperature of the body, but to the tiny organs in the skin that feel hot and cold. Whenever there is less warm blood in them they send a "cold" report to the brain. This report is skin temperature only. The brain receives few other temperature reports, except from the lining of the mouth and digestive tract (skin also). When the body is making too little heat, the blood vessels in the skin contract until their tubes are very small and let only a little blood through the skin. This checks the heat outlet and keeps it within the body.

Dr. Rudolf Steiner, Rosicrucian Initiate, writes: "The soul of the light is stopped by the human skin." And already there is some evidence to show why and how the skin is sensitive to light. The skin is evolving an optic nerve. The following quotation is from Eyeless Sight by Jules Romains: "There is a rapid skin evolution. A new group of microscopic organs are developing in the epidermis, called ocelli. Each ocellus is constituted of (I) a nerve ending; (2) a coarse oval cell of granular protoplasm clearer than the protoplasm of the neighboring cells and equipped with a voluminous nucleus of remarkable refractive powers, and is called the sensory cell; (3) a nerve fiber linking it with the system of ocelli, termed the optic body. When the luminous rays have crossed the upper layers of the epidermis, whose transparency is sufficient for this, they undergo three successive refractions and form on the ocellary retina a more or less crude image."

Consequent upon this discovery, Dr. Douglas Baker in Esoteric Anatomy relates how he taught blind people to see through the skin, which is more sensitive over some areas of the body than others due to the larger number of ocelli in such areas. The forehead, the chest, and the palms of the hands are among the sensitive areas enumerated. Dr. Romains offers evidence to show that the ocelli are true embryonic eyes,

already sufficiently well-organized to serve as organs of vision if properly educated. Here again we have a hint of what the future holds in store for the body of the human race.

Now we have bones and muscles and nerves. We have the arteries and veins, the lymphatics and the organs of digestion and respiration and the skin is enclosing them all. Apparently, we have a complete man. But the apparent is not true. We have the appearance of a man; that is all. For this thing is inert, it is helpless, it is dead! All we have is a collection of chemical elements assembled in a certain highly ingenious manner. But it has no power of animation. It cannot feel or think. It has no vitality, no intelligence, much less any of the really beautiful spiritual qualities which often are found in the human race. Though the brain is there, it cannot think. Though the muscles are there, they cannot move. Though the nervous system is there, not a single message is passing over its wires. Though the heart is there, it does not beat. Though there are lips and tongue, they do not speak. Is it not clear that this is a body, it is not a man? It is a machine but the operator is missing.

Science tries to endow physical matter with super-physical qualities and powers. Yet there is the physical matter, every atom of it. Chemically it is complete. But all the higher attributes are missing. How can those higher things be contained within the physical substance? Such a materialistic outlook as this leads to problems which defy solution. Theosophy tells of the super-physical orders of matter, specialized for just those forces, and gives a logical, understandable answer that breaks through the impasse that science has reached.

There must be more than the purely physical. There is more. Science as yet has not penetrated far enough into the invisible, so we turn to Theosophy to learn of the subtler bodies that man possesses, which function in co-operation with the Physical body. We have seen that man has several bodies of physical matter. Each makes its own specific contribution to the family of bodies. We have also seen that they interpenetrate each other. They are not separate, as shown in Figure IX-2, as we well know: that is merely symbolical and expresses an idea. We have also seen that there are parts of the Physical body that are visible and parts that are invisible, except that the invisible parts may be rendered visible by an extension of man's powers of physical eyesight, which in this case is accomplished by the use of a microscope. All these things apply, also, to the subtler bodies which we shall now go on to

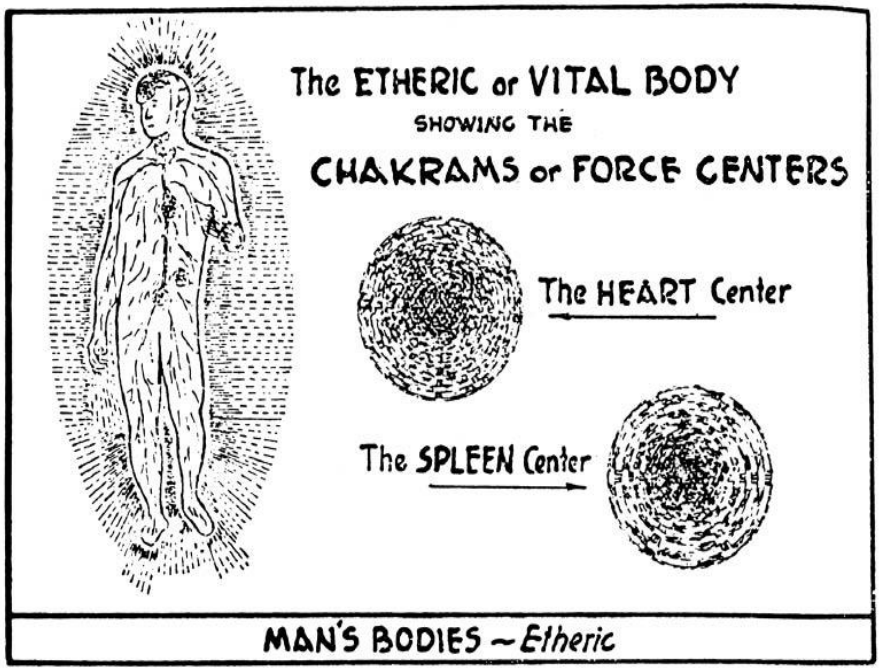
consider. For convenience it will be necessary to show them separately; but they all interpenetrate. Each one has its own specific contribution to make to the family of bodies. At least one of them has been observed by purely scientific methods, and experimental evidence of others is available. Except for the next one we shall study, they are all invisible to normal eyesight. And, as it was seen that the Circulatory body, if separated from the others, would appear to be surrounded by a halo, so we find the subtler bodies showing around the exterior of their denser companion in just the same manner. As the unseen parts of the physical body may be seen by using a microscope to extend physical vision, so the unseen superphysical bodies can and have been seen by those who, in the course of hastened evolutionary processes, have developed extended sense organs which penetrate the super-physical worlds.

These facts regarding our super-physical bodies are logical extensions of those which apply to the Physical body. This does not mean that they rest only upon logical deductions: for they are known by many to be true. But truth can always be tested by reason and we can take and test them in that way.

The next body we shall consider is the Etheric or Vital body. It interpenetrates the family of physical shapes and extends as an aura for some distance beyond its periphery (Figure IX-4). An inner aura terminates an inch or so around the physical vehicle, varying a little in different parts. This body is the power supply of the system. It absorbs energy from the sun and spreads it over the nerves. It provides forces and energies related to electricity, which flow through the nervous system and contribute to the overall vitality of the body, including the nervous system itself. The chemical metabolism of the body provides primarily maintenance of tissue, heat and muscle contraction. That total response and vitality which distinguishes the animal from the vegetable requires something more, which is provided by the etheric body. It may be linked to the chemical processes through the generation and movement of electricity in tissues and nerves. Our main supply of vitality comes from the Sun and is absorbed into the Etheric body through a specialized etheric organ within it. In his book, Man, Visible and Invisible, Mr. C. W. Leadbeater describes the appearance of this body. Vitality or prana is taken into it and, after it has completed its vitalizing activities, it is projected outward in straight lines from the pores of the skin. Mr. Leadbeater describes it as "bluish-white" and as "having the

appearance of being striated". This phrase is interesting in view of the fact that, about ten years later, Dr. Walter B. Kilner, of St. Mary's Hospital, London, published a book entitled The Human Aura in which he described observations he had made of the aura — obviously the Etheric body — for diagnostic purposes. Ability to see this body was induced by the use of slides made from dicyanin dyes in a solution of alcohol. Such a result is possible because, it will be realized, etheric substances are still of the physical world and, therefore, amenable to physical laws. In his book, it is interesting to note, Dr. Kilner refers to what he calls the "Inner Aura" (Mr. Leadbeater calls it the "Health aura") and says that it is "striated".

Figure IX-4



Within the Etheric body itself, there are several force centers or etheric organs known as Chakrams. The existence of these chakrams has been known for centuries and they are described in many occult books throughout the east, particularly in Hindu sacred writings. Six of them are indicated in Figure IX-4. They arise in the etheric portion of nerve centers within the spine but terminate in circular depressions, somewhat like the flower of the convolvulus or morning-glory vine. Each one is a

center of intense activity. Two of them deal particularly with the Physical body. The others are primarily links with the subtler bodies, bringing their forces to manifest in the dense material, as we shall shortly see. One center, not indicated, is at the back of the body over the extreme lower end of the spine. It is specialized to absorb a force, known as "kundalini" that emanates from the Earth and gives life to the organs of the body. This force is at present just becoming known to modern science.

The second center, situated over the spleen, is specialized to receive vitality or prana from the sun. In this center prana is split up and distributed to various parts of the body, vitalizing the many nerve centers and causing a flow of ethers over the physical nerves. The other centers, as we shall see, are links by means of which forces from the subtler bodies are expressed through the Physical body.

The term "ether" we are using to describe this borderland of matter is just now becoming clearly defined by New Age Scientists. However, in the past occultists and clairvoyants have seen the etheric forces by means of their extended vision, and have described them in terms of their own coining. Scientists, on the other hand, have discovered the laws governing phenomena of certain lower ethers and many valuable inventions have resulted. So we know the ethers by their products. New Age science is destined to meet with traditional occult science in this area, with benefit to both.

Marconi, famed as the inventor of wireless, is usually regarded as the first to use the etheric forces in radio transmission, thus opening the door to that vast development of intercommunication that is so rapidly drawing all peoples of the world into a close-knit human fellowship. Those and similar developments in that subtle etheric realm are possible because of the interpenetration of the physical by the etheric. The latter is sometimes referred to as a network of forces.

Just as our planetary body is permeated by these invisible yet potent forces, so is the physical body of man. They constitute a field of force, an etheric double. And just as the Earth's etheric envelope is the means by which universal and solar life flow into our planet, so the etheric double interpenetrates man's physical body and is the channel for the inflow of vitality or life force from the surrounding network of global forces.

Life could not exist on Earth without this etheric envelope, since it is the medium for those forces in nature that animate forms. Occultists reverently refer to Universal Life as the Christ Consciousness or the Christ Life. Again, we speak of the "World of Life Spirit," meaning not only one of the planes of spirit-matter, but also an exalted state of consciousness in which only the One Universal Life is recognized. The Supreme Master of human evolution, Christ Jesus, is the world's outstanding example of what the attainment of this Universal Life Consciousness can mean.

By the Law of Reflection familiar to all esotericists, this high plane of Universal Life is the prototype of the etheric realm and its manifold phenomena. Things visible and tangible in the etheric realm are signs and tokens of great powers resident in the higher realm of Life Spirit or Christ Consciousness. This means that there is a very intimate connection between the Christ Life and the life forces which operate in the twilight realm of matter, into which material science is now groping its way.

Through mental, moral and physical discipline according to spiritual law, a new etheric sheath is actually formed within and from the refined essences of the etheric body. This second etheric structure is a prerequisite to all initiatory development. Hence, without the etheric body, progress through higher spiritual planes or states in Initiation would be an impossibility.

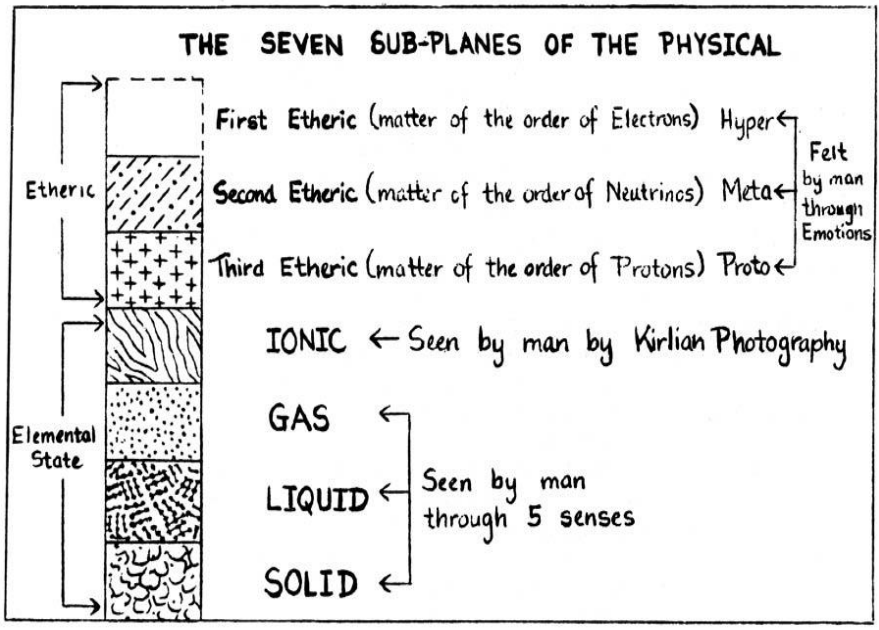
THE FOUR ETHERS

Occult science teaches that the ethers are capable of division into four states or properties of varying degrees of density, each having its own special function.

The densest of the four ethers is called the Chemical Ether because it is the field of activity for chemical forces which underlie the structure of our material universe, and in which is realized the alchemist's dream of transmuting one element into another. It is so nearly material that only a slight extension of sight is necessary to see it. Its basic color is dark blue and it is sometimes observed under the appearance of blue flames as when gas is turned very low; or it may have the appearance of thick mist or smoke. In this ether the New Age chemist will be able to study activities of chemical forces which he knows now largely through their

results and not by direct observation. In the human organism this ether seems to take the form of prisms through which the colorless solar energy radiates, assuming a rosy hue. These prismatic ether atoms seem to be embedded in the center of the physical body atoms.

Figure IX-5



The Chemical Ether is a twofold current possessing a positive and a negative pole or function. (All spirit or life is dual in manifestation, expressing itself as positive-negative or masculine-feminine.) The positive etheric current attracts and builds the physical atoms of the body; the negative current disintegrates and eliminates them. Thus, we may describe the Chemical Ether as a whirlpool of forces into which new molecules flow through the positive pole and out of which old molecules flow through the negative pole. These molecules have actually been recognized in some instances as pertaining to known substances. To the lay mind this process suggests that vital electricity converts the body into a kind of electromagnet for attracting or holding elements needed in body building and for rejecting or eliminating those not needed, the flow of the Life force corresponding to the turning off and on of a current.

The second ether known to occult science is called the Life Ether because it is concerned with the propagation of the species, whether plant, animal, or man. Physical science is eagerly anticipating the day when it can study these life forces at first hand; this it has not yet done, but the time is not far distant when anticipation will be actualized, as now intimated in the remarkable work done with carbon compounds and in new experiments in biological electricity. Yet instruments and inventions alone will not suffice. The scientists himself must become an instrument of investigation. This New Age development is not unknown to a few great modern scientists, some of whom are already partially clairvoyant without being aware of the fact.

The Life Ether is also positive and negative, and in it is to be found the secret of sex; hence, knowledge of this ether will give to biological science control of the sex of unborn infants, and even of adults. Sex hormones are crystallizations in this ether. Differentiation of the sexes as we know it today will seem very crude and primitive to future generations, in whom the ideal masculine and the ideal feminine will find adequate expression without the perversions and inequalities which burden the race today. The vital fluids (including blood) are generally crystallizations in the Life Ether. To the etheric vision, blood is seen to course through veins in the form of a gas, which reminds one of the legend that certain Spirits known to oriental mythology were said to have fire in their veins instead of blood. Ancient Greeks thought that the veins of their gods were filled with nectar instead of blood, a hint again of the miraculous powers stored in this Life Ether.

These two ethers, the Chemical and Life Ethers, surround and interpenetrate the physical form, constituting its matrix. The Chemical Ether reveals itself as a blue field, whilst the color radiation of the Life Ether is a rosy or orange hue, which varies somewhat according to species and status in evolution but is always present where life is to be found. In the plant kingdom it is a delicate pink-orange, the color of a certain lotus known in the Orient. In the human kingdom it is described as the color of new-blown peach blossoms, a deep pink with a suggestion of blue or violet overtones.

These are the ethers most commonly observed. A higher degree of spiritual perception is necessary for investigation of the two higher ethers known as Light and Reflecting Ethers.

Motion and color characterize the planetary Light Ether. It is an ether which sparkles and flashes with all the hues of the rainbow. It is sensitive to the presence of light, whether from the Sun or from artificial illuminants, under which it beats or pulsates with a wing-like motion while "seeds of light", many or few according to the intensity of the light, float about in it – probably the photons of physics.

Light Ether also has a connection with the blood in human beings, as its positive current infuses the blood with heat, and controls circulation as well. The negative current operates through the five senses, especially sight. Although the basic color of the Light Ether is said to be that beautiful golden effulgence ascribed to the Christ Ray, it actually displays all the colors of the spectrum. Because this ether is the avenue for Sensation (by vitalizing the nerves), its sensitization by spiritual thought makes it a channel for sensations which ordinarily do not register in the brain – i.e., the eye begins to see colors not usually visible, the ear to hear sounds not usually audible, etc. Even the sense of touch is stimulated so an individual can feel the etheric currents both in his own body and in the atmosphere. Biological electricity is an expression of the negative pole of Light Ether as biological heat is an expression of its positive pole.

Most attenuated and refined of all etheric substances is the fourth or Reflecting Ether. This substance is beautifully clear and luminous, and is truly a reflector of eternal Truth as transcribed upon the Scroll of the Ages. It, too, has its positive and negative aspects, but this ether is scarcely physical at all in any known sense of the word. It is the avenue through which thought makes its impress upon the human brain.

The masculine or positive aspect of the Reflecting Ether works through the brain and voluntary nervous system, promoting reason and creative activity; the negative or feminine aspect operates in and through the involuntary nervous system promoting intuition, feeling and memory. The positive pole of the Reflecting Ether is, therefore, the special channel of the Ego; the negative pole, that of the Race Spirit or collective "soul". The Ego is now gradually taking over the functions formerly governed by the Race Spirit, the "God of our Fathers". It is therefore invading the sympathetic system, awakening it to new life under control of individual will, and discovering many new and miraculous powers latent therein. The work of Initiation stimulates both aspects of this ether into new and higher activity. No ether is more important than this Reflecting Ether in the mysterious labor of Initiation.

The Reflecting Ether in its negative aspect is the subconscious mind of nature and of man. It is the blue-white crystal in which the seer reads certain records, but it is not the true Memory of Nature, which is found in a higher sphere.

Now that we have observed the four states of ether, remember that all of these are part of the Physical Plane as shown in the drawings. Remember that each ether exists inside of the other and at the fourth state or ionic state, their compound density is so great that gravity precipitates them and they become gases which are attracted not only to each other but also to the Earth. Once pressed inside an atmosphere, they become liquids and solids.

As our bodies and environments are thus fashioned, let us examine our bodies more closely. The study of the etheric body and its relationship to the physical realms presents a linking of space, time, motion, gravity and magnetism. Here is how gravity comes to our own being.

Gravity does not work at all like most people think, and it is not related to magnetism. Magnetism is a physical plane of energy; gravity is a universal fact existing on all planes simultaneously holding them together in perfect balance. An understanding of gravity is not necessary to overcome its effects.

Every atom in the body possesses consciousness. That consciousness receives its direction from the mind. The mind can think positive, and consciousness of the atoms spontaneously forms molecules which begin forming healthy cells. The conscious mind does not have to understand how this process occurs but only has to think positively about its occurrence.

The second thing necessary to know about gravity is the physical plane's rebounding action called karma, which either makes us lighter or heavier physically in relation to the earth's karma, which by simple definition is the old philosophy of an eye for an eye, give love and you shall receive love, serve others and you in turn shall be served.

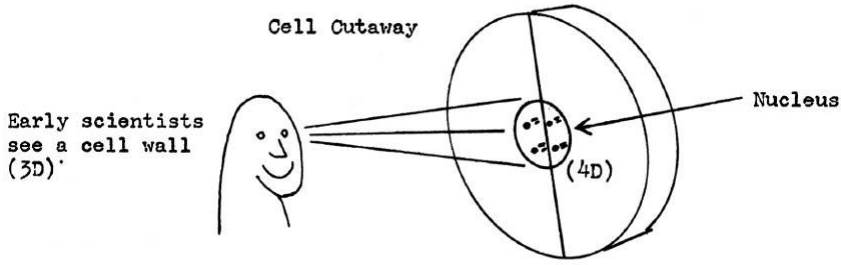
The third thing necessary to understand about gravity is the action of the will and its purpose for self achievement. Anyone who seeks to find the principle of antigravity will find it. Some strive for conscious development so that they may dominate and use others, while the

majority strive to release themselves from the limited bonds of earthly karma so that they may help others develop more efficiently.

Either motive can bring us to the state of levitation but the one who reaches it for selfish gains will be a slave to it while the one who accepts it as a step towards self-improvement will pass on to higher goals and accomplishments.

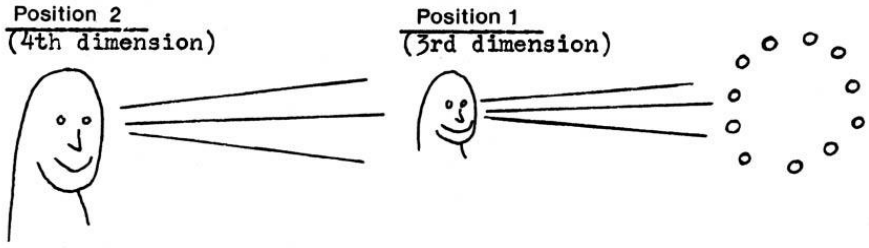
The pyramid works through the etheric double. Every cell in our bodies is permeated with small holes viewable at 250,000 times on an electron microscope. The energy or etheric current is still invisible like electricity through a wire. But you can see with the microscope the etheric passageway.

Figure IX-6



These are "holes" in the cell brain or nucleus where etheric energy passes, giving each cell an etheric brain to control physical growth. The sum total of all these cells forms an etheric brain or body.

Figure IX-7

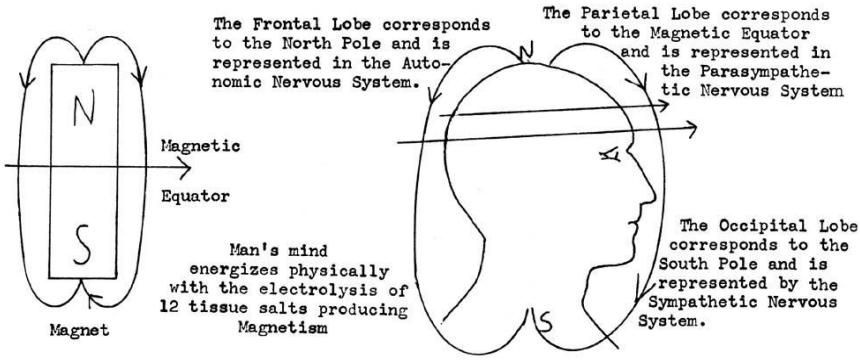


Notice in Position 1, modern man a few years ago. He had only a normal microscope (5,000 times) and could not see the brain of a cell. This left a vast area of consciousness unused because awareness could not focus

on anything but three-dimensional matter. But as we reached 250,000 times on an electron microscope, we saw holes which had to have a body of energy to form and reform 50,000 million times a second in the average person, and this would only mean a higher form of intelligence was a common part of every individual human being. Then, by placing yourself in Position 2 and viewing all the tunnels converging, you can perceive a higher body in the shape of a man in his finest detail of form. This body is called the etheric double and the pyramid works on this body and affects it, as sure as sunlight sustains life and man's physical body.

In pyramid energy, this is Level I or the path of the violet ray 7, ray of ceremonial order and magic, depending on who is the Relative Observer and what level he can perceive, view, cognize, then maintain or store. This ability to contain knowledge when exposed to it, and realize its existence long enough to recall it again and again for experience, is called memory. Memory is magnetic. Magnetism attracts unto itself its opposite pole, and if expressed as a full circle, half North Pole, half South Pole, the midway point or the equator is a neutral line of attraction or gravity. This fact in the human brain allows thought energy to travel along the magnetic equator formed in the etheric counterpart of its gray matter and thus gravity can be observed as a holding or unifying principle in the human mind as well as the universal mind. The individual "gravity" we all possess forms our ego, which grows with the passage of time.

Figure IX-8



The invisible part of the physical body is of great importance to us, for it is the vehicle through which flow the streams of vitality which keep the body alive, and without it as a bridge to convey undulations of

thought and feeling from the astral to the visible denser physical matter, the ego could make no use of the cells of his brain. It is clearly visible to the clairvoyant as a mass of faintly-luminous violet-grey mist, interpenetrating the denser part of the body, and extending very slightly beyond it.

The life of the physical body is one of perpetual change, and in order that it shall live it needs constantly to be supplied from three distinct sources. It must have food for its digestion, air for its breathing, and vitality in three forms for its absorption. This vitality is essentially a force, but when clothed with matter it appears as though it were a highly-refined chemical element. It exists upon all planes, but our business for the moment is to consider its manifestation in the physical world.

Although the etheric body penetrates every cell in our bodies, there are seven energy centers that direct all lower chemical metabolizing processes. These are called chakras.

THE CENTERS

The chakras or force-centers are points of connection at which energy flows from one vehicle or body of a man to another. Anyone who possess a slight degree of clairvoyance may easily see them in the etheric double, where they show themselves as saucer-like depressions or vortices in its surface. When quite undeveloped they appear as small circles about two inches in diameter, glowing dully in the ordinary man; but when awakened and vivified they are seen as blazing, coruscating whirlpools, much increased in size, and resembling miniature suns. We sometimes speak of them as roughly corresponding to certain physical organs; in reality they show themselves at the surface of the etheric double, which projects slightly beyond the outline of the dense body. If we imagine ourselves to be looking straight down into the bell of a flower of the convolvulus type, we shall get some idea of the general appearance of a chakra. The stalk of the flower in each springs from a point in the spine, so another view might show the spine as a central stem from which flowers shoot forth at intervals, showing the opening of their bells at the surface of the etheric body.

The seven centers with which we are at present concerned are indicated in the accompanying illustration (Figure IX-9). Figure IX-10 gives their English and Sanskrit names.

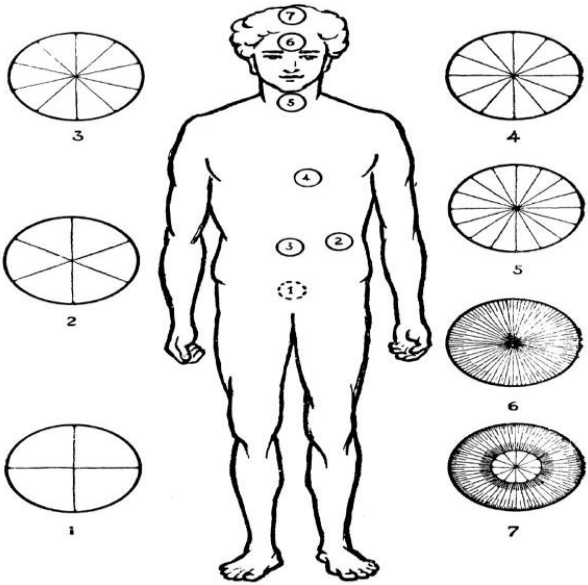
28 AGADA, legends parables and sayings from the Talmud and the midrashes, in four parts. Compiled from original sources by I.H. Ravnitsky and H.N. Bialik. Published by S.D. Saltsman, Berlin.

29 My emphasis to illustrate "cultivation of opposites." D.M.B.

Figure IX-9

This shows a man, with chakras all round him.

Figure IX-10



All these wheels are perpetually rotating, and into the hub or open mouth of each, a force from the higher world is always flowing – a manifestation of the life stream issuing from the Second Aspect of the Solar Logos – which we call the primary force. That force is sevenfold in its nature, and all its forms operate in each of these centers, although one of them in each case usually predominates over the others. Without this inrush of energy, the physical body could not exist. Therefore the centers are in operation in everyone, although

NO.	English Name	Sanskrit Name	Situation	NO. of Spokes or Perm.
1	Root or Basic Chakra	Mūlādhāra	At the base of the spine	4
2	Spleen or Splenic Chakra	*	Over the spleen	6
3	Navel or Umbilical Chakra	Manipūra	At the navel, over the solar plexus	10
4	Heart of Cardiac Chakra	Anāhata	Over the heart	12
5	Throat or Laryngeal Chakra	Vishuddha	At the front of the throat	16
6	Brow or Frontal Chakra	Ājnā	In the space between the eyebrows	96
7	Crown or Coronal Chakra	Sahasrāra	On the top of the head	960

in the undeveloped person they are usually in comparatively sluggish motion, just forming the necessary vortex for the force, and no more. In a more evolved man they may be glowing and pulsating with living light, so that an enormously greater amount of energy passes through them, with the result that there are additional faculties and possibilities open to the man.

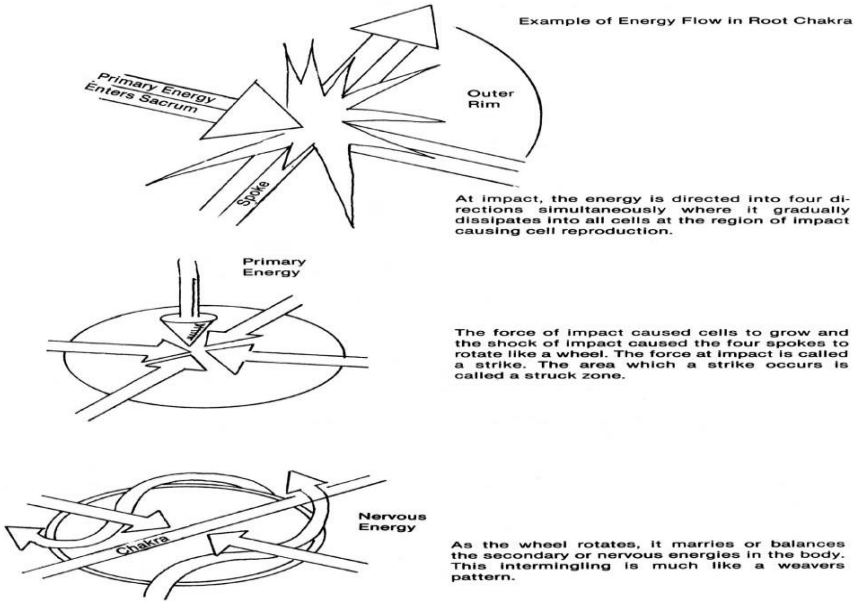
THE FORM OF THE VORTICES

This divine energy which pours into each center from without sets up at right angles to itself (that is to say, in the surface of the etheric double) secondary forces in undulatory circular motion, just as a bar-magnet thrust into an induction coil produces a current of electricity which flows round the coil at right angles to the axis or direction of the magnet. The primary force itself, having entered the vortex, radiates from it again at right angles, but in straight lines, as though the center of the vortex were the hub of a wheel, and the radiations of the primary force its spokes. By means of these spokes the force seems to bind the astral and etheric bodies together as though with grappling hooks. The number of these spokes differs in the different force-centers, and determines the number of waves or petals which each of them exhibits. Because of this, these centers have often been poetically described in Oriental books as resembling flowers.

Each of the secondary forces which sweep round the saucer-like depression has its own characteristic wavelength, just as has light of a certain color; but instead of moving in a straight line as light does, it moves along relatively large undulations of various sizes, each of which is some multiple of the smaller wave-lengths within it. The number of undulations is determined by the number of spokes in the wheel, and the secondary force weaves itself under and over the radiating currents of the primary force, just as basket-work might be woven round the spokes of a carriage-wheel. The wave-lengths are infinitesimal, and probably thousands of them are included within one of the undulations. As the forces rush round in the vortex, these oscillations of different sizes, crossing one another in this basket-work fashion, produce the flower-like form to which I have referred. It is, perhaps, still more like the appearance of certain saucers or shallow vases of wavy iridescent glass, such as are made in Venice. All of these undulations or petals have that shimmering pavonine effect, like mother-of-pearl, yet each of them has usually its own predominant color, as will be seen from our illustrations.

This nacreous silvery aspect is likened in Sanskrit works to the gleam of moonlight on water.

Figure IX-11



These chakras naturally divide into three groups, the lower, the middle and the higher; they might be called respectively the physiological, the personal and the spiritual.

The first and second chakras, having but few spokes or petals, are principally concerned with receiving into the body two forces which come into it at that physical level — one being the serpent-fire from the earth and the other the vitality from the sun. The centers (see Figure IX-10) of the middle group, numbered 3, 4, and 5, are engaged with the forces which reach man through his personality — through the lower astral in the case of center 3, the higher astral in center 4, and from the lower mind in center 5. All these centers seem to feed certain ganglia in the body. Centers 6 and 7 stand apart from the rest, being connected with the pituitary body and pineal gland respectively, and coming into action only when a certain amount of spiritual development has taken place.

In the following explanation and discussion, follow the author through a series of steps and see if you can construct a mental image using the basic steps outlined in this book. Images thus formed help to "feel" the invisible principles of nature.

Imagine as we continue onward that your relative point of view is outside yourself looking back and seeing a side or front view.

Every human on this planet is out of balance in one way or another. So as energy from a balanced universe such as ours strikes our bodies entering through our bodies at the chakra points shown in the following drawings (Figure IX-12 and Figure IX-13), at the exact moment it encounters our unbalanced bodies, it is put into a state of temporary shock.

Figure IX-12

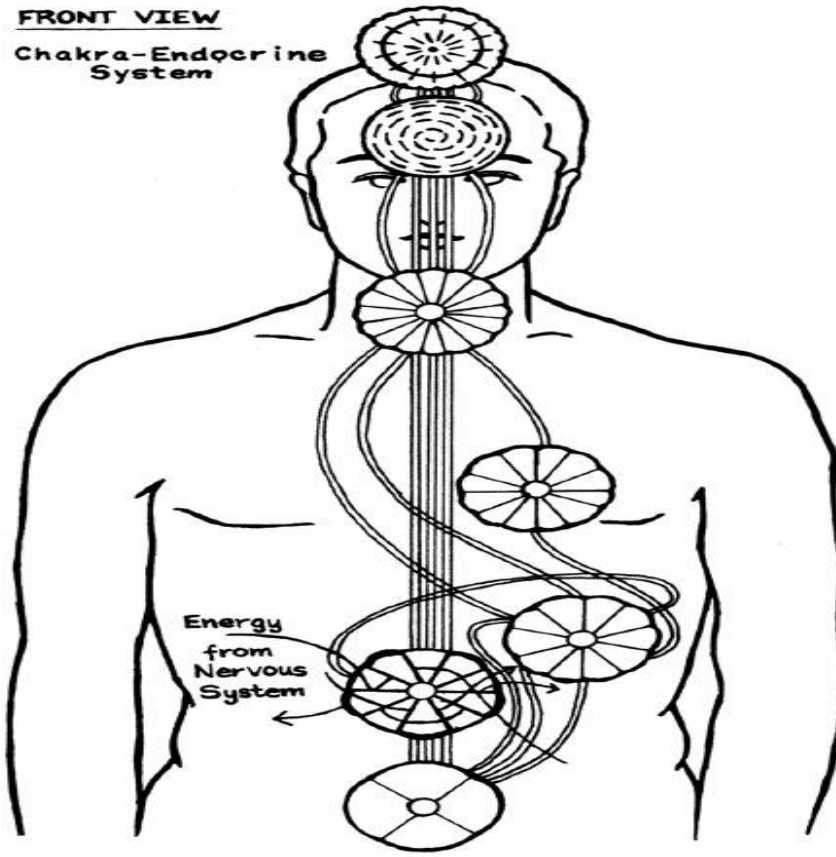
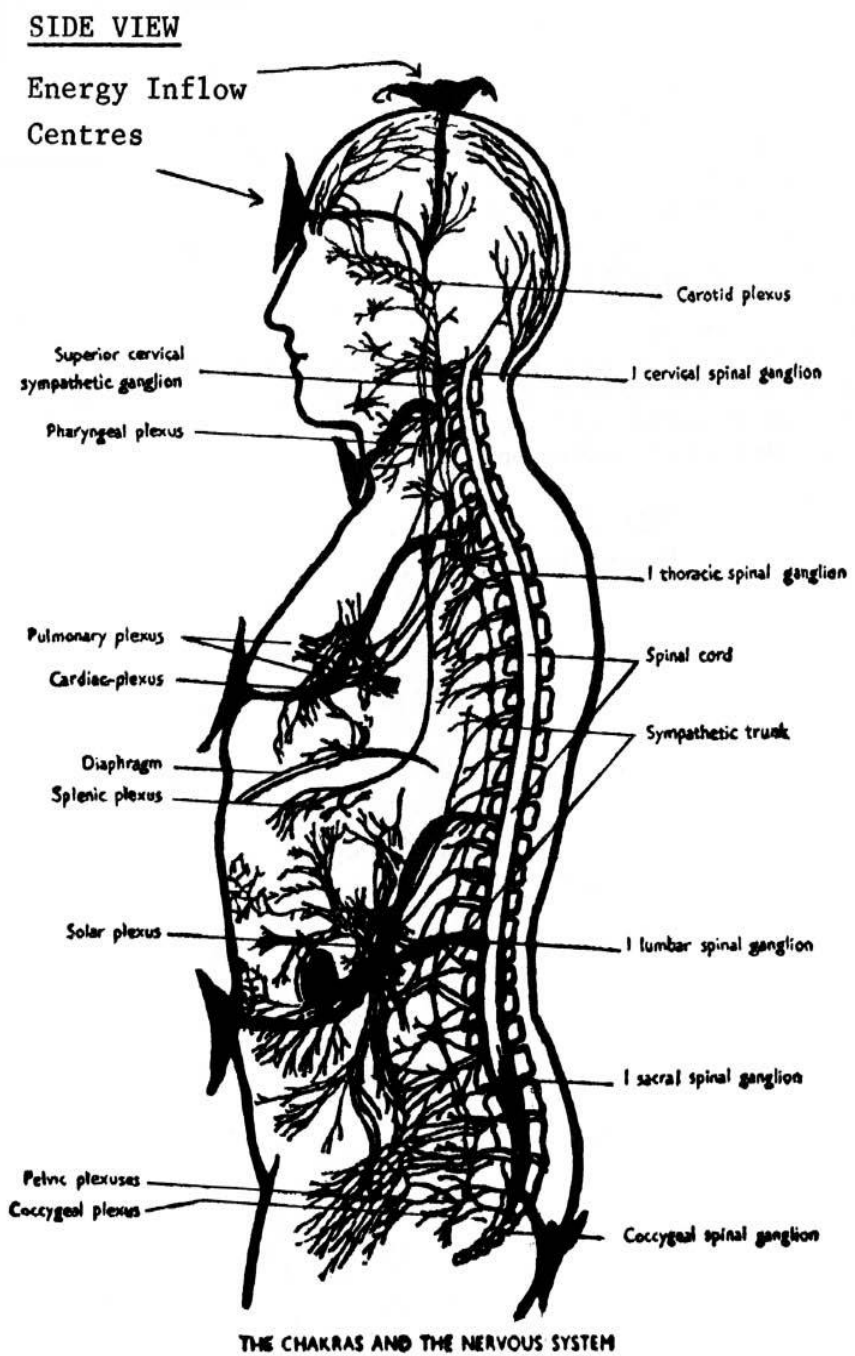
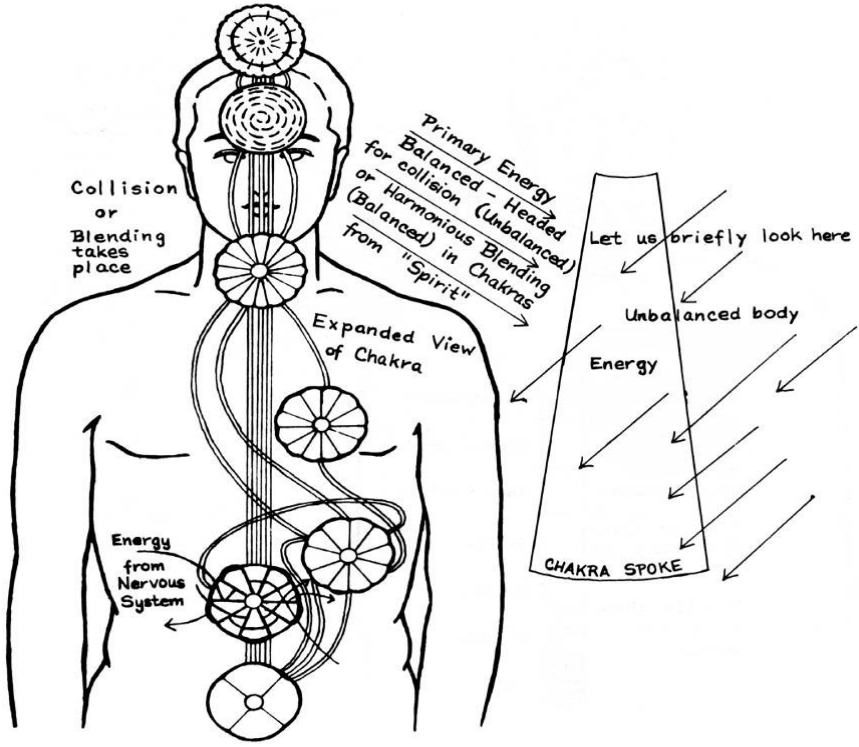


Figure IX-13



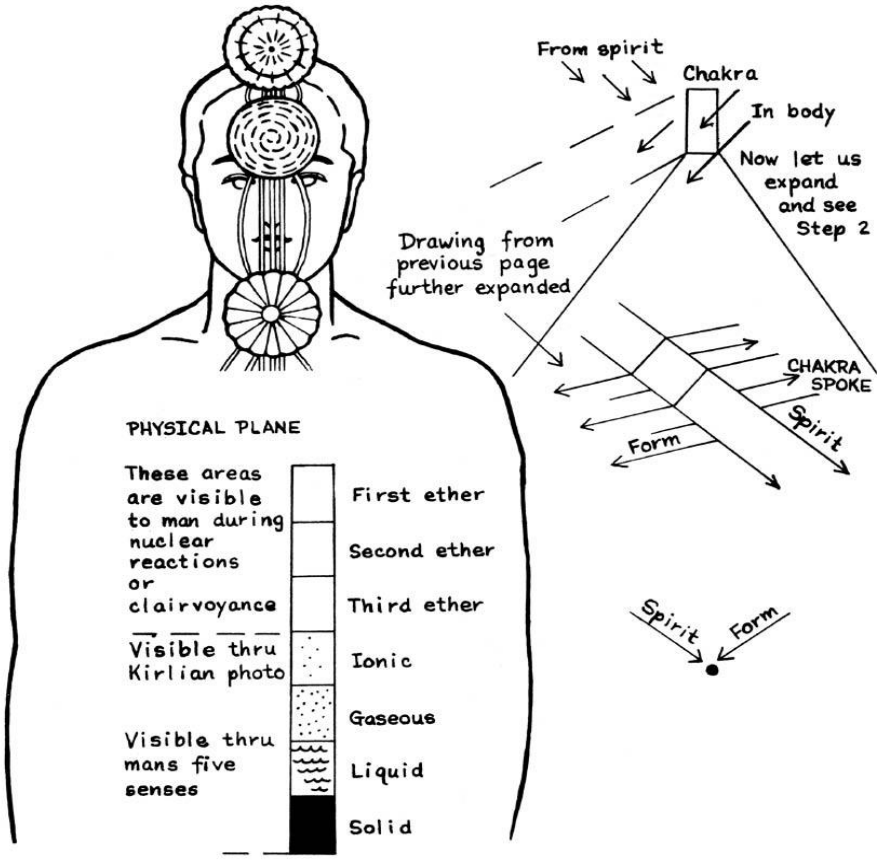
THE CHAKRAS AND THE NERVOUS SYSTEM

Figure IX-14



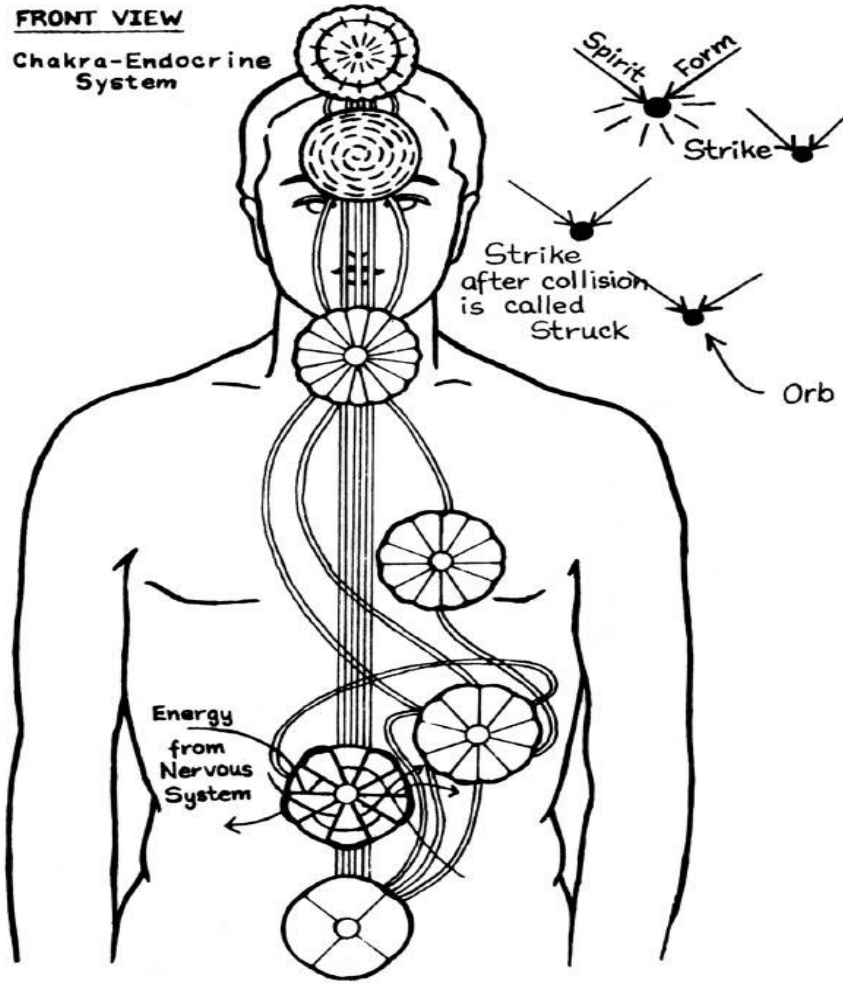
STEP 1. Primary energy from the upper realm discovered in previous chapters enters the body at the chakra point (strike zone) causing a shock (struck). This shock only lasts a split second but a lot happens; mainly, life is sustained in our bodies and gravity is created. Let us follow in sequence this shock.

Figure IX-15



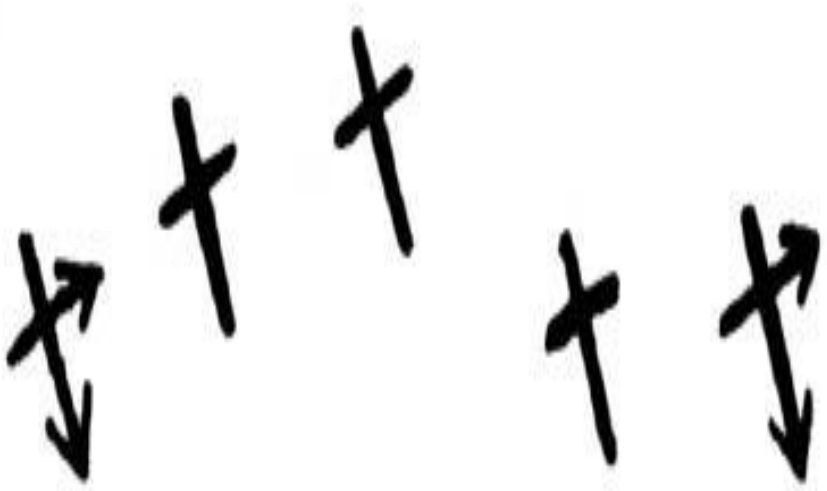
STEP 2. Some of the energy balances perfectly, sustaining life in the form, while some energy collides with the form. This energy is called strike-zone energy and causes fusion of the three etheric zones by which, during the reaction, the four levels of solids are created. Although all form is created this way, the spirit enters through the chakras first. It is the molding essence.

Figure IX-16



Energy constantly permeates all forms this way and forms patterns. If viewed at the various intersections, the strike itself is a fusion pattern and a network of strikes, and can be visualized macroscopically as a Pyradyne Orb or as a carbon molecule.

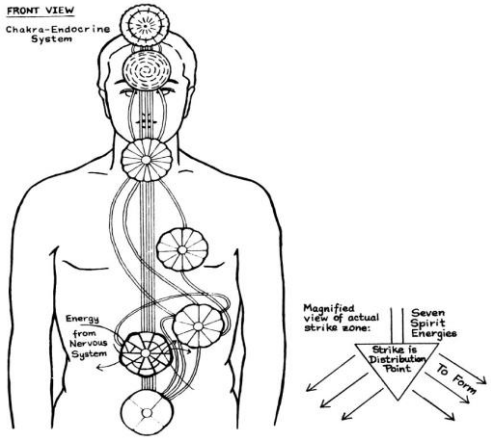
This strike pattern is an Orb. The individual collision is like a pyramid.



The angle at which collisions occur is always to the right so it is seen as a series of crosses.

The Orb is the framework of the strike and struck zones forming all form as we know it. It is also the shape of the physical and etheric body relationship. It is a crystal. A crystal, remember, is the perfect synthesis of spirit and matter in zero time.

Figure IX-17

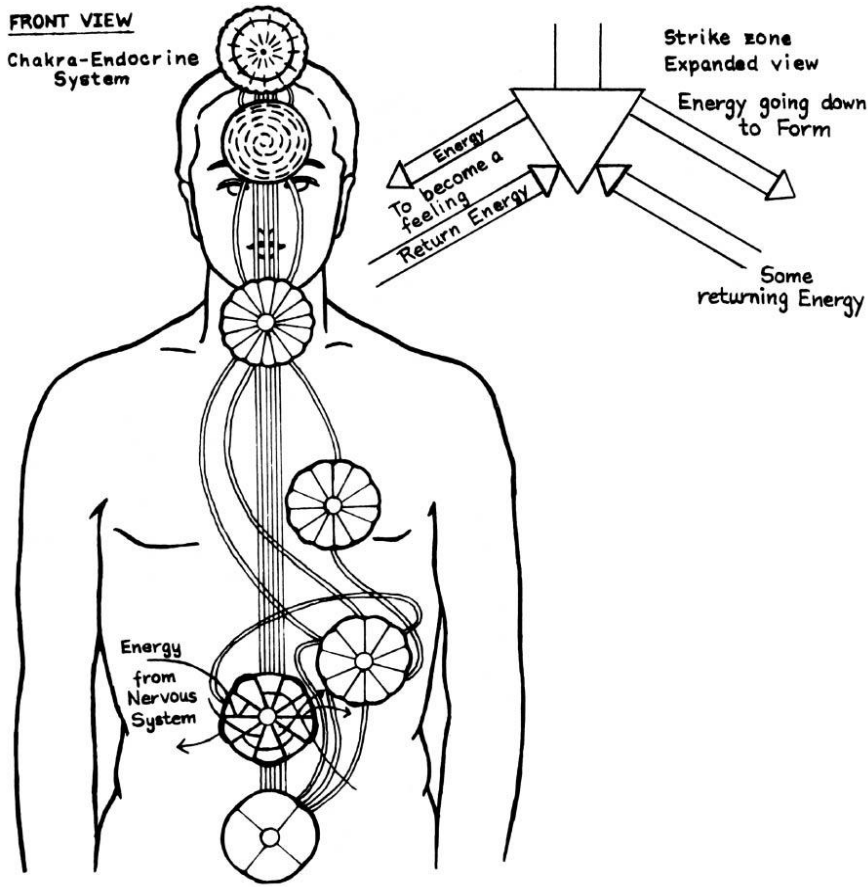


Now as spirit is trapped into form to animate it, it awakens a spontaneous desire to return to its source once it experiences the form re-feeling. If the form is clear and moving with the spirit it becomes lighter, if it is caught in the desire of the lower nature, energy will be trapped and form becomes heavier.*

*A total synthesis would be either pure light or pure matter.

This constant vacillation between the two natures constitutes gravity. Gravity is the interchange of energy from seven planes of consciousness. It is a mutual force causing a downward thrust of seven energies coming from an upward-inward direction (spirit).

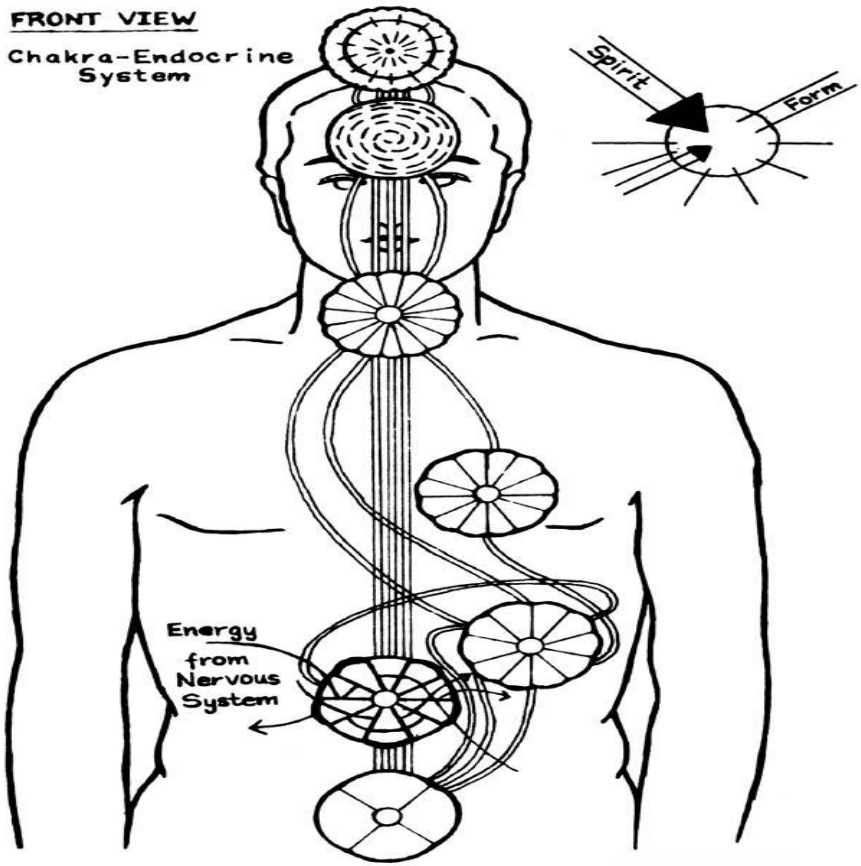
Figure IX-18



Also occurring in the struck zone is some energy that has worked off karma or spent itself. Remember, energy is not destroyed or created, only transmuted. This coming and going in the struck zones creates a rhythm that is known as time.

Time is the vibratory exchange rate of spirit and matter. Motion is the movement of divine will being split by desire. Gravity is the recombination of desire ascending to spirit after its expression through form. Anti-gravity, detachment or impartiality is created by mind when it is disciplined to be free of desire, thus free of the time zone on a particular plane of consciousness. However, all the time on all the planes is interpenetrable. Each of the seven planes has its own time zone. From our point of view, the higher the plane, the slower the time.

Figure IX-19



Spent energy from the physical returning to spirit is also called the "Christ Principle".

Struck zone interchange can be seen as fusion, or the return of the Kundalini as spirit releases itself into form, creating time, the law of

inertia, causes a downward flow and the effect is attraction of physical to physical (a sort of bonding action). In a highly developed individual the organized force is in balance and moves out of and away from the physical and creates the anti-gravity state of consciousness. Control of this energy comes from the mind via the upper mental plane when the lower mind stands aside and allows the higher mind to reach the astral and the physical bodies.

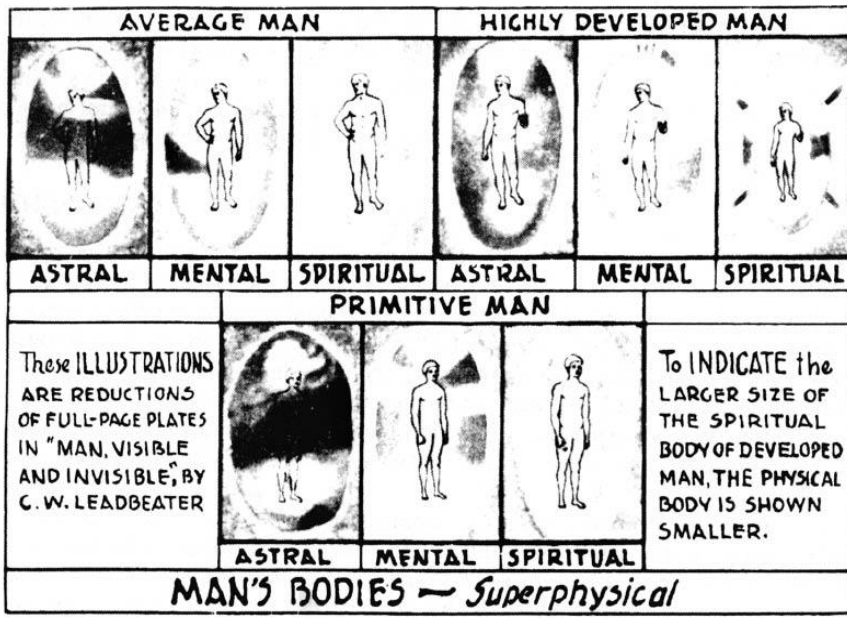
Anti-gravity consciousness is being reached by people through various yoga disciplines and a side effect of levitation is demonstrated. The yogis call this state of consciousness "siddhi". One area of public attention where this is happening is where people taking advanced courses in Transcendental Meditation (TM) are "hopping" and levitating during public demonstrations. The author uses his Systems III balancing antennas and levitates people in the audience. Levitation is not the goal of siddhi, only a side effect. Once a person reaches this consciousness, he sees a better goal and proceeds onward. Levitation itself serves no purpose other than giving the levitator a sign that siddhi has been reached.

So, here has been described the Vital or Etheric body. We shall place it over the others and the nerves will become "alive" and our bodily telephone system can be put into operation. We now have the physical mechanism for motion, with, in addition, the vitality to produce the motion. Messages can now be sent by the brain to all parts of the denser vehicle. Action can be ordered and the multitude of subconscious operations of the body can be set in action. But there is more to man than mere vitality. He is vastly greater than an automaton moving and acting without a glimmer of understanding about it all. Man can feel. He can think, hope, love and even turn his mind to contact the sacred realm of spiritual aspirations. Action is an end product of all these greater things. An automaton moves. But man moves with purpose, and that makes all the difference.

We must go further. We have the physical mechanism and the Vital body which gives life and animation. But it is a heartless, senseless thing that we have produced. It has organs of sense, but it cannot use them. It does not know the fragrance of flowers or the inspiration brought by the odor of pines. It has lips and tongue and vocal chords; but it cannot utter a word. Each of its eyes has half a million nerve fibers leading to the brain and several million rods and cones to receive light impressions from the

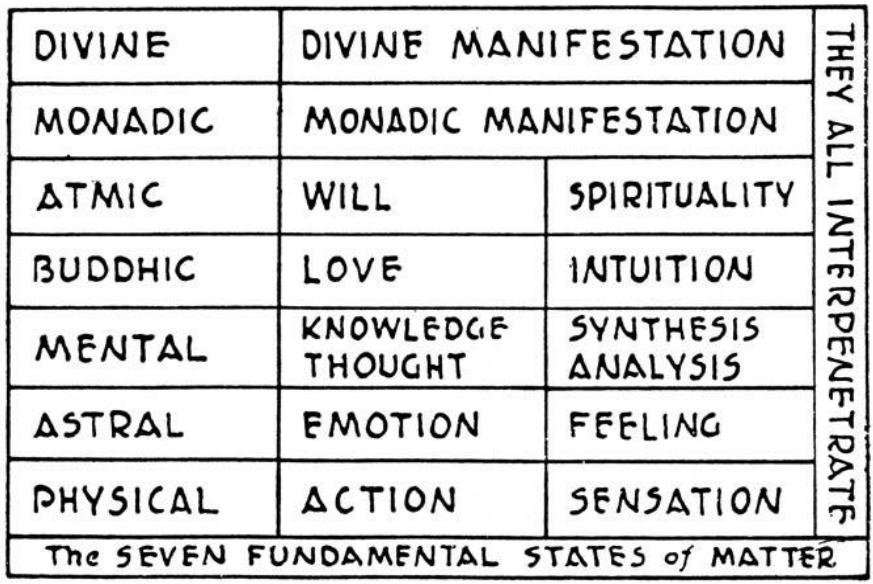
retina which have been transformed into electrical impulses but there is no consciousness of the glories that vision brings. The ears are ready to catch the sounds around it – ear drum, anvil, all Nature's amazing devices – but only vibrations reach the awaiting mechanism and there is nothing to turn them into the sweet cadences of melodious sound that man can contact and respond to with ecstatic joy. To supply this need, Theosophy will now take us beyond the physical realms entirely and, to the collection of the vehicles of human consciousness that we have assembled, we must add three more, so that our man may stand up before us complete.

Figure IX-20



In Figure IX-20, we are introduced to these three vehicles, the Astral, Mental and Spiritual bodies. These illustrations are monochrome copies of full page color plates in the book, Man Visible and Invisible, which has been mentioned previously. The three orders of matter corresponding to these super-physical bodies have been described, and are illustrated in Figure IX-21. Each body is shown in three stages of its evolution. The qualities of these higher bodies are expressed in colors, a subject which is a deep study in itself, and is dealt with extensively in the book from which the illustrations were taken.

Figure IX-21



The name "astral" is not of our choosing; we have inherited it from the medieval alchemists. It signifies "starry", and is supposed to have been applied to the matter of the plane next above the physical because of the luminous appearance which is associated with the more rapid rate of its vibration. The astral plane is the world of passion, of emotion and sensation; and it is through man's vehicle on this plane that all his feelings exhibit themselves to the clairvoyant investigator. The astral body of man is therefore continually changing in appearance as his emotions change, as we shall presently see.

THE DESIRE BODY

So far, we have observed that since ethers at the threshold of the ordinarily perceived Physical World are simply a rarefied condition of matter, slight physical development is required for their investigation. In fact, thousands of people who have given no special thought to either psychic or spiritual development have seen, and are continually seeing, one or more of them without knowing there is anything unusual about the experience. As the Aquarian Age draws near, the number of persons sensitive to the finer ethers will increase year by year. Even now there are cases on record among pioneering scientists where etheric vision is

momentarily opened in the course of particular investigations. This was well demonstrated as Sandoz Laboratories in Switzerland with the discovery of Lysergic Acid (LSD) in the rye mold.

The etheric region may be designated as the atomic and subatomic areas of the material world. Invisible to human senses as now developed, ether is none the less a substance belonging to the Physical World, though raised to a higher vibratory octave than physical matter. This being so, it is gradually yielding up to material scientists many mysteries that for centuries have been known only to occultists.

It is quite otherwise with the Desire or Astral World. Unlike the region of the ethers, the realm of the Desire World is another plane of being. It is not just a finer gradation of matter. Actually, it is non-material; it is astral. While it flows in and through the Physical World, interpenetrating the chemical and etheric regions of the physical and constantly influencing all activities within this sphere, it is of a different nature, and subject to laws other than those operating in either the Physical World or the higher worlds of mind and spirit.

Students unfamiliar with theosophical terminology will have no difficulty in understanding the Desire World if they think of it as the world of the heart's desire or simply as the Soul World; for this "World" or state of consciousness corresponds to what orthodox theology describes as "hell" and/or "heaven" where the Spirit abides after physical death. The orthodox heaven is a place of inconceivable bliss, every heart's desire being fulfilled through God's infinite goodness and love. The occultist prefers to give this "place", this state of consciousness, another name. It is generally known in Western Wisdom Teachings as the Desire or Astral World.

When, in later infancy, a child begins to be conscious of its environment, at first it is not aware of the substance of things. It does not realize that certain solid objects can bruise its body or that sharp objects will pierce it. Nor does it have a sense of distance. Even an adult is not able to perceive with his physical senses the atoms comprising the substance of material forms, including his own body. In a similar way, when first entering the Desire World, untrained clairvoyants see its form but not the nature of the substance of which those forms are composed. This being so, observations recorded are not uniform, some being based on clearer seeing and deeper understanding than others. This accounts for

the variation in the visions of Church saints, who may be mystical Seers but not necessarily trained clairvoyants. Consequently, their conclusions are not always corroborated by the findings of occult scientists who have made a study of that world.

The Desire World is composed of what may best be described as force-matter. Unlike ether, desire substance is not just a finer gradation of chemical matter. Physical instruments cannot penetrate its secrets. It is the world of life, feeling, emotion. As our bodies, with their physiological functions, consist of material substance, so our feelings, sensations, and emotions assume tangible form in the force-matter of the Desire World, each type having its own particular form, color, and rate of vibration. It is not incorrect to say that the emotional states of mankind combine to form a globe-encircling, globe-penetrating "cloud" or "aura" which, in every sense of the word, constitutes a world of its own.

The Desire World is not a space-time realm. It belongs to what mathematicians call the "fourth dimension"; and the aura, the feeling body, is in fact a fourth-dimensional body. Its senses (sensations) are, by its very nature, keener than those known to man when in a physical body – as is evidenced, for example, by the ecstasy accompanying that soul-transporting experience known as Illumination.

The force-matter of the Desire World is in continuous motion, pulsating in a brilliant kaleidoscopic array of ever-changing lights and colors. Its basic "substance" is soul light, out of which everything is formed. Where soul light is either partly or completely absent there exists the condition spoken of in the Bible as "outer darkness", where dwell unregenerate Spirits until purged of the base elements in their natures. This is the purgatorial region of Catholic theology, the hell of Protestant orthodoxy.

Force-matter or basic soul light is both positive and negative, masculine and feminine, in function. The terms fire and water as applied to the masculine and feminine principles respectively, derive from the Desire World – for here the masculine qualities now manifest in fiery, glittering radiations familiar to every Seer, while feminine soul qualities are visible as most exquisite colors seen in clouds of light having a distinctly watery appearance, a water such as no one on earth sees with physical vision. As evolution advances, feminine souls display more and more of the fiery masculine qualities, while masculine souls take on the ethereal beauty of the feminine.

In our present state of unfoldment desire is the mainspring of action. It motivates our conduct and thought. Such being the case, angelic Beings inhabiting the Desire World are of prime importance to our development.

The dominant laws of the Desire World are those of Attraction, Metamorphosis, and Transformation. Added to these is the Law of Repulsion, the force of hate and self-assertion that prevails on lowest levels of this world. Fairy tales are beautiful illustrations of the ever-changing substance of this realm, where form is not fixed as in the Physical World, but constantly metamorphosing.

The Desire World is the home of innumerable Beings who operate in diverse subtle ways to influence man by means of his desires and emotions. Their activities are sensed but their presence is unperceived by the vast majority of people. To the activities of these denizens of that realm man owes his inestimable opportunity for growth through experience, by which he is building increasing moral strength and beauty and achieving mental vivification – for in our present stage of development the average man's mind is but dimly awakened.

As previously stated, the principal element of the Desire World is soul-light, the chief function of which is transmutation (metamorphosis). It is readily amenable to the power of thought. Both the Archangels (Hierarchy of Capricorn) and the Angels (Hierarchy of Aquarius) are active in the higher heavenly region of this world, whereas the Lucifers have charge of the lower purgatorial levels. The Lucifers' activities, however, are not confined to these levels but are now extending into the heaven realms as well.

How the two divisions of the Desire World, the higher planes where the force of Attraction holds sway and the lower where the force of Repulsion is dominant, are related to human experiences and the manner in which they operate are the subject of this lesson.

Man is a free agent. He can revel in unbridled passion (low desire); he can elect to live, as do the majority, by drawing to himself proportionate amounts of both high and low desire substance; he can follow the spiritual path, as do true aspirants, and thereby lay hold of transmuting, transforming powers having their source in the higher planes of the Desire World. In these higher planes is the Fountain of Life, the

Fountain of Youth long sought-for by medieval alchemists but entered only by those who give their all to the Quest.

THE EARTH-BOUND OR SIN BODY

When the vital and desire bodies become interlocked in the grip of their baser, unyielding substance, they form what is known as the sin body. It is this that becomes earthbound. That is, it is bound by its own nature and desires to the physical plane. The Ego then misses its normal purgation immediately following release from the physical body, as is the divine beneficent plan. If this were to take place in one whose vital and desire bodies are sin-locked, the Ego's torture would be past endurance. The necessary separation between the evil built into such a body and the Spirit inherent therein does not take place, therefore, until after a long or shorter lapse of time, during which the evil condition is generally "worn down".

The "sin body" of an earthbound entity stays close to the earth plane for a period varying with conditions, and it clings like a leech to persons and places where it can feed on the heavy, noxious emanations of liquor, tobacco, blood, and all "foul and pestilential vapors" that arise from these contacts. In extreme cases an earthbound entity has been known to hover for centuries about haunts where-to its evil deeds have linked it. These are the "ghosts" that haunt places, and some ghosts have become historic through their long association with ancient castles and famous old estates.

The reason they are sometimes seen is because the body, when it is fully alive and functioning, emits gases in the form of amino compounds. These gases are stored and impregnated into buildings, houses, etc., and over the period of time, a large amount of compounds is thus stored and can be drawn upon by a spiritual entity that has passed on. Old structures have usually a tremendous amount of amino gas because many people have dwelled in them over long time periods. This makes it relatively easy for a spirit to draw upon these gases, and the mixture of amino gas and mind forms ectoplasm, which usually aberrates into a semblance of the force commanding it thus. These are often called "aberrations".

At the dawn of the Christian Era, the Earth was literally haunted by large numbers of Egos held captive in their sin bodies. They were the cause of the obsessions, and of many bodily ills encountered by the Christ in

His healing ministry. What He did for individuals so afflicted while He ministered in the flesh He has continued to do cosmically for humanity as a whole. The influence He releases into our planetary sphere is of such a redemptive character that it has gradually lessened malefic conditions of both outer and inner planes, thus reducing the number of Egos held in bondage.

Two factors make it difficult for an earthbound Spirit to return to normal. The first has to do with its life in a physical body; the second with its life after leaving the physical plane. In the former instance the evil far outweighs the good; hence, elements of immortality for building into the soul are lacking. In the latter instance the conscience is undeveloped because of the absence of purgation out of which conscience evolves.

Evil, like good, "grows by what it feeds on", so the tendency is for evil to grow increasingly worse and for good to grow progressively better. Unless some drastic experiences intervene to stay and alter the downward course, one given over to evil reaches the point of severance between his personality and its higher egoic counterpart. He literally becomes a soulless, conscienceless creature capable of unbelievably cold-blooded and fiendish crimes. He will be completely unemotional, and without any indication of remorse during the re-enactment of a most hideous offense. The fact is that he has no feeling about it, his emotions having been dulled by the hardening of his desire body. They are no longer fluidic and responsive to emotional impacts. Such persons are the most dangerous of all types of criminals, and the hardest to control. These people are often called hardened killers.

Modern psychology has gone far in exploring physical conditions underlying abnormal behavior as described, and has developed scientific techniques for assisting such persons to return to normalcy. When scientific psychiatry effectively supplements the best of medical practice, the two conjoined will come into enlightened spiritual understanding. Then we shall have a beneficent healing ministry under practitioners who are in very truth priest-physicians – enlightened ones who will treat patients not merely as physical bodies, nor yet as physical-emotional-mental mechanisms, but as Spirits possessing several vehicles of expression. These scientific-spiritual healers will look upon ailing man as a spiritual being in a physical body, and minister to him accordingly.

Many times I have been called to major hospitals to help out when someone who is strapped into a confinement table full of tranquilizers, administered in vain by helpless doctors who stand uselessly by and watch, freaks out after a nervous breakdown or demonic possession brought on by stress, drugs, alcohol or a combination of them. By using healing methods presented in this book, I have many times calmed the person back into the real world. If one other reader is moved into a position to understand what I am now saying, the works contained herein will be well worth the time it took to compose.

Comparatively speaking, evil's reign on earth will soon end. Consequently, the Dark Forces are using every wile to bring under their control all who can be influenced by them. Their aim is to wreak as much havoc and spread as much dissension as possible in the time left. They are the main instigators of evil manifest in the world today – war being one form of it. They must have food to sustain them, else they starve and die. They survive and wax strong on energies generated by hate, treachery, greed, envy, cruelty, and every demoniac deed in the calendar of crime. Hence, all who indulge in destructive thoughts, feelings, or actions are furnishing them with sustenance, and this carries a tremendous karmic debt.

Instead of transmuting darkness into light, as does the White Brotherhood, the Dark Forces seek to increase evil, with a view to overbalancing the power of good. To further their objective they secure the aid of elementals and discarnate Spirits of a low order who are amenable to engaging in the required vicious practices. These provocateurs gather in liquor joints, gambling dens, houses in iniquity, slaughter pens and like places, where they feed on the sordid emanations and try to gain control of their operators and those who frequent them, instigating responsiveness to over-indulgence that leads to crime. It is no exaggeration to say that entrance into a saloon or brothel is often the first step on the road to ruin, because sinister projections from the other side of the veil are more powerful than influences of the physical plane. Those who dwell or visit these places should visualize a white Astral light of protection around them.

The Pyramid also works through the Astral Body. Its energy level is level Two and its ray is called Ray Six. I will cover this further in later chapters, but remember the Raydome and Powerdome "curb" desire for excessive appetite of various foods, and here is given a clue to this action.

The Mental Plane and the corresponding Mental Body is "fire matter" of two essences. One is built upon logical, natural laws of nature called the Rupa or Lower Mental Plane, and the higher essence of spontaneous, purifying fire that would defy logic as we know it, is called the Higher Mental Plane or Arupa. This is why the Tibetans always say the mind is the slayer of the real, because logic or lower mind only serves the desire nature or feeds the Astral and Vital bodies, hiding the real secret of life's simple truths with its devious selfish purpose. But keyed to the higher mental plane, we are aspired to the greater and inner secrets of life very rapidly. I will cover the mental plane in greater depths in later chapters.

In the Astral body of the primitive man a broad band of brown red indicates the presence of sensuality. Dull scarlet tells of anger, and other colors dull and muddy tell of other undesirable traits. It is obviously unorganized and loosely built. In the Astral body of the average man there is evidence of improved organization and, therefore, the colors are in more orderly arrangement. In the highly developed man they are vastly improved and a great deal of yellow around the head indicates that that emotions and desires have been brought under control of the mind.

Looking at the Mental body of the primitive man we see little development. However, some yellow at the top indicates a slight amount of mental ability. Some improvement is shown in the case of the average man and, in the man of high development, advanced mental powers are evident. All the colors in it are much more refined and delicate, and the yellow of his intellect is displayed in great strength, to which is added actual beauty of appearance.

The Spiritual bodies show corresponding progress. However, in the earlier stages of their evolution there are not unpleasant colors; there is only a lack of color. For there are no evil qualities in the Spiritual vehicle; only the absence of good ones. This lack is made up with lavish generosity as evolution proceeds, as the illustrations may show, though very inadequately. Regarding the Spiritual (or Causal) body of the advanced person, Mr. Leadbeater writes:

Composed of matter inconceivably fine, delicate and ethereal, intensely active and pulsating with living fire, the Causal body becomes, as its evolution proceeds, a radiant globe of flashing colors, its high vibrations sending ripples of changing hues over its surface – hues of which earth knows nothing – brilliant, soft and luminous . . . How hopeless it seems

to try to represent all this glory on paper! Yet our artist has skillfully contrived to suggest that which no brush could paint, and, however far even the cleverest image may be from that transcendent reality, it at least gives our imagination a starting point from which we may try to build a conception.

As stated in the above quotation, it is obviously impossible to give more than a feeble representation of the subtler bodies, for the least attractive of them all, the Astral body, is more vivid and vital and glowing with life than anything we can know in these physical realms of consciousness. They are not only beautiful but, especially in the higher stages of development, full of radiating power. They are living, vital, iridescent things, which can never be portrayed in static form. Seldom at rest, they change their appearance from moment to moment, showing new facets of their latent powers, sometimes startling in their suddenness and dramatic in their appearance, with passing emotions and thoughts, aimless or purposeful, that are constantly passing through the mind. With the Spiritual body it is different. Its steady, powerful radiations sometimes glow with a greater intensity and glory than at others, but as time goes by it becomes an object of transcendental magnificence.

When colors are mentioned, it should be realized that the reference is to the color in the subtler substance which corresponds to the one we know in the physical world and is in consonance with it, but one or more "octaves" higher according to the matter in which it is being expressed.

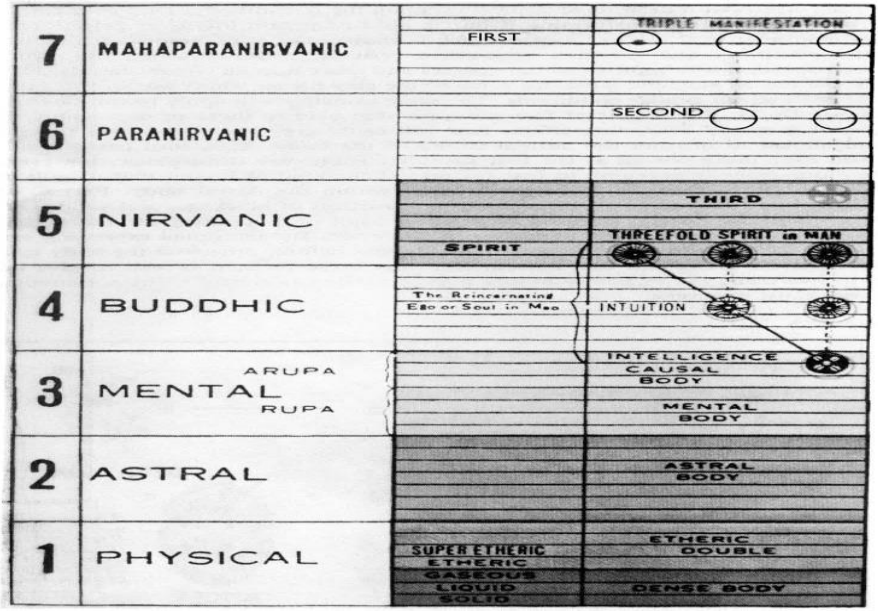
A realization of these facts, together with the help of the illustrations, should give some idea of the reality of the bodies of man, each one more charged with power and showing more strength of color than those of the world less subtle than itself.

So now we have the Man in his Causal body, showing through it the spiritual powers that he has developed. This is what the Christian would call the "Soul". In Theosophical literature it is frequently referred to as the "Ego". This Spiritual or Causal body, in man's present state of evolution, expresses through appropriate channels the forces of Will and Love, as well as the higher reasoning powers. It also is a storehouse for the knowledge he gains throughout the normal period of his human evolution. When in incarnation in the physical world, he has his Mental body with which he thinks, gathers information, analyzes it, and expresses his creative abilities. He has his Astral body through which he

can feel and desire, and the Physical body which is especially a vehicle for action, and through each of these he becomes conscious of the world to which they correspond.

Figure IX-22

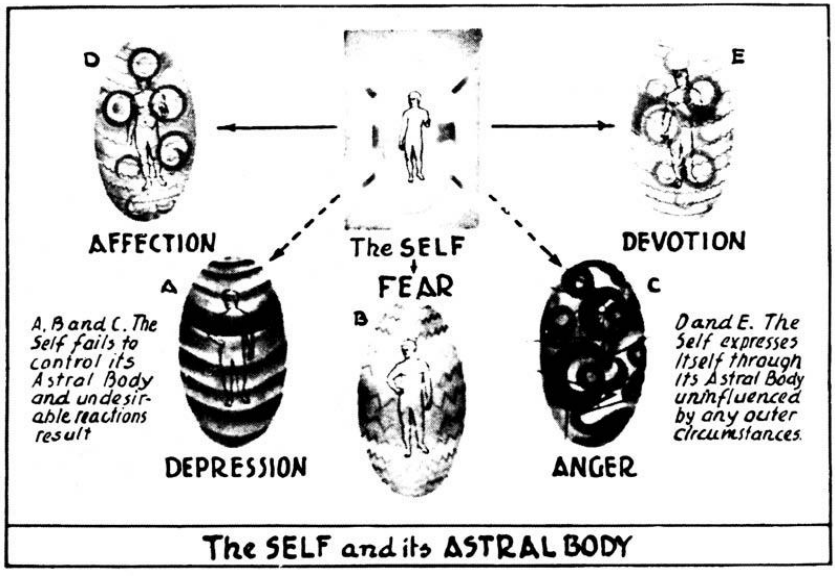
PLANES OF NATURE WITH CORRESPONDING BODIES



Each of the bodies grows by use. The physical body grows through the exercise of its various faculties. So do the higher bodies. Use or abuse, action or neglect, will raise or lower the quality and responsiveness of the bodies. We know of this effect in the physical world. In Figure IX-23, we see illustrated the effects of certain emotions upon the Astral body. Similar conditions apply to the Mental body. These illustrations, are reproductions from the same source as Figure IX-20. Part A of Figure IX-23 shows the effects of a deep fit of depression upon the Astral body. Dull gray bands begin to form around the body, gradually transforming it into a kind of prison house of dejection if the condition is allowed to continue. In the extreme case which is shown, the other colors of the body have become almost totally obscured and the man becomes a veritable prisoner within his own Astral vehicle. Gradually the condition will improve as time passes and more normal circumstances claim his attention. But the body will not be quite the

same, for some of the gray matter which was drawn into it will remain, making it easier to repeat similar conditions. The same principle will apply to the cases shown in Part B and C of Figure IX-23. The effects of fear are somewhat akin to those of depression. But here, rather than showing as a steady deadening effect, fear will cause grey horizontal lines to vibrate with great agitation and almost to obscure the normal colors of the body. This, too, passes and almost normal conditions will once more prevail as the fear subsides. Each such disturbance, however, will leave the body a little more prone to succumb to fear, because of the kind of matter that is built into it. Anger is another violent emotion that can cause great havoc within the Astral body. Part C of Figure IX-23 shows the results of an intense fit of anger. Coils and vortices of blackness and vivid flashes of lurid red light almost obscure the normal coloring of the body, not only harming the body itself, but also the Physical vehicle through which it will ultimately expresses. The individual expressing such a murderous emotion as this must have given way to anger many times before, otherwise the body could not produce such violent eruptions of malice and hatred. Knowing these facts, it is well to give heed to signs of danger and to overcome the difficulty before it becomes too powerful to be surmounted and nature's drastic methods must intervene.

Figure IX-23



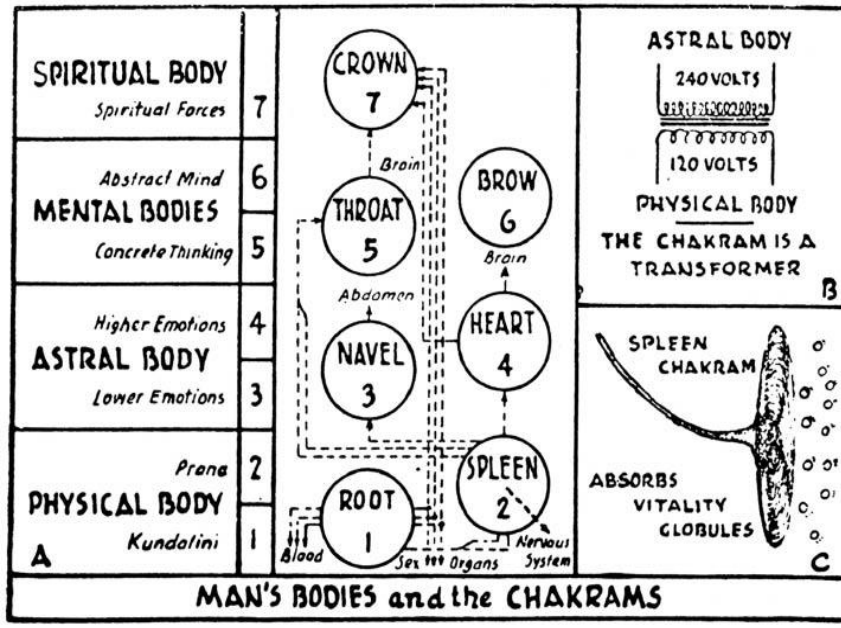
Note particularly that, as stated in the illustrations, it is not the Spiritual man himself who gets angry, or feels depressed, or is fearful. He fails to control his Astral body and these conditions are allowed to occur as uncontrolled reactions to stimuli from outer conditions. Careful analysis of the conditions of our consciousness at such a time will often, probably invariably, reveal that there is an inner voice, the voice of the Self, which is vainly trying to be heard above the violent reactions of the body, and desperately trying to control the body and to bring it back to a condition of balance.

Looking on the brighter side of things, we see in Part D of Figure IX-23 the effect produced upon the Astral body by the Self expressing itself as pure affection, and in Part E of Figure IX-23 as intense devotion. Rose color predominates in the former, for that is the color in which affection clothes itself; while blue, the color of devotion, is more pronounced in the latter. In each of these cases the vibrating parallel lines indicate an intensely concentrated emotional condition, but the coils or vortices show a pouring out from the Self toward the object with which the emotions are identified. In contrast to the three undesirable conditions shown in A, B and C, it should be noted that D and E are examples of direct action by the Self through its Astral vehicle. Such effects within the body raise its Level and quality so that it will the better show forth the beauties of the Self on future occasions. In many ways the Astral body is drawn upward or downward and its present degree of unfoldment in any person is a balance sheet of all his efforts of the past, or good or ill. Fortunately, an effort expended in the subtler kinds of matter, associated with the highest emotions or thoughts, produces more effect than a similar effort exerted in substances of a grosser kind, just as a given amount of energy used to walk through the air with feet upon the ground, would result in a greater distance being covered than by an equivalent amount expended in an attempt to walk on the ocean bed through the water. Gradually, by many such activities, the Self and its bodies are going forward on the pathway of life, each improving as time rolls along.

Now that the subject of man's subtler bodies has been introduced we can consider some further information about the chakrams, for they perform highly important functions, both in bodily health and in the evolution of the human consciousness. Each chakram performs a dual function within the body. It absorbs life and energy and also acts as a

transformer by means of which vital forces generated within the body are changed in intensity so that they can be expressed through a denser vehicle, in precisely the same manner as electrical energy can be transformed from one electrical potential to another.

Figure IX-24



In Part B of Figure IX-24 we have shown a conventional symbol for such a transformer. Heavy machinery, for example, as used in a factory, would be 240 volts or higher, but for the more restricted needs of the home this might be reduced to 120 volts. To use the higher voltage directly with equipment designed for the lower, would quickly cause damage and finally destruction. Reference to the upper left hand part of Figure VI-1 again will show why it is possible to reproduce emotional creations of the Astral body within the physical, for it will at once be seen that the physical atom stands unique in that it has within it matter of all the other worlds and therefore it can express the life of those worlds, though in a more restricted measure. The chakram reduces the intensity of the force to the more restricted possibilities of physical matter. This same fact applies to any of the higher bodies in its relationship to the vehicles of consciousness lower or denser than itself.

Once more in the physical world we find the keys that also apply to the super-physical, for the same Laws exist at all levels.

In Part A of Figure IX-24 these force centers are listed, as they appear in action in the Etheric body. The first two are primarily concerned with the physical body, bringing it health and strength. The third and fourth transform emotional forces generated within the Astral body into physical expression. Numbers five and six transform thoughts and reasoning into physical brain expression and the seventh brings into physical consciousness the Spiritual forces of the Man himself. Their appearance, as previously explained, looking at them on the surface of the Etheric body, is somewhat like that of a convolvulus or morning-glory vine, though with wheel-like extensions beyond the limits of the flower, as shown in Part C of Figure ix-24. Each one, however, varies from the others in the number of "spokes" to be seen in the wheel-like extensions and in the flower-shaped hub of the wheel. In each one currents are generated which swirl around, weaving under and over the "spokes" in turn, giving it the appearance of the bottom of a circular basket but with the depression in the center.

In addition to the food we eat, and the water we drink, the Physical body absorbs forces from the etheric atmosphere which surrounds us. One of these forces comes from the Earth and has been called "Kundalini"; the other comes from the Sun. It is "Prana" or vitality. Neither of these has yet been recognized by science, though the latter seems to be suspected by some scientists. Kundalini has a number of different levels of expression, but the one we are considering now is the lowest and densest of them all. It affects the physical construction of the dense body, giving it health and functional vigor. Those who dig in the earth, the farmers and the gardeners, know of the feeling of wellbeing that such an intimate contact with the soil can bring. This force is absorbed by the Root chakram, which is situated near to the lower end of the spine and opens out at the surface of the Etheric body (Figure IX-24, Part A, No.1). After absorption and internal action, the Kundalini rises up the spine and is distributed throughout the nerves of the body. It also acts upon the blood steam and the sex organs. This chakram receives also a specialized type of Prana from the Spleen center, which is redistributed along with the flow of Kundalini and plays a highly important part when man comes to his higher levels of development.

Prana comes to us directly from the Sun. It is the active power in producing all vital phenomena. In physical world manifestation it clothes itself in a particularly bright little particle consisting of seven ultimate physical atoms (or anu). This has been called the "Vitality Globule". It is seen by many who do not realize what it is, for these little bright particles are present in the atmosphere on any sunny day, darting hither and thither with great speed. They are most easily seen when facing away from the Sun and looking into a blue sky. Prana, in the form of the Vitality Globule, is absorbed by the Spleen center, situated close to the physical organ so-named. In this center, Prana is specialized into seven different streams, arising from the seven ultimate atoms which enter into the formation of the Vitality Globule. These streams show themselves as different colors within the body, which closely resembles the seven colors of the spectrum. As shown in Part A of Figure IX-24, the Spleen chakram sends two streams of specialized Prana to the Throat center. They are blue and violet in color, but before reaching their destination they join and enter the Throat chakram as one stream. Two others, in color dark red and orange, go to the Root center. But these also join and enter the Root chakram as one. A fifth kind, yellow, goes to the Heart center, a sixth to the Navel center. This one is green. A seventh, rose color, is distributed throughout the entire nervous system.

The Root chakram has four spokes and the Spleen chakram, six. As will be noted from Part A (1 and 2) of Figure IX-24, their main function is to bring life and vitality to the dense physical body. These forces are absorbed into the body from the atmosphere. The Spleen chakram is illustrated in Part C of Figure IX-24.

The next two, it will be seen, are transformers by means of which emotional forces are reproduced in physical expression, the Navel center (Figure IX-24, Part A-3), dealing with the lower and more primitive astral feelings, such as anger, fear, greed and irritability. We all know well how these things are actually felt in the "pit" of the stomach over the solar plexus and near to this chakram. The higher emotions, such as love, devotion and sympathy, find their expression through the transformer action of the Heart center (Figure IX-24, Part A-4). Again, it is not difficult to feel that chakram in action as such emotions enter the body to find physical expression. The Navel chakram has ten spokes and the Heart chakram has twelve. The Throat center, we note in Figure IX-24, Part A-5, brings into physical expression the activities of the Mental

body, linking concrete thought with the physical brain. This center vitalizes particularly the vocal organs and the thought centers of speech as a physical expression of concrete thinking. It has sixteen spokes.

It will have been observed that the number of spokes in the centers has been gradually increasing: from four in the Root center to sixteen in the Throat center. But when we come to consider the next (Figure IX-24, Part A-6), the Brow chakram, we find something obviously different from all the others we have considered so far. For it has no fewer than ninety-six spokes. This becomes understandable when we realize that we have now passed from man's mortal bodies to connect with the Causal or Spiritual body, which is immortal and remains with the Man throughout all his many incarnations. And in the Crown chakram (Figure IX-24, Part A-7) we have an even greater jump, for it has 960 spokes, with an inner central hub which has twelve spokes, making a total of 972. This chakram is a center for the transforming of the highest spiritual inspirations down into physical consciousness, and as a guide for spiritual action. These two are connected with the etheric portions of the pituitary body and pineal gland within the brain.

While Kundalini and Prana are necessary for the physical wellbeing and vital activities of the dense physical body, it could not function without the forces which come into it through the chakrams from the Astral and Mental bodies. When these forces are withdrawn, the Physical body, robbed of their supporting influence, "dies". But, to be truly a Man, the Spiritual forces must be there also, for these constitute the outstanding difference between the human and sub-human species. It is in the higher Mental and Spiritual worlds that man's greatest progress will be made as his evolution proceeds, and therefore these two centers will assume a widening significance as time passes. There will come a time when Kundalini will unfold its higher potencies and, passing up the spine, it will stimulate all the centers into increased activity and continue on to produce far-reaching effects in the Brow and Crown chakrams, endowing the Man in his physical consciousness with the power to express spiritual manifestations for beyond anything hitherto accomplished.

The chakrams exist in each of the bodies, the centers being coincident, but the outermost parts stretching further because of the larger size of the subtler bodies. They perform similar functions, though modified by the nature of the vehicle itself. However, each one is a transformer of

force, the contiguous surfaces acting by induction to effect the transformation, exactly as the coils of an electrical transformer induce a current over space without actual contact. Thus, in the physical world, man's vehicles of consciousness are, as it were, welded into one and, though modified and limited by the transition, in his Physical body man can express the whole range of consciousness that his several vehicles of consciousness cover.

Here, then, we find an answer to many of the deep problems of human nature. But still, to many, only the visible and tangible can possibly be true. Therefore we now turn for a while to examine some of this so-called visible and tangible evidence and see if it will stand or fall in the light of a little critical analysis.

Little by little, I am presenting the Pyramid Principle, and in the following chapters, I will form a conclusion.

CHAPTER X – KIRLIAN PHOTOGRAPHY:s THE DYNAMIC IMPRINT OF HUMAN RESPONSE

Electro-photography, or mapping the electrical field pattern through silver iodide crystals on a piece of unexposed film, is not a recent discovery. Long before the work of the late S. D. Kirlian in Russia in the 1920s and 1930s, scientists have studied the effects of Kirlian photography. Michael Faraday, Nichola Tesla, Thomas Edison are just a few of the names that crossed through the mysteries of the human aura. At the turn of the century, Nichola Tesla photographed not only fingertip auras, but auras of the entire body.

Let me present to you some of my experiences photographing the human aura. I have taken thousands of aura pictures over the past five years, making careful comparisons with the results of the same individual's barium X-rays, iridology reports, blood tests, kinesiology, electro-myograph, electro-encephalograph and bio-feedback, just to name a few, and the results are the same. There is a direct correlation between the human aura photograph and the aforementioned tests.

Let us back-track a little and study just how the body produces a magnetic aura.

First, remember that minerals are ingested into the bloodstream via the large intestine or colon. Then they are carried to the brain and deposited into the gray and white matter of the brain areas. Energy is invoked by thought resonance and triggers a reaction between the occipital and parietal regions, which appears as a difference in potential or polarity. Then, motion set forth by the Spirit response of the etheric body (See Chapter XIII) modulates the potentials into oscillation called by scientists delta, alpha, beta and theta response. This creates a process called electrolysis and causes the brain to provide or give up free ions to the starting point of the three nervous systems, which begins at the base of the brain medulla oblongata. There are twelve tissue salts or mineral combinations in the brain, and each salt will give off free electrons (ions) when the particular modulation of alpha, delta, beta, theta is at its peak output. Copper, selenium, and iron would produce ions more abundantly in the delta state, which is a higher vibration, such as when we are walking, running or talking. Sodium, potassium and chromium

would be more actively consumed in midrange alpha, and precious metals such as silver would be consumed during theta states. Hence it becomes apparent that there are twelve basic minerals divided into three rates of vibration and, interestingly enough, there are twelve cranial nerves providing three main actions: sensory response, via sympathetic ganglia; motor response via autonomic ganglia; and intuitive response via para-sympathetic ganglia. The brain itself is divided into three main areas: the medulla or reflex center, which corresponds to the first outpouring, the will aspect in action, of which the third ventricle is a part, containing the pineal and pituitary glands; the cerebellum or muscle-control center, which is a part of the second outpouring providing action of the will via muscle movement; the cerebrum which is the seat of consciousness – the third outpouring, or active intelligence. Now let us continue realizing that these processes generate electricity, sending it in pulses at the rate of 200 miles per hour down through the spinal cord and all over the body. There are at least 72,000 major wires conducting electricity through the body, and millions of minor wires conducting smaller amounts of electricity through the body. As we have pointed out earlier, magnetism is always at right angles to electrical impulse passageways, so you can easily see now that the body is full of magnetism. Now the major electrical conduits (nadis) start in the brain and run to the base of the spine, and since these nadis are parallel to each other, they send up a process of mutual induction which amplifies the field pattern when they are in phase with each other, which occurs when we are in mental harmony with the universe. This field pattern has a definite embodiment and is called the magnetic aura. The aura has its North Pole in the third ventricle of the brain and its South Pole in the base of the spine. It is electrical, electrostatic and ionic in its content. It changes by nature of environment (of which air quality is a major factor), emotional status and contents of foods and liquids digested.

Figure X-1

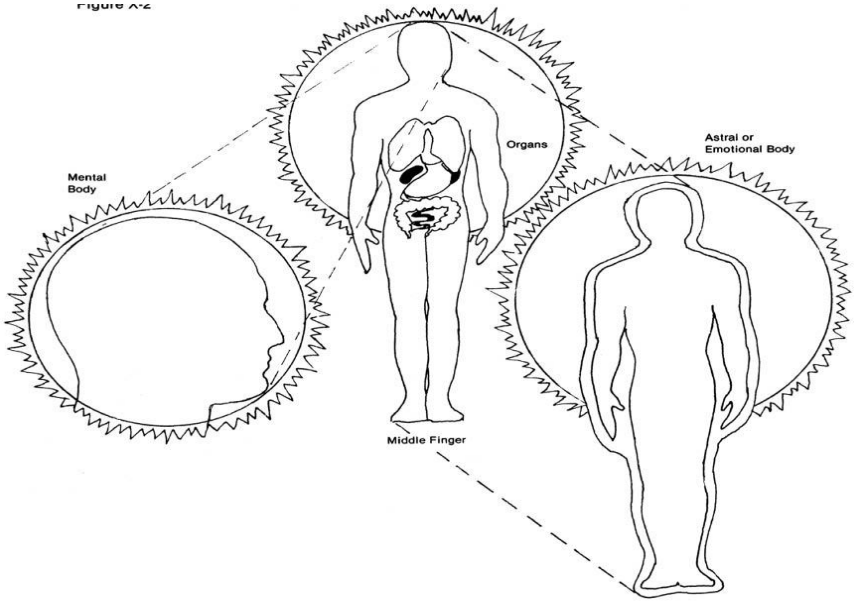
TYPES OF BRAINWAVES AND ASSOCIATED STATES

BRAINWAVE	FREQUENCY (Hertz)	AMPLITUDE (Microvolts)	MENTAL STATE
Delta	0.2 - 3.5	10 - 50	Deep dreamless sleep, trance state
Theta	3.5 - 7.5	50 - 200	Drowsiness, hypnogogic imagery, creativity, receptivity
Alpha	7.5 - 13	10 - 100	Tranquility, meditative state, diffused inner self awareness
Beta	13 - 28	10 - 50	Focused awareness, anxiety, concentration, problem solving

The outward radiation of the aura is powerfully affected by the thought content of the Mental body, the emotional qualities of the Astral body and vital qualities of the Etherico-physical body.

When we do Kirlian photography, the index or first finger shows changes in the Mental body. The middle finger shows changes in the Physical body and the ring finger shows changes in the Astral or Emotional body. The other finger and the thumb relate to other bodies, but it is not desirable to elaborate on these yet. The main importance now is to understand the basic relationship of the fingers to body functions. When healing is done, it is this body climate and aura of energies that has to be reached and reached through by the healer.

Figure X-2



These three fingers in Figure X-2 show a connection of body function versus energy passage. Each body of energy overlaps the other, but the main center is represented by the individual finger.

Through a careful perusal of the axioms presented in this book, deep understanding of the nature and qualities of the body climate can be gained.

The penetration of healing forces can be blocked by many unsatisfactory or even hostile elements in the patient's aura. For this reason it is helpful to know the nature of the disease and the chakra through which the disease wreaks its havoc. With sufficient knowledge and understanding of these, the healing energies can be made more effective, and instead of being dissipated over needless areas of the body they can be concentrated into one region where the relevant chakra is sited.

These three fingers in Figure X-2 show a connection of body function versus energy passage. Each body of energy overlaps the other, but the main center is represented by the individual finger.

WHAT KIRLIAN PHOTOGRAPHY TELLS US

Kirlian photography is visual representation of changes between the etheric body of man and the physio-electrical body of man as it behaves in the presence of electrical stimulation, and this change is recorded on film. Like Iridology and Reflexology, it uses man's reflex points to view organ conditions within the body, because a blocked or weakened organ means a blocked nerve, which indicates little or no electrical change at the reflex point. But unlike Iridology or Reflexology, it can show spontaneous changes in the body as the body is subject to stress. To accomplish this, the person being photographed is directed to think a negative thought. This puts stress on the body and the aura is pushed away from the finger. Then the person is asked to think a positive thought. This brings the aura back to the finger indicating relief from stress.

The elapsed time and amount of change usually indicates the toxicity of the body; i.e. a toxic person has a slow response time. The figures used are: the index finger, which appears to represent the mind or Mental body, the middle finger which appears to represent the physical structure of the body, and the ring finger which appears to represent the emotions or Astral body.

Figure X-3

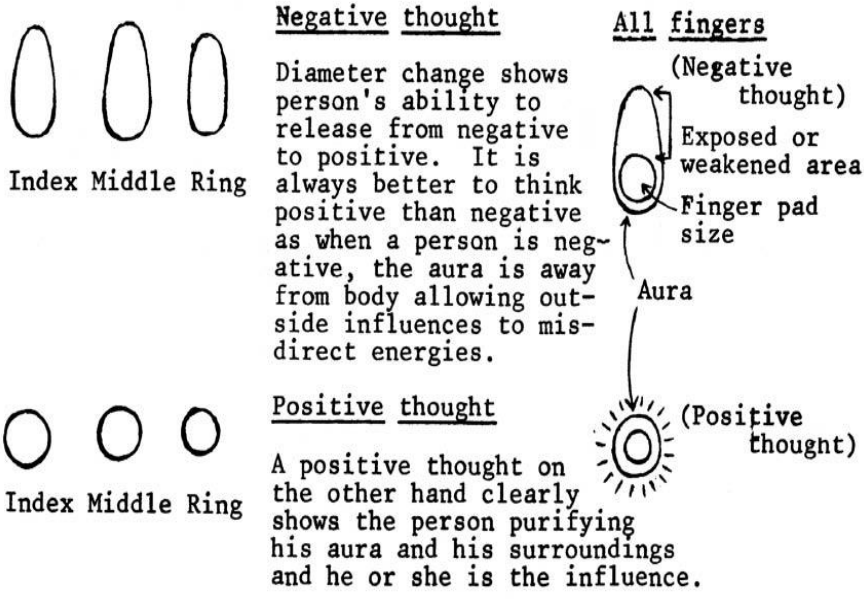
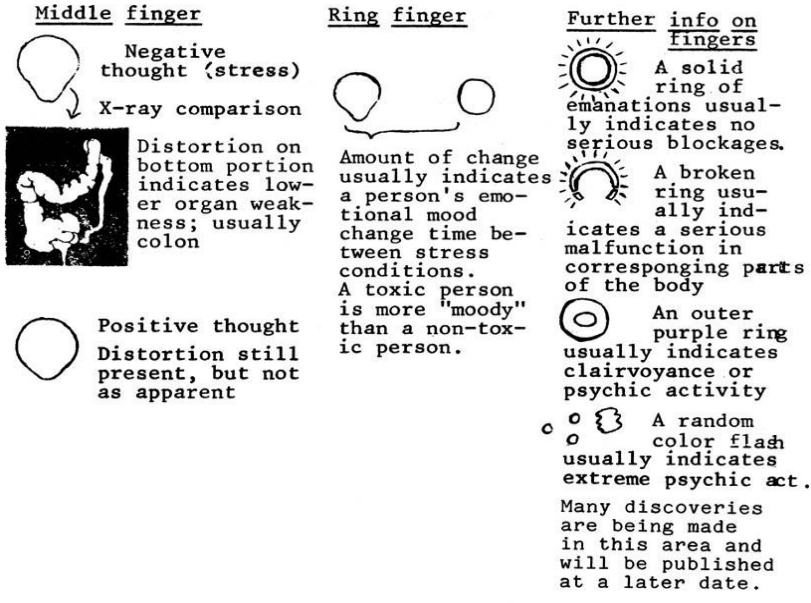


Figure X-4



When electricity flows in perfect harmony through a wire in perfect alternating motion as we view this motion through an oscilloscope, we see perfect positive and negative sine waves like this. Usually our source of electricity is grounded to the earth and our source of electricity for the oscilloscope is also grounded. Any distortion present may easily be cleaned or corrected by this earth ground. However, man who is also an electrical generator is not grounded. This can cause man to have an erratic waveform unless he balances his life and grounds himself by his actions.

Figure X-5

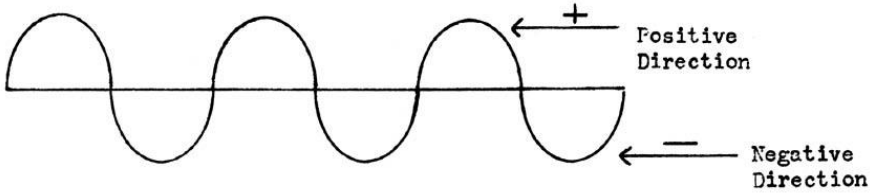


Figure X-6

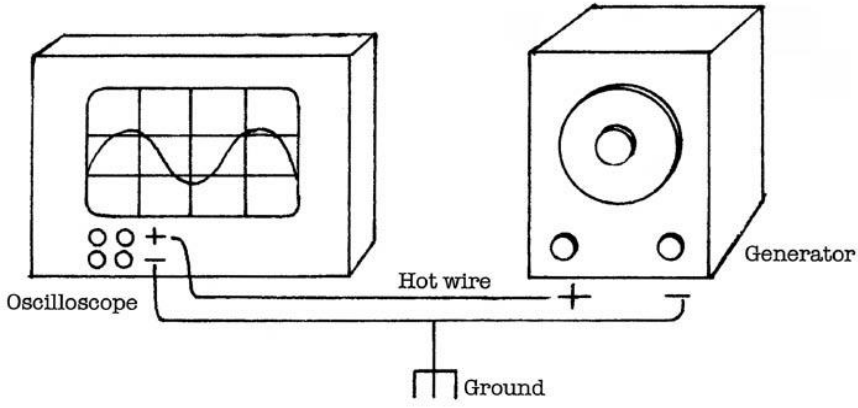
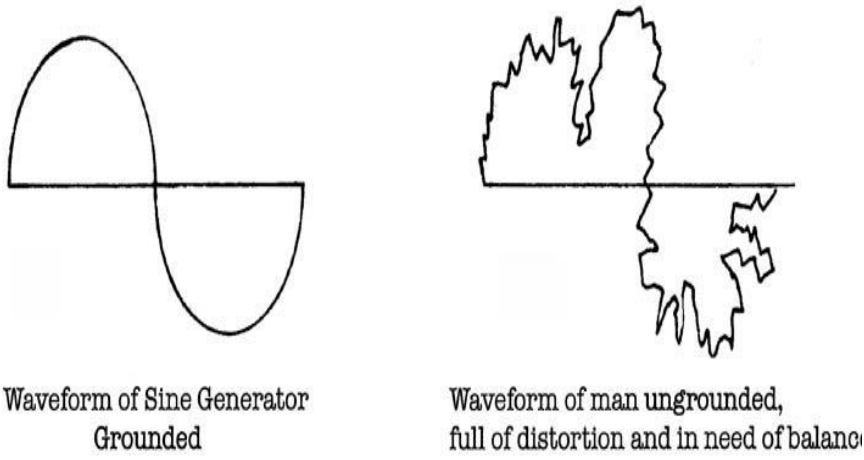


Figure X-7



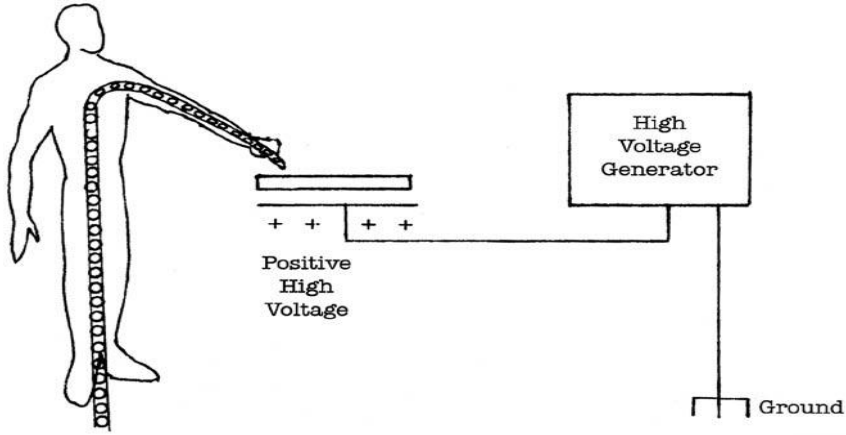
Waveform of Sine Generator Grounded

Waveform of man ungrounded, full of distortion and in need of balanc

So it may be feasible to say that ground or earth is a good reference point for comparison, and any waveform viewed by any conventional electronic means will use earth ground as a clear reference point if a distortion measurement is to be made. Now let us look at Kirlian photography again. One side of the photograph plate has high voltage with a positive elevated potential and a negative ground or earth potential. When ungrounded man places his finger in the camera, he is grounded to earth during the exposure time and his resistance to ground is measured in the corona of the discharge of hi-voltage. With the earth as a reference point, the differences in potential can be studied as a diagnostic indication of that individual's progress. As the sum total of every man and woman's electrical vibration is different, and because the fingertip is a discharge point into the air, which is in this case a dia electric, the corona at man's fingers forms a cellular passageway of the least resistance as the electrons flow into the air, and this personalized passage is called the finger print. Furthermore, man is also a negative-ion generator, and you can demonstrate this by a rapid-beathing exercise. The Fire Breath generates large amounts of electricity, and doing this and directing this electricity into a glass of grapefruit juice with your finger tips, you will change the taste from bitter to sweet just as though you had used a pyramid.

Here is a chematic of a Kirlian camera and man. During the positive swing, man is energized and during the negative he is grounded. The film is neutral and records the differences.

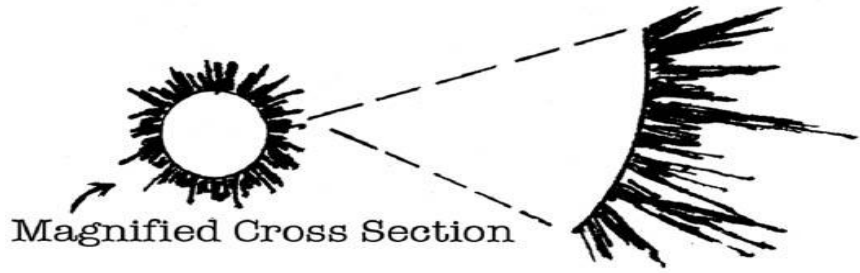
Figure X-8



We have noted three different types of development in man in hi-voltage photography. One does not indicate a better individual than the other, only that some people have evolved farther than others. We all get back to God eventually.

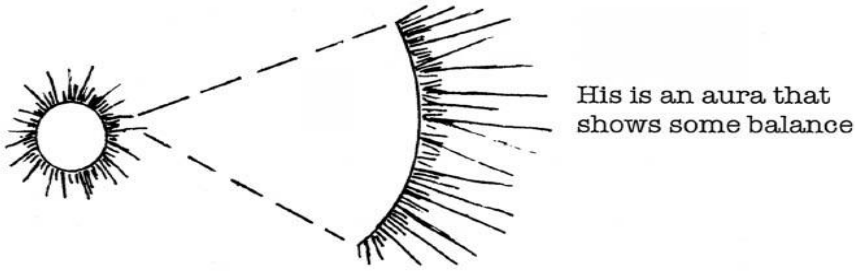
The first type is conscious man. His aura records as a rough unfocused imprint with points of light still undefined.

Figure X-9



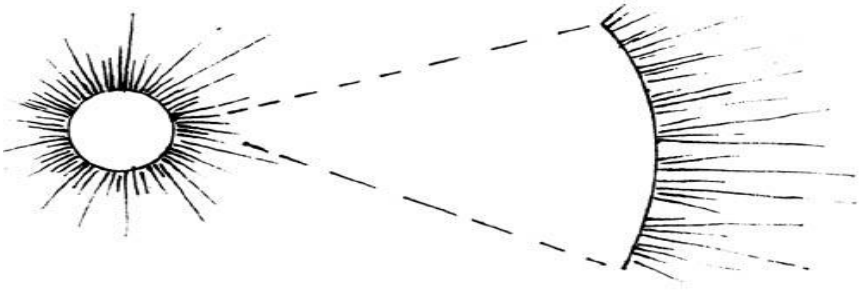
The second type is self conscious man. He is aware of himself in relation to others and knows he must balance.

Figure X-10



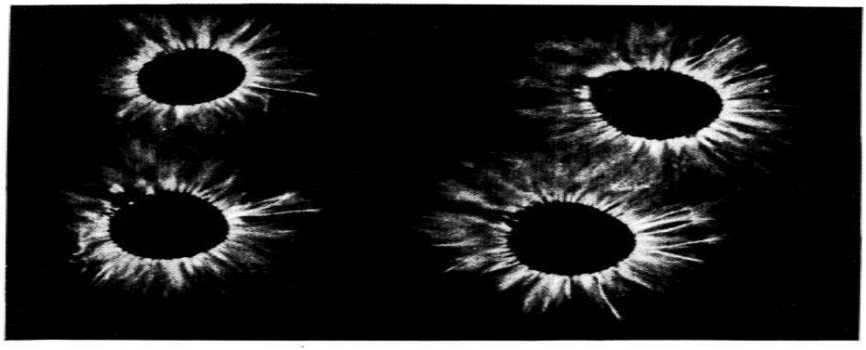
The third type is God conscious man. This is the man who has been aware of the balance and practiced many years, and is reaching body and spiritual perfection.

Figure X-11

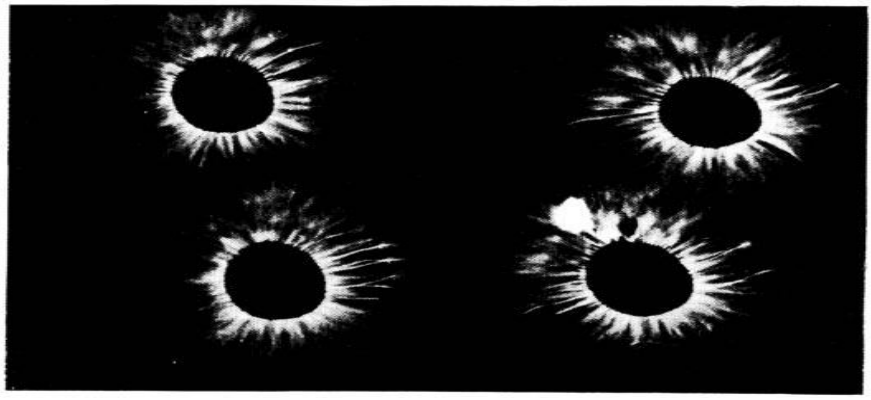


In the next picture, you will see actual examples of levels of development, and these levels being enhanced by the use of the Pyramid to balance the aura.

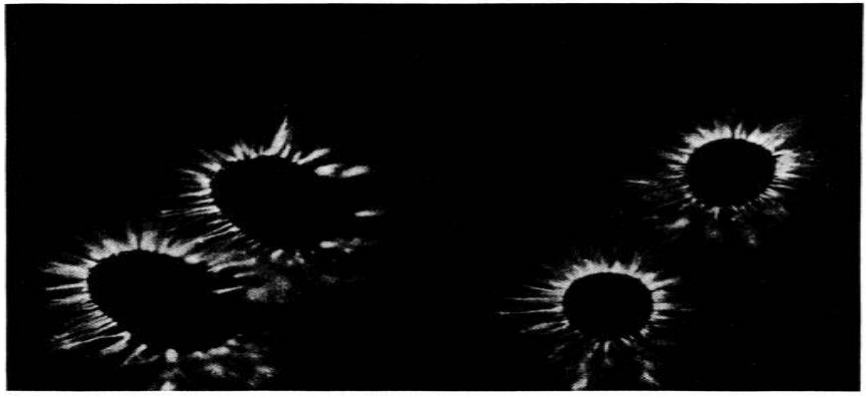
Figure X-12 KIRLIAN PHOTOGRAPHY



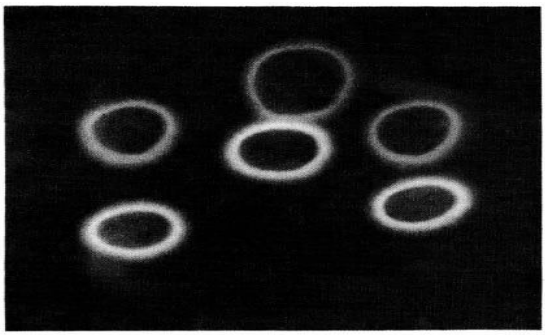
Set 1 indicates even energy distribution with the Firedome.

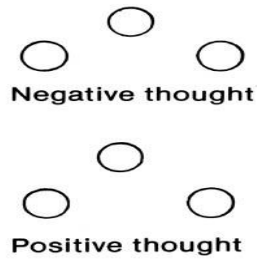


Set 2 indicates individual with Firedome has personality not fully integrated but balanced aura due to endocrine-balancing effect of Firedome.



Set 3 indicates strong personality totally unintegrated with extreme blockage, No Firedome being worn, on the left, and same individual as Set 2 being subject to unintegrated personality, but unaffected due to protective environment of the Firedome.



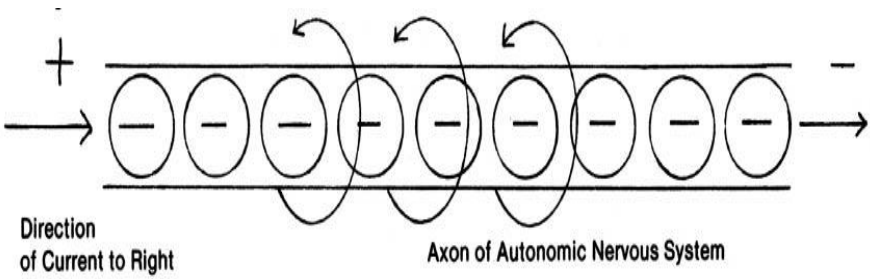


This photograph is of the author's right hand. The upper three fingerprints are of a negative thought and the elliptical pattern indicates my ability to release and separate or disassociate from the environment. This is necessary for balance for you must remove yourself mentally away from stress and view yourself from a point of no attachment. This allows a true picture of what is taking place.

The lower set of fingerprints is a positive thought, and I was meditating on healing. The misty line which connects the fingers forms a Pyramid and will be seen only on individuals who have opened their Kundalini under disciplined and careful practices. The line is the passage of life force sometimes called the silver cord.

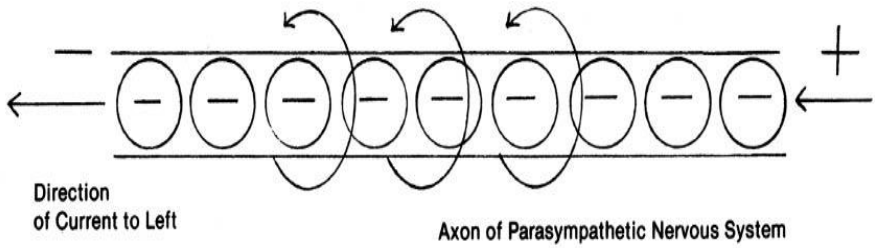
Now let us look again at the human aura. The sum total of all the nerve meridians passing electricity in the body creates a magnetic body of energy. The meridians are positive and negative in regards to one another.

Figure X-14



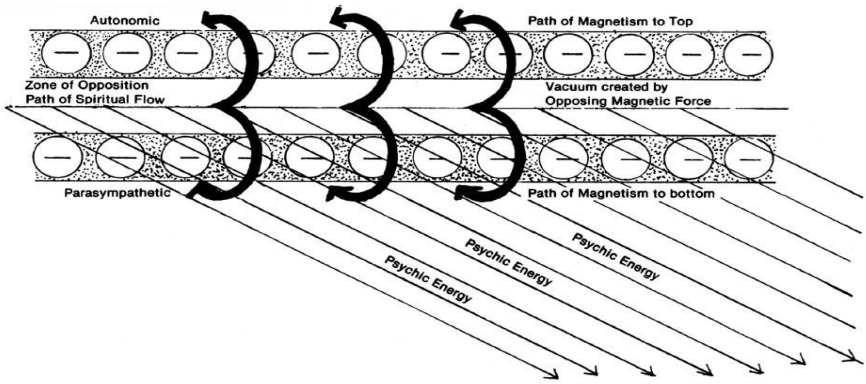
In the autonomic and sympathetic nervous system, the current travels from the right to the left. However, in the parasympathetic nervous network (vagus nerve), the current travels from left to right.

Figure X-15



This means that there will be an integration of energy in the meridians where these opposing directions of current meet. This path is the path left open to psychic energy, which moves down from higher planes and is clearly demonstrated as random and sporadic influences of light and dark splashes of light on the Kirlian picture.

Figure X-16



Because the parasympathetic is the only reverse-polarized network in the body, it is often called the psychic aerial of the body. When it is in perfect balance, it allows you to hear that little voice inside your head that tells you what is about to happen, usually a little bit before it happens, or when the phone rings and you already know who the caller is.

Now let us again look at the aura. The North Pole is in the third ventricle of the head at the site of the pineal and pituitary body, and the South Pole is in the base of the spine. In electricity, the voltage (potential) moves ahead of the current and in opposite directions. When connected across a battery, voltage moves from the positive terminal of the battery through the wire and comes to rest on the negative side.

Figure X-17

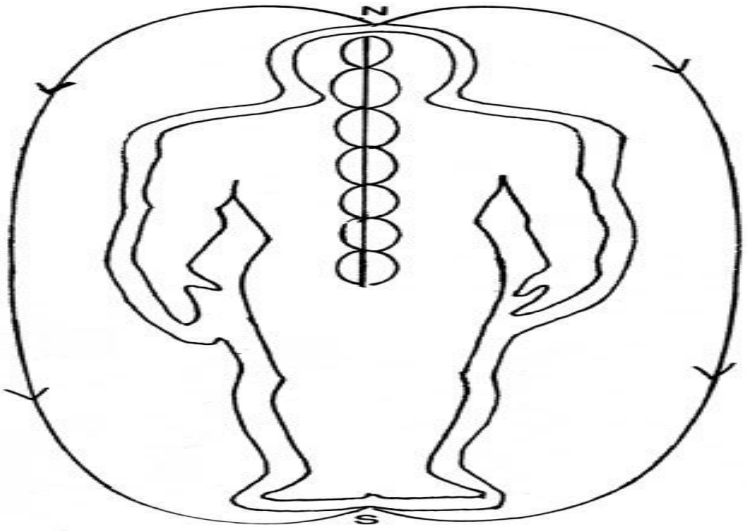
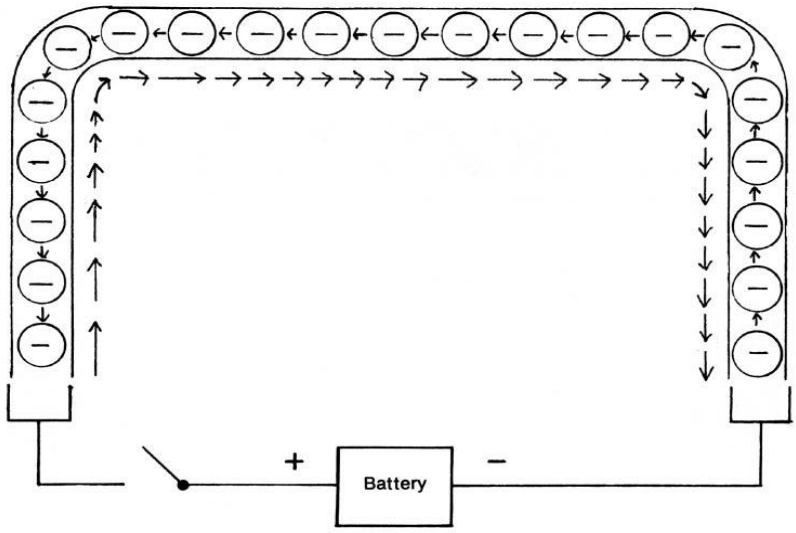


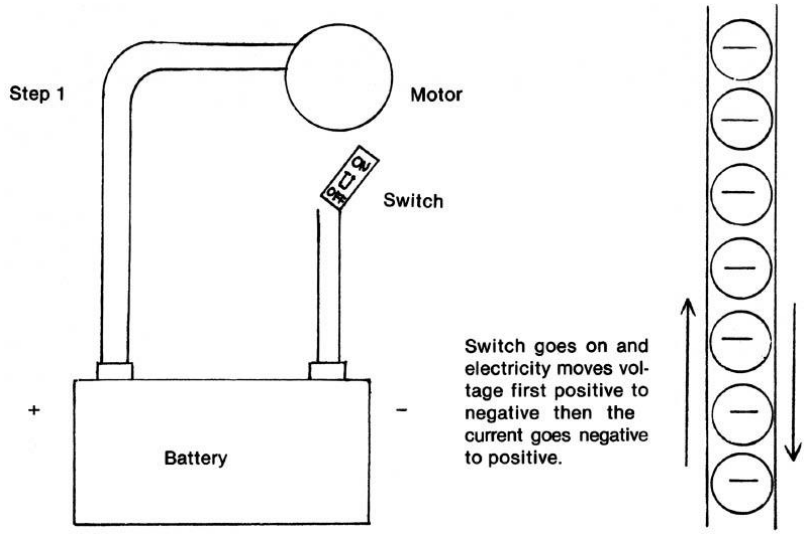
Figure X-18



Electrical current, however, moves in the opposite direction, and cannot flow until the positive potential or voltage completes its path and balances. Then current flows in the opposite direction and work is performed or motion set to be. An example is when you plug in an

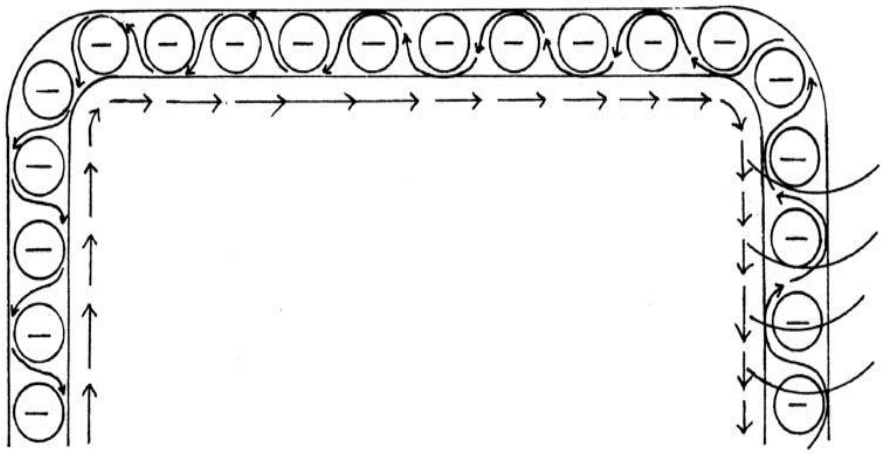
electric motor, the instant the switch is turned on, electricity would move through the wire and be felt across the motor. The speed at which electricity moves is that of light speed (186,273 miles per second).

Figure X-19



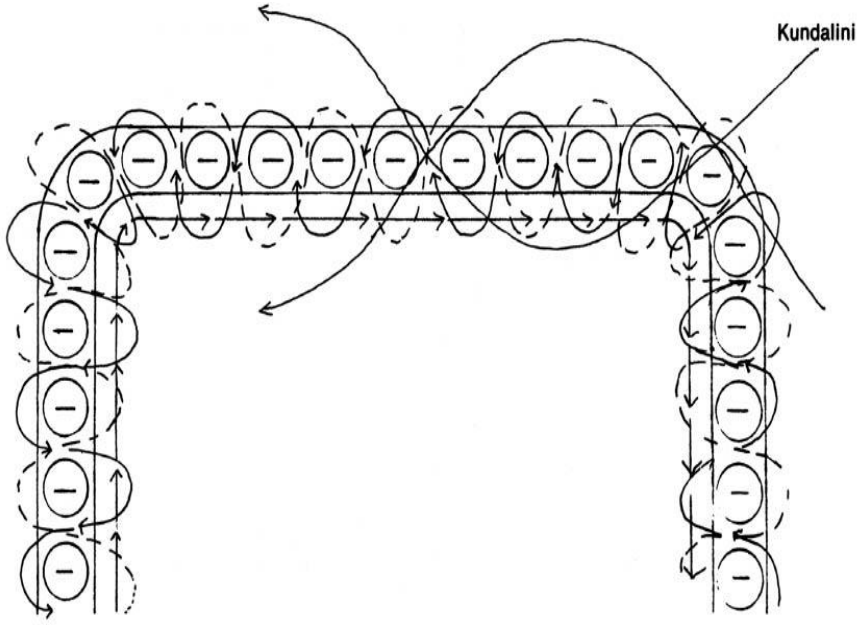
When the voltage is balanced across the circuit, then current moves in the negative to positive direction. Magnetism is a force set up at right angles the moment the current balances with the voltage.

Figure X-20



The same thing happens in us when we engage our minds to perform body work, except in step four, we receive energy from the higher planes.

Figure X-21

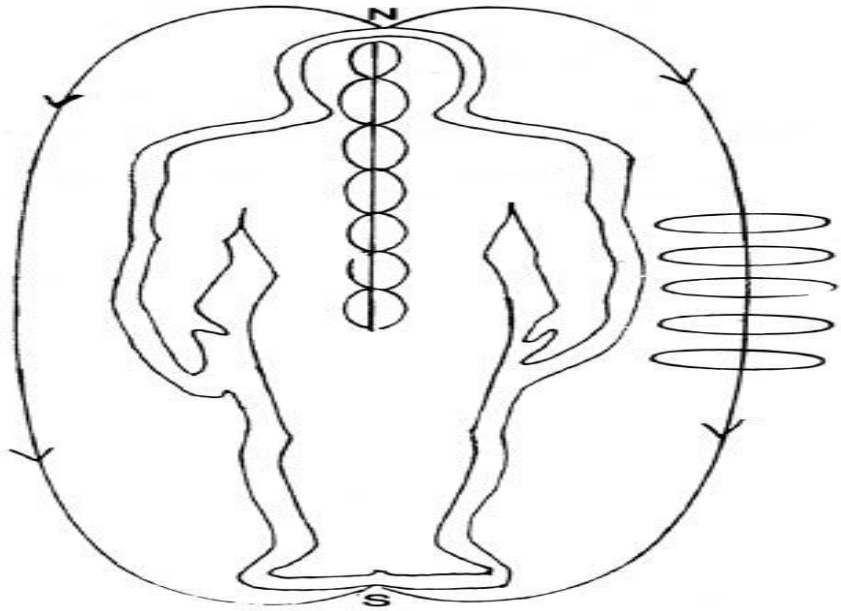


The Kundalini attracts an energy path from the higher planes. Magnetism is felt on the Physical Plane and motion of a motor begins. This same principle is true of human consciousness. When we enter a room where someone else is present, we immediately sense the presence (voltage) and then feel (current) whether they are good vibes or bad vibes. Next, we react either positively or negatively toward that person (motion). In human existence, karma follows the path of motion or action like the wake follows the boat propelled by the wind.

If we walk into a room feeling positive and meet a negative person, the ideal thing is to polarize that person positive also, i.e., create a positive feeling, heal, balance, etc. Then when you both feel positive, you and magnetism balances, true spiritual communication begins, because the true action of the spirit (wisdom) is then in totality with the form. Remember, during this time, your feelings are changing and consciousness is occurring. The more individual (self) you feel, the more individual is your consciousness. But as you move towards the feelings

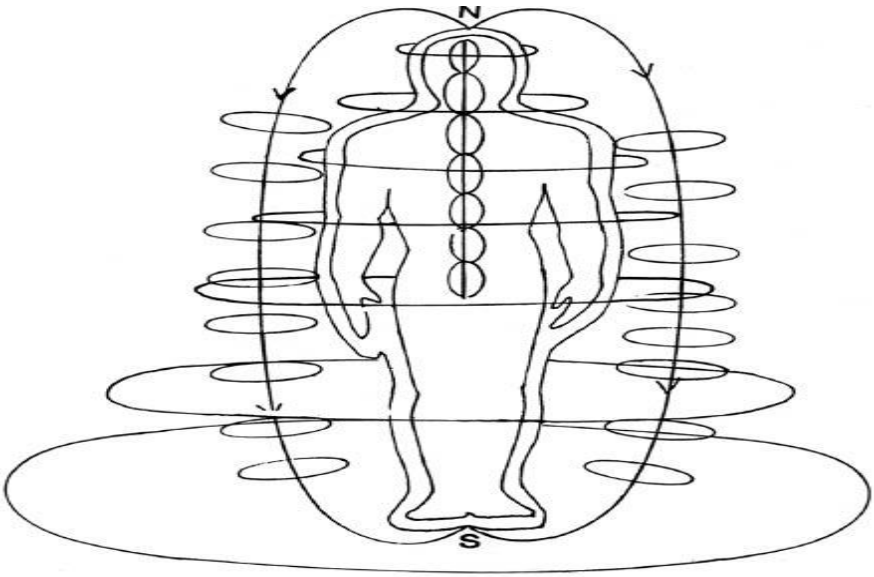
of another in a compassionate way (union of other selves), the more consciousness grows and unifies and shares with the whole (universal mind). The pattern of the whole (spirit) moves freely to your individual consciousness only when positive balance is achieved in group feelings. Here, 'group' means all living things; man, beast, insect, flower, etc. Thus the word spiritual (man's alignment, physical, chemical, electrical, emotional with other selves) becomes understood. Karma can be accumulated by the individual's failure to achieve balance. Thus the need for further experience is shown to the universe. Or the karma can be worked off by individuals reaching balance allowing spirit to be demonstrated on a physical individual level.

Figure X-22



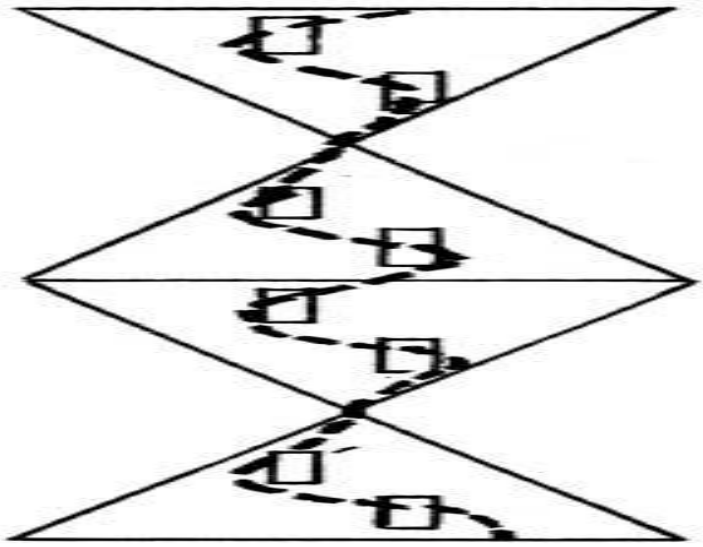
The actual nodes of electrical balance in the body can be calculated by the number of spokes in each chakra and the result will be a Fibonacci number. The Great Pyramid also depicts this by the location of the King's and Queen's chambers. If you stood thirteen Pyramids end to end and placed an imaginary thread through the chambers, you would see the path of Kundalini in respect to a living organism.

Figure X-23



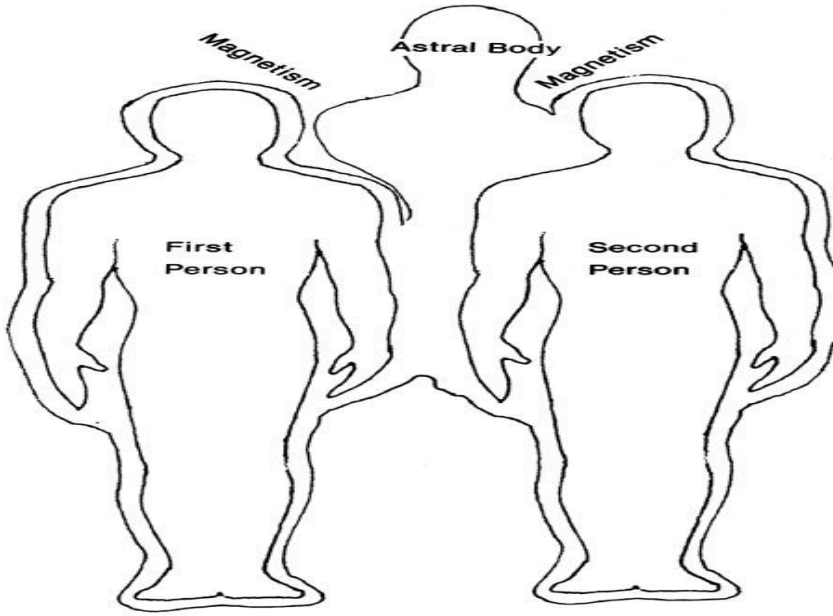
If you place pyramids end to end, you will see one half of the path of the Kundalini. If you imagine the pyramids end to end, in the other half of the wave you will find the Hidden Chambers yet to be discovered.

Figure X-24



As man learns this fact, and reflects this, it will give him courage to spend the time and money required to find the hidden passageways, because he will have discovered his own hidden treasures.

Figure X-25



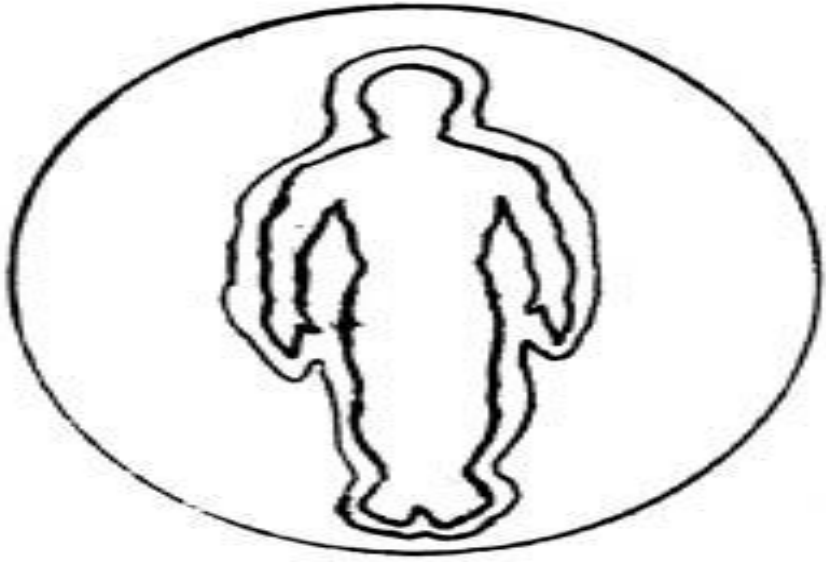
The Astral body is formed by two or more forms or persons when they are feeling each other. These feelings are not limited by distance or time. In Kirlian photography, the Astral body is represented by the ring finger.

The reaction of the five senses to the rhythm of the Astral body forms the pattern of logic used by the lower mind on the Mental Plane. This is known as the Causal body or the Auric egg.

When consciousness is directed from the lower mind, karma is created until logic establishes a path for feeling. Feeling births experience and demonstrates conscious mind harmony. When conscious mind achieves harmony from experience and conflict, unconscious mind comes forth to conscious mind, bringing forth spirit, and the third eye is said to open. This causes Intuition to be realized and spontaneous action becomes the lifestyle. This is the working of the higher mind or the upper Mental body. In Kirlian photography, we see both upper and lower, and call the lower the Mental body, and the upper the Intuitive body. The Mental

body is represented by the first finger. The small finger represents the Intuitive body and the thumb, the Godhead. More on Kirlian I cannot say at this time, but in my next book, I will touch again on this exciting subject.

Figure X-26



CHAPTER XI – THE CELL

It was three centuries ago that Robert Hooke of London, while observing slices of cork under his primitive microscope, saw that they were made up of a vesicular structure which reminded him of a honeycomb pattern. He called these walled cavities "cells".

The modern microscope has revealed an astonishing diversity in both the structure and the functions of the cell. Cells are shaped like rods, spirals, shoe boxes, spheres, daisies on their stalks, snowflakes, string beans and blobs of jelly. In some cases the shape of a cell is dictated by its surrounding environment; this is apparently true of the neatly shaped rectangular cells packed in the stalk of a plant and of the spherical floating eggs of certain marine animals. The shape of other cells is often related to their function; human red-blood cells are saucer-shaped and fairly flat, permitting the ready transfer of the oxygen and carbon dioxide they carry throughout the body, while nerve cells have long, thin extensions to transmit messages.

CELL LIFE

Nowhere, perhaps, in all the course of human evolution does the law of harmony and rhythm manifest itself more beautifully or more exactly than in the marvelous and complicated processes of cell life.

The majority of growing tissue cells undergo a very elaborate process of change and transformation termed mitosis or karyokinesis. In the concentrated granules in the nucleus is imbedded a substance of strange and subtle power. It possesses no distinctive shape until the cell is ready to divide. Then it arranges itself in long skein-like filaments which later, in response to unseen forces, begin to bend and curve and to assume a horseshoe shape. This subtle substance is known as chromosome (colored matter).

The principal point of interest in all this complicated process is that each species of plant and animal life has its own specific and fixed number of chromosomes and that each species duplicates the same rhythmic motion in cell division.

The evolutionary status of development appears to set its signature upon these differentiations. In certain life forms just entering the animal life wave, as, for instance, in a lowly worm, the number is two. A lily, on the

other hand, having reached well nigh a perfect attainment in the flower kingdom, sets its signature in 13 chromosomes. A human being bears evidence of his status in a mark of 48.

A cell can be a pleuropneumonia microbe 1/250,000th of an inch in diameter or it can be the yolk of an ostrich egg, which is the size of an orange. An organization of cells can be a buttercup, a mayfly, a 125-ton blue whale or a 1,000-year-old redwood tree.

This is variety with a vengeance. And yet, for all this diversity, all cells are built according to a fundamental design which provides them with certain common features apparently necessary to life. Every cell has an outer wall which makes it a room (the Latin meaning of "cell"). Within the surrounding membrane is a semifluid material called cytoplasm in which the life activities of the cell are carried on. At the heart of the cell is the nucleus, a control center that bears within it the cell's hereditary material, ensuring the survival of its line.

To understand both the nature of a cell as an independent unit and its role in the life processes of larger organisms, it is necessary to examine it on various levels; it should be studied as a whole organism, as an organization of structural parts and, finally, in terms of the molecular units which form the basic building blocks of the cell and its parts.

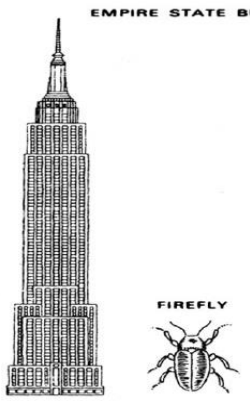


Figure XI-1

THE FIREFLY AS A MICRON

The drawings on these pages compare familiar objects and units of measurement with the infinitesimal units scientists use when they study the microscopic universe of the cell. The picture above illustrates the comparative size of the micron (from Greek, "small") and the inch. The Empire State Building, 1472 feet high, bears the same size relationship to a firefly as an inch does to a micron: both are 25,000 times larger.

THE CASE OF THE ANIMAL PLANT

The Euglena gracilis, one of the most versatile of all single-celled organisms, is an excellent subject through which to examine the

structure and behavior of the cell as a unit. Euglenas frequently make up the green scum that covers stagnant ponds. Though they are unique in a number of ways, euglenas share certain basic features with other single-celled organisms and with all the higher organisms, including man. One of the euglena's most unusual attributes is its ability to change its very nature – from plant to animal and back again to plant – as its environment changes. This microscopic half-plant, half-animal thus provides a showcase of cell operations in both worlds.

The stage upon which the euglena is seen as a whole cell is a relatively spacious one in which the unit of measurement is the micron, which equals 1/25,000th of an inch. At this level, enlarged 100 times under the light microscope, euglenas appear as bright green, mistily transparent creatures about the size of the head of a thumbtack and shaped something like long narrow boats: rounded at one end, tapering at the other and broadest amidships. They glide along with a sort of tadpole movement, with a bit of a wriggle, as they touch and veer away and slip over and past one another.

When the magnification is increased from 100 to 1,000 times, the euglena organism takes on the appearance of a kind of animated corkscrew. It literally "bores" its way through its watery world, revolving about its long axis with a screw-type motion with the aid of a single flagellum a whip-like extension which slashes around in the water. Sometimes the euglena stops boring and shifts to another type of locomotion. It pulls its rear end toward its front end, forming a ball, then extends its front end, then pulls its rear forward again and so on. Moving this way within its cellular wall, the euglena suggests the antics of a person trying to crawl while secured in a burlap bag.

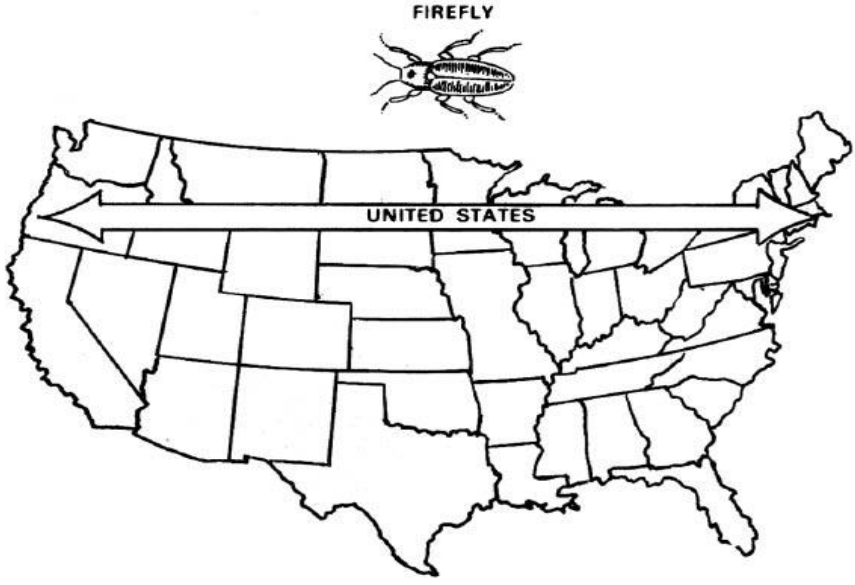
The sheath of transparent membrane which forms the cell wall of the euglena is permeable, allowing molecules of certain food substances to enter the cell. There is also a mouth opening and a primitive gullet which ingest food particles. The cell wall encloses the cytoplasmic fluid, a jellylike substance carrying the structures within which most of the life processes of the cell take place. Floating in the cytoplasm are a number of green bodies resembling bits of colored glass in a kaleidoscope; they are the chloroplasts, minute manufacturing centers which contain the plant pigment, chlorophyll. Deep within the cytoplasm lies the nucleus containing the cell's hereditary material – the blueprint for all succeeding generations of each particular euglena.

Since the euglena uses its chloroplasts to synthesize plant food from sunlight, air and water, it is generally listed as a simple plant. The euglena, however, is not this easily categorized, for it often slips over into the other great division of living matter – the animal world. In the absence of light, the plant transforms itself into an animal – that is, the euglena temporarily loses its green color and its ability to use light in producing food and, like amoebae and other micro-organisms classified as members of the animal kingdom, lives on ready-made foods available in the environment. When exposed to sunlight again, the euglena can revert to its green form and its plantlike existence.

A CELL THAT SEES

Though it is a relatively simple organism, the euglena can "see". Up front, not far from the gullet, is a single reddish eye or eyespot – one of the most primitive light-sensing structures known. As the euglena revolves and bores its way through the water, its eyespot scans the world outside. Apparently there is a link between the eyespot and the euglena's propulsion mechanism, for the organism bends its' body to swim toward the light. The creature also seems to be able to distinguish between red and blue light.

Figure XI-2



THE FIREFLY AS AN ANGSTROM

The angstrom is a tiny unit of scientific measurement whose size is indicated by this drawing of a firefly and the United States. It would take 250 million three-quarter-inch fireflies, end to end, to span the nearly 3,000-mile distance from coast to coast. It would take the same number of angstroms to span one inch. Even an electron microscope cannot reach below two angstroms.

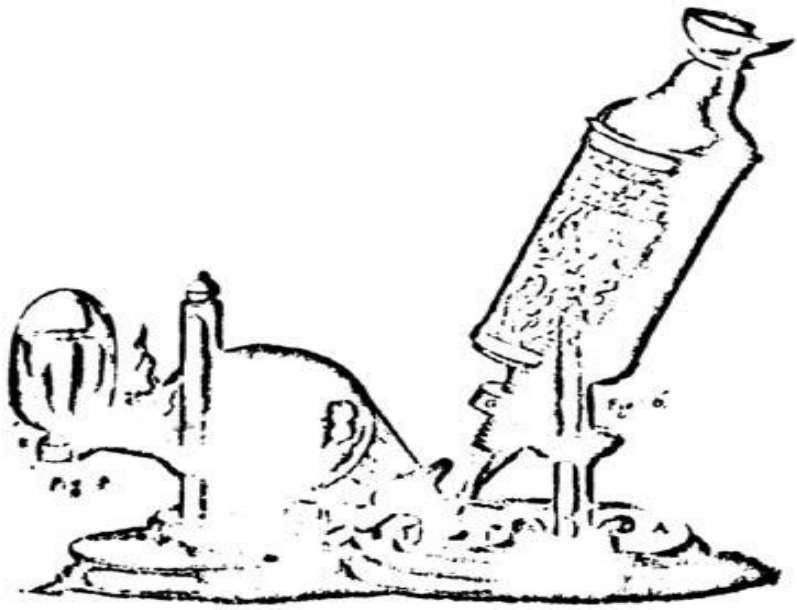
Communities of euglenas also exhibit a sense of time. Though individual euglenas live less than a day before passing through their reproductive cycle and dividing into two creatures, it has been proved by experiment that the movements of a colony of euglenas will follow a 24-hour rhythm. This experiment involves a euglena colony, a tank of water with a beam of light shining through it and a photocell, or electric eye, placed outside the tank to measure the intensity of the beam of light. When the euglena colony migrates toward the light beam in order to absorb energy to fuel the creatures' life processes, some of the light is dissipated or blocked off from the sensitive photocell. A recording device attached to the photocell keeps track of the colony's movements.

Repeated tests with this equipment reveal an approximate 24-hour rhythm in the euglena colony's movements. For 12 hours the euglenas respond to the light and gather in the beam; for the next 12 hours they ignore the light and scatter. The rhythm persists under unchanging laboratory conditions, where there is no night or day.

The rhythmic movements of the euglena colony, unrelated to any changes in the creatures' environment, will persist for a number of days. This suggests not only that the individual euglena possesses a biological clock, but also that the time-measuring facility is an inherited characteristic, being passed along from one euglena generation to the next. This sense of time is but one of the basic features which euglenas have in common with many other cells and with all the higher organisms.

These shared characteristics – such as the ability to reproduce, to react to stimuli and to produce the chemical compounds necessary to the cell's life processes – point to the familial relationship which joins all manner of cells. These shared features also underscore the fact that all species of living things, including the complex organizations of cells which form the larger organisms, have evolved from the single cell.

Figure XI-3



MICROSCOPE FROM HOOKE'S BOOK. 1665

THE FIRST FINDER OF THE CELL

In 1665 English scientist Robert Hooke published a description of an ornate new microscope he had perfected. Hooke did not invent the microscope (the invention is attributed to Dutch spectacle-maker Hans Janssert or his son Zacharias, about 1590), but this instrument was powerful enough for him to see and identify the entity which he named the "cell." Today's light microscopes work on the same basic principle.

INTO THE SUB-MICROSCOPIC WORLD

Cells also disclose subtler signs of the unity of all life. To observe these less obvious relationships it is necessary to shift the level of observation – to turn from the cell as a unit to a study of its individual parts and their coordinated activities. The shift in scale demands the use of modern developments in electronics and biochemistry.

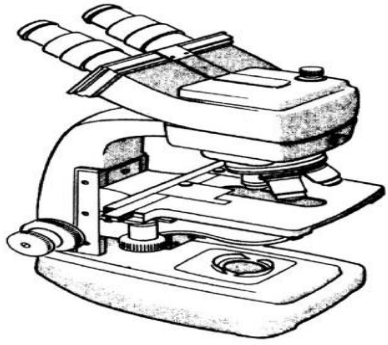
Until a relatively few years ago, man's conception of the cell was limited to what could be seen through a microscope employing visible light. Magnifications of 1,000 to 2,000 times, the practical limit for the so-

called light microscope, revealed the cell's outline, the cytoplasm and the nucleus at the center. Smaller structures either appeared as tiny dots or strands, or remained invisible. For many years the ability to observe these smaller entities of the submicroscopic world was restricted by the limitations of the light microscope, which resulted from the relatively long length of the waves of the visible light employed in the instrument. Something smaller than a light wave was needed to "see" the minute working parts of a cell.

The most important step in the long-term endeavor of opening the interior of the cell to further visual exploration occurred in 1931 with the development of the first practical electron microscope. This relatively massive instrument employs high electrical voltages to drive a beam of electrons through a vacuum to magnify the image of the object being observed. As the wavelength of these electrons is about 1/100,000th that of the normal wavelength of white light, the electron microscope can discriminate between far smaller objects. Actually, present-day electron microscopes can detect objects about 1/1000th the size of those revealed by the best light microscopes.

A second modern aid to the study of the cell has been the development of biochemistry during the past two decades. Chiefly through the use of radioactive agents, scientists can now "tag" the atoms and molecules that form the building blocks of cells and follow them through the various life processes constantly at work within the cell.

Figure XI- 4



LIGHT MICROSCOPE WITH BINOCULAR VIEWING

A POWERFUL TOOL OF SCIENCE

Fundamentally the same as Hooke's instrument, the modern light microscope still preserves the sequence of light source, condenser, object, objective and eyepiece. But two centuries of improvements have made it a vastly superior tool. In this model, the object is seen by transmitted light: mirrors and prisms permit two-eye viewing: its effective magnification is about 2,000 diameters, contrasted with the 100 diameters for Hooke's instrument.

THE THINNEST SLICES EVER MADE

The electron microscope reduces the observational area of cell study to a stage on which the unit of measurement is the angstrom (a unit named after a Swedish physicist, who used it in his study of light-waves), which is equal to about one 1/250 millionth part of an inch, or 1/10,000th of a micron, the dimension used in light microscopy. Working at this level, investigators embed cells in transparent plastic, slice them into sections a few millionths of an inch thick by means of glass or diamond knives, and examine the specimens at magnifications which range up to 200,000 times.

From the electron microscope and biochemical research has come a precise picture of the cell's outer membrane. The single-celled euglena, the cells of men and the cells of all the intermediate species have the same basic type of outer coating, consisting of a layer of a compound called protein on either side of a thin layer of fat. The total thickness of the sandwich is about one three-millionth of an inch.

The electron microscope not only shows more details of previously known parts of the cell, it also reveals new parts. The light microscope and meticulous staining techniques disclose what appear to be stringy structures in the fluid portion of the cell. These barely visible structures spring into focus when seen at the high magnifications available in the electron microscope.

These structures, submerged in the fluids of the cell, form networks of hollow ducts, a maze of segmented micro-tunnels. These networks are known as the endoplasmic reticulum, or ER for short, and its branching channels extend throughout the cell's interior like a system of roots or blood vessels. Generally, the ER is believed to be a transport system designed to carry materials from one part of the cell to another.

The "factory district" of every cell also lies in the cytoplasm, in the form of numerous ribosomes, spheroids a little less than a millionth of an inch in diameter. Ribosomes are the site of the manufacture of the protein compounds which form a major part of every organism. Proteins – various combinations of carbon, hydrogen, nitrogen, oxygen and, usually, sulfur, exist everywhere – in cells which make up tissues and organs, in membranes and muscle fibers and skin and bone and cartilage. (Among the most important proteins are substances called enzymes, which keep the wheels of life spinning by speeding vital biochemical processes.) To manufacture the many forms of protein it needs, a cell may utilize thousands of ribosomes, some floating in the cytoplasm and others attached to the ER like berries on a vine.

Two other parts of the cell are currently the subjects of intense study: Golgi complexes and mitochondria. The Golgi complex is named after Camillo Golgi, the Italian physician who discovered it nearly 70 years ago in the brain cells of barn owls. It consists of four or five flat hollow disks which may have swollen or bulbous edges and are piled one above the other like saucers. Biologists now know the Golgi complex is involved in the "packaging" of the proteins manufactured in the cell, turning them into units that can be distributed outside the cell.

POWER PLANTS OF THE CELL

Mitochondria are so elaborately designed that they have been referred to as cells within the cell. Their interiors look something like cutaway models of ocean liners, with many chambers and compartments and dividing walls. They are miniature power plants and provide the cell with the energy it needs for growth, reproduction and other functions.

Most of the cellular structures revealed by modern microscopes – the ER, the ribosomes, the mitochondria, the Golgi apparatus and the nucleus, as well as many others – are common to all cells. Microphotographs disclose them in many specialized cells such as those of the human heart, brain and liver as well as in the free-living euglena. But a catalogue of parts does not explain how the assembled machine works. This emphasizes the chief limitation of the electron microscope; it provides pictures of dead material, pictures of cell sections in which all activity has been "frozen". The problem facing biologists is, therefore, to reconstruct the dynamic operation of a cell from static photographs which show how the cell looked during a brief instant of its lifespan.

This is like trying to deduce the plot of a feature-length motion picture from a few frames clipped from the entire roll.

One way to visualize a cell in action is to construct a hypothetical working model of an average cell and then "feed" into the model information which has been gathered through microscopic and biochemical studies. Though such a procedure (sometimes called a "thought experiment") poses the danger of oversimplification and the risk of having conjectural material taken for fact, it has the great virtue of showing the cell as the restless and dynamic heart of life.

Let us assume, therefore, that someone has invented an instrument which would show a live, single-celled organism in three dimensions, magnified 100,000 times. The living model which resulted would be a globular mass about six feet in diameter enclosed in a thin, flexible membrane. This hypothetical giant is a viable body, continually changing in shape, heaving and pulsing, oozing out here and snapping back there, like a rubber sheet. Even the outer membrane operates as a highly active system. It extends tentacle-like arms in an incessant search for food and footholds. It folds around outside materials and engulfs them. It contains many gateways where only selected molecules may pass. The two-way traffic shuttling through these gates is swift and steady.

Swimming in the fluid interior of this giant model are the mitochondria, sausage-shaped bodies almost a foot long and several inches in diameter. Like fish among coral reefs, the mitochondria dart in and out of spaces near the lattice structures of the ER. Partly hidden at the center of the cell is the nucleus, a dense body which looks something like a medicine ball. The fluid between the nucleus and the cell's outer membrane is marked here and there by cloudy patches, indicating the presence of ribosomes. Even at this magnification the ribosomes are no larger than the head of a match.

TURMOIL IN THE CYTOPLASM

The interior of the giant cell is in a continual state of upheaval. The ER network not only shifts and sways like seaweed in the surf along a rocky coast, but actually breaks up into pieces and re-forms and breaks up again. The mitochondria have been described as cylindrical bodies, and that is true if one thinks in terms of photographs, which catch them in a fraction of a second. But in the living cell they twist and slither along like

eels – very peculiar eels since they are constantly splitting into equally active bits and fusing end to end to form elongated swimming systems. Moving with them, drifting about in cytoplasmic currents, are fatty globules and fragments of the ER.

A few minutes in the presence of such a huge animated blob would hardly bolster one's faith in the harmony of nature. The initial impression would certainly be one of utter chaos. Yet there is an order in this strange commotion. It is the invisible and elusive kind of order called life, a phenomenon which in some ways seems increasingly difficult to comprehend as we learn more and more about it.

What delicate equilibrium of forces preserves the integrity of higher organisms? They are, after all, systems made up of these same ever-changing and hectically active cells. The adult human body is estimated to contain 60,000 billion cells, every one of them subject to the rules and regulations of the group. Yet every one of them also remains a rugged individualist and may go on rampages and break laws. An example of this antisocial behavior is cancer, which foists a sort of mob rule by errant cells upon the body.

Figure XI-5

A MOLECULAR MATCHMAKER

The drawing below illustrates the function of an enzyme. The boy and girl represent molecules that are capable of getting together, but are chemically shy. An enzyme, the matronly matchmaker, breaks the ice and then leaves, chemically unchanged. Such a substance, which causes a reaction but is not changed by it, is called a catalyst. There are more than 700 known enzymes – biological catalysts – such as ptyalin in saliva, which breaks down starch, and pepsin from stomach cells, which aids digestion by splitting proteins.

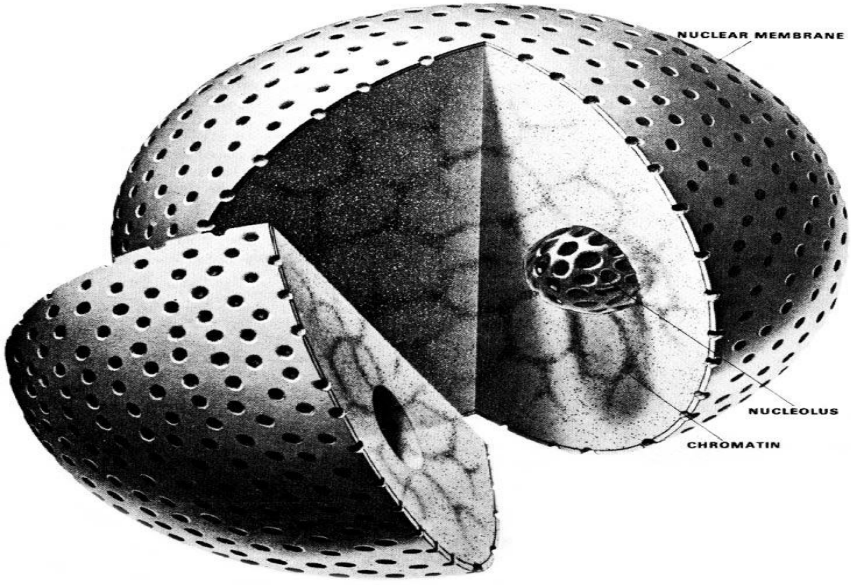
It speaks well for the body's control mechanisms that things run smoothly more often than not. We are more or less the persons we were yesterday because a kind of cellular discipline has been maintained, although it is by no means a rigid discipline. Every organism must keep its biological books balanced throughout its lifetime. Every second some 50 million of your body cells die. During the same period 50 million infant cells are born to take the place of the dying cells.

All organisms endure in a "soft" way – by shifting and riding with punches, by avoiding impacts, by yielding to forces and slipping around obstacles. Life may be compared to a candle flame, a cool blue flame. Something enormously complex is going on inside the flame. It is a burning process that involves the continual play of atomic particles, a constant replenishment of fuel and a constant transformation of energy.

The flame is never the same yet always the same. The matter that makes up the flame at any given instant has vanished by the next instant and has been replaced by fresh matter. What persists in this luminous heart of chemical activity is not the substance but the form. And life itself persists in an analogous, although far more complex, fashion.

CONTROL – KEEPING THE CELL IN OPERATION

Figure XI-6



THE BRAINS OF THE OUTFIT

The cell's brain, the nucleus, is contained by a pore-pocked membrane through which the nucleus communicates to the surrounding cytoplasm. The nucleolus (of which there may be several) is something of a mystery, but it may be the vital source of nuclear protein. The chromatin material contains all the heredity information needed for the reproduction of new cells.

Anything that works, works best under control. For a door, the knob provides the control point. For the cell, control is located in the nucleus (below) – a computer, design department, construction boss and board of directors all rolled into one. Almost all the cell does is supervised by the nucleus. Cut an amoeba (a one-celled animal) in half and that part with the nucleus grows back and thrives; the other half falters and dies. Graft an extra nucleus into an amoeba and the animal will grow in size as dual command posts order double of everything.

But the nucleus's most dramatic performance comes during the cell's division. An urgent message brings about a mystifying change; cell activity appears to stop dead, as if in response to a factory's five-o'clock whistle. Gradually the nucleus dissolves; soon two nuclei form and the cell divides in two. Suddenly there are two cells, at full production, each under the competent command of a brand-new boss.

POWER – PRODUCING ENERGY TO MAKE THINGS HUM

Where does the energy come from that keeps a small boy going at full blast all day long? For little boys, as for all living things, plant and animal, it comes from a tiny, sausage-shaped pod (below) with a Greek name, mitochondrion. The mitochondrion – along with perhaps 1,000 more in every liver cell just like it – is the powerhouse of the cell.

Its job is like that of a generating plant in which a raw material – coal – is burned to produce power – electricity – which is then sent out to light lamps, heat stoves and run machines. The mitochondrion's raw material is the food absorbed by the cell and partly broken down in the cytoplasm. In a chemical operation, the cellular powerhouse "burns" the food to release its energy and then loads this energy onto a chemical molecule with a jawbreaker for a name: adenosine triphosphate, or ATP for short. This precious stuff – essentially raw power – is to cells what electricity is to the machines in a factory: it runs them.

Figure XI-7

THE SEAT OF POWER

The cell's powerhouse, the mitochondrion, consists of two membranes, one enclosing it, and one which folds voluminously back and forth across the anterior. It is here, within the membranous folds, that the conversion of food to energy takes place. The spherical granules are regions which collect calcium (and possibly magnesium) needed for the mitochondrion's work.

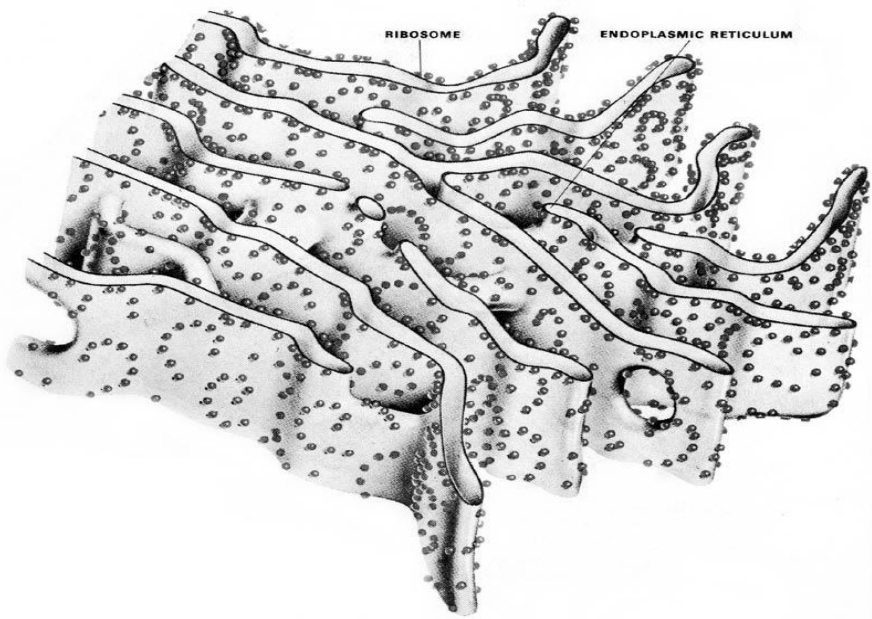
PRODUCTION – MANUFACTURING FOR GROWTH

Just as any manufacturer does, the cell takes simple materials and transforms them into complex substances. And just as a manufacturer must be prepared to deliver his product to customers, so some cells deliver their materials where needed. Part of this manufacturing and trucking firm is shown below. What looks like scattered buckshot are

manufacturing units which put chemicals together – just as a child stacks blocks – to make protein, the prime building material of the cell.

These units are called ribosomes and they do their work under supervision of the nucleus. Sometimes they operate in isolation, but often they are linked in a transfer and delivery setup known as the endoplasmic reticulum, or ER for short. A fine mesh of hollow sheets (below), the ER spreads in networks through the cytoplasmic material. Parts of it are connected to the nucleus, and scientists believe that it transports the proteins made by the ribosomes around the cell.

Figure XI-8



A JOINT OPERATION

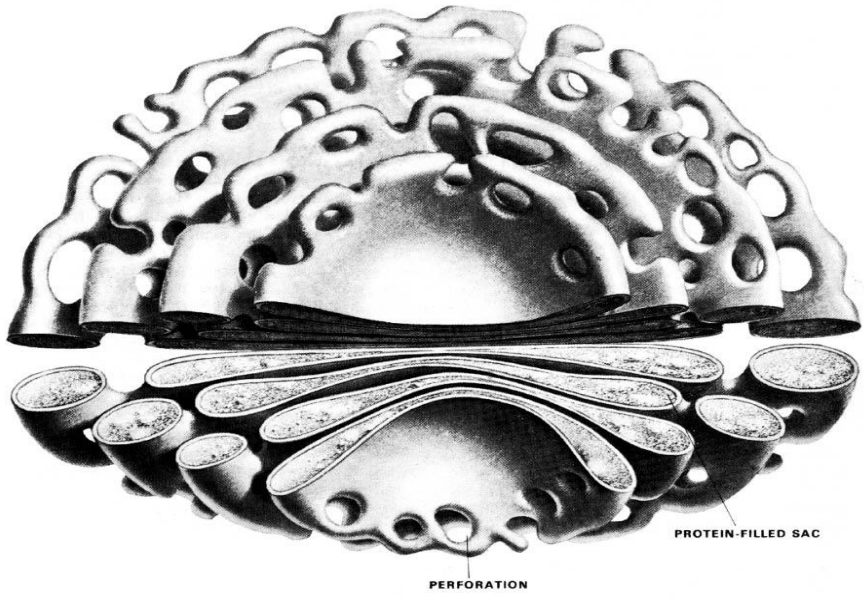
The ribosomes shown dotting the endoplasmic reticulum are thought to be made at the surface of or inside the nucleus and then sent out to produce their protein in the cytoplasm. Their teamwork with the ER is especially apparent in cells that make protein to be shipped out, but in many cells that do not export their products the ribosomes float freely in the cytoplasm.

PACKAGING – WRAPPED FOR SHIPMENT

Though it was discovered back in 1898, the odd-looking apparatus below is still one of the cell's most baffling mysteries. It was first seen by (and is named after) Italian physician Camillo Golgi in the brain cells of a barn owl, and later in the nerve cells of a cat, but its existence was emphatically disputed for many decades until the modern electron microscope proved its presence in almost all cells. All together, more than 2,000 learned papers have been written about it – and yet even now there are very few facts that can be stated with certainty.

Scientific consensus is that the Golgi bodies store and package proteins which the cell exports. Proteins, produced and delivered by the assembly-line operation on the opposite page, come to the Golgi body and collect in its hollow sacs. When protein is to be shipped out – or perhaps even when needed inside the cell – bits of the Golgi body break off, and the protein, neatly packaged, goes off to market.

Figure XI-9



A STACK OF SACS

This view shows a Golgi body from the top and also in cross-section. It consists of a stacked pile of flat, protein-filled sacs, which, at their outer edges, are pitted with perforations. It is these frayed edges which break away as free-floating packets of protein. Golgi bodies are most often

found in animals, though some plant cells appear to have similar complexes.

Life, wherever it exists, is a product of starlight. All life on earth feeds on radiation coming from a yellow and middle-aged star which we call the sun. The energy of sunlight becomes life through the mediation of plant and animal cells. The essential operation involved consists of changing energy from one form to another – specifically, transforming radiant energy from the sun into chemical energy which enables the single cell to thrive and multiply, the tree to flourish, the tiger to stalk its prey and man to write his history in the stars.

Every cell needs energy to maintain its organized structure and to perform the varieties of mechanical, electrical and chemical work that constitute its life processes. This chapter traces the course of this energy, from its origin in sunshine through the electrical and chemical transformations that package it into food and fuel for the living cell.

Sunlight, the energy released from the fusion of matter by the thermonuclear furnace within our sun, radiates into space in all directions. A tiny fraction of the total, about one part in two billion, reaches the surface of the earth. Plants capture about a hundredth of this trickle of radiation and use it to drive the balanced processes of life.

The role the sun's energy plays in life processes on earth is illustrated by a simple experiment. A snail is placed in a glass test tube about two thirds full of pond water, and a growing piece of any aquatic plant is added. Then the tube, its open end sealed, is exposed to the sun. Within the sealed glass tube, the life processes continue. Fueled by sunlight, the green plant takes in carbon dioxide and water from the surrounding atmosphere, and gives off oxygen as it builds and replenishes its substance. The snail absorbs the plant's oxygen wastes, emits carbon dioxide and eats the plant tissues, which contain food for animal cells. If the cycle is properly adjusted and if the plant's life processes work just fast enough to replace the tissues which the snail is eating, the result is a system which may remain balanced for weeks or months.

The process by which cells use sunlight to transform carbon dioxide and water into life-sustaining chemical substances is called photosynthesis. Early naturalists believed that plants derive all their food from the soil – an assumption generally known as the Humus Theory. Johann van

Helmont, a Flemish physician, disproved this hypothesis around 1630 when he planted a willow branch weighing five pounds in 200 pounds of soil – and found that after a five-year water diet the plant had gained about 164 pounds and the soil had lost only two ounces.

Van Helmont concluded that the water, rather than the soil, nourished the plant. It remained for scientists of a later day to prove that plant growth is a result of combining water and carbon dioxide, and that the energy for this manufacturing process comes from sunlight captured by the plant leaves.

We now know that the unique transformation process involved in photosynthesis is accomplished in two distinct steps. The first group of reactions is called the "sparking" sequence. This operation depends on the presence of light, and is a characteristic feature of the life process of plant cells. Once this initial step, unique to the plant world, has been completed, the rest of the energy-transformation processes necessary to life can take place without light. These appropriately named "dark" reactions may be found throughout the living world, in animals as well as in plant cells.

The plant in the sealed test tube carries out the sparking sequence – a series of reactions that is still under intensive investigation. The best way to visualize the first link in the chain, the first reaction, is to imagine a single ray of sunlight as it enters the test tube and passes through the wall of one of the cells of the aquatic plant and then through a wall within a wall – the outer membrane of one of the many globular bodies floating in the cell's fluid interior. These bodies are called chloroplasts, and it is they that contain the apparatus for photosynthesis.

THE LIGHT TRAP

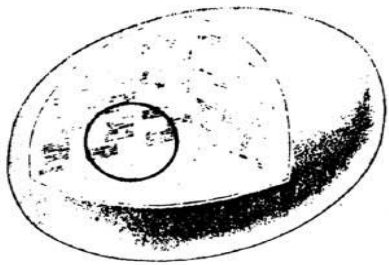
Within the chloroplasts are light-trapping molecules of a substance called chlorophyll. The first reaction of the photosynthetic process takes place within these green-colored chlorophyll molecules. To understand how this reaction works, it is necessary to examine the arrangement of atoms which gives the chlorophyll its chemical character.

The chlorophyll molecule is a complex organization of carbon, hydrogen, nitrogen and oxygen atoms surrounding a magnesium atom. Associated with these atoms is a cloud of orbiting, negatively charged electrons, which are normally in a low-energy state. When a ray of

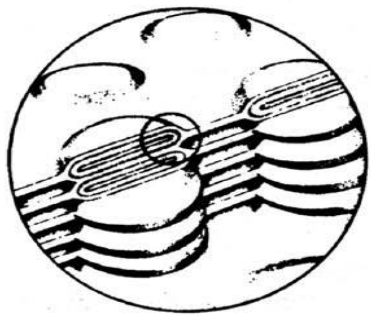
sunlight strikes the green plant, one of these low-energy electrons may absorb a particle (called a photon or quantum) of light energy and jump to a higher energy level.

Figure XI-10

LETTING THE SUN SHINE IN – AND THEN HOLDING IT



CHLOROPLAST WITH EXPOSED GRANA



GRANA STACKS OF QUANTASOMES

QUANTASOME CONTAINING CHLOROPHYLL

MICROSCOPIC MINT WAFERS

Before a plant cell can transform sunlight into chemical energy, it must first capture light. The snaring is done in the chloroplast (top), a highly organized structure about five thousandths of an inch long. The chloroplast is made up of columns called grana (center). A granum is a pile of quantasomes (bottom) arranged in a pattern resembling a stack of mint waters and containing the light-snatching green molecules of chlorophyll.

For a rough idea of the nature of this reaction, think of a man at a test-your-strength circus sideshow. He swings a heavy mallet, slams it down on the padded end of a lever, and sends a weight shooting up a grooved shaft toward a bell at the top. The weight strikes the bell, making a loud clang.

The raised weight in this analogy represents the electron after it has absorbed a light photon and moved to a higher energy level.

Now imagine that in another instant the electron, like the weight, will crash down to ground level and dissipate its energy. This, in fact, is exactly what takes place most of the time in the atomic world. Everywhere on the earth's surface, countless electrons are gaining and losing energy, absorbing and emitting light, jumping from one level to another.

It is at this point in photosynthesis that the life processes begin. With an extraordinary intervention at this crucial moment, the earth might be as sterile today as it was in the beginning. To be of use in sparking life, an electron must be drawn into the photosynthetic process while it contains an extra charge of energy – while it is, as the scientists say, "excited". If the timing is not exact, the electron will lose its charge of energy spontaneously and return to its former low-energy state.

A BUCKET BRIGADE FOR ENERGY

As yet, the exact manner in which the excited electron enters the photosynthetic process is unknown. Current studies suggest that the electron excited by the light photon, having gained enough energy to leave the chlorophyll molecule, moves to a special site called a "trapping center". At this site the excited electron parts company with the chlorophyll molecule temporarily and hops to a neighboring body known as an "acceptor" molecule. This hop-and-catch of the electron must be a high-speed movement, for an electron usually remains in its excited state for less than 1/100 millionth of a second.

Having trapped the energetic electron outside the chlorophyll, the first acceptor molecule now passes the charged-up runaway along a chain of four other acceptor molecules. Each one of these electron-carriers, or transfer agents, drains some of the energy from the excited electron before passing it on to a neighbor. The action of this transport chain could be compared to the tossing of a hot potato around a circle, from person to person, until it cools off. The last step for the electron involves a return to the chlorophyll molecule. In essence, the prodigal electron, having left by the front door and distributed its riches, now returns home through the back door.

According to current theory, this electronic bucket brigade works constantly in the photosynthetic process. As long as light is available, electrons move along definite pathways, out of chlorophyll molecules

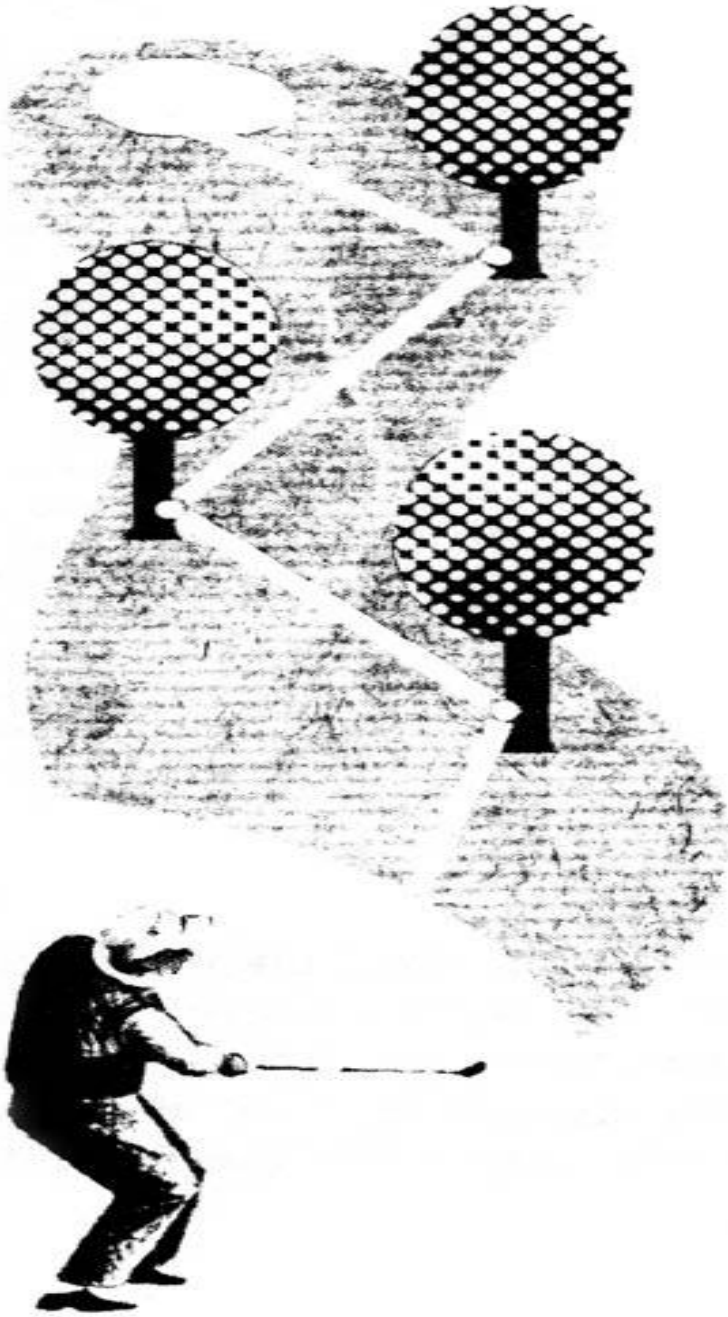
and along chains of acceptor substances and then back to the chlorophyll molecules again. In the course of this step-by-step movement, the electrons distribute their excess energy to provide fuel for the life processes. This movement of electrons is actually a kind of electricity. Life is powered by this energy and the generators which produce it are located in the chloroplast light-traps, the chlorophyll molecules.

This existence of electrical energy-producing processes within the cell carries certain implications. Sustained electric currents cannot be obtained simply by throwing some parts together. Organization, plans and circuit diagrams are needed, just as they are in the production of man-made electricity. Nature makes use of precise plans and specialized equipment in its energy-producing processes in the cell; furthermore, powerful microscopes reveal details suggesting that existence of an even more sophisticated circuitry at the molecular level – an important frontier of cell research.

Within the chloroplasts the higher magnifications of the electron microscope reveal certain drum-shaped cylindrical bodies, called grana, which are linked together in chain formations. Magnified 90,000 times, each one of the grana is seen to consist of about a dozen disk-shaped envelopes, stacked one on top of another like a pile of pennies. The flat chlorophyll molecules are too small to be seen, even at this high magnification, but it is believed they are contained within the enveloped of the grana.

It is at this level, where biology and electronics meet, that problems of cellular organization are encountered in their full complexity. The same basic phenomena seem to be taking place in the grana, the close-packed cylindrical bodies within the chloroplast, as in the crystal lattices of the transistors that are now used in many television, radio and radar sets, electronic wristwatches and the guiding systems of long-range missiles. The operation of transistors involves the controlled flow of electrons through fixed atomic structures; the plant bodies designed to capture solar energy appear to function in the same way. The substance of cells is a fluid, gelatinous material; but within it, beyond the present range of the most powerful microscopes, are rigid, semi-solid structures. Something crystalline, something electronic, is at work within every plant cell.

Figure XI-11



CAROMING A MOLECULAR GOLF BALL

In this drawing the golfer's club represents a photon and the ball is an electron. When a photon hits a chlorophyll molecule, an electron is slammed into an excited state. It then travels on an erratic course of "acceptor" molecules—trees, in this analogy. The electron loses energy at every bounce until it returns to its original level—at rest on the green. Energy at each step is used to produce ATP.

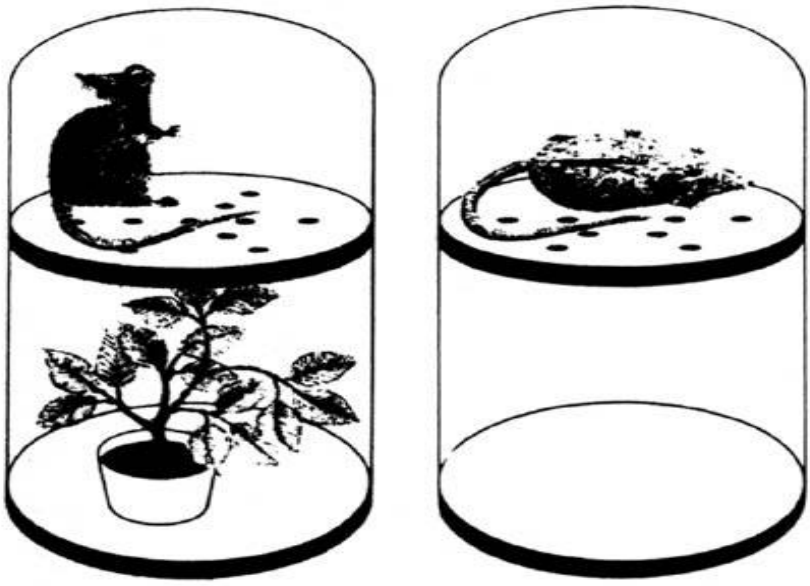
MAN'S SOLAR BATTERIES

What has happened so far in the plant cell within the test tube? A controlled flow of electrons has been produced by the chlorophyll molecule in the chloroplast. Light energy has been converted into electrical energy, as it is in the solar batteries designed to provide power for artificial satellites.

The essential point of photosynthesis, however, is not to create currents but to make energy-rich food substances out of the carbon dioxide and the water which the plant extracts from its environment. The next step of the photosynthetic process employs another conversion, the conversion of electrical into chemical energy. The energy released by the chloroplasts' electrons must now become a part of a chemical compound.

This change in the form of the energy carried by the chloroplasts' electrons takes place while they are losing their excess energy along the electron-carrier chain of the acceptor molecules. The mechanics of the process can be explained through an analogy. The process resembles a waterfall dropping down a series of cascades. At each level the water spins a rotor which absorbs the energy of the falling water and uses it to turn wheels and operate the machinery of a chemical plant. A somewhat comparable situation holds for electrons cascading along the chain of the acceptor molecules in the chloroplast; like the rotor, each acceptor molecule receives some of the passing electron's dissipated energy.

Figure XI-12



A MATTER OF LIFE OR DEATH

In one of his famous experiments, Joseph Priestley used a mouse and a sprig of mint to show the interdependence of plant and animal life. In one closed jar, he put both a sprig of mint and a mouse, and together they flourished. The same mouse, however, died when alone in the jar. This discovery, although not developed further by Priestley, was influential in later biological research.

The formation of a vital chemical compound, adenosine triphosphate, or ATP, results from this energy-sharing process. As the word "triphosphate" indicates, the ATP molecule contains three phosphate (phosphorus-plus-oxygen) groups of atoms. They are hitched like a kite tail to the central group of atoms forming the molecule. The chemical energy that has resulted from the electronic activity within the chloroplast is now tied up in the force that ties, or "bonds", the last of these three phosphate groups to the molecule.

FUEL FOR THE FLAME OF LIFE

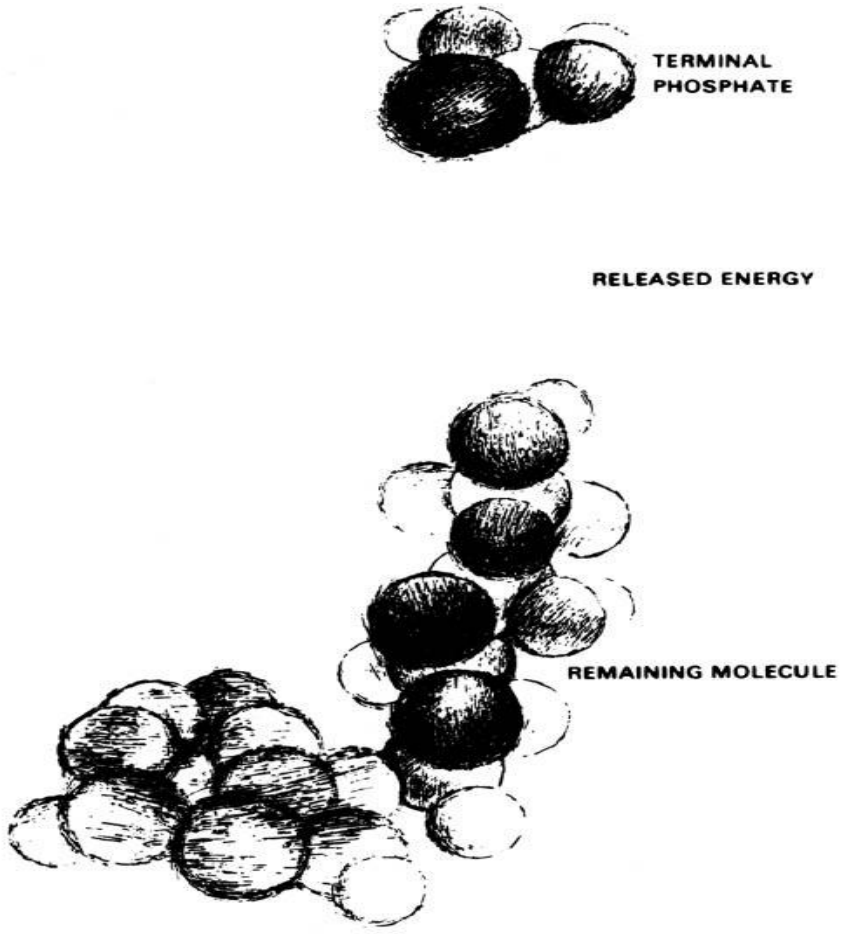
The synthesis of the energy-rich ATP molecule is an all-important cell function because it provides essential fuel for the whole range of life processes. Energy originally released by the sun and converted successively into light and electricity has come to roost in an organic chemical. The energy required to attach that third phosphate group is now locked within the ATP molecule and will be released when the bond breaks and the third phosphate group is released. The molecule is like a tightly coiled spring ready to uncoil the instant a trigger is pressed.

While the "charged" ATP molecules (sometimes called the "energy currency" of the cell) are being produced, an associated reaction in the chloroplast uses energetic electrons to "split" the water the plant absorbs from the atmosphere. The result of this reaction is the formation of carrier molecules called TPNH2 which incorporate some of the hydrogen from the split water molecule. This reaction also discharges oxygen into the atmosphere, where it is used by animal organisms.

ATP and TPNH2 are the major products of the first stage of photosynthesis. The second stage consists of a set of interrelated reactions (the so-called "dark" reactions) which use carbon dioxide and hydrogen as raw materials to turn out the variety of substances required to build and maintain plant tissues. The carbon dioxide for this manufacturing process is absorbed from the atmosphere. The hydrogen is contributed by the TPNH2 molecules. The energy for the process, supplied by ATP, is made available when the "trigger" is pressed, the coiled "spring" released and the third phosphate group is split apart from the ATP molecule.

One major end product of this ATP-fueled second stage of photosynthesis is the food-compound glucose, a form of sugar. The glucose molecule contains a definite pattern of six atoms of carbon, 12 of hydrogen and six of oxygen – all of these constituents coming from the flow of raw materials absorbed by the cell from the atmosphere and the soil. This production job – a recombination of chemical elements, using energy provided by the sun – is a kind of biological Tinkertoy game in which structures are built up step by step, bit by bit, with each change being made according to strict specifications. The final result of this assembly-line process is a chemical product, glucose, which has captured the energy of sunlight, and a waste product, oxygen, which is necessary to all higher forms of animal life. Glucose will now keep the energy until it is needed.

Figure XI-13



POWER-PACKED PHOSPHATE

Within every living cell are myriad molecules performing chemical tricks which allow the cell to move, grow and reproduce. These reactions require energy supplied by ATP, a compound found in all cells. At one end, ATP holds a phosphate in an energy-rich chemical bond. Triggered by the proper enzyme, the molecule ejects its terminal phosphate and releases energy for such functions as building protein and contracting muscle.

Though the energy of sunlight is the essential fuel for photosynthesis, it needs help. The primary chemicals involved in each step of this process react sluggishly with each other, far too slowly to support the continuous and critical demands of living cells. In fact, if the basic chemicals involved in the photosynthesis process are mixed in a laboratory solution, nothing much happens.

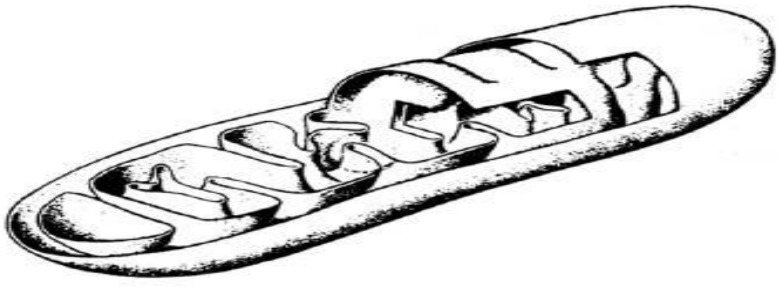
Nature speeds up cellular chemical reactions with protein compounds called enzymes, which act as catalysts. The enzyme, like a bellows which fans a sluggish fire, can accelerate a chemical reaction immeasurably, enabling a cell to do in one minute what would otherwise require several thousand years. There would be no life as we know it without enzymes.

Though it is an involved process combining both electronic and chemical reactions, photosynthesis is an amazingly efficient operation. Laboratory analysis has indicated that it converts as much as 75 per cent of the light energy received by the plant into chemical energy. Man-made mechanisms for transforming energy – steam engines, for example – are generally around 30 per cent efficient.

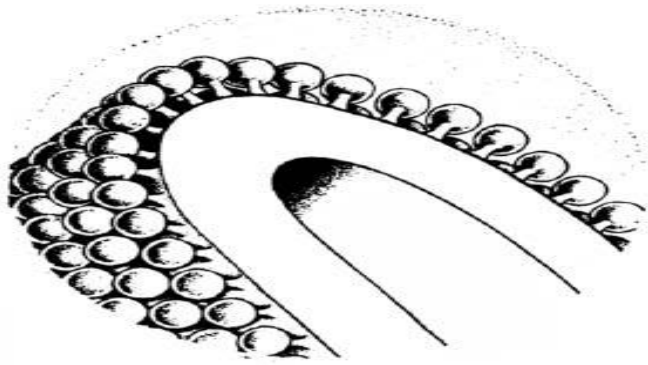
It should be emphasized that many of the steps in the photosynthesis process are still under investigation. Scientists know that light, water and carbon dioxide go into one end of the photosynthesis assembly line and that glucose and oxygen are produced at the other end – the glucose being stored in the plant tissue and the oxygen being distributed in the atmosphere. But information on the intermediate steps of the process is so speculative that researchers often allude to the photosynthesis reactions as "the black box" – indicating that they know what goes in and what comes out but are not sure about everything that goes on inside.

Figure XI-14

MITOCHONDRION: THE POWERHOUSE OF THE CELL



EXPOSED MEMBRANES



RESPIRATORY ASSEMBLY

CELLULAR LABYRINTHS OF ENERGY

The sausage-shaped cutaway above is a mitochondrion, the part of the cell that converts nourishment into energy. Its outer membrane dictates a fairly regular size and shape. But the inner membrane is a convoluted labyrinth containing the enzymes that are needed to produce ATP. The enlarged circled area shows the globules believed to be respiratory assemblies where the ATP-producing reactions take place.

OPENING THE ENERGY PACKAGE

The second part of the great natural system which, with photosynthesis, makes the life processes a regenerative cycle, takes place in animal cells; its function is to extract the energy packaged in the glucose in a form that can be used by animal organisms.

This second major system is also in operation in the sealed test tube containing the snail and the water plant. The process begins as the snail

nibbles the green plant leaves and takes in the plant's oxygen wastes. The energy-providing glucose which the plant has synthesized is consumed by the snail, is carried to the individual cells by the bloodstream and is absorbed through the cells' outer membranes.

Animals, like plants, require the high-grade universal fuel, ATP, to run their life processes. But they do not make it from sunlight; instead, they synthesize it with energy obtained from glucose. The first step of this process, which takes place in the fluid part, or cytoplasm, of the cell, is known as glycolysis. In a series of reactions fueled by ATP and accelerated by appropriate enzymes, each glucose molecule yields two molecules of a substance called pyruvate. Glycolysis uses up two ATP molecules (which the cell has obtained from previous processing of glucose) but produces four new ATP molecules, for a net gain of two.

Glycolysis is a preparatory step to an involved process known as the Krebs cycle, after a German-born biologist who first suggested it in 1937. In this process, the animal cell, in the presence of oxygen, takes up the pyruvate and transforms it in a cycle of reactions that forms carbon dioxide. This activity also leads to the formation of water and an additional supply of ATP.

THE CELL'S POWERHOUSES

The Krebs cycle in animal cells uses bodies called mitochondria for what is, in effect a reversal of the photosynthesis process. Mitochondria, often called the powerhouses of animal cells, are sausage-shaped capsules large enough to be seen with a powerful light microscope. They have a permeable outer wall which readily absorbs the materials necessary to the Krebs cycle.

The Krebs cycle within the mitochondria, like the photosynthesis process in plant chloroplasts, can be likened to a production line with an associated energy-producing system. Again, as in photosynthesis, the Krebs cycle uses specific enzymes to accelerate the chemical reactions which comprise each of the dozen or so steps of the process.

Starting with the pyruvate molecules delivered by the glycolysis operation, the Krebs cycle and its associated electron-transport system produce 36 ATP molecules for each original glucose molecule which entered the glycolysis operation. This immense energy gain is

accompanied by the production of carbon dioxide and water as waste products.

Though there is still much to be learned about the many reactions involved in these processes, some of the steps are known to resemble those in the plant chloroplasts in which high-energy electrons are passed from one acceptor molecule to another as they give up the energy used to manufacture ATP. In the mitochondria, however, the electrons are originally excited by energy obtained from the Krebs cycle (which, in turn, gets the energy from pyruvate, the glucose product) rather than from the energy in sunlight.

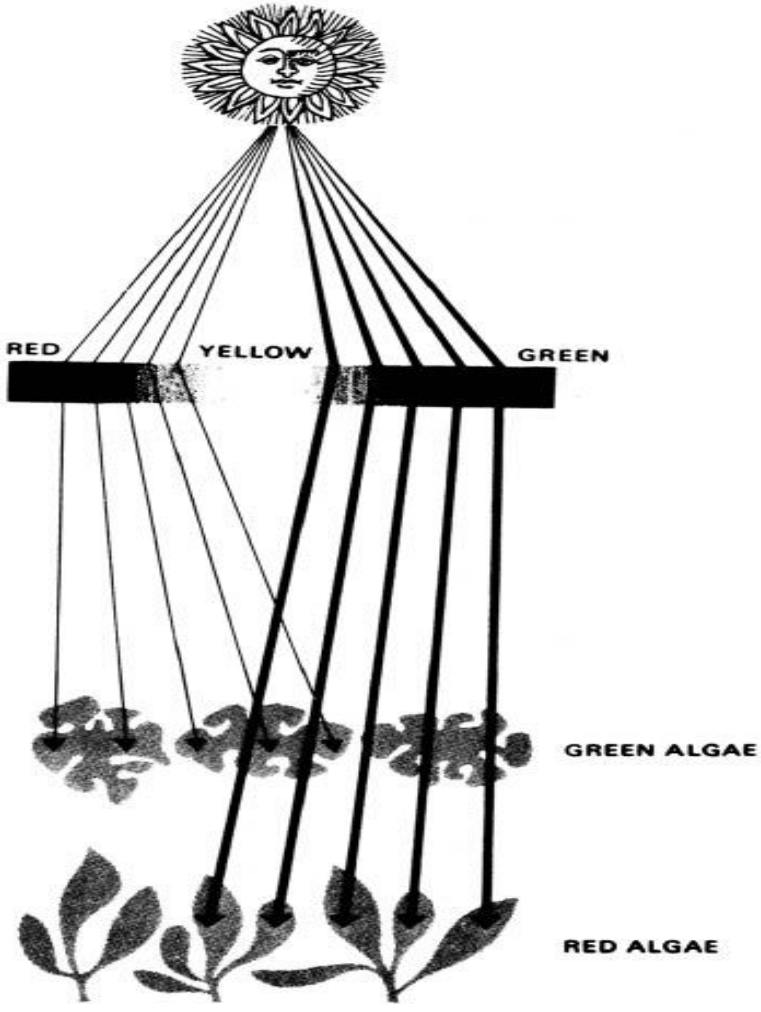
The energy-deriving operation of the mitochondria (an operation now being investigated by researchers such as Britton Chance and his associates at the University of Pennsylvania) apparently employs a process similar to that used in plant cells to produce ATP, but the end products are quite different. In plant photosynthesis, hydrogen atoms are removed from water to form oxygen. In the energy chain within the mitochondria, on the other hand, hydrogen atoms which are by-products of the Krebs cycle are split into positively charged protons and negatively charged electrons. The electrons are then passed from molecule to molecule (as in the photosynthesis process) until they have yielded most of their energy for the manufacture of ATP. Finally the protons combine with free electrons to form hydrogen atoms, which then combine with oxygen to from water. Thus the end products of two essentially similar reactions are in one case water and in the other oxygen.

Peter Mitchell of Glynn Research Laboratories became interested in ATP. Mitchell's concern has been with the mechanism by which the living cell obtains, transforms and utilizes the energy needed for its manifold activities. The primary energy-carrying molecule is adenosine triphosphate (ATP). A key puzzle is the mechanism by which an inorganic phosphate group is coupled to adenosine diphosphate (ADP) in the process of oxidative phosphorylation. Before Mitchell's work the prevailing hypotheses postulated that the linkage was achieved directly by enzyme intermediates. In spite of intensive research in many laboratories, however, these hypotheses had found no support.

In 1961 Mitchell proposed a radically different idea. He suggested that a flow of electrons through a system of carrier molecules drives hydrogen ions (protons) across the outer membrane of bacterial cells, or the similar

membranes that enclose such subcellular organelles as mitochondria or chloroplasts. As a result an electrochemical gradient is created across the membrane. The gradient consists of two components: a difference in pH, or hydrogen-ion concentration, and a difference in electric potential. Together they provide what Mitchell calls a "proton motive" force capable of driving the synthesis of ATP. Long viewed skeptically, Mitchell's "chemiosmotic theory" is now generally accepted (see "How Cells Make ATP", by Peter C. Hinkle and Richard E. MacCarty; SCIENTIFIC AMERICAN, March).

Figure XI-15



COLOR-CONSCIOUS SEA PLANTS

The sea absorbs the component colors of sunlight in varying degrees according to depth: red light is absorbed in the upper regions while green light penetrates much deeper. This phenomenon has forced algae, which derive energy from light, into some unique adaptations. Green algae near the surface utilize red light, deep-dwelling algae have a red pigment which helps turn green light to energy.

When cells go through mitosis approximately once every 10 days, they reform and, in groups, begin to vibrate on the life wave of their prime elemental nuclei which, as you remember, is not its atoms but the Anu described in earlier chapters. When the life wave is one of high vibration, the human soul begins to feel these and direct them into a molecular form which contains the key to heredity. This is from the DNA.

The DNA molecule gives instructions which enable offspring of a particular species to reproduce its own kind. It is shaped like a long, twisting ladder, and contains a complex coded message which carries the genetic traits of the species.

DNA is made up of phosphates, sugars and bases containing nitrogen. The rungs of the ladder are made up of the bases: adenine, thymine, guanine and cytosine. The spirals contain the phosphates and sugars.

The power of DNA is unique for a chemical substance because it can reproduce itself. It begins by splitting down the middle like a zipper being unzipped. The DNA, located in the nucleus of the cell, then picks up free-floating nucleotides. These nucleotides snap on to each free split side. As soon as each loose rung is completed, the original DNA molecule now becomes two, both exactly like the original.

The DNA molecule in a human is thought to have as many as 10,000 rungs in its ladder, each carrying a particular trait. DNA serves as a pattern that can be reproduced again and again, setting forth the chemical specifications for a living organism.

Proteins are necessary for sustaining life. They are manufactured by instructions given by the DNA.

In order to build proteins, the DNA molecule produces messenger-RNA and transfer-RNA. Messenger-RNA is a copy of just part of the DNA

molecule. Transfer-RNA is a shorter strand than messenger-RNA. They work together to assemble amino acids that are needed to make protein. Each transfer-RNA is chemically attracted to a particular amino acid and links back up with the messenger-RNA once the amino acid is attached.

When the transfer-RNA with the amino acid links with the messenger-RNA, the amino acids link together to form a protein molecule. This protein molecule breaks away from the RNA to perform its function in the body.

When these protein groups are in threes, they are called peptides and when the peptides group again, we have polypeptides.

GARBLED MESSAGES IN THE GENETIC CODE

If DNA can produce so many million exact copies of itself without error, what accounts for genetic mishaps – the freaks and "sports" that occur in both animal and vegetable life? They are usually caused by attacks on the nucleus from chemicals, heat or radiation.

Since matter is mostly empty space, an X-ray, a gamma ray from fallout or a cosmic ray from space, may penetrate billions of molecules without disturbing anything. But eventually it happens: a ray scores a bull's-eye in DNA, garbling part of its coded message.

Mutation may mean a change in the appearance of the offspring, such as the naked-neck chicken. Another, more dangerous, result may be a misspelling in the part of the message that carries instructions for building proteins that sustain life, such as hemoglobin. The normal hemoglobin molecule, a complex structure made up of 574 amino acids, is designed to do a specific job: carry oxygen through the bloodstream. The deadly hereditary disease called sickle-cell anemia occurs when one of these amino acids is faultily placed in the molecule because of an altered DNA message.

Sickle-cell anemia is found in some 250,000 Americans, and almost always kills its victims before age 40. But molecular biologists are planning a new assault on such genetic diseases. They hope that synthetic varieties of DNA and RNA, made to order in the laboratory and injected into the sick cells, will edit their DNA text so that its message will be once again a clear, unmistakable call for health.

In the last three billion years, life on earth has evolved from primitive cells wallowing in the primeval ooze to that sophisticated labyrinth of nucleic acids and proteins that constitutes a human being. How did this miracle of evolution happen? A large part of the answer is mutations: no organism can go on producing exact replicas of itself for eternity. Mistakes are made; a mutant is born; environmental conditions determine whether or not the mutant survives.

Most mutations – like the albino kangaroo – do not improve the species. But others, like the black peppered moth, were born with certain traits that helped them live in an environment where the normal was dying out.

As molecular biologists become ever more knowledgeable about the ways of genes and DNA, the closer man will come to controlling the very evolution of life – a breathtaking possibility and a solemn responsibility. The adventure has already begun. DNA and RNA have been synthesized and analyzed. One species of bacteria has been changed into another. And a genetic tour de force – turning back the clock of evolution – is described in a story of Japanese goldfish.

Figure XI-16

THE DNA MOLECULE

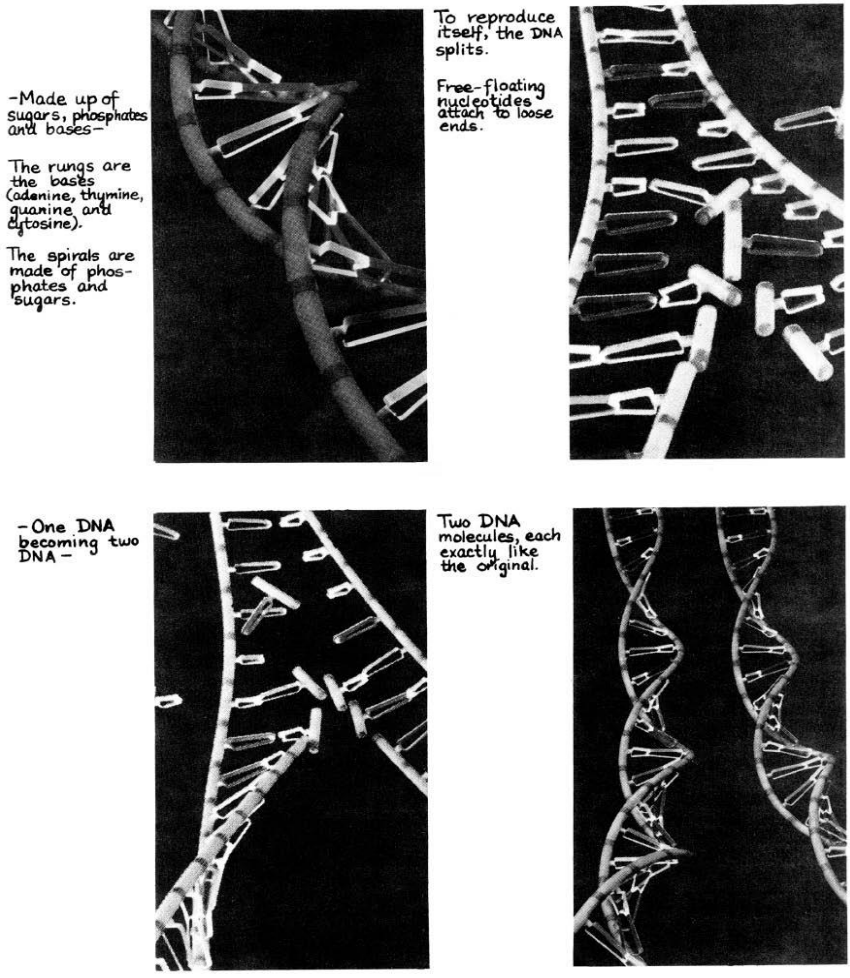
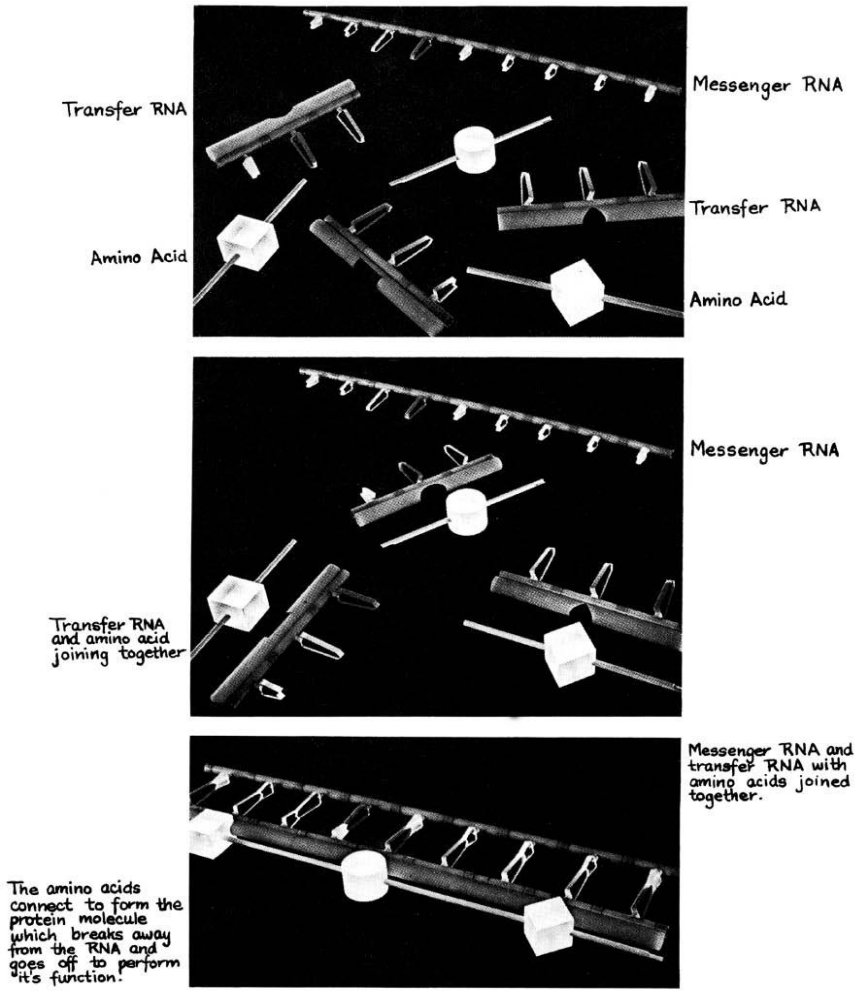


Figure XI-17



Cells move in many ways. Some single-celled organisms, such as the paramecium, move by the beating of the hair-like extensions called cilia. Amoebae creep along by extending the cell wall and the cytoplasm within it. The sperm cell moves by strokes of its whip-like flagellum.

All these forms of locomotion apparently result from interactions at the molecular level. In the larger organisms, the movement of muscle cells also involves some of the most sophisticated and ingenious processes found in nature.

Muscle is one of the most remarkable of all the body's specialized tissues. Few of us realize how strong we actually are. Several years ago in Tampa, Florida, a boy was working under the rear end of the family station wagon when the jack slipped, pinning him under the car. His mother, a small woman, grabbed the rear bumper and lifted the 3,300-pound auto off her son; he suffered nothing worse than a few bruises. In the emergency the mother had tapped a source of strength far greater than any she uses in normal situations.

This reserve of power is but one of several unusual properties built into muscle. Muscle tissue is also remarkably adaptable. You exert a force of a fraction of an ounce in picking up a pin or paper clip, about seven pounds in holding a heavy book, and 20 pounds or so on the handle of a lightly packed suitcase; the same muscles can apply a maximum right-handed squeeze of more than 150 pounds.

The structure of a muscle is altered repeatedly during the routine actions of everyday living. In its completely relaxed state, muscle is unimpressive – a jellylike substance which hardly looks like the structural material for the prime movers of the body. This slushy tissue, however, can undergo a drastic and rapid transformation when it is called upon to contract and exert force. In a few hundredths of a second it can change into a hard, tough, elastic material with dynamic characteristics that intrigue engineers and physicists as well as biologists.

Despite its unique characteristics, muscle tissue has a chemical basis not unlike that of other body tissues. If a mass of muscle fiber is minced, wrapped in cheesecloth and squeezed in a press under high pressure, a fluid called "press juice" can be extracted. Analysis of the solid residue and the juice shows muscle to contain: about 78 per cent water, 20 per cent protein, 1 per cent carbohydrate and some fat and salt. The same contents and ratios could be used to describe most other forms of body tissue – so the unusual capacities of muscle must result from the organization of its parts, rather than its basic material.

Muscle could be defined as a tissue of cells which enables an organism and its parts to move. The basic mechanical process involved in all muscle action is the contraction of many individual muscle cells, or fibers.

Muscle could be defined as a tissue of cells which enables an organism and its parts to move. The basic mechanical process involved in all muscle action is the contraction of many individual muscle cells, or fibers. While all cells can contract to some extent, contraction is a specialty of the muscle cell. The formation of the highly specialized muscle fiber begins during embryological development, when a great many similar cells from the middle-layer group come together. The outer membranes of the cells seem to fuse at the contact points, forming a single unit enclosed on a continuous membrane. The resulting fiber may contain hundreds or even thousands of nuclei – one from each of the original cells. The average muscle cell, or fiber, is a long cylinder, which measures about 1/500th of an inch in diameter and several inches in length.

MATCHING MUSCLE TO THE LOAD

An individual muscle cell contracts when it receives a stimulus from the appropriate motor nerve. The degree of stimulation must be above a certain minimum level, or threshold, before the muscle fiber will react. When the fiber does react, however, it contracts to its maximum ability. Scientists call this an "all-or-none" type of response. In order to keep the entire muscle from responding in this fashion, not all the cells are alerted at once, except in rare cases. Just enough impulses are sent to match the force to the load – a few to pick up a paper clip, many for a suitcase.

The process of matching the response of a muscle to a specific load suggests a feedback system similar to that used in many modern electronic devices. Muscle action will increase as the load increases, just as a tractor engine is so made that it speeds up automatically when the plow hits heavy ground. Without such a feedback control in our muscular system, we would expend as much energy in lifting a spoon as we would in raising a heavy stone.

Unlike many other types of body cells, the muscle cells cannot divide and therefore cannot reproduce themselves in the conventional manner. In man (and most other mammals), however, new muscle cells can be formed to replace cells damaged in adulthood; the intricate process involves the assembling of structures already floating in the cell fluid and can be likened to rebuilding an old car from scavenged parts of a number of wrecks. Such replacements help maintain a certain level of muscle

ability, but they cannot for long offset the attrition which is the result of dying cells. Indeed, the weight of some muscles may drop as much as 30 per cent between the ages of 30 and 75. This does not mean, of course, that muscles cannot grow in size and capacity during these years; but the bulging biceps of a boxer do not indicate an increase in the number of muscle cells in the area – they are rather a sign that the individual cells or fibers have grown larger.

The exact relationship of muscle growth to exercise is as yet determined. It is thought that muscle growth may be correlated to the level of activity of the individual muscle fibers. It is known that when a nerve is destroyed by disease or accident and the nerve impulses to the fiber are thus cut off, the muscle fiber becomes inactive, shrinks and may eventually disappear and be replaced by connective tissue. Presumably, if the situation is reversed and the muscle is highly active, it will increase in size and power; muscular development may thus be looked upon as a direct product of muscle use.

All of the skeletal muscles of the body, such as the biceps, are composed of muscle fibers which are striated, or banded – the striations indicating that they are made up of a chain of shorter sections. In addition to skeletal muscles, which are responsible for most of the voluntary movements of the body, there are smooth muscles, which activate the internal organs, and the unique heart muscle, which works ceaselessly throughout the life of the body.

A single striated muscle may be made up of many hundreds of thousands of muscle cells or fibers packed together to form a kind of living cable. This cable pattern is repeated down to the molecular level. In turn, each of the many fibers in a muscle consists of some 1,000 to 2,000 smaller strands called fibrils, which run parallel to one another and represent the contracting elements – the parts that do the actual work. The fibrils are about one twenty-five-thousandth of an inch in diameter. The spaces between them are filled with the fluid, or cytoplasm, of the cell.

MUSCLE'S MIGHTY MITES

There is still another set of cables in the muscle cell. Packed inside each fibril are hundred of filaments, the smallest component of muscle. The filaments come in two sizes, a thick form and a thin one. When a cross section of a fibril is magnified about 200,000 times by the electron

microscope, these superfine filaments are seen to be arranged in a geometric pattern in which thick and thin filaments alternate.

Research thus reveals striated muscle as a system of fibers, each of which is a bundle of fibrils, with each fibril being a bundle of filaments. These structural details are meaningful, however, only insofar as they explain how a muscle works.

As a muscle fibril contracts, the filaments do not seem to become shorter. This suggests that the thin filaments may be arranged so that they slide between the thick filaments. This theory might be illustrated by imagining two wooden disks studded with projecting needles. As the disks are brought closer together, the two strands of needles mesh and slide past each other, and the space between the disks decreases without any contraction of the needles. The limit of contraction is reached when the needles studded in each disk touch the opposite disk.

Any description of the mechanics of muscle action would be incomplete if it did not account for the power supply which enables a muscle to contract. Muscle is no exception to the rule that doing work requires energy. The generation of muscle energy, like that produced by an automobile engine, calls on electrical and chemical forces.

The "firing" of a muscle fiber – the contraction, or twitch, which occurs when the muscle cell is properly stimulated – begins at a point where the associated motor nerve is joined to the outer membrane of the muscle fiber. The resting muscle cell, which is charged with energy, goes into action when this nerve delivers a signal which "tells" it to contract. The transmission of this message involves two sequences of electrical activity and an intervening chemical event.

The action begins with a series of electrical pulses flashing along the various nerve fibers from the brain to the nerve-and-muscle junction on the muscle-fiber membrane. When the pulses reach this junction they initiate a chemical reaction which releases a squirt of a substance known as neurohumor. The neurohumor somehow changes the properties of the muscle cell's outer membrane so that the cell releases its pent-up electrical charge. This electrical discharge spreads over the surface of the cell.

With this discharge the muscle fiber is almost ready to contract. The second sequence of electrical activity then occurs. An action message is

transmitted from the surface of the muscle fiber to the innermost contracting elements, the fibrils. This takes several thousandths of a second. When this message is received, the fibrils contract. The total time for a single muscle-cell twitch – for stimulation, contraction and subsequent relaxation – is about a tenth of a second.

THE ELECTRICITY OF THE MUSCLE

The electrical changes within the muscle fiber start when the neurohumor touches the surface of the resting cell. In this state the cell or fiber is a charged battery carrying 0.09 of a volt – a so-called resting potential which is maintained by the structural integrity of the cell's outer membrane. The neurohumor apparently changes the structure of this membrane temporarily so that there is a two-way flow of sodium and potassium ions (an ion is an atom which is in an electrically charged, rather than a neutral, state) between the cell and the fluid which surrounds it. As these ions pass through the membrane and redistribute themselves, the electrical balance of the muscle fiber changes and it becomes temporarily discharged. In this discharged state, the muscle fiber is ready for contraction.

All muscular effort requires a series of intricate reactions taking place at many sites simultaneously. Every body activity mobilizes millions of muscle fibers. Electronic interactions take place incessantly as electricity flows back and forth through the cell membranes and along pathways within the fibers. The pacemakers which control this activity are the nerve signals that release the squirts of neurohumors at millions of nerve-muscle junctions.

The critical importance of the reactions which occur at the junction of the nerve and muscle fibers is underscored by the immediate and far-reaching effects of any interference with the work of these junctions. The lethal toxin of botulism and other poisons such as strychnine, cocaine and curare all work by blocking the chemical activities at the nerve-muscle junctions. Myasthenia gravis, a rare disease in which patients suffer from abnormal fatigue and muscular weakness, is also the result of an as yet unidentified defect in the workings of nerve-muscle junctions.

FUEL FOR THE MUSCLE ENGINE

Muscle-triggering neurohumors can be compared to the sparking mechanisms of an internal-combustion engine. The next line of inquiry concerns the operation of the engine itself. Once a muscle fiber has been stimulated it requires energy to perform its work. ATP, the universal fuel of all plant and animal cells, supplies this energy. Muscle fiber, being an animal cell, makes some of its ATP by breaking down glucose molecules through a sequence of reactions called glycolysis.

This preliminary step in energy-making sets the stage for ATP production on a large scale by the Krebs cycle, described earlier. The assembly lines are located in mitochondria, the cylindrical bodies which serve as power plants and which lie packed in the fluid filling the spaces between muscle fibrils. Here the Krebs cycle takes place. The final steps involve the flow of electrons through molecules thought to be arranged in definite patterns on the walls of the mitochondria. Because of the high energy requirements of muscle, the muscle fibers generally contain many more ATP-synthesizing mitochondria than are found in most other cells.

Muscle can also produce ATP by another process which bypasses the Krebs cycle and takes place outside the mitochondria. The Krebs cycle requires oxygen and sometimes, during violent exercise, the body's oxygen demands exceed the supply. A trained athlete can inhale enough air to supply his blood with some eight pints of oxygen a minute. In order to distribute this oxygen during those 60 seconds, the heart must pump more than 20 quarts of blood to the tissues. This represents just about the maximum capacity of the heart-lung system.

When circumstances call for an effort which exceeds the individual's oxygen-providing capacity, the heart and lungs cannot supply enough oxygen to meet the energy demands of the hard-working muscle fibers. In this situation, the Krebs cycle is jammed up by lack of oxygen and the cell must produce ATP by glycolysis. When oxygen again becomes available, the Krebs cycle resumes operation and produces energy oxidation in the normal manner.

These particular reactions in the muscle cells are of special interest since they show that all cells work according to common principles. While research biologists were unraveling the details of oxygen-free energy-producing processes in muscle cells, they realized that these processes were similar to a series of reactions that occur in plant cells – alcoholic fermentation.

People running in smog get into a similar predicament with a shortage of oxygen. Wearing a pyramid helps because the pyramid bypasses the Krebs cycle and converts magnetism directly into electricity which the ATP in the cells can draw from.

This can be demonstrated by lifting weights and monitoring the electricity directly with an EKG machine connected to the muscle under stress. Then after a series of measurements of electricity vs. weights is recorded, repeat the experiment wearing a Firedome or Raydome. You will find that the body will have a much higher voltage potential than it did before, clearly demonstrating that the pyramid has converted the magnetism in the air directly to electricity and the mind has utilized that conversion by directing the energy to the muscle for usage. In some cases with athletes, their pulse is even lowered while running with a pyramid on which indicates a greater relief on their heart. The idea is to get maximum energy with minimum effort or pure body resonance. This insures long life and healthy body functions.

Nerve cells are quite unique. The main parts are axons, which are like wires, the myelin sheath which is like an insulator, and dendrites, which are at the beginning and the ends of the axons. The colon digests minerals and the minerals produce electricity in the brain through stimulation of the mind, and the stimulation is thus transmuted and received along the axons via the three nervous networks.

The individual neuron is an ingenious device that sends and receives electric signals. To accomplish this, it has two kinds of highly specialized structures: dendrites, antennae which receive signals; and a single axon, a filament which acts as a self-powered transmission cable. The power originates in a chemical exchange between the axon and its surroundings, which sets up a minute voltage difference. When a dendrite or the cell body is stimulated by an incoming signal from another cell, or by an original cause such as a pinprick or a loud noise, this voltage is perturbed, causing a wave of fluctuations to travel down the axon and, as described below, stimulate the cell next in the chain.

The neurons that thus flash messages around the body are of three kinds. Sensory neurons report on the outside world and on internal muscular status. Interconnecting cells act as middlemen and, in the brain, sort out messages and issue orders. Finally, motor neurons conduct action commands out to the muscles.

Bundles of axons, or individual nerve fibers, within the olfactory nerve of the pike are shown in transverse section in this transmission electron micrograph. Each axon is a membranous tube filled with a viscous fluid, the axoplasm. The axon membrane has separate molecular channels for sodium and potassium ions; the flows of these two ions across the membrane give rise to the nerve impulse. In the pike axon the sodium and potassium channels are sparsely distributed, with a density of only a few channels per square micrometer of membrane. This micrograph, which magnifies the fibers 80,000 di-meters, was made by Alexander von Muralt of University of Bern.

Figure XI-18

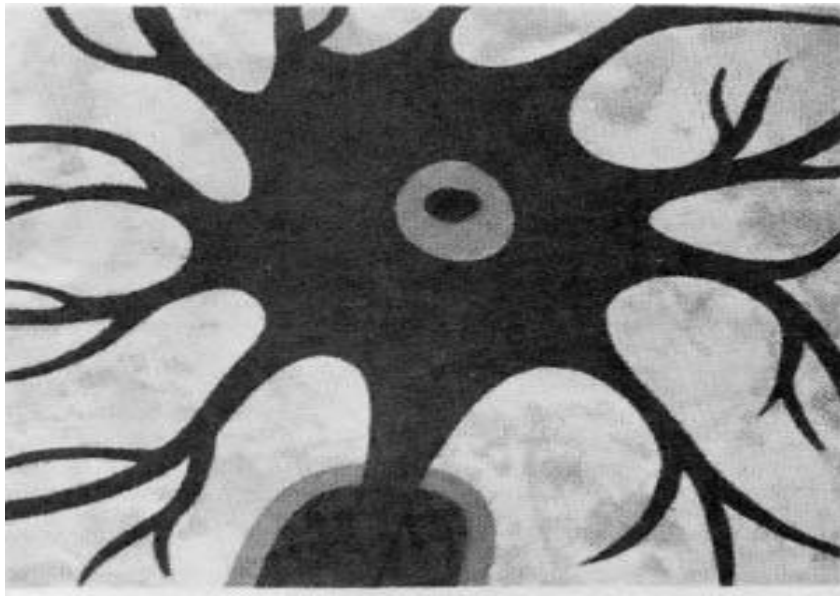
BUNDLES OF AXONS, or individual nerve fibers, within the olfactory nerve of the pike are shown in transverse section in this transmission electron micrograph. Each axon is a membranous tube filled with a viscous fluid, the axoplasm. The axon membrane has separate molecular channels for sodium and potassium ions; the flows of these two ions

across the membrane give rise to the nerve impulse. In the pike axon the sodium and potassium channels are sparsely distributed, with a density of only a few channels per square micrometer of membrane. This micrograph, which magnifies the fibers 80,000 diameters, was made by Alexander von Muralt of University of Bern.

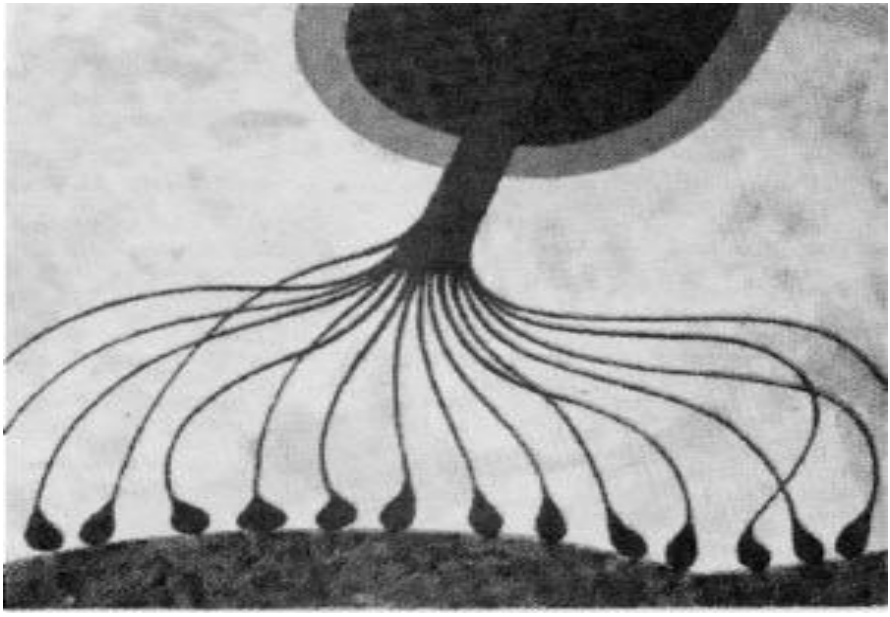
It was popular belief for a long time that nerve cells could not reproduce. But what happens when you cut off a lizard's tail? It grows back. If you take a Kirlian photograph of a lizard after the removal of its tail you will see the etheric body of the tail as though it was still there. This etheric body guides or transmits messages to the cellular DNA of the remaining picture and a tail is then rebuilt. Often times, people who have had arms or legs amputated will feel areas where there is no physical limb. Once we get over our mental block about nerve reproduction, we will solve one more mystery and be able to grow back limbs. We have already been successful in helping people recover from paralysis with pryamid energy, as the pyramid directs intelligence to dead nerve cells and re-energizes them. The following letter testifies to this fact.

Figure XI-19

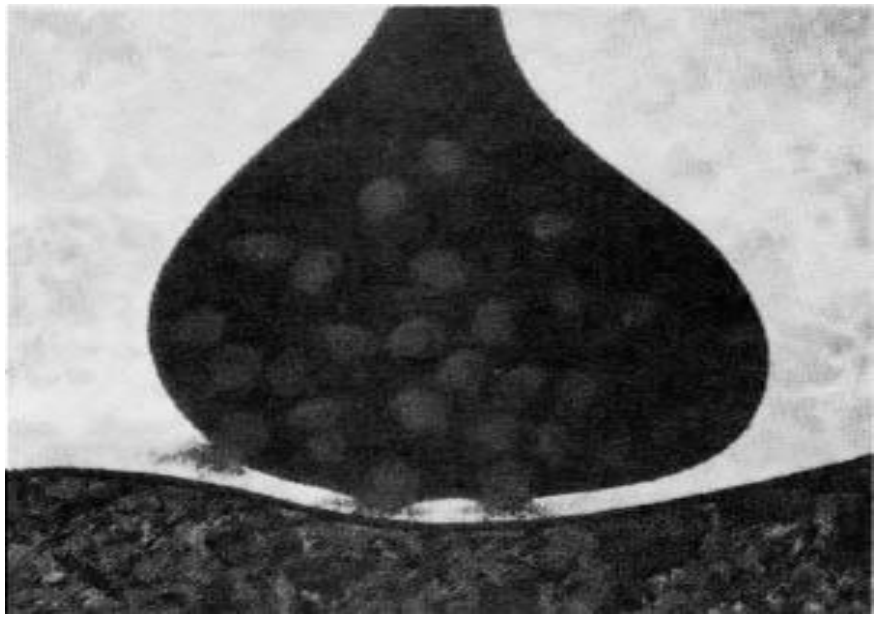
HOW A SIGNAL IS SENT



STARTING with the branching, tentacle-like dendrites, where the stimulus is received, these panels show in views of increasing magnification the beginning and end of a signal's journey through the anatomy of a neuron. The dendrites conduct the stimulus to the cell body (red) and to the axon, with its membrane (green-blue) and protective sheath (dark blue), where it initiates electric impulses.

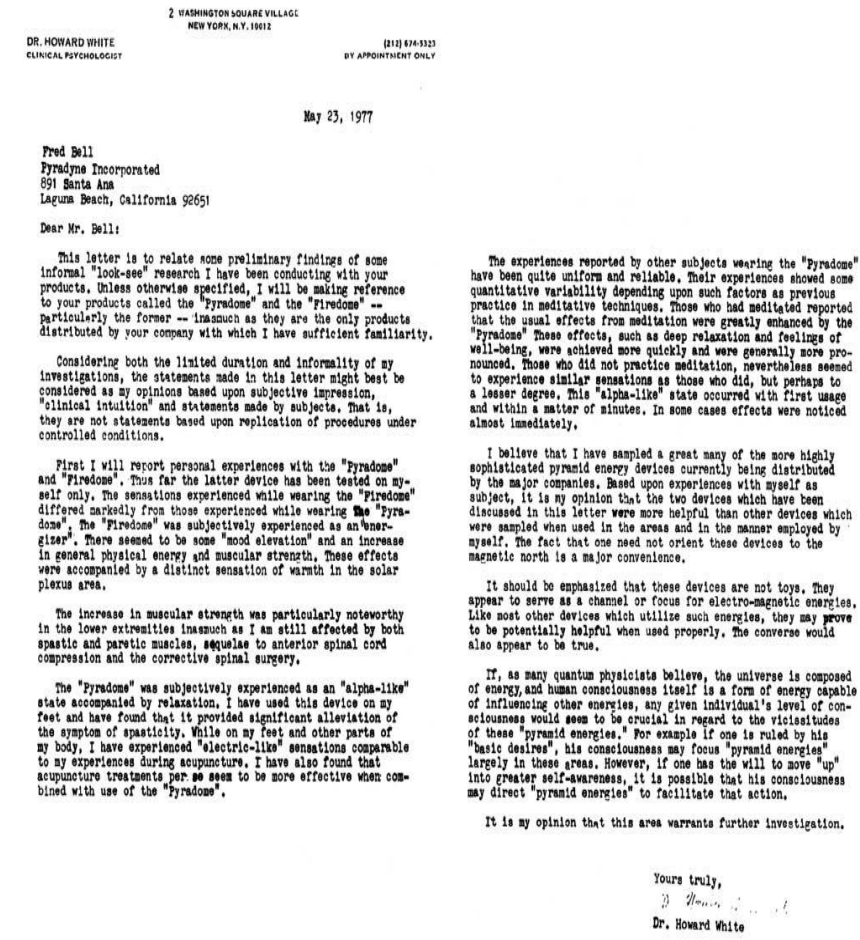


TRAVELING in waves along the axon, the impulses come to the axon's end, which branches out in tiny filaments. These filaments, which are not covered by the axon's sheath, terminate in many bulbous feet, shown here in near-contact with a dendrite of another neuron. They may also make connections with muscle or gland cells, and different types of neurons have different-shaped endings,



ARRIVING at a synapse, which is a junction of two neurons, the signal has to jump a slight gap. The way it makes the leap is shown at left. The pulse's arrival at the foot releases packets of a chemical messenger, which cross the gap and stimulate the neighboring dendrite to start the cycle again. Even in cells with long axons, the complete process takes no more than a fraction of a second.

Figure XI-20



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DR. HOWARD WHITE
CLINICAL PSYCHOLOGIST

(212) 674-3323
BY APPOINTMENT ONLY

May 23, 1977

Fred Bell
Pyradyne Incorporated
891 Santa Ana
Laguna Beach, California 92651

Dear Mr. Bell:

This letter is to relate some preliminary findings of some informal "look-see" research I have been conducting with your products. Unless otherwise specified, I will be making reference to your products called the "Pyradome" and the "Firedome" -- particularly the former -- inasmuch as they are the only products distributed by your company with which I have sufficient familiarity.

Considering both the limited duration and informality of my investigations, the statements made in this letter might best be considered as my opinions based upon subjective impression, "clinical intuition" and statements made by subjects. That is, they are not statesents based upon replication of procedures under controlled conditions.

First I will report personal experiences with the "Pyradome" and "Firedome". Thus far the latter device has been tested on myself only. The sensations experienced while wearing the "Firedome" differed markedly from those experienced while wearing the "Pyradome". The "Firedome" was subjectively experienced as an "energizer". There seemed to be some "mood elevation" and an increase in general physical energy and muscular strength. These effects were accompanied by a distinct sensation of warmth in the solar plexus area.

The increase in muscular strength was particularly noteworthy in the lower extremities inasmuch as I am still affected by both spastic and paretic muscles, sequelae to anterior spinal cord compression and the corrective spinal surgery.

The "Pyradome" was subjectively experienced as an "alpha-like" state accompanied by relaxation. I have used this device on my feet and have found that it provided significant alleviation of the symptom of spasticity. While on my feet and other parts of my body, I have experienced "electric-like" sensations comparable to my experiences during acupuncture. I have also found that acupuncture treatments per se seem to be more effective when combined with use of the "Pyradome".

The experiences reported by other subjects wearing the "Pyradome" have been quite uniform and reliable. Their experiences showed some quantitative variability depending upon such factors as previous practice in meditative techniques. Those who had meditated reported that the usual effects from meditation were greatly enhanced by the "Pyradome" These effects, such as deep relaxation and feelings of well-being, were achieved more quickly and were generally more pronounced. Those who did not practice meditation, nevertheless seemed to experience similar sensations as those who did, but perhaps to a lesser degree. This "alpha-like" state occurred with first usage and within a matter of minutes. In some cases effects were noticed almost immediately.

I believe that I have sampled a great many of the more highly sophisticated pyramid energy devices currently being distributed by the major companies. Based upon experiences with myself as subject, it is my opinion that the two devices which have been discussed in this letter were more helpful than other devices which were sampled when used in the areas and in the manner employed by myself. The fact that one need not orient these devices to the magnetic north is a major convenience.

It should be emphasized that these devices are not toys. They appear to serve as a channel or focus for electro-magnetic energies. Like most other devices which utilize such energies, they may prove to be potentially helpful when used properly. The converse would also appear to be true.

If, as many quantum physicists believe, the universe is composed of energy, and human consciousness itself is a form of energy capable of influencing other energies, any given individual's level of consciousness would seem to be crucial in regard to the vicissitudes of these "pyramid energies." For example if one is ruled by his "basic desires", his consciousness may focus "pyramid energies" largely in these areas. However, if one has the will to move "up" into greater self-awareness, it is possible that his consciousness may direct "pyramid energies" to facilitate that action.

It is my opinion that this area warrants further investigation.

Yours truly,

Dr. Howard White

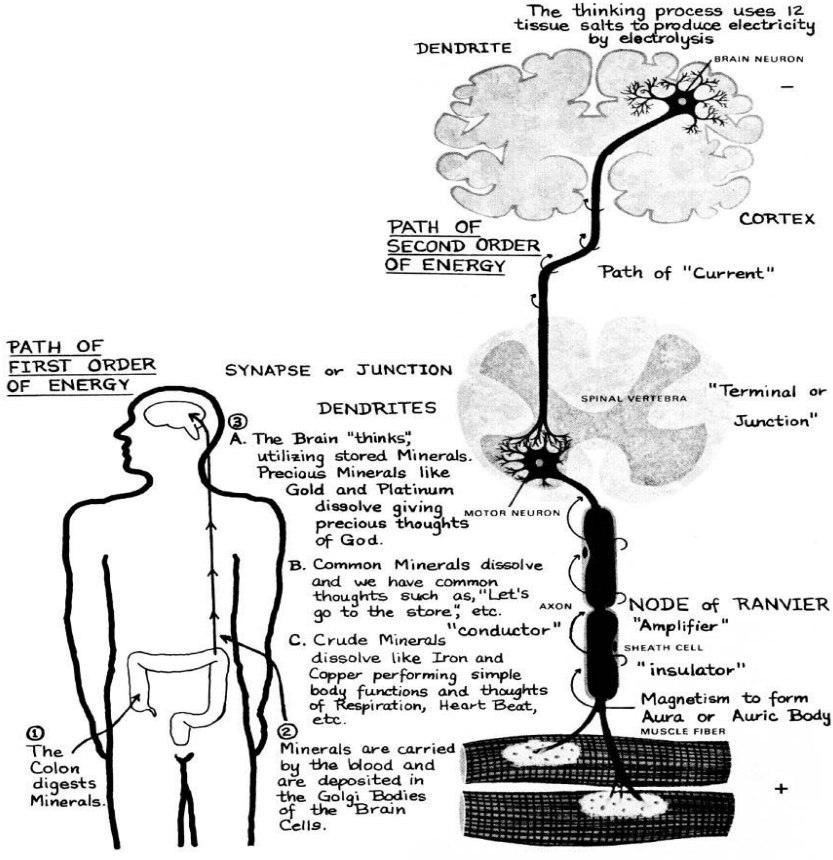
The nerve cell is a self-contained unit, but it works effectively as part of a team. All over the body, ganged up by the millions, battalions of neurons work together, each individual cell contributing its special talent toward the common goal. These pages show the intricate joint effort made by neurons to give man his precious sense of sight.

Within the one-inch spheres of man's eyeballs are more than 100 million neurons, all working to keep him visually informed. They are stacked up in three layers in the retina, the "film" at the back of the eyeball, where they intercept the light-waves focused on them by the lens in the front part of the eye. Their job, simply, is to convert the light-waves into

electric signals and send them along to the brain, where they will be interpreted. How the several different kinds of sight nerve cells team up to accomplish this magic is illustrated in the following two cross-section views of the neuron-seeded retina (Figure XI).

Eye problems such as near-sightnedness (myopia) or far-sightedness are stress-related and basically what has happened is that the eyeball is out of round causing a focus problem in the retina. Working with a special solid wall seven-color stained-glass gold-bearing pyramid accompanied with solar illumination and the Pyradyne Orb, Dr. Lawrence Kennedy of Lake Tahoe, California has successfully corrected some vision problems. The work is also being carried on by the famed Dr. James Carter of Ross, California. Please write the publisher for more information.

Figure XI-21



ORDERS FOR ACTION

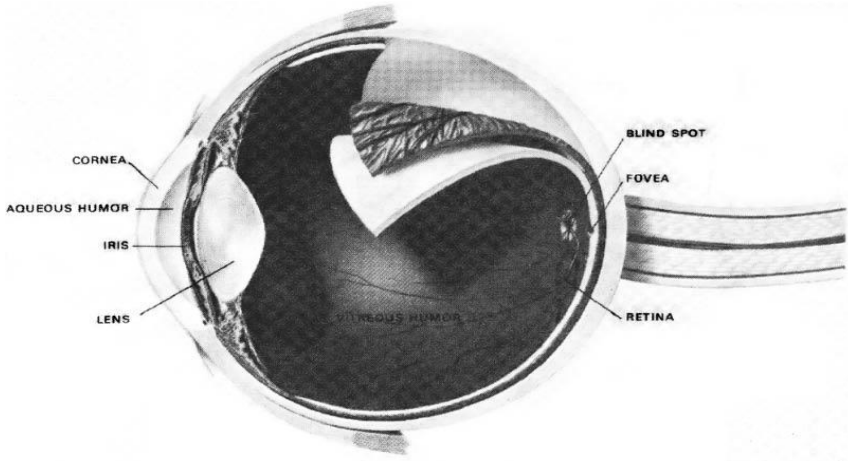
THE PATH OF AN ORDER from the brain for muscular action is followed in this schematic diagram. From a neuron (red) in the cortex a signal leaves the brain, crosses to the other side of the spinal cord (each side of the brain controls the opposite side of the body) and stimulates a motor neuron in the spinal column. The neuron's axon, encased in its sheath, leads to the muscle and makes contact with its fibers, which then react to the signal by contracting.

GENETIC MUTATIONS

Because cells possess individual consciousness and group cells produce group consciousness, the group behavior pattern is subject to growing in a changing environment.

One hundred years ago, the average man lived to be approximately forty years of age. Man then had no harmful radio waves, dirty air or food additives, but still he lived only a short time. As man began to realize he could get rid of disease through drugs, resist seasonal diseases and viruses through vitamin therapy and a multitude of other life-giving discoveries, we often forget that the change had to take place in the cell first. This change is permanent right down to the DNA code. This means with the proper guidance people who had inheritable diseases, by proper discipline, could break the hereditary bond and not transmit a disease or genetic weakness like diabetes to the next generation. The discipline to accomplish this can be a tremendous test on the individual, as it can take as long as 21 years to complete three cycles of body cell change and reach the DNA, the last cells to make this change. However, when DNA acknowledges this, the change is permanent.

Figure XI-22



Window on a Colorful World

Light waves are readily blocked, and the eyes, unlike the ears, must be aimed at what they see. The eye operates on the same principle as the camera – the only machine directly modeled on a sense organ. The eye, however, takes two simultaneous pictures, one in black and white, the other in color. Cells in the retina, called rods, register black and white only; they are so sensitive they can detect light as feeble as a 100-trillionth of a watt. Other retinal cells, the cones, are affected by color, and are most abundant at the fovea, the place where the image falls when the eye focuses. The blind spot, lacking both rods and cones, is where the optic nerve leaves the retina, carrying its pictures for the brain to develop.

If you stop and meditate on what I am really saying, it is that we are all basically immortal beings and physical immortality to a degree is becoming feasible. Why should an olive or redwood tree with a lesser degree of intelligence live one, two or three thousand years? A whale, two or three hundred. A simple parrot 75-120 years? The answer is attunement. These plants and animals are attuned to the natural vibration of nature herself, not confused with a maze of intellect that only could hurt them.

Why does a plant grow three times faster under a pyramid? Why does my dog, Robbie, 7 years in a pyramid doghouse and almost 16 years in age, have more vitality than most puppies? Why does an apple placed

under a pyramid stay fresh up to a year? The answer is plain and simple attunement to a form that can bring every cell in its metabolism closer to immortality.

Let us look at another thing in our culture that is mutating cellular development. Narcotic drugs. At the first mention of the word, narcotic, most people turn away from what follows in sheer disgust. Why? Because all they have ever been exposed to are the negative attributes of drug misuse. The author, however, did not turn his head. In 1974-1975, he led a drug rehabilitation center in Hollywood, California, the drug capital, and learned more about the long-term effects of drugs such as Marijuana, LSD, Heroin, PCP, THC, Cocaine, STP, Barbiturates and tranquilizers than most universities will ever uncover. This, he clearly demonstrated in a California desert by consuming enough strychnine to kill 50 people, and walked away from the experience with no side effects other than enough knowledge to fill 50 volumes. This would not have been possible had I not taught every cell in my body discipline, discipline under stress, chemical as well as emotional. The school room I attended was God's classroom, conducted at a drug rehabilitation center serving those who could not control their habits.

Now, let us take a wide-scale view of things.

The main reason the establishment is down on formula B-15 is that it is a clear form of nerve nutritition. If enough people take it long enough, they will overcome their mass paranoia because their mental strength will overcome the oppression and greed that is currently dictating their daily routine.

The establishment encourages current multivitamin B complex because it is full of yeast. Yeast is a deadly bacteria carrier and gradually poisons the body. It takes 50-60 years to take effect, just long enough to keep you asleep to Big Brother who "knows" while he steals around you while you sleep in your bliss of ignorance.

Wake up, America! The 1980 Olympics are coming! The Russians take drugs, do not take yeast, take pure B-15, use Pyramid energy, maintain a vigorous 24-hours-a-day program of exercise and meditation and have mutated their cells to become supermen. I am not encouraging you to become Russians, but I am saying, in the jungle the strongest survive and the weak become extinct. The race that demonstrates physical and

spiritual prowess is going to rule the Earth because this is what it takes to play God, and that is what all nations are trying to do.

VITAMINS

One area of health care where I have found a large amount of misunderstanding is vitamin consumption. Vitamins in the body serve in four main areas:

1. As replenishment of the ingredients and chemicals in our internal laboratories called the endocrine system.
2. To maintain and rebuild the cellular structure of the body.
3. As an aid in carrying oxygen throughout the body – the negative ion effect.
4. To help speed up and detoxify the body and fortify the body's immunity systems.

Because everyone is an individual and every individual is in a different state of development, the vitamin requirements are different. I will outline a basic guideline that will apply to everyone.

To start with, the basics recognize that all vitamins known to man fall into seven main forms, spoken of in earlier chapters, and that their chemical action aids the body in converting energy into action. The energies are clearly visible through Kirlian photography and demonstrable through Kinesiology. The next thing to know is that vitamins will help balance the body in stress conditions such as hypertension, dirty air, contaminated food, poor water supplies, etc.

Vitamins A, C, D, and K are stress vitamins and oxidizers. Vitamin A helps balance the hormones in the head centers, and is a vitamin of the first ray, or will. It is considered in cancer therapy an as anti-tumor vitamin because it is essential in balancing estrogen, a neurohormone that the body overproduces under stress when there is a vitamin A deficiency. Large amounts of estrogen in the bloodstream causes cellular protein deposits, fat, which then blocks off the body's oxygen supply in these regions and you have a benign tumor. Cancer flourishes in the absence of oxygen as the tumor continues to grow and the benign tumor then becomes malignant.

The best form of Vitamin A is as a dry tablet, not as an oil. The dosage under stress or smog conditions can be as high as 70,000 I.U. a day, and never with alcohol. For higher dosages, such as are required in cases of malignancy, vitamin A should be consumed in an emulsified form that bypasses the liver.

Vitamin C is also a stress vitamin and oxidant. In addition, it is a powerful cleanser and should be followed with large amounts of water. It may be taken with alcohol because it speeds up the healing action of the liver and helps prevent the formation of kidney stones. There is no minimum dosage requirement or maximum dosage as the body will not retain it very long. Wearing a Firedome helps increase its absorptive effects and allows the body a higher utilization of vitamin C. The average daily dosage in most adults is one to ten grams.

The B vitamins are stress vitamins and are very essential in rebuilding nerve and brain cells and the first symptom of a B deficiency is paranoia and nervousness. B vitamins should be consumed around mealtime and should not be consumed in a combined form containing yeast as a binder, because yeast is poison to the body and causes sluggishness of the brain, dry and cracked skin in old age, and hosts unfriendly bacteria throughout the body.

Niacin, which is vitamin B-3 is an important B vitamin as it cleans the body of stored antigens (unhealthy protein) as well as building up cellular staying power. It should be taken in its pure form and the average dosage can be 500 units a day. Caution is required at first because when the toxins are released from most cells in the body, a rapid flashing may result. This can be balanced by water consumption. If you are not a regular niacin user, start with 100 mg. dosage and increase in 100 mg. increments every other day until you reach 500 mg.

Vitamin B-15 is a super stress vitamin and a super oxidant. 200 units a day is minimal under stress of any nature and if taken in the form of calcium pangamate, it should be chewed thoroughly. The B vitamins are rays three through seven.

Vitamin E is a cleanser. It helps the body break down fat and oil and improves circulation. It speeds up healing processes as an oxygen transporter. It helps counter the long-term effect of yeast that has been foolishly ingested. It should be consumed in a minimal amount of 400

units up to whatever feels good. My indication of too little is aching muscles, usually in the legs, and too much is excessively oily hair.

Lecithin should be always taken with vitamin E, as it insures the body's proper utilization and absorption of vitamin E. Lecithin rebuilds the myelin sheaths in the body, so it falls under stress nutrients. Vitamin E and Lecithin are rays two and six respectively.

Although the body is only five percent minerals, without these minerals being present in the body – and their presence must be in harmony – you will have tremendous difficulty in assimilating and retaining the above-mentioned vitamins. The best form of commercial minerals are Hyland's Cell Salts and chelated mineral substances in individual forms such as Zinc, Sodium, Potassium, etc. If you are not sure about your mineral balance and what to take, because this is a highly specialized area of body chemistry, I recommend that you see your physician or consult a holistic doctor who specializes in body chemistry, testing and balance. An example of a critical mineral would be the Calcium-Phosphorus balance. If your Calcium is too low, you will get cramping in the body, often in the feet first. Then you will get rapid tooth decay. If the Calcium is too high, you get dangerous build-up in the body, causing circulatory restriction in the mouth and brittle bones, which can break very easily. To alleviate any uncertainties in this area, Calcium-Phosphorus tests are available. One great pioneer of this is Dr. Jack Alpan on Third Street in Los Angeles. Contact him for a clinic in your area.

The next gray area I find in vitamin usage is storage and consumption. Vitamins decay quite rapidly with heat and sunlight, and lose their potency. Secondly, if the wrong combinations are taken, they can have negative effects. Examples of this are: vitamin C and vitamin E cancel each other out; and vitamin A taken with alcohol can destroy cells rather than build them.

Here are some general rules I find that work on almost everyone:

5. Start the day out with a glass of water followed by vitamins A, E and Lecithin. Vitamin A taken by itself putrefies in the intestinal tract but with E and Lecithin, vitamin A is readily absorbed. In short, vitamin A, E and Lecithin should be taken 15 minutes or more before the first meal of the day.

6. Take the B vitamins and minerals with meals. In some cases of weak digestive tracts, taking them alone on an empty stomach, people get severe indigestion and nausea from vitamin B-3 (niacin). Play it safe. Eat with the B vitamins and minerals.
7. Vitamin C should be taken by itself, alone anywhere you find a space, 1 hour after vitamins A, B's. E, etc. I eat C like candy throughout the day instead of "junk" snacks.

Remember, vitamins are energy in a solid form and you are the converter. Use them with respect and discretion.

CHAPTER XII – BLOOD: THE TRUE ELIXER OF LIFE AND THE PRODIGY OF SPIRITS- COMPONENTS OF A QUARTET

Blood has four main components. About 55% of it is a fluid, plasma. The remaining 45% is made up of three kinds of cells: Red cells, or erythrocytes – Malpighi's find; white cells, or leukocytes; and platelets, or thrombocytes. Except for one variety of white blood cells, all the cellular components are manufactured in the bone marrow.

Plasma, in which the cells float, is a yellowish solution, 92% water, the other 8% a host of substances indispensable to life. Among them are nutrients – glucose, fats and amino acids; inorganic materials like sodium potassium and calcium; special protein like fibrinogen, albumin and various globulins; antibodies, defensive globulins which fight off viruses and other unwelcome intruders in the body; and hormones such as insulin and epinephrine, more familiarly known as adrenalin, which speeds up the heart rate whenever some emergency requires a greater blood flow to the muscles. With its potent arsenal to draw upon, plasma plays a crucial role in maintaining the body's chemical balance, water content and temperature at a safe level – a function quite apart from its role in the transport of food, oxygen and waste.

The red cells outnumber the white cells 700 to 1. Theirs is the exclusive and all-important job of picking up oxygen in the lungs, carrying it to the rest of the body and convoying waste carbon dioxide back the other way. Their life is hectic and short; after about three or four months they fall apart and are replaced by new recruits sent into the bloodstream from the bone marrow. The red cells' effectiveness as an oxygen-carrier is due to their content of hemoglobin, a compound of protein and iron which gives blood its red color. Hemoglobin has a chemical way of latching onto oxygen and holding it in its grip until its destination is reached. Because oxygen does not dissolve well in plasma, the binding power of hemoglobin is vital. Otherwise the blood could carry only enough dissolved oxygen for two and a half seconds, and any period of breathlessness, such as the brief time after a sneeze, might well prove fatal. When, for any reason, the hemoglobin content dips below minimum body needs, the result is anemia, meaning although not quite literally, "no blood". A diet deficient in iron-rich foods, such as meat, may cause anemia in truck drivers as well as in frail old ladies.

THE RALLY OF WRIGGLERS

The white cells constitute the blood's mobile guard. Some are endowed with the curious ability to wriggle out of the bloodstream and back in again. They rally in great numbers wherever invading bacteria gain entry into the body, engulfing and destroying them. Whenever white cells mobilize for action, the body compensates by manufacturing more. Double the usual number may appear in the blood within hours. Often this rising white count, as doctors describe it, serves as an early tip-off to dangerous infections.

Perhaps the strangest of blood's three cellular components are the platelets, named for their resemblance to tiny plates. For a long while these cells, discovered about a century ago, utterly baffled researchers. Then it was observed that people with low platelet counts were very vulnerable to bleeding. Platelets were found to be vital to blood-clotting. When they touch the roughened surface of a torn blood vessel, they burst apart, releasing chemicals that set off a reaction in the blood leaking out. The exact steps are still in dispute, but the result is the conversion of one of plasma's proteins, fibrinogen, into a network of crystals that enmesh the red blood cells – thereby forming a clot which seals the leak.

In its basic operations blood finds a powerful ally in the substance known as lymph. This watery fluid, as mentioned earlier, serves as a bridge across which oxygen, nutrients and wastes pass between the capillaries and the body cells. As the bloodstream unloads its outgoing cargoes through the capillaries, many of its plasma proteins – fully half of them in the course of a day – also escape, under the force of blood pressure. Once they have broken out, the errant proteins cannot get back directly into the bloodstream. The lymph, therefore takes a hand. It conveys them – via a special circulatory system of its own, composed of lymphatic capillaries and ducts – into veins near the shoulders, which pass them into the heart. Lymph also carries along a number of chemical products, including droplets of fat and cholesterol which are absorbed during the process of digestion. By the time the meandering and relatively sluggish lymphatic system brings these cargoes back to the heart, they have been greatly diluted.

The performance of the lymph, and of the blood itself, has been largely revealed within our own century. Today, for example, it is commonplace knowledge that an individual possesses either blood type A, B, AB or O.

It was only in 1900 that the existence of various blood types were established; the discoverer was an Austrian physician, Dr. Karl Landsteiner who later won the Nobel Prize for his work. His research was the inevitable outcome of centuries of trial-and-error in blood transfusions. The transfusion technique was a probable offshoot of the early custom of drinking blood as a means of rejuvenation: the Romans, for example, would rush into the arena to quaff the blood of dying gladiators. The first transfusion on record was effected in 1667, by Jean Baptiste Denis, physician to Louis XIV of France. Denis temporarily restored a dying boy by injecting about eight ounces of lamb's blood into his veins. In time, transfusion attempts became more widespread. But why some worked, and why some failed, or even proved fatal, was a question that continued to perplex doctors until Landsteiner.

ANSWERS IN A TEST TUBE

The simple technique which Landsteiner used to reach an answer was to mix, in test tubes, the plasma of one person with the red cells of another. In some cases the two blended smoothly; in others, the cells would not mix, clumping together instead. Inside the body such clumping would clog the capillaries a dangerous and perhaps deadly situation. The key to clumping or not clumping, Landsteiner found, was the way red cells containing a particular protein, or agglutinogen, reacted to plasma containing another type of protein called an agglutinin. Red cells with one type of protein would be compatible with plasma containing one type of agglutinin, but not with plasma containing another type.

Landsteiner accordingly typed human blood as A, B or O (for zero). The red cells of this latter type contained no agglutinogens at all, and could thus provide a blend with any type of plasma; hence a type-O person became known as a "universal donor". The next year, two other researchers, one a pupil of Landsteiner, found a fourth blood type, AB, whose plasma would receive any type of red cell; hence a type-AB person became known as a "universal recipient". In 1940, four decades after his original discovery, Landsteiner, now an American citizen, discovered, in collaboration with Dr. Alexander S. Wiener, a new substance in the red cells which they labeled the Rh factor, after the rhesus monkey whose plasma they mixed with human red cells. It was found that when a mother who lacked the Rh factor, and was "Rh-negative", gave birth to a baby who was "Rh-positive", the infant would sometimes die.

Other new factors, whose behavior is still unclear, have also been detected in the blood, and new complexities of other sorts have been revealed about it. As often in medical science, the deeper the probe has gone the less simple the answers begin to be. The same is true for the heart, which in recent decades has been subject to inspection, manipulation and operation to an extent William Harvey and his successors would never in their wildest dreams have imagined to be possible.

BLOOD

The blood is the direct channel of the Spirit within the body of man. It contains the deepest secrets of life. A "blood tie" means a bond that is indissoluble; it can be severed only through a Spirit's final release from its body. This fact was borne out by an interesting press report about a man who had given of his blood to a considerable number of persons requiring transfusions. He stated that whenever one whom he had so served died, he was immediately aware of the passing and also saw the likeness of the departed. What we saw was not merely a likeness, but the disembodied Spirit itself.

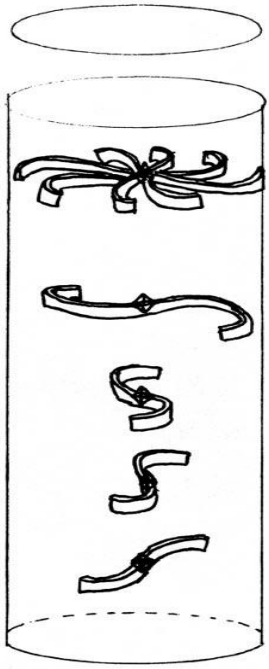
In the case of blood transfusions great care should be exercized to secure the proper blood type and a donor belonging astrologically to the same element as the patient. A patient coming under a fire sign should accept blood only from a donor who comes under either a fire or an air sign: a water patient should draw on someone belonging to an earth or water sign; an air patient, from a fire or air donor; an earth patient from one coming under a water or an earth sign.

Two persons coming into such an intimate relationship as the mixing of blood usually do so in liquidation of some debt incurred in the past. One who frequently gives his blood in this manner is probably atoning for blood he has shed, perhaps in the course of wars of ruthless aggression. In the case of a person highly sensitized through clean and holy living, insufficient precautions may be serious or even fatal. In such a case it is desirable to obtain blood from one who abstains from meat, tobacco, and alcoholic liquors. Where the vibratory rate of the newly infused blood varies too greatly from that of the patient, the Ego may not be able to reconcile the difference and bring the "alien" life – for "the life is in the blood" – under its complete control, in which event derangement, or even death, is the result.

HEMOGLOBIN – HEART OF THE RED BLOOD CELL

Hemoglobin moves through the veins and arteries like a roto-rooter rapidly picking up carbon dioxide and other waste materials and dropping off a fresh supply of oxygen. Its actual physical structure resembles a four-stage axial compressor in a jet aircraft, and each stage functions like a rotary engine in a Mazda automobile. The result of their rotary action moves the life force "Prana" via the etheric body and spreads this life ebb to every cell in the body. The Pyramid, via the action of the Vitality Globule, pushes the hemoglobin into a high-speed rotary motion, and the negative ions from a negative-ion generator, or nature, supply the electricity needed to complete the chemical action, which is explained following this brief introduction in a recently completed work by M. F. Perutz.

Figure XII-1



One heme in hemoglobin with its compressors all neatly contained.

Hemoglobin is like a four stage axial compressor. It corkscrews through the arteries picking up waste material and leaving a trail of oxygen in its wake.

The irony of it all is that a jet engine works in the reverse. It sucks oxygen and leaves pollution in its wake.

The exchange principle of the individual "hemes" or compressors in hemoglobin works like a rotary engine. A concentric compressor rotates

in one direction only, burns and exhausts itself with no back pressure, like a normal auto engine, which has opposing parts and consumes a lot of energy, defeating its own opposition.

Figure XII-2

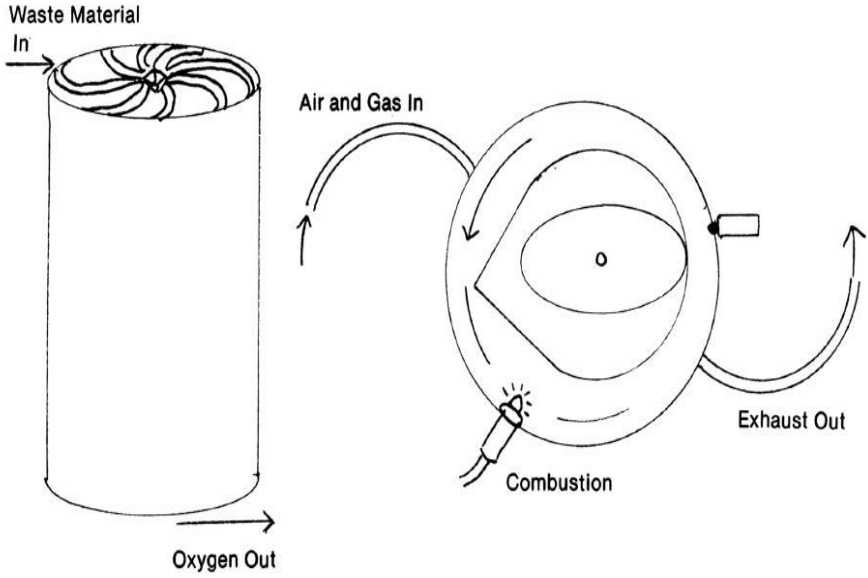
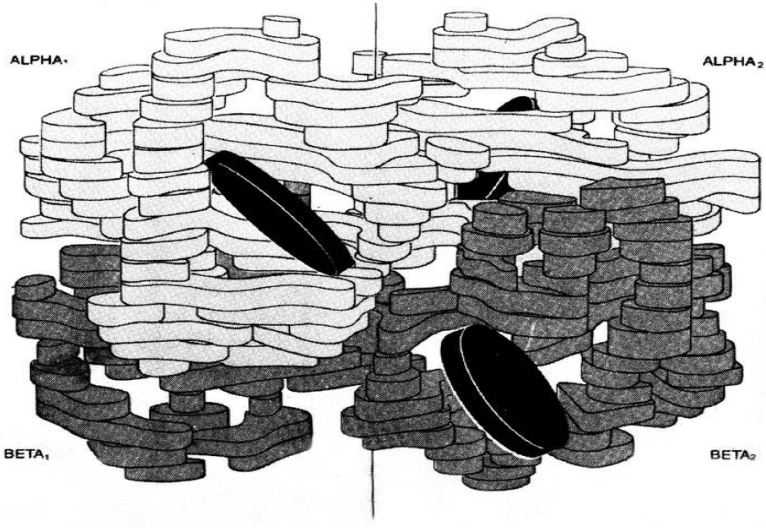
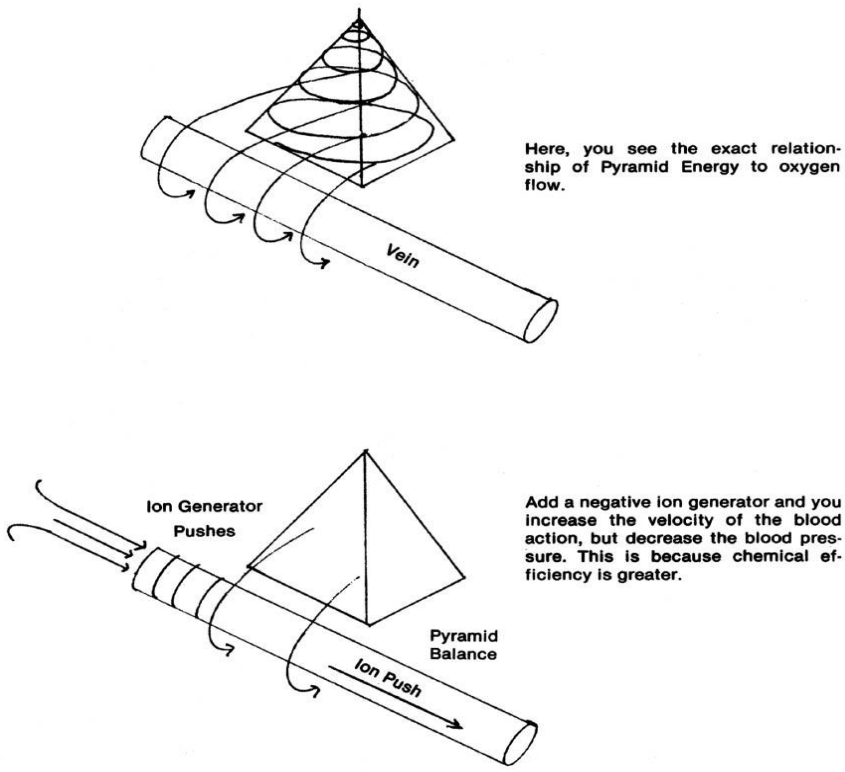


Figure XII-3



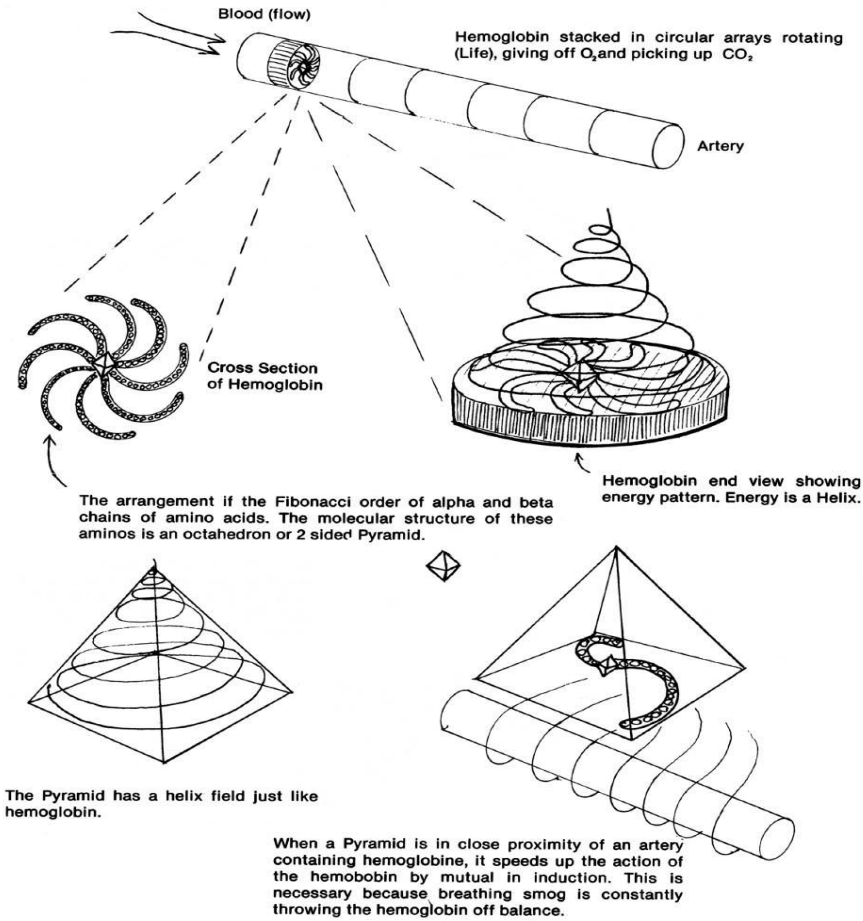
COMPLETE MOLECULE of hemoglobin is made up of four sub-units, each of which consists of one polypeptide chain and one heme. There are two kinds of sub-unit, designated alpha (white) and beta (gray), which have different sequences of amino acid residues but similar three-dimensional structures. The beta chain also has one short extra helix. The four sub-units, seen here in two views, are arranged at the vertexes of a tetrahedron around an axis of two-fold symmetry. Each heme (color) lies in a separate pocket at the surface of the molecule.

Figure XII-4



This joint action of Pyramid energy and negative ion generators, if properly digested, presents a solution that will allow us to enter and conquer the effects of air pollution by causing genetic mutations down to the cellular Level.

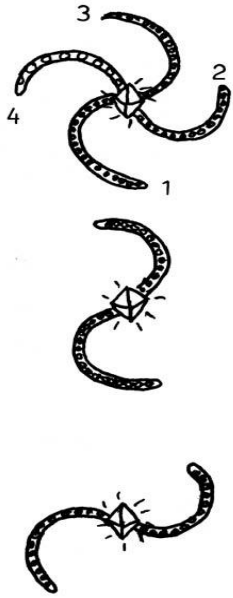
Figure XII-5



When our bodies make this change and stabilize, we will no longer need Pyramids or negative-ion generators. But this does and will take time. I estimate that the average individual in the future, bearing in mind that pollution will be curtailed in a few years, will wear or be around the environment of Pyramids and negative-ion generators some ten to fifteen years before they are no longer needed. Remember, it takes time to reach that DNA to make a change permanent, but with the grace of God, we realize our predicament, and by the same grace, will undo it. Remember, the Pyramid is on every dollar bill and is the seventh wonder of the world.

Hemoglobin is the vital protein that conveys oxygen from the lungs to the tissues and facilitates the return of carbon dioxide from the tissues back to the lungs. These functions and their subtle interplay also make hemoglobin one of the most interesting proteins to study. Like all proteins, it is made of the small organic molecules called amino acids, strung together in a linear sequence called a polypeptide chain. The amino acids are of 20 different kinds and their sequence in the chain is genetically determined.

Figure XII-6



The Hemoglobin molecule is composed of 4 Polypeptide chains of

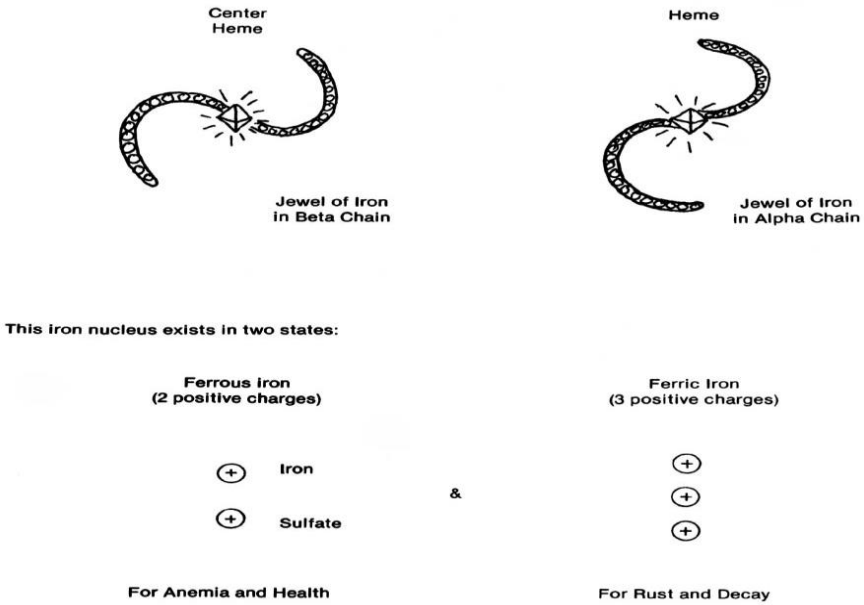
Two Alpha Chains of 141 amino acid residues

& Two Beta Chains

In the nucleus of these chains is one "heme" made up from a ring of carbon, oxygen, nitrogen and hydrogen called a porphyrin with a single iron atom like jewel at its center.

Normally, the ferrous iron would react and form rust, but when it is immersed in the folds of the Alpha and Beta chains in the hemoglobin, it is protected so that its reaction with oxygen is reversible.

Figure XII-7



The effect of the globin on the chemistry of the heme has been explained only recently with the discovery that the irreversible oxidation of heme proceeds by way of an intermediate compound in which an oxygen molecule forms a bridge between the iron atoms of two hemes. In myoglobin and hemoglobin the folds of the polypeptide chain prevent the formation of such a bridge by isolating each heme in a separate pocket. Moreover, in the protein, the iron is linked to a nitrogen atom of the amino acid histidine, which donates negative charge that enables the iron to form a loose bond with oxygen.

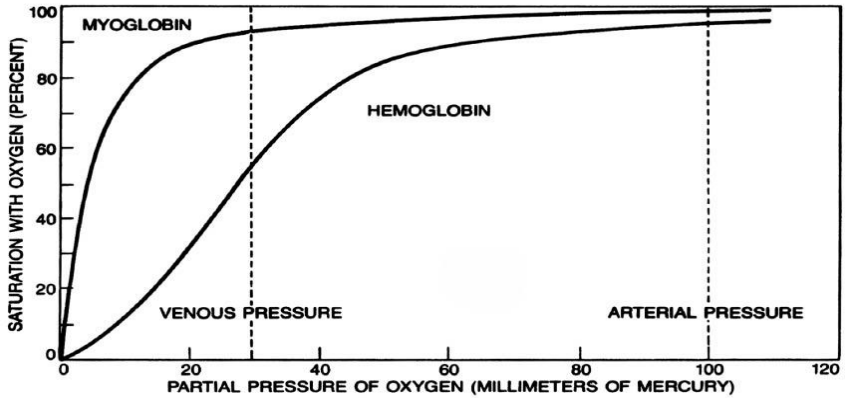
An oxygen-free solution of myoglobin or hemoglobin is purple like venous blood. When oxygen is bubbled through such a solution, it turns scarlet like arterial blood. If these proteins are to act as oxygen carriers, then hemoglobin must be capable of taking up oxygen in the lungs, where it is plentiful, and giving it up to myoglobin in the capillaries of muscle, where it is less plentiful; myoglobin in turn must pass the oxygen on to the mitochondria, where it is still scarcer.

A simple experiment shows that myoglobin and hemoglobin can accomplish this exchange because there is an equilibrium between free oxygen and oxygen bound to heme iron. Suppose a solution of

myoglobin is placed in a vessel constructed so that a large volume of gas can be mixed with it and so that its color can also be measured through a spectroscope. Without oxygen only the purple color of deoxymyoglobin is observed. If a little oxygen is injected, some of the oxygen combines with some of the deoxymyoglobin to form oxymyoglobin, which is scarlet. The spectroscope measures the proportion of oxymyoglobin in the solution. The injection of oxygen and the spectroscopic measurements are repeated until all the myoglobin has turned scarlet. The results are plotted on a graph with the partial pressure of oxygen on the horizontal axis and the percentage of oxymyoglobin on the vertical axis. The graph has the shape of a rectangular hyperbola: it is steep at the start, when all the myoglobin molecules are free, and it flattens out at the end, when free myoglobin molecules have become so scarce that only a high pressure of oxygen can saturate them.

To understand this equilibrium one must visualize its dynamics. Under the influence of heat, the molecules in the solution and in the gas are whizzing around erratically, and are constantly colliding. Oxygen molecules are entering and leaving the solution, forming bonds with myoglobin molecules and breaking away from them. The number of iron-oxygen bonds that break in one second is proportional to the number of oxymyoglobin molecules. The number of bonds that form in one second is proportional to the frequency of collisions between myoglobin and oxygen, which is determined in turn by the product of their concentrations. When more oxygen is added to the gas, more oxygen molecules dissolve, collide with and bind to myoglobin; this raises the number of oxymyoglobin molecules present and therefore also the number of iron-oxygen bonds liable to break, until the number of myoglobin molecules combining with oxygen in one second becomes equal to the number that lose their oxygen in one second. When that happens, a chemical equilibrium has been established.

Figure XII-8



EQUILIBRIUM CURVES measure the affinity for oxygen of hemoglobin and of the simpler myoglobin molecule. Myoglobin, a protein of muscle, has just one heme group and one polypeptide chain and resembles a single sub-unit of hemoglobin. The vertical axis gives the amount of oxygen bound to one of these proteins, expressed as a percentage of the total amount that can be bound. The horizontal axis measures the partial pressure of oxygen in a mixture of gases with which the solution is allowed to reach equilibrium. For myoglobin (black) the equilibrium curve is hyperbolic. Myoglobin absorbs oxygen readily but becomes saturated at a low pressure. The hemoglobin curve (color) is sigmoid: initially hemoglobin is reluctant to take up oxygen, but its affinity increases with oxygen uptake. At arterial oxygen pressure both molecules are nearly saturated, but at venous pressure myoglobin would give up maybe about 10 percent of its oxygen, whereas hemoglobin releases roughly half. At any partial pressure myoglobin has a higher affinity than hemoglobin, which allows oxygen to be transferred from blood to muscle.

The distribution of oxygen among the hemoglobin molecules in a solution therefore follows the biblical parable of the rich and the poor: "For unto every one that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath." This phenomenon suggests there is some kind of communication between the hemes in each molecule, and physiologists have therefore called it heme-heme interaction.

A better picture of the underlying mechanism of heme-heme interaction is obtained in a logarithmic graph. The equilibrium curve then begins with a straight line at 45 degrees to the axes, because at first oxygen molecules are so scarce that only one heme in each hemoglobin molecule has a chance of catching one of them, and all the hemes therefore react independently, as in myoglobin. As more oxygen flows in, the four hemes in each molecule begin to interact and the curve steepens. The tangent to its maximum slope is known as Hill's coefficient (n), after the physiologist A. V. Hill, who first attempted a mathematical analysis of oxygen equilibrium. The normal value of Hill's coefficient is about 3; without heme-heme interaction it becomes unity. The curve ends with another line at 45 degrees to the axes because oxygen has now become so abundant that only the last heme in each molecule is likely to be free, and all the hemes in the solution react independently once more.

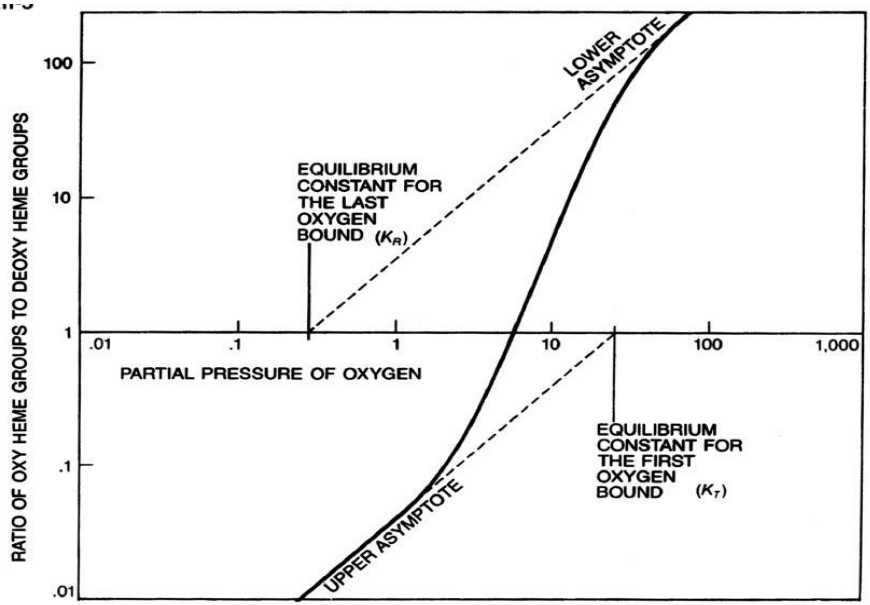
Hill's coefficient and the oxygen affinity of hemoglobin depend on the concentration of several chemical factors in the red blood cell: protons (hydrogen atoms without electrons, whose concentration can be measured as pH), carbon dioxide (CO2), chloride ions (Cl–) and a compound of glyceric acid and phosphate called 2, 3-diphosphoglycerate (DPG). Increasing the concentration of any of these factors shifts the oxygen equilibrium curve to the right, toward lower oxygen affinity, and makes it more sigmoid. Increased temperature also shifts the curve to the right, but it makes it less sigmoid. Strangely, none of these factors, with the exception of temperature, influences the oxygen equilibrium curve of myoglobin, even though the chemistry and structure of myoglobin are related closely to those of the individual chains of hemoglobin.

What is the purpose of these extraordinary effects? Why is it not good enough for the red cell to contain a simple oxygen carrier such as myoglobin? Such a carrier would not allow enough of the oxygen in the red cell to be unloaded to the tissues, nor would it allow enough carbon dioxide to be carried to the lungs by the blood plasma. The partial pressure of oxygen in the lungs is about 100 millimeters of mercury, which is sufficient to saturate hemoglobin with oxygen whether the equilibrium curve is sigmoid or hyperbolic. In venous blood the pressure is about 35 millimeters of mercury; if the curve were hyperbolic, less than 10 percent of the oxygen carried would be released at that pressure, so that a man would asphyxiate even if he breathed normally.

The more pronounced the sigmoid shape of the equilibrium curve is, the greater the fraction of oxygen that can be released. Several factors conspire to that purpose. Oxidation of nutrients by the tissues liberates lactic acid and carbonic acid; these acids in turn liberate protons, which shift the curve to the right, toward lower oxygen affinity, and make it more sigmoid. Another important regulator of the oxygen affinity is DPG. The number of DPG molecules in the red cell is about the same as the number of hemoglobin molecules – 280 million – and probably remains fairly constant during circulation; a shortage of oxygen, however, causes more DPG to be made, which helps to release more oxygen. With a typical sigmoid curve, nearly half of the oxygen carried can be released to the tissues. The human fetus has a hemoglobin with the same alpha chains as the hemoglobin of the human adult but different beta chains, resulting in a lower affinity for DPG. This gives fetal hemoglobin a higher oxygen affinity and facilitates the transfer of oxygen from the maternal circulation to the fetal circulation.

Carbon monoxide (CO) combines with the heme iron at the same site as oxygen, but its affinity for that site is 150 times greater; carbon monoxide therefore displaces oxygen, which explains why it is so toxic. In heavy smokers, up to 20 percent of the oxygen-combining sites can be blocked by carbon monoxide, so that less oxygen is carried by the blood. In addition, carbon monoxide has an even more sinister effect. The combination of one of the four hemes in any hemoglobin molecule with carbon monoxide raises the oxygen affinity of the remaining three hemes by heme-heme interaction. The oxygen equilibrium curve is therefore shifted to the left, which diminishes the fraction of the oxygen carried that can be released to the tissues.

Figure XII-9



SIGMOID SHAPE of the oxygen equilibrium curve appears more pronounced when the fractional saturation and partial pressure of oxygen are plotted on logarithmic scales. On such a graph the equilibrium curve for myoglobin becomes a straight line at 45 degrees to the axes. The hemoglobin curve begins and ends with straight lines, called asymptotes, at the same angle. Their intercepts with the horizontal line drawn where the concentrations of deoxyhemoglobin and oxyhemoglobin are equal give the equilibrium constants for the first and last oxygen molecules to combine with hemoglobin. In the allosteric interpretation of the curve these are respectively the equilibrium constants of the R structure (KR) and the T structure (KT). For the curve shown, the two constants are respectively 30 and .3, indicating that the affinity for the last oxygen bound is 100 times the affinity for the first. This ratio determines the free energy of the heme-heme interaction, which is a measure of the influence exerted by the combination of any one of the four hemes with oxygen on the oxygen affinity of the remaining hemes. If the beginning and end of the curve cannot be measured accurately, the maximum slope of the curve, known as Hill's coefficient, indicates the degree of the heme-heme interaction.

If protons lower the affinity of hemoglobin for oxygen, then the laws of action and reaction demand that oxygen lower the affinity of hemoglobin for protons. Liberation of oxygen causes hemoglobin to combine with protons, and vice versa; about two protons are taken up for every four molecules of oxygen released, and two protons are liberated again when four molecules of oxygen are taken up. This reciprocal action is known as the Bohr effect and is the key to the mechanism of carbon dioxide transport. The carbon dioxide released by respiring tissues is too insoluble to be transported as such, but it can be rendered more soluble by combining with water to form a bicarbonate ion and a proton. The chemical reaction is written CO2 + H2O – – HCO3– + H– . In the absence of hemoglobin this reaction would soon be brought to a halt by the excess of protons produced, like a fire going out when the chimney is blocked. Deoxyhemoglobin acts as a buffer, mopping up the protons and tipping the balance toward the formation of soluble bicarbonate. In the lungs the process is reversed. There, as oxygen binds to hemoglobin, protons are cast off, driving carbon dioxide out of solution so that it can be exhaled. The reaction between carbon dioxide and water is catalyzed by carbonic anhydrase, an enzyme in the red cells. The enzyme speeds up the reaction to a rate of about half a million molecules per second, one of the fastest of all known biological reactions.

There is a second but less important mechanism for transporting carbon dioxide. The gas binds more readily to deoxyhemoglobin than it does to oxyhemoglobin, so that it tends to be taken up when oxygen is liberated and cast off when oxygen is bound. The two mechanisms of carbon dioxide transport are antagonistic: for each molecule of carbon dioxide bound to deoxyhemoglobin either one or two protons are released, which oppose the conversion of other molecules of carbon dioxide to bicarbonate. Positively charged protons entering the red cell draw negatively charged chloride ions in with them, and these ions, too, are bound more readily by deoxyhemoglobin than by oxyhemoglobin. DPG is synthesized in the red cell itself and cannot leak out through the cell membrane. It is strongly bound by deoxyhemoglobin and only very weakly bound by oxyhemoglobin.

Heme-heme interaction and the interplay between oxygen and the other four ligands are known collectively as the cooperative effects of hemoglobin. Their discovery by a succession of able physiologists and biochemists took more than half a century and aroused many

controversies. In 1938 Felix Haurowitz of the Charles University in Prague made another vital observation. He discovered that deoxyhemoglobin and oxyhemoglobin form different crystals, as though they were different chemical substances, which implied that hemoglobin is not an oxygen tank but a molecular lung because it changes its structure every time it takes up oxygen or releases it.

THEORY OF ALLOSTERY

The discovery of an interaction among the four hemes made it obvious that they must be touching, but in science what is obvious is not necessarily true. When the structure of hemoglobin was finally solved, the hemes were found to lie in isolated pockets on the surface of the sub-units. Without contact between them how could one of them sense whether the others had combined with oxygen? And how could as heterogeneous a collection of chemical agents as protons, chloride ions, carbon dioxide and diphosphoglycerate influence of oxygen equilibrium curve in a similar way? It did not seem plausible that any of them could bind directly to the hemes, that all of them could bind at any other common site, although there again it turned out we were wrong. To add to the mystery, none of these agents affected the oxygen equilibrium of myoglobin or of isolated subunits of hemoglobin. We now know that all the cooperative effects disappear if the hemoglobin molecule is merely split in half, but this vital clue was missed. Like Agatha Christie, nature kept it to the last to make the story more exciting.

There are two ways out of an impasse in science: to experiment or to think. By temperament, perhaps, Michael Perutz experimented, whereas Jacques Monod thought. In the end their paths converged.

Monod's scientific life had been devoted to finding out what regulates the growth of bacteria. The key to this problem appeared to be regulation of the synthesis and catalytic activity of enzymes. Monod and Francois Jacob had discovered that the activity of certain enzymes is controlled by switching their synthesis on and off at the gene; they and others then found a second mode of regulation that appeared to operate switches on the enzymes themselves.

In 1965 Monod and Jean-Pierre Changeux of the Pasteur Institute in Paris, together with Jeffries Wyman of the University of Rome, recognized that the enzymes in the latter class have certain features in

common with hemoglobin. They are all made of several subunits, so that each molecule includes several sites with the same catalytic activity, just as hemoglobin includes several hemes that bind oxygen, and they all show similar cooperative effects. Monod and his colleagues knew that deoxyhemoglobin and oxyhemoglobin have different structures, which made them suspect that the enzymes too may exist in two (or at least two) structures. They postulated that these structures should be distinguished by the arrangement of the sub-units and by the number and strength of the bonds between them.

If there are only two alternative structures, the one with fewer and weaker bonds between the sub-units would be free to develop its full catalytic activity (or oxygen affinity); this structure has therefore been labeled R, for "relaxed". The activity would be damped in the structure with more and stronger bonds between the sub-units; this form is called T, for "tense". In either of these structures the catalytic activity (or oxygen affinity) of all the subunits in one molecule should always remain equal. This postulate of symmetry allowed the properties of allosteric enzymes to be described by a neat mathematical theory with only three independent variables: KR and KT, which in hemoglobin denote the oxygen equilibrium constants of the R and T structures respectively, and L, which stands for the number of molecules in the T structure divided by the number in the R structure, the ratio being measured in the absence of oxygen. The term allostery (from the Greek roots allos, "other", and stereos, "solid") was coined because the regulator molecule that switches the activity of the enzyme on or off has a structure different from that of the molecule whose chemical transformation the enzyme catalyzes.

The ingenious theory simplified the interpretation of the cooperative effects enormously. The progressive increase in oxygen affinity illustrated by the parable of the rich and the poor now arises not from any direct interaction between the hemes but from the switchover from the T structure with low affinity to the R structure with high affinity. This transformation should take place either when the second molecule of oxygen is bound or when the third is bound. Chemical agents that do not bind to the hemes might lower the oxygen affinity by biasing the equilibrium between the two structures toward the T form, which would make the transition to the R structure come after, say, three molecules of oxygen have been bound rather than after two molecules have been bound. In terms of allosteric theory such agents would raise L, the

fraction of molecules in the T structure, without altering the oxygen equilibrium constants KT and KR of the two structures.

ATOMIC STRUCTURES

Perutz' approach to the problem was also influenced by Haurowitz' discovery that oxyhemoglobin and deoxyhemoglobin have different structures. Gradually, he came to realize that we would never explain the intricate functions of hemoglobin without solving the structures of both crystal forms at a resolution high enough to reveal atomic detail.

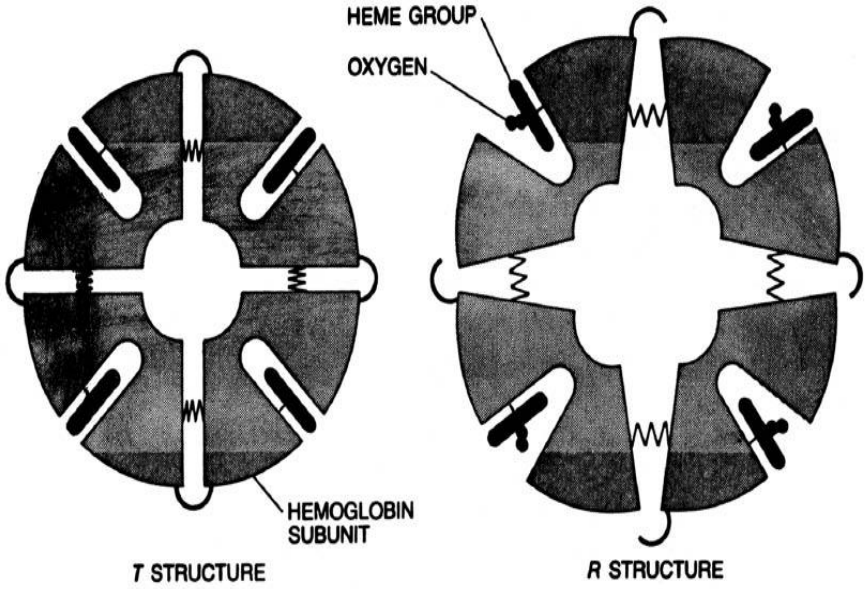
In 1970, 33 years after Perutz had taken his first X-ray-diffraction pictures of hemoglobin, that stage was finally reached. Hilary Muirhead, Joyce M. Baldwin, Gwynne Goaman and Perutz got a good map of the distribution of matter not in oxyhemoglobin but in the closely related methemoglobin of horse, in which the iron is ferric and the place of oxygen is taken by a water molecule. William Bolton and Perutz got a map of horse deoxyhemoglobin, and Muirhead and Jonathan Greer got one of human deoxyhemoglobin. These maps served as guides for the construction of three atomic models, each a jungle of brass spokes and steel connectors supported on brass scaffolding, edifices of labyrinthine complexity nearly four feet in diameter. At first it was hard to see the trees for the forest.

In allosteric terms their methemoglobin model represented the R structure and their two deoxyhemoglobin models the T structure. They scanned them eagerly for clues to the allosteric mechanism but could not see any at first because the general structure of the sub-units was similar in all three models. The alpha chains include seven helical segments and the beta chains eight helical segments interrupted by corners and non-helical segments. Each chain enveloped its heme in a deep pocket, which exposed only the edge where two propionic-acid side chains of the porphyrin dip into the surrounding water.

The heme makes contact with 16 amino-acid side chains from seven segments of the chain. Most of these side chains are hydrocarbons; the two exceptions are the heme-linked histidines, which lie on each side of the heme and play an important part in the binding of oxygen. The side chain of histidine ends in an imidazole ring made of three carbon atoms, two nitrogen atoms and either four or five hydrogen atoms. One of these histidines, called the proximal histidine, forms a chemical bond with the

heme iron. The other histidine, called the distal one, lies on the opposite side of the heme, in contact with it, and with the bound oxygen, but without forming a covalent chemical bond with either. Apart from these histidines, most of the side chains in the interior of the sub-units, like those near the hemes, are hydrocarbons. The exterior of the hemoglobin molecule is lined with side chains of all kinds, but electrically charged and dipolar ones predominate. Thus each sub-unit is waxy inside and soapy outside, which makes it soluble in water but impermeable to it.

Figure XII-10



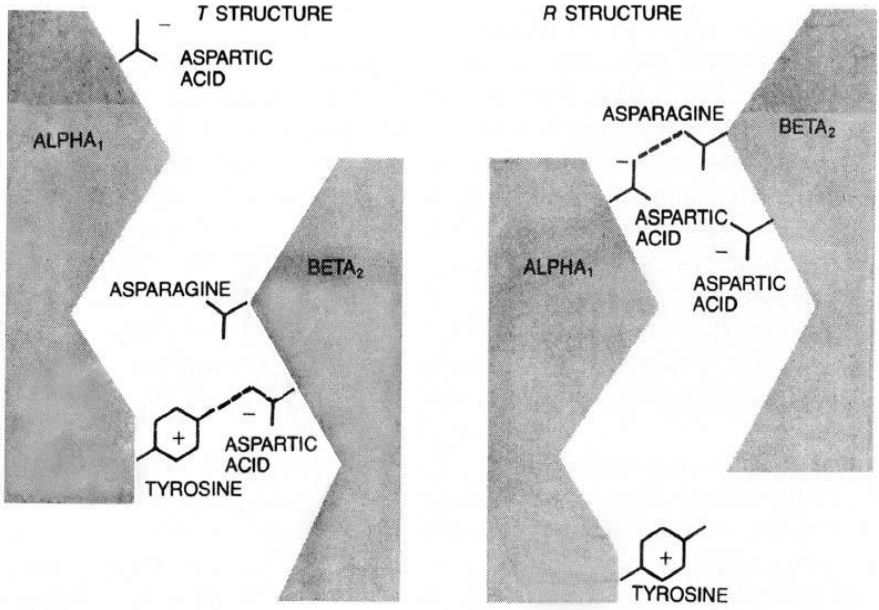
ALLOSTERIC THEORY explains heme-heme interaction without postulating any direct communication between the heme groups. The hemoglobin molecule is assumed to have two alternative structures, designated T for tense and R for relaxed. In the T structure the subunits of the molecule are clamped against the pressure of springs and their narrow pockets impede the entry of oxygen. In the R structure all the clamps have sprung open and the heme pockets are wide enough to admit oxygen easily. Uptake of oxygen by the T structure would strain the clamps until they all burst open in concert and allow the molecule to relax to the R structure. Loss of oxygen would narrow the heme pockets and allow the T structure to re-form. This is like a rotary engine.

The four sub-units are arranged at the vertexes of a tetrahedron around a two-fold symmetry axis. Since a tetrahedron has six edges, there are six areas of contact between the subunits. The two-fold symmetry leaves four distinct contacts, which cover about a fifth of the surface area of the sub-units. Sixty per cent of that area is made up of the alpha1 + beta1 + and alpha2 + beta2 contacts, each of which includes about 35 amino-acid side chains tightly linked by from 17 to 19 hydrogen bonds. (Hydrogen bonds are made between atoms of nitrogen (N) and oxygen (O) through an intermediate hydrogen atom (H), for instance N-H . . . N, N-H . . . O, O-H . . . O or O-H . . . N. The hydrogen is bonded strongly to the atom on the left and weakly to the one on the right.)

The numerous hydrogen bonds between the alpha1 + beta1 and alpha2 + beta2 subunits make them cohere so strongly that their contact is hardly altered by the reaction with oxygen, and they move as rigid bodies in the transition between the T and the R structures. On the other hand, the contact alpha1 – beta1 in the R structure looked quite different from that in the T structure. This contact includes fewer side chains than alpha1 – beta1 and is designed so that it acts as a snap-action switch, with two alternative stable positions, each braced by a different set of hydrogen bonds. Perutz wondered at first whether these bonds were stronger and more numerous in the T structure than they are in the R structure, but that did not seem to be the case.

Where, then, were the extra bonds between the subunits in the T structure that allosteric theory demanded? They spotted them at the ends of the polypeptide chains. In the T structure the last amino acid residue of each chain forms salt bridges with the neighboring subunits. (A salt bridge is a bond between a nitrogen atom, carrying a positive charge, and an oxygen atom, carrying a negative charge.) In our maps of the R structure the last two residues of each chain were blurred. At first Perutz suspected this to be due to error, but improved maps made by his colleagues Elizabeth Heidner and Robert Ladner have convinced them that the final residues remain invisible because they are no longer tethered, and wave about like reeds in the wind.

Figure XII-11



CONTACT between the two dimers has two stable conformations, one for the T structure and the other for the R structure. On transition between the structures the dimers snap from one position to the other. They are stabilized by alternative sets of hydrogen bonds formed between amino-acid side chains attached to the opposing faces of the dimers. The two bonds shown here were first discovered by X-ray crystallography. In 1975 Leslie Fung and Chien Ho, at the University of Pittsburgh, demonstrated the presence of these bonds in solution. This provides evidence that the two structures found in crystals are the same as the structures in red blood cells.

Geometrically, the transition between the two structures consists of a rock-and-roll movement of the dimer alpha1 – beta1 with respect to the dimer alpha2 – beta2. Baldwin has shown that if one dimer is held fixed, the movement of the other can be represented by rotation of some 15 degrees about a suitably placed axis together with a small shift along the same axis. The movement is brought about by subtle changes in the internal structure of the subunits that accompany the binding and dissociation of oxygen.

FUNCTION OF THE SALT BRIDGES

The salt bridges at the ends of the polypeptide chains clearly provide the extra bonds between the sub-units in the T structure predicted by Monod, Changeux and Wyman. They also explain the influence on the oxygen equilibrium curve of all the chemical factors that had puzzled them so much. All agents that lower the oxygen affinity do so either by strengthening existing salt bridges in the T structure or by adding new ones. Not all these extra bonds, however, are between the sub-units; some are within the sub-units, and oppose the subtle structural changes the sub-units undergo on combination with oxygen.

The salt bridges explain both the lowering of the oxygen affinity by protons and the uptake of protons on release of oxygen. Protons increase the number of nitrogen atoms carrying a positive charge. For example, the imidazole ring of the amino acid histidine can exist in two states: uncharged, when only one of its nitrogen atoms carries a proton, and positively charged, when both do. In neutral solution each histidine has a 50% chance of being positively charged. The more acid the solution, or in other words the higher the concentration of protons, the greater the chance of a histidine becoming positively charged and forming a salt bridge with an oxygen atom carrying a negative charge. Conversely, the transition from the R structure to the T structure brings negatively charged oxygen atoms into proximity with an uncharged nitrogen atom, and thereby diminishes the work that has to be done to give the nitrogen atom a positive charge. As a result a histidine that has no more than a 50% chance of being positively charged in the R structure has a 90% chance in the T structure, so that more protons are taken up form the solution by hemoglobin in the T structure.

Hemoglobin includes one other set of groups that behave in this way: they are the amino groups at the start of the polypeptide chains, but their nitrogen atoms take up protons only if the concentration of carbon dioxide is low. If it is high, these nitrogens are liable to lose protons, and to combine instead with carbon dioxide to form a carbamino compound. The physiologists F. J. W. Roughton and J. K. W. Ferguson proposed in 1934 that this mechanism plays a part in the transport of carbon dioxide, but their proposal was treated with skepticism until it was confirmed 35 years later by John Kilmartin, working with Luigi Rossi-Bernardi at the University of Milan. I was pleased that Roughton, who had fathered their experiment, was still alive to see his ideas vindicated. My colleague Arthur R. Arnone, now at the University of Iowa, then showed that in

the T structure, such carbamino groups, which carry a negative charge, form salt bridges with positively charged groups of the globin, and are therefore more stable than they are in the R structure. This finding explains why deoxyhemoglobin has a higher affinity for carbon dioxide than oxyhemoglobin, and conversely why carbon dioxide lowers the oxygen affinity of hemoglobin.

The positions in hemoglobin taken up by chloride ions are still uncertain. Arnone has spotted sites in the T structure where other negatively charged ions bind, and these might also be the chloride binding sites. If they are, then chloride ions also brace the T structure by forming additional salt bridges.

The most striking difference between the T and the R structures is the width of the gap between the two beta chains. In the T structure the two chains are widely separated, and the opening between them is lined by amino-acid side chains carrying positive charges. This opening is tailor-made to fit the molecule of 2,3-diphosphoglycerate and to compensate its negative charges, so that the binding of DPG adds another set of salt bridges to the T structure. In the R structure the gap narrows, and DPG has to drop out.

THE TRIGGER

How does combination of the heme irons with oxygen make the subunits click from the T structure to the R structure? Compared with the hemoglobin molecule, an oxygen molecule is like the flea that makes the elephant jump. Conversely, how does the T structure impede the uptake of oxygen? What difference between the two structures is there at the heme that could bring about a several-hundred-fold change in oxygen affinity?

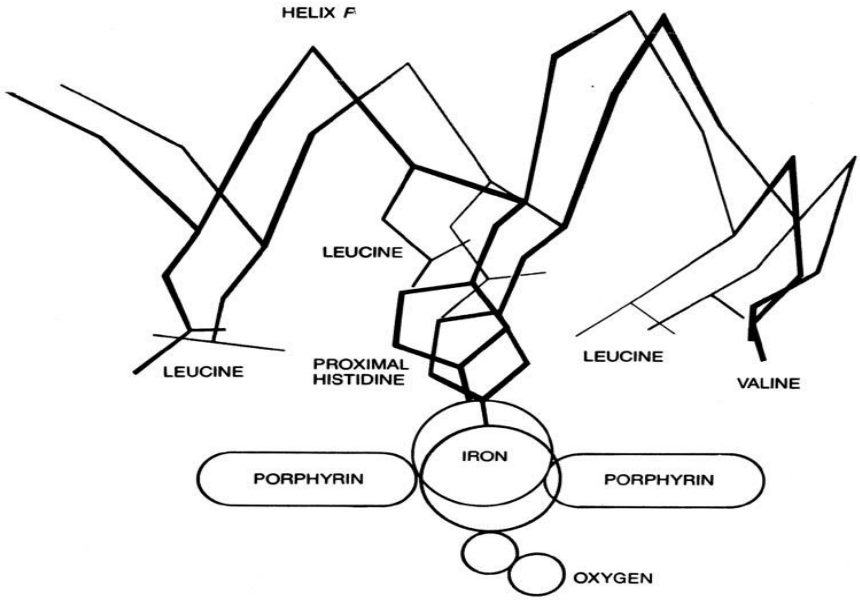
In oxyhemoglobin the heme iron is bound to six atoms: four nitrogen atoms of the porphyrin, which neutralize the two positive charges of the ferrous iron; one nitrogen atom of the proximal histidine, which links the heme to one of the helical segments of the polypeptide chain (helix F), and one of the two atoms of the oxygen molecule. In deoxyhemoglobin the oxygen position remains empty, so that the iron is bound to only five atoms.

Perutz wondered whether the heme pockets might be narrower in the T structure than in the R structure, so that they had to widen to let the

oxygen in. This widening might be geared to break the salt bridges, rather like the childish mechanism shown in the illustration at the top of page 105. When the atomic model of horse deoxyhemoglobin emerged, Bolton and Perutz saw some truth in this idea because in the beta sub-units a side chain of the amino acid valine next to the distal histidine blocked the site that oxygen would have to occupy. The alpha sub-units, however, showed no such obstruction. Then they noticed the odd positions of the iron atoms. In methemoglobin, which has the R structure, the iron atoms had been displaced very slightly from the porphyrin plane toward the proximal histidine, but in deoxyhemoglobin (with the T structure) the displacement stood out as one of the most striking features of their maps. In each sub-unit the iron atom had carried the proximal histidine and helix F with it, so that they too had moved away from the porphyrin plane. I quickly realized that this might be the long-sought trigger.

Recently Arnone and Perutz' colleague Lynn Ten Eyck have obtained an excellent map of human deoxyhemoglobin, to which Giulio Fermi fitted an atomic model of heme by computer methods. Fermi's calculations show that each iron atom is bound, lies at a distance of 2.7 ($\pm$.1) angstroms from the same plane. So far we have no direct measure of the corresponding displacements in oxyhemoglobin because oxyhemoglobin oxidizes to methemoglobin in the X-ray beam. There the iron atoms are displaced from the porphyrin plane by .1 angstrom in the alpha sub-units and by .2 angstrom in the beta sub-units; the corresponding displacements of the histidine nitrogens are 2.2 and 2.4 angstroms. Judging by the structures of model compounds, the displacement of the histidine nitrogen in oxyhemoglobin should be 2.1 angstroms, which means that the nitrogen would be .6 angstrom closer to the porphyrin plane than it is in deoxygemoglobin. This shift would trigger the transition from the T to the R structure.

Figure XII-12

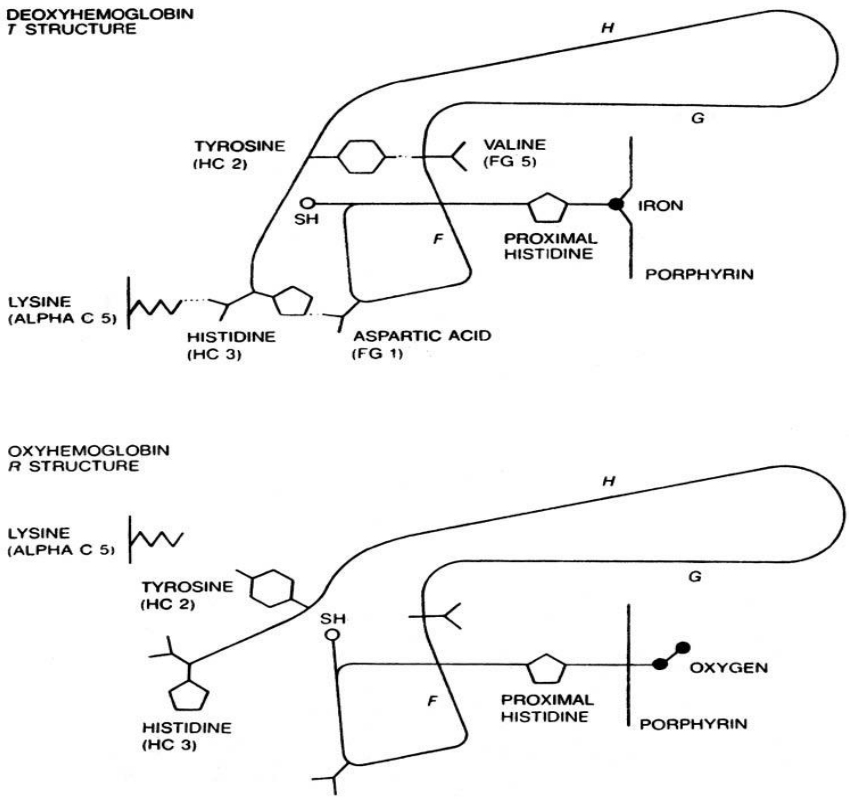


TRIGGERING MECHANISM for the transition from the T to the R structure is a movement of the heme iron into the plane of the porphyrin ring. In the T structure (black lines) the center of the iron atom is about .6 angstrom unit above the plane. (One angstrom unit is 1010 meter.) When the molecule switches to the R structure (colored lines), the iron moves into the plane, pulling with it the proximal histidine and helix F. Once the iron has descended into the plane it can readily bind an oxygen molecule. In the reverse transition (from R to T) the iron is pulled out of the plane and the oxygen cannot follow because it bumps against the porphyrin nitrogen atoms. The iron-oxygen bond is thereby weakened and usually breaks. These movements are transmitted to the contacts between the sub-units and promote the transitions between the T and R structures. Diagram is based on a drawing by John Cresswell of University College London.

How is this movement transmitted to the contact between the sub-units and to the salt bridges? One might as well puzzle out how a cat jumps off a wall from one picture of the cat on the wall and another of it on the ground, because our static models of deoxyhemoglobin and methemoglobin do not show what happens in the transition between the T and the R structures. Perutz tried a bold guess. The second amino-acid

residue from the end in each chain is a tyrosine whose side chain carries a phenol group, that is, a benzene ring with a hydroxyl group (OH) attached. In the T structure the tryosine in each sub-unit is wedged into a pocket between helixes F and H and its hydroxyl group is tethered by a hydrogen bond to an oxygen atom in the FG segment of the main polypeptide chain. In carbonmonoxy-hemoglobin, which is the nearest relative of oxyhemoglobin, and which has the R structure, the tryosines are free. Hence there must be some mechanism that loosens the tyrosines when oxygen is bound.

Figure XII-13



EXTRA BONDS in deoxyhemoglobin are formed by the last two residues of the beta chain. In oxyhemoglobin the iron atom lies in the plane of the porphyrin, the sulfhydryl group (SH) of the amino acid

cysteine lies in the pocket between helixes F and H, and tyrosine HC 2, histidine HC 3 and lysine C 5 are free. In deoxyhemoglobin the iron is displaced from the plane of the porphyrin toward helix F, and the tyrosine has displaced the SH group from the pocket between F and H and forms a hydrogen bond with valine FG 5. Finally, the terminal histidine forms salt bridges with aspartic acid FG 1 of the same chain and with lysine C 5 of the alpha chain. Formation of bridge causes histidine to take up a proton and become positively charged.

As Perutz wondered what this mechanism might be, he saw that the movement of the proximal histidine toward the porphyrin plane that accompanies oxygen binding pulls helix F in a direction that narrows the pocket into which the tyrosine must fit. If the tyrosine were squeezed out of its pocket, it would tear the last amino-acid residue of the chain away from its salt-bridged partner. In this way one salt bridge might be broken for each heme that combined with oxygen in the T structure. When enough salt bridges have been broken, the T structure would become unstable and click to the R structure.

If movement of the proximal histidine and the iron toward the porphyrin puts into motion a set of levers that loosens the tyrosines and breaks the salt bridges, then the making of the bridges and the binding of the tyrosines into their pockets must cause the same set of levers to go into reverse and move the histidine and the iron away from the porphyrin. The oxygen molecule on the other side cannot follow because it bumps against the four porphyrin nitrogen atoms, and so the iron-oxygen bond is stretched until it finally snaps.

To be guided by the atomic models toward the molecular mechanism of respiratory transport seemed like a dream. But was it true? Would the mechanism stand the cold scrutiny of experiment? It has been said that scientists do not pursue the truth, it pursues them.

TESTING THE SALT BRIDGES

According to allosteric theory, there should be no heme-heme interaction without a transition between the T and the R structures. This prediction was also tested by Kilmartin. He cleaved the final amino-acid residue from the ends of all four polypeptide chains, so that there should be no salt bridges to stabilize the T structure. This modified hemoglobin maintained the R structure even in the absence of oxygen, and showed

a hyperbolic oxygen equilibrium curve with high oxygen affinity. Kilmartin then selected an abnormal human hemoglobin that can be made to maintain the T structure even when it is saturated with oxygen. Again the curve was hyperbolic, but it was shifted to lower oxygen affinity, so that the central thesis of allostery was proved.

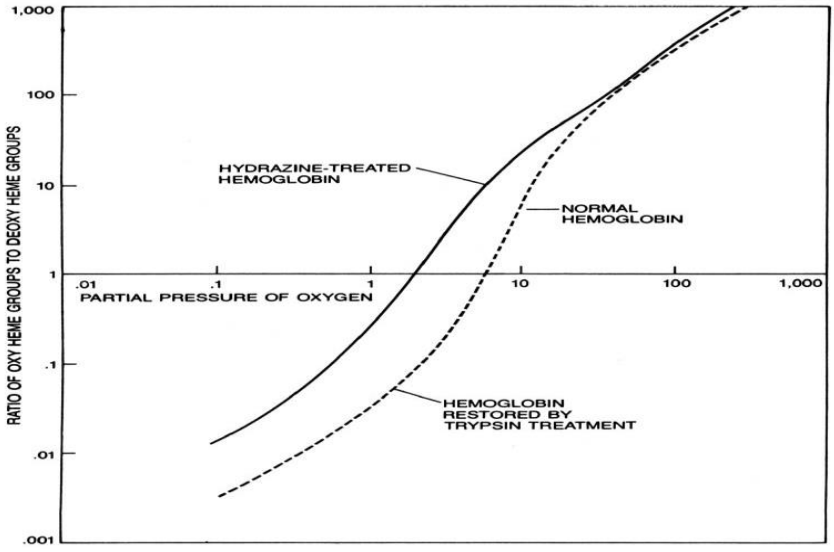
The next question concerned the exact role of the salt bridges. At one extreme the strain arising from the combination of any one heme with oxygen might be distributed uniformly throughout the molecule, so that there would be no change in oxygen affinity until all the salt bridges broke in unison, when the structure clicked from T to R. This would fit pure allosteric theory, according to which the salt bridges should do more than raise L, the fraction of molecules in the T structure. According to Perutz' mechanism, on the other hand, a salt bridge should break every time an oxygen combines with the T structure. If that were true, the salt bridges should raise KT as well as L, that is to say, they should also lower the oxygen affinity of the T structure. To the general reader this may seem like a fine distinction, but to the workers in the field it seemed to cut at the roots of the mechanism, and raised passionate controversies that are still going on.

Several experimental results favor Pertuz' version of the mechanism. In 1965 Eraldo Antonini, Todd M. Schuster, Maurizio Brunori and Jeffries Wyman at the University of Rome, and in 1970 R.D. Gray at Cornell University, showed that binding of oxygen and liberation of Bohr protons go hand in hand right from the start, while hemoglobin is still in the T structure. Kilmartin then showed that most of the Bohr protons come from the rupture of salt bridges. Taken together, the two results prove that salt bridges are broken on binding of oxygen by the T structure, which implies that they lower its oxygen affinity. To test whether they really do, Perutz had to make an accurate comparison of the oxygen equilibrium curves of normal hemoglobin and a hemoglobin that lacks one of the salt bridges. Kiyohiro Imai and Hideki Morimoto of the University of Osaka had just developed an ingenious method that allows an oxygen equilibrium curve to be measured precisely and fast with only .1 milliliter of hemoglobin solution. Imai came to Cambridge to build one of his new machines, and with Kilmartin measured the equilibrium curves of hemoglobins that lacked specific salt bridges. They found that the absence of any of the bridges left KR unchanged but lowered both L and KT, in accord with Perutz' mechanism.

Paradoxically, another set of observations contradicts these findings. Perutz' colleagues Leigh Anderson and Kilmartin, together with Seiji Ogawa of Bell Lavoratories, have shown that the salt bridges break only if the hemoglobin molecule is free to click to the R structure but not if that transition is stopped. This happens in certain abnormal human hemoglobins and in fish hemoglobins in acid solution, where the T structure is unusually stable. It seems the T structure must be free to bend and stretch so as to shake off its shackles; if it is laced too tightly, it fails to respond.

Perutz here suggested that the transition from the T to the R structure is triggered mainly by the movement of the heme iron toward the porphyrin ring. What makes the iron move? There are two reasons, one steric and the other electronic. If the iron is bound to atoms on both sides of the heme, then their attraction by the iron and repulsion by the porphyrin nitrogens tend to balance the iron in the center of the ring. On the other hand, if the iron is bound only to the proximal histidine while the oxygen site is empty, then there is repulsion between the porphyrin nitrogens and the oxygen, so that the histidine is pushed away from the porphyrin and pulls the iron with it.

Figure XII-14



BLOCKING OF SALT BRIDGES in the open position shifts the oxygen equilibrium curve to the left, toward higher oxygen affinity. The initial equilibrium curve for normal hemoglobin is shown in color. The hemoglobin was then treated with hydrazine ($NH_2–NH_2$), which prevents the carboxyl terminus of each alpha chain from forming a salt bridge with a lysine on the neighboring alpha chain. When the salt bridge cannot form, the stability of the T structure is diminished. The resulting equilibrium curve is shown in black: affinity for oxygen at low oxygen pressures, when hemoglobin has the T structure, is increased by a factor of about five, and the transition from the T to the R structure comes earlier in the reaction. (Both KT and L are reduced.) There is no effect at high oxygen pressures, where both normal molecules and treated ones are in the R structure. The normal equilibrium was restored (broken line) by treating the altered protein with trypsin, which removes hydrazine. The experiment was carried out by John Kilmartin and Janice Fogg of Cambridge and Arthur R. Arnone of University of Iowa.

The electronic story is more complex. The ferrous iron atom has six outermost electrons. In oxyhemoglobin these form three pairs located halfway between the bonds that join the iron to its six surrounding atoms. Repulsion between the electrons of the iron and the electrons of the surrounding atoms is thereby minimized. In deoxyhemoglobin, on the other hand, four of the six electrons are unpaired and two of them lie along bond directions, where they repel the surrounding atoms of the porphyrin ring. This repulsion tends to push the iron farther out of the porphyrin plane than the repulsion between the proximal histidine and the porphyrin nitrogen atoms would do on its own.

TESTING THE TRIGGER

Suppose the iron does move in and out of the porphyrin plane every time it combines with or loses a molecule of oxygen. How could we find out if it is really this movement that triggers the allosteric transition between the two structures. Perutz could think of no experiment that would answer the question directly, but he argued that if his proposition were true, then by the laws of action and reaction a forced transition from R to T must put the gears into reverse and pull the iron and the histidine away from the porphyrin ring. In that case the T structure should exercise a tension on the heme, which should be detectable by physical methods. Perutz' teacher David Keilin always told him to work with colored proteins because the spectra of light they absorb can reveal

so much. Hemoglobin is doubly blessed because one can feel its pulse both by its absorption spectrum and by the magnetic properties of its iron atoms.

Before we could exploit these properties we had to find a way of switching the structure from R to T other than the usual way of removing the oxygen. Sanford R. Simon of the State University of New York at Stony Brook and Perutz found that this could be done with an analogue of DPG, a substance called inositol hexaphosphate (IHP), which has six phosphate groups in place of the two of DPG and therefore binds to the T structure more strongly.

When IHP was added to oxyhemoglobin, it caused some of the oxygen to be cast off, as was to be expected. Perutz then replaced the oxygen with nitric oxide (NO) because this gas binds to the iron so strongly that the bond, once formed, cannot be broken. When he added IHP to nitric oxide hemoglobin, the structure switched from R to T and the spectrum changed drastically. Analysis of these and other spectral changes told him what had happened: because the strong bond to nitric oxide had held the iron atom tightly to the plane of the porphyrin, the tension exercised by the T structure had snapped the weaker bond between the iron and the proximal histidine instead. Most remarkably, this had happened primarily in the alpha sub-units, whose hemes are 35 angstroms away from the phosphate binding site, rather than in the beta subunits, to which the IHP was actually bound. This experiment was done by Kyoshi Nagai, Attila Szabo and Perutz at Cambridge together with John C. Maxwell and Winslow S. Caughey of Colorado State University at Fort Collins. Robert Cassoly of the Institute of Physicochemical Biology in Paris discovered the spectral changes at the same time they did.

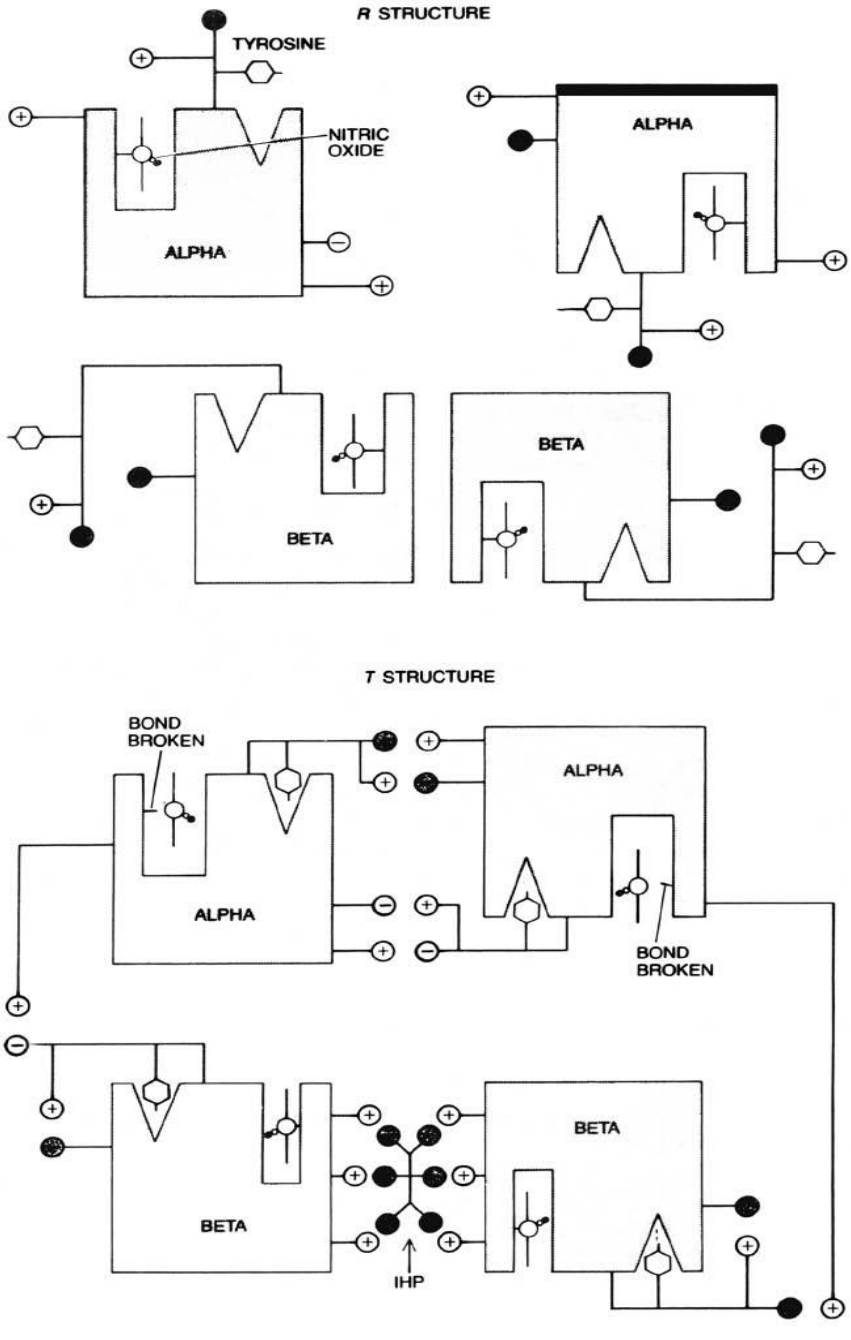
Their experiment proved that the tension exists but did not tell them how large it is. To measure it, Perutz decided to exploit certain hemoglobin compounds in which the iron atoms are in a state of equilibrium between a weakly and a strongly paramagnetic state. (A paramagnetic substance cannot be permanently magnetized, as metallic iron can, but is drawn into a magnetic field.) At low temperature all the iron atoms are weakly paramagnetic, and the paramagnetism falls as the temperature rises; above a certain temperature the iron atoms begin to oscillate between the two magnetic states, which causes the total paramagnetism to rise as the temperature rises. Today it is known that that bonds between the iron and its surrounding atoms are slightly longer

in the strongly paramagnetic state than they are in the weakly paramagnetic one. Therefore if tension in the T structure stretches the bonds to the iron, it should make the proportion of iron atoms in the strongly paramagnetic state larger in the T structure than it is in the R structure and thereby raise the total paramagnetism of the solution.

After several false starts a lucky coincidence finally brought this experiment off. Robert W. Noble appeared at Cambridge from the State University of New York at Buffalo with his pockets full of carp hemoglobin. He showed Perutz how easily the structure of any of the derivatives of this hemoglobin could be switched from R to T by adding a little acid and IHP. Together they set out for Rome, where Massimo Cerdonio and Calogero Messana had just built a highly sensitive superconducting magnetometer at the Snamprogetti Laboratory, but while changing trains at a London Underground station, Perutz left the thermos with their precious samples on the platform and never saw it again. Luckily, he had some more carp hemoglobin in their deep freeze at Cambridge, and with it he started off once more for Rome.

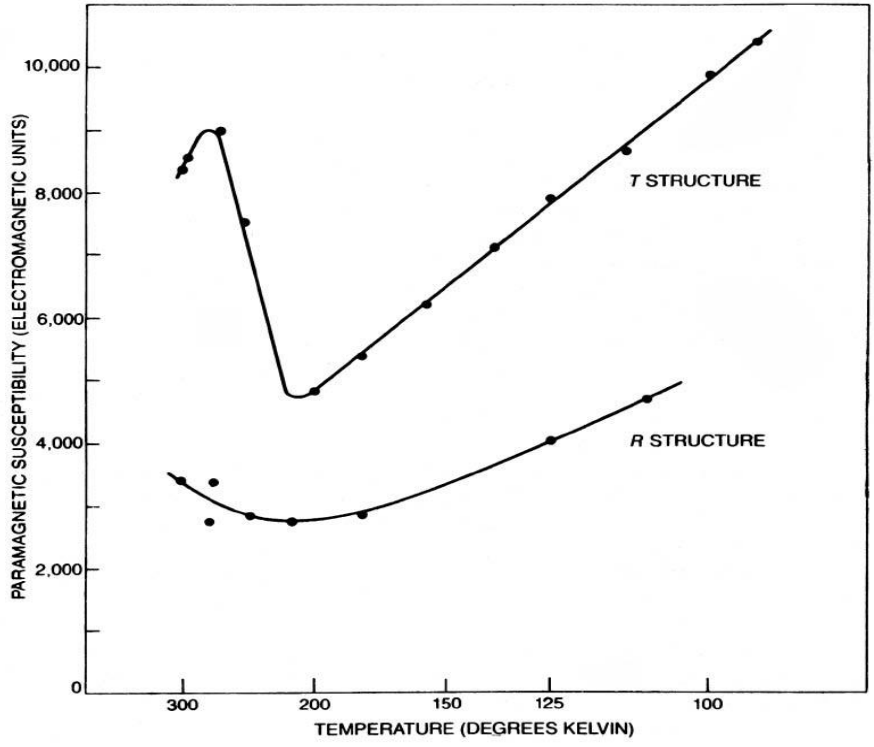
The most useful derivative of carp hemoglobin was a ferric form in which the place of oxygen is taken by an azide ion (n3–). They measured its paramagnetism in both the R and T structures between –180 and +30 degrees Celsius. The results gave them a tremendous thrill: at all temperatures azide methemoglobin of carp was far more strongly paramagnetic in the T structure than in the R structure, which proved that the T structure does favor the state of the heme with the longer iron-nitrogen bonds. The tension at the heme can be gauged from the difference in energy between the two magnetic equilibriums. Perutz's colleague Fermi, with his son Robin Perutz of the University of Oxford, worked out that the difference amounts to about 1,000 calories, a third of the free energy of heme-heme interaction. They are not sure where the remaining two-thirds comes from but suspect that the R-to-T transition produces a smaller change of heme structure, and therefore also a smaller change of tension, in azide methemoglobin than uptake and loss of oxygen does.

Figure XII-15



TENSION in the T structure was demonstrated by a forced transition from the R to the T structure. The effect was discovered when the author tested the effect of the transition on all known hemoglobin derivatives. The transition was forced by the addition of inositol hexa-phosphate (IHP), which replaces DPG but forms more salt bridges with the beta chains. Oxygen was replaced by nitric oxide (NO), which binds to iron very strongly and also weakens the iron-histidine bond. At the top all the heme irons have bound NO, the molecules are in the R structure and there are no salt bridges between the sub-units. At the bottom IHP has converted the molecule to the T structure and the sub-units are clamped by salt bridges. The resulting tension has broken the bonds between the iron atoms and the proximal histidines in the alpha sub-units, which are much farther away from the IHP binding site than those of the beta sub-units, showing that proteins can transmit mechanical effects over large distances.

Figure XII-16



MAGNETIC CHANGES are observed on switching carp azide methemoglobin from the R to the T structure. Paramagnetic susceptibility is plotted on the vertical axis and absolute temperature on the horizontal axis. The paramagnetism of the iron atoms is higher in the T structure than it is in the R structure at all temperatures. In the R structure at low temperatures all the iron atoms are in a weakly paramagnetic state and the susceptibility drops with rising temperature. At about 200 degrees Kelvin the iron atoms begin to oscillate between a strongly and a weakly paramagnetic state, so that the susceptibility rises with rising temperature. In the T structure at low temperature a random mixture of strongly and weakly paramagnetic iron atoms is frozen in. At about 250 degrees K. the fraction of strongly paramagnetic iron atoms begins to rise sharply, only to fall again at higher temperatures for reasons that are not clear. The free-energy equivalent of the tension in the T structure is calculated from the difference in height between the two curves. The magnetic susceptibility measures the force that is exerted on one gram equivalent of iron (55.8 grams) by a magnetic field of one gauss.

In the meantime Arieh Warshel of the University of Southern California, Bruce W. Gelin and Martin Karplus of Harvard University, Joyce Baldwin and Cryus Chothia of University College London have tried to disentangle the set of atomic levers that generates the tension in the T structure and relieves it on transition to the R structure. They have demolished some of Perutz' early ideas and elaborated others.

All agree that the T structure exerts little or no tension on the deoxygenated heme and that the tension arises only when the iron tries to move toward the porphyrin plane on combination with oxygen, rather as the spring of a screen door is relaxed when it is closed but exerts increasing tension as it is opened. James P. Collman of Stanford University has therefore suggested that one should speak of restraint rather than tension. The restraint may be generated by a lopsided orientation of the proximal histidine with respect to the porphyrin, which brings one of the histidine carbon atoms close to one of the porphyrin nitrogen atoms. Repulsion between these two atoms would restrain the histidine from moving closer to the porphyrin ring. On transition to the R structure a shift and rotation of the heme in relation to helix F straightens out the histidine, so that it and the iron atom can move toward the porphyrin without restraint.

In the beta sub-units a movement of the heme with respect to helix E, which carries the distal valine and distal histidine, may be more important. In the T structure the valine blocks the oxygen combining site, but after the shift to the R structure the site is uncovered.

All these mechanisms are consistent with Perutz's early ideas, but his suggestion that the movement of the proximal histidine is transmitted to the salt bridges by squeezing the penultimate tyrosine out of its crevice was too simplistic. Instead the hydrogen bond that holds the tyrosine in place may be stretched, but this loosening may not be enough to break the salt bridges. They may be loosened further by small perturbations of the bonds between the subunits that have so far eluded analysis.

One of the strangest features of both the T and the R structures is the absence of any entrance to the heme pocket wide enough to allow an oxygen molecule to pass. Either the distal histidine or some other group must swing out of the way, but science does not know how this is done because our X-ray analyses portray static structures, which allow us only to guess at the dynamics of the molecule.

John J. Hopfield of Princeton University once said that hemoglobin plays the same role in biochemistry that the hydrogen atom does in physics, because it serves as a touchstone for new theories and experimental techniques. Hemoglobin is the prototype of protein molecules that change their structure in response to chemical stimuli. Scientists will therefore continue to explore its many-faceted behavior. The mechanism that Perutz has outlined here will need further refinement before it can explain all their observations, but he is pleased that the main features have stood up to experimental tests and that it accounts reasonably well for the physiological properties of hemoglobin. Perutz has not mentioned here that it also explains the symptoms of patients who have inherited abnormal hemoglobins, because that is another story. It is Perutz' hope that understanding of the structure and mechanism of the hemoglobin molecule will eventually help to alleviate those symptoms and to interpret the behavior of more complex biological systems.

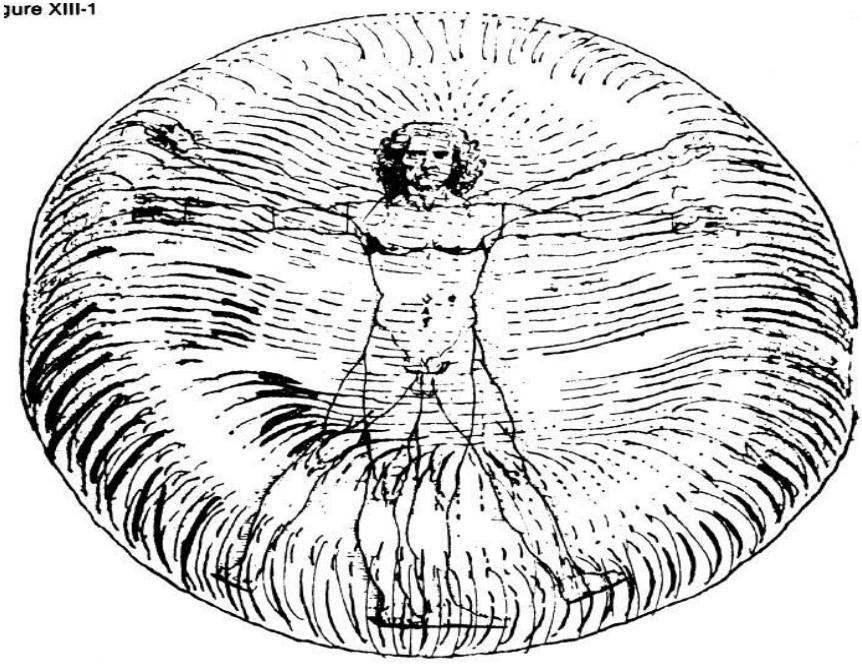
CHAPTER XIII – ASSEMBLY OF THE PARTS

Now that we have examined the blood, let us see how it moves through the body.

A SHAPE FOR SENTIMENTALISTS

The heart itself is no bigger than a good-sized fist. It weighs less than a pound, and its shape resembled the popular Valentine image sufficiently to satisfy the sentimentalists. It lies, pointed downward, in the chest cavity, at about the mid-center body line. The walls of the heart are of thick muscle, twisted into rings, whorls and loops. Within them are four hollow chambers: a left and a right receiving chamber, or atrium, and below them a left and a right pumping chamber, or ventricle. In the right atrium is the sinus node – a minute blob with a mammoth job. Composed of special, nerve-like muscle tissue found nowhere else in the body, the sinus node starts the heartbeat and sets its pace, much like the coxswain of a racing shell.

Figure XIII-1



THE RED BLOOD CELL

The erythrocyte is a hologram, a microcosm of Man the macrocosm.

A solid partition of muscle, the septum, separates the left and right sides of the heart. Before Harvey A. Reaserener in the 17th century, a stubbornly held misconception was that the blood moved through the heart by seeping through pores in the septum. The passages, however, open not from side to side but from top to bottom. These openings – with valves to control the direction of blood flow – connect the left atrium with the left ventricle, and the right atrium with the right ventricle. In effect, the heart is thus two pumps back to back. To get from one side of the heart to the other the blood must go the long way around, through the body.

Since the blood travels endlessly, an arbitrary choice must be made of a starting point to describe its route. Assume that a batch of fresh blood has just moved into the left atrium. At this point the heart is between beats – an interval of about three-fifths of a second; it is only during this relaxation that the receiving chambers fill up. Then the atrium contracts, shoving the blood down into the left ventricle. As the ventricle contracts in turn, the blood is squeezed. This forces shut the left atrioventricular valve and forces open another valve leading to the aorta, the body's main artery. Out into this surges the blood.

THE ESOTERIC SIGNIFICANCE OF HEART TRANSPLANTATION

"Two souls but with a single thought,
Two hearts that beat as one."

INGOMAR THE BARBARIAN, ACT III

The problem of heart transplantation is essentially one of energy, the energy from WITHIN. Energy from within is constant but most marked during the natural and refreshing act of sleep. Any deliberate attempt to draw on the energy consciously, by undergoing tremendous disciplines involved in such feats as meditation, one-pointed concentration and selfless acts of service produce a shortening of the path of evolution for the person concerned. Any other interference with the natural processes of drawing on this energy is hazardous and bound to produce the most appalling toll.

Anatomically speaking, the heart is an ordinary enough organ, a mere pump made out of unusual muscle capable of contracting at sufficient strength to pump the blood under pressure through the arteries to every tissue in the body. In theory, it should have been even easier to transplant the heart than a liver or kidney, wherein toxic substances abound and compatability between donor and recipient might be a very difficult problem to overcome. The surgery is more difficult in the case of the heart, but this has not been the obstacle.

The real truth of the matter lies deeper. It lies in the esoterically known anatomy of the heart as the basic organ of bodily vital force. It is the primary energizer of the body, and no mere pump. It is the advanced power station through which the planetary Lord expresses His Life. It is the meeting point for forces of mind, body and emotions (vagus, sympathetic nerves and sinus node). It is the point through which the soul begins to grasp the vehicle whilst in its embryonic stage of development. It is the point of attachment and detachment of a thread of etheric and subtler material, withdrawn at death. It is strongly linked to the actions of the thymus gland as an outward expression of the heart chakra. The etheric energies that pour into it express the Ray qualities of subtler bodies and higher Beings.

CHARACTERISTICS OF HEART ENERGY/FORCE

The heart is the seat of the soul traditionally but there are very definite qualities which are associated with the energies which pour through this region from higher planes. Compassion, the ability to feel for all life in its many forms and to identify oneself with those forms, is a soul and especially a heart characteristic. The ability to work in groups is an outward manifestation of this. Love of one's neighbor and of all humanity, inclusiveness as opposed to separativeness . . . these are heart qualities. But also, associated with the heart is the all-important quality of recognizing what is not-self, i.e. not-Self. There is no other more important quality to be cultivated in the aspirant on the Path of Return. When we talk of the Self, we mean ultimately the Soul, the eternal and undying "I" within, the possessor of the body, the point of consciousness which directs the bodily kingdom, that migrates in sleep and departs in death. In forming the antakarana with the soul, in strengthening the soul's grip on our outward sheaths, we learn to discriminate between the real, which is the eternal, and the unreal, which is the unenduring part of us, the material and false. This discrimination

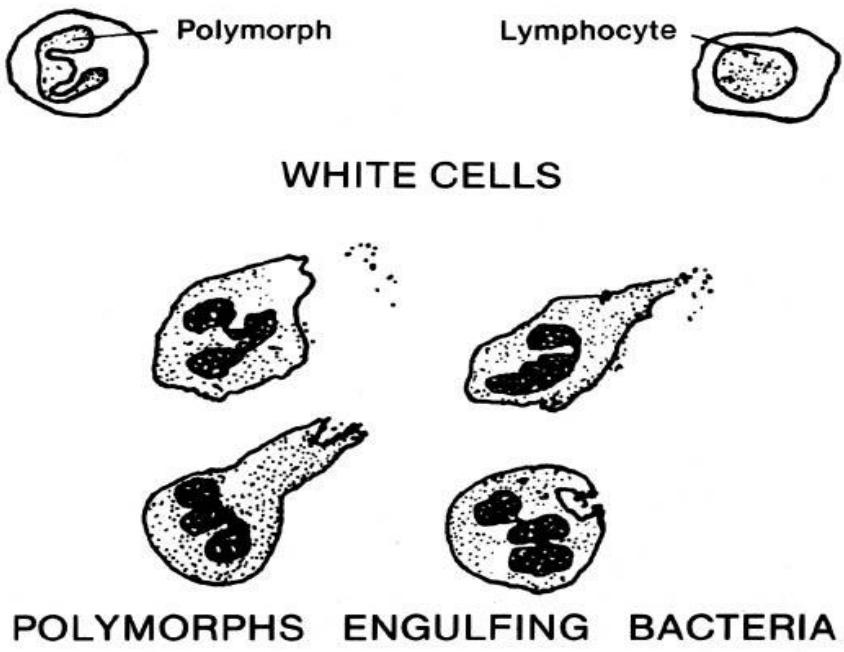
which leads on to REJECTION of the unreal lies at the root of REJECTION of organ implants, for discrimination exists at all levels. We learn to reject first at the emotional level but already, since long before birth, we have been rejecting at a physical level in embryo and subsequently. Rejection of not-self starts early in the cells and molecules, far below our awareness, and is almost reflex in action. For centuries, surgeons have been dealing with these problems of rejection . . . assisting the patient in his fight between self and not-self. Not-self, in this respect, is the germ and virus and their products.

But now, attention has shifted to the battle going on at a higher level, and this time, the surgeons are fighting to get the self to accept a piece, a whole organ of not-self . . . A FAR MORE DIFFICULT TASK.

We are experiencing more and more auto-immune diseases in which the body fights off or rejects even parts which it is elaborating itself (Hashimoto's disease) . . . we are becoming more and more sensitive to invasion of our bodily kingdoms. This is going on at all levels. Eventually, our surgeons and doctors will be giving much attention to the fight against schizophrenia . . . where there is rejection of personality at a mental and emotional level.

Heart transplants have made the public more aware of this active rejection of tissue or invasion by the body. The body fights off transplants as if they were foreign bodies or groups of germs. The white cells of the blood are mainly concerned with this task. Drugs are therefore given to reduce the activity of these cells. If insufficient of the particular drug is given, the white cells produce massive rejection of the transplanted organ. If too much of the drug is given the white cells may be depressed too far and the body becomes the target of any invading organism, and without enough white cells to defend itself, the body succumbs to massive overwhelming infection. This is the outward story.

Figure XIII-2



But there are inner factors at play which escape the attention of surgeons, and these are linked to the heart's esoteric functions. Before considering them, let us first look once again at these white cells of the blood, on which so much depends. More than half of them are what we call "polymorphs". They have strange nuclei which change their shape almost as fast as the cell changes its outline. By changing their shapes they engulf foreign particles, including germs. They have traditionally been correlated with the astral nature of man and the astral plane of the emotions, partly because of their amoeboid characteristics, their ever-changing shape, their elusive nature and ghost-like forms.

The other white cell is the lymphocyte. Lymphocytes don't change shape; their work is to produce minute antibodies which counteract foreign, not-self particles, including the organ transplants of donors! These cells are produced by the thymus gland, a strange organ lying beneath the breastbone close to the heart with which it has very strong esoteric links. Lymphocytes go to populate the lymph nodes of the body and the spleen. The thymus gland is an endocrine organ, and therefore of special esoteric significance because each endocrine organ in the body

is closely related to an etheric chakra. The thymus normally atrophies around about adolescence. In some people it persists . . . to produce "thymic types" which very frequently are either criminal psychopaths or highly developed "soul" types. We shall come back to the thymus again.

Now it is a very well-known scientific fact that we are constantly replacing the tissues of our bodies right down to the very molecules and atoms which make up our cells. What is not generally known is that even atoms and molecules are alive and possess a consciousness of their own, highly or lowly developed according to that of the one of which they are a part, the one in whom they live and move and have their being.30 Therefore, according to the esoteric development of the soul, the "I", or possessor of the body, so will atoms of Carbon, Oxygen, Hydrogen and trace elements be attracted into the body tissues. According to our consciousness, we accept the more enlightened atoms, or less enlightened, and tend to reject all else. The highest atoms, in esoteric development are found in the plant kingdom, less so in animals and even less so in minerals. We can therefore supply our bodies with atoms (food) of the highest order or of lesser orders, and these living beings are incorporated into us, thus permitting the organism as a whole a larger or lesser awareness and potential for esoteric development. All this takes place under the guidance of the heart chakra. The heart chakra energizes, amongst other organs, the thymus gland, which we have seen is able to produce lymphocytes which initiate the main reaction to transplanted organs.

Although figures as yet do not show it, I venture to prophesy that those most likely to accept a heart-transplant will be the least developed on the scale of esoteric evolution, other immunological problems aside, for these, the younger souls in incarnation have the lowest powers, on all levels, of discriminating between self and not-self. They are most likely to accept transplants of not-self.

The factors producing rejection of a transplant, just when it seems the body is accepting the graft, stem basically from the astral body acting as it does preponderantly through the blood stream and the white cells. And I would say, or agree that heart-transplants at this stage should be regarded as palliative rather than as permanent or cure.

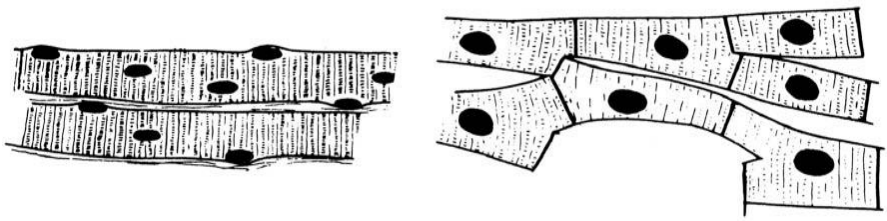
I would also say that the measure of success so far gained has, in the main part, been the result of the surgical technique of retaining a large

amount of the recipient's right atrium which holds the all-important sinus node. The sinus node is the most important anatomical part of the heart, esoterically speaking, and for very good reasons (see Figure XIII-5). Heart muscle has extraordinary powers not shared by ordinary muscle. It is possible to remove cardiac muscle and place it in a special solution of ions and salts, whereupon it will continue its contractions for a long time.

"The cardiac fiber has the power of originating within itself the impulse that makes it contract. This is one of the first properties to appear in the course of (embryonic) development. As soon as the heart is formed in the embryo. . .it contracts rhythmically and this rhythmic beat persists even after it has been separated from the organism."[31]

The part of the heart which beats the fastest and initiates the contraction of all other fibers is called the sinus node (see Figure XIII-5). From this strange tissue, waves of electrical excitation pass to all parts of the heart, and it imposes its rhythm on all, so it is known as the "pacemaker". It is through this very "sacred" piece of tissue that waves of etheric impulses descend into the purely physical atoms. The sinus node of the heart of every organism is linked by an etheric "umbilicus" to the etheric body of mother earth and thence to the Sun itself.

Figure XIII-3



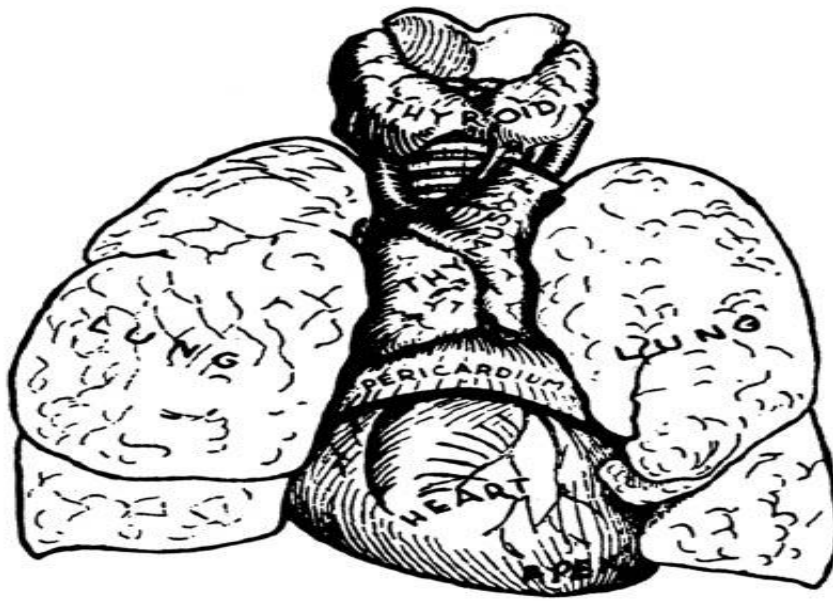
Ordinary (striped) muscle

Heart (cardiac) muscle

Thus, the life force wells up within the heart from the earliest stages of development in the embryo, right through life until it is withdrawn at death. At death, life is said to be withdrawn in two stages according to ancient teachings. Thus, consciousness leaves the head first and the diminished life forces pause for a while in the region of the heart and its chakra. From here, life is finally withdrawn. If there is a rallying, the life-force retakes possession of the body and consciousness is reasserted. This is one reason for the occult insistence on cremation.

And so, whilst other organs which are transplanted carry the normal hazards, the heart transplant has special ones, esoterically speaking. The heart rate is decided by the sensitive tissue of the sinus node or any other cardiac muscle cells that will accept the task as a receiving and transmitting station for planetary etheric energy. This station is related to forces welling from the center of the earth and thence from the center of the earth and thence from the center of the sun. If you are very still you can sometimes feel the sun's gentle impulses modifying the action of the heart. They are slower than the heart and cannot be confused with pulse beats which are shorter and more abrupt. (Swedenborg describes them and I have felt them often.) One day, they will be "discovered" and measured accurately, and about this time a new type of electrical force will be discovered, a third type, not negative, not positive but without which negative and positive cannot exist.

Figure XIII-4



The Thyroid Gland (Throat Chakra) and the Thymus Gland (Heart Chakra) are shown above with their relationship to the Heart and Lungs.

Whilst the heart of the donor functions in the recipient there will be effects felt on the astral plane where the remainder of the donor's living self is temporarily in residence, and whilst this situation exists, it will be

more difficult for the donor to free himself from the earthly terrain, and to this extent, there may be some slight effect of overshadowing of the recipient by the donor's astral consciousness but it would be very mild and confused, spasmodic and ever-weakening. The recipient on the other hand has a great gap in his etheric body, which takes time to adjust. This weakness brings to his chest and lungs, in particular, the hazards of insufficient etheric vitalization. I hazard a forecast that only when the atoms and molecules of the donated heart are all replaced by normal processes, with atoms and molecules of an order and quality in harmony with the receiver and his bodies, will this threat of devitalization and infection be overcome so that the rent in the etheric is thus repaired, the link with the donor is finally broken (and the influences reaching the recipient via his blood from that astral quarter terminated). Until then doctors would have to maintain a strict vigil, applying constantly all their genius for immunological therapy. I have seen the fight put up by one of these dying heart recipients on the astral plane, and I don't ever want to see such a hopeless struggle again.

THE OCCULT ANATOMY AND PHYSIOLOGY OF THE HEART

Any attention paid to the special properties of the heart is always rewarding to the esoteric healer. It should always be remembered that, through its link with the vagus nerve, the heart is the mediator of the energies of Solar Fire and their capacity to solarize, make of the same nature as their source, the organs with which it comes in contact. The heart as the prime circulator of the blood, distributes in that blood, to every organ of the body, the qualities flowing from the Heart Chakra as they are modified by the vagus nerve.

That axiom of Esoteric Healing which states: "when in doubt, heal through the Heart Chakra" is based on sound knowledge of occult anatomy and physiology of the heart. The heart and its chakra are the doorway into the aura of the forces of Buddhi, and they become a floodgate for the compassionate energies of Buddhi as the healer treads the Path of Initiation. Inseparable from the flow of healing energies that stem from this region are the qualities of the Christ-force, as He Himself once said, "Behold I stand at the door and knock". Place your forefinger on the skin one inch below your left nipple and you will feel the thud of His knock as the apex of the heart strikes the wall of the thoracic cage just there.

A careful study of the diagram of the anatomy of the opened heart (Figure XIII-5) will reveal much of help to the esoteric healer if he uses the following statements to help him in his observations:-

The circled region shows the anatomical area which is of critical importance in heart transplants. It is also a region of great esoteric importance. Here, there flows into the sinoatrial node, etheric energies from the heart of the sun. Here also is the meeting place of vagal and sympathetic fibers which regulate the rate of the heart. This region is generally retained in the recipient and the donor's tissue is built around it. The truth in the esoteric teaching is emphasized when the heart is seen as a receiver of energies in the same way that its microcosm, the anu (ultimate physical atom) receives energies into its vortex from higher planes. The similarity is taken further in the illustrations shown overleaf.

This is also the site of anchorage of the Life Force. It is here the Physical Permanent Atom builds around itself the very first atoms, in embryo, which dictate the quality of physical form adopted thereafter. It is through this permanent atom that the physical karma of the individual is mediated. The Lords of Karma are related to the four cavities of the heart, i.e. two atria and two ventricles.

The rod of the caduceus may be compared to the A.V. Bundle of His which conducts the electrical forces of the sinus node to all parts of the heart muscle. The negative and positive acting forces of the sympathetic and vagal fibers would then correspond to those of Ida and Pingala.

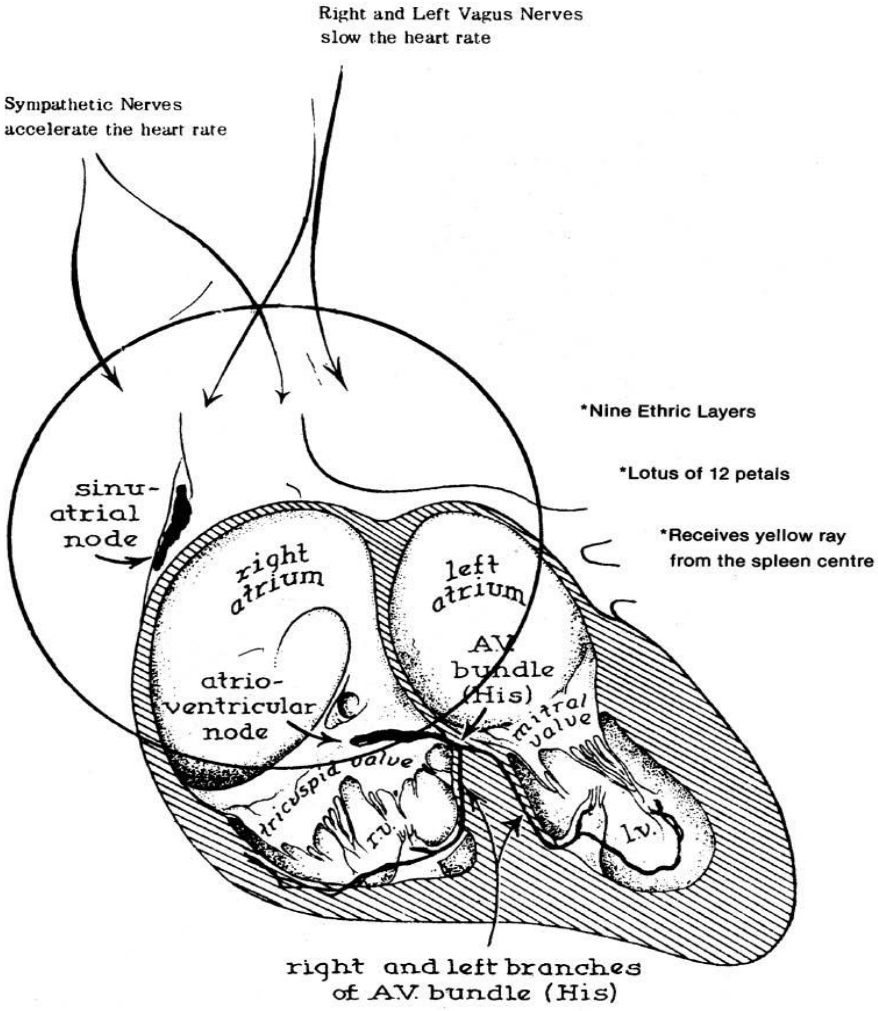
The clairvoyant perception of the Heart chakra is relevant here: —

When studied clairvoyantly the heart is found to be truly the Sun of the body. As the Earth, which is outwardly dark, is composed of nine layers with a central light flaming always at its core, so the heart possesses nine etheric layers with a luminous rose or lotus blossom in their midst. When a life is set to the rhythms of universal consciousness this heart flower expands and its petals gleam and sparkle with lights of blue and gold. When, however, the love life of the individual is impure or selfish, these flower petals tend to bend backwards and curl upon themselves. This stultification of the heart-flower reacts physically as heart trouble in this or later lives. Paracelsus well says that disease can be intelligently studied only in connection with Karma and the invisible bodies of man...

30 The Jewel in the Lotus (Vol. l of Seven Pillars of Ancient Wisdom), p. 25.

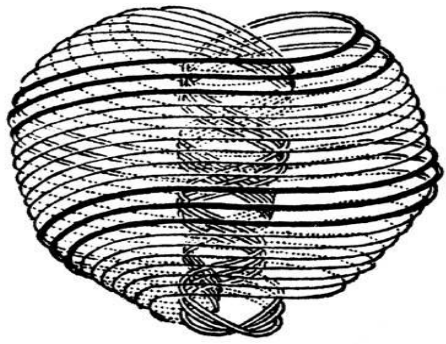
31 Human Physiology, by Houssey.

Figure XIII-5

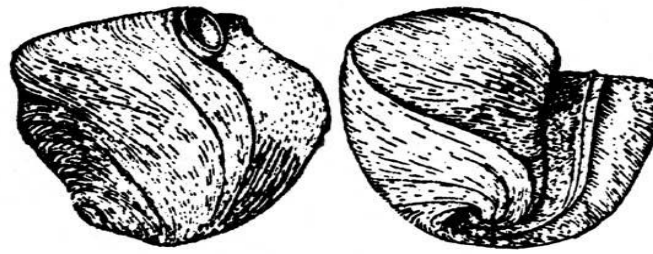


Anatomy of the Heart

Figure XIII-6



The pulsating Anu or ultimate Physical Atom.



Dissection of Heart muscle to show the course of the fibers.

THE HEART AND THE ANU COMPARED TO THE CADUCEUS AS UNITS FOR THE RECEPTION, CONDUCTION AND DISSEMINATION OF HIGHER ENERGIES.

Heart consciousness is most active during hours of sleep. The important work of the aspirant is to impress this heart memory upon the brain mind. Man must learn to think with his heart. This will only be possible as love becomes the animating motive power of life. David, the poet-seer, understood these inner truths when he said: "As a man thinketh in his heart so is he."

Paracelsus writes: "As the Sun worketh in the planet, so does the heart in the body and the Moon in the brain." The mystic marriage is

alchemically described as the uniting of the Sun and Moon. When complete regeneration is accomplished, a stream or nerve current of light will flow along the pneumogastric (vagus) nerve, coordinating the powers of head and heart. This is the mystic highway traversed so often by Mary and Joseph between Bethlehem and Jerusalem. All the principal events in the Bible are also found within the body of man.32

THE RAMIFICATIONS OF AN ARCH

The aorta, about one inch wide, curves in a great arch – up from the heart, down along the backbone into the abdomen. From it other large arteries lead to the head, the digestive organs, the arms and the legs. From these branch the smaller arterioles, and from these the tiny capillaries, thousands of them in each of a countless number of networks – the last station on the blood's outward-bound journey.

Any fluid driven by a pump, and flowing in a circuit of closed channels, operates under pressure. The pressure from the heart is increased by muscles in the walls of the aorta; if the aorta were opened, blood would spout a column six feet high. The large arteries therefore have tougher walls than do their branches – thick layers of muscle and elastic tissue with lots of give. The importance of this resiliency is perhaps best appreciated when the walls harden as a result of the deposit of fatty materials and calcium. This condition, with its coincident constriction of the artery channels, is known as arteriosclerosis, one form of which is atherosclerosis. Healthy arterial walls, however, stretch and rebound with each heartbeat. This movement is what we feel as the pulse, at any area of the body where the arteries lie close to the surface.

By the time the blood reaches the capillaries it is moving at a relatively slow rate, along channels so narrow that its own cells, the corpuscles, must slither through sideways. Here the blood discharges its load of dissolved food and oxygen. These leak through the microscopically thin capillary walls, across a watery bridge provided by a fluid called lymph, and into the body's cells. Back into the bloodstream, via the same route, come carbon dioxide, urea and uric acid – castoffs from the cell. This brisk maneuver is executed in an area whose size may be judged by the fact that no capillary lies more than a hair's breadth away from a cell.

In yielding up oxygen and taking on waste, the blood turns color from bright to dull red. It now starts back to the heart, trickling from the

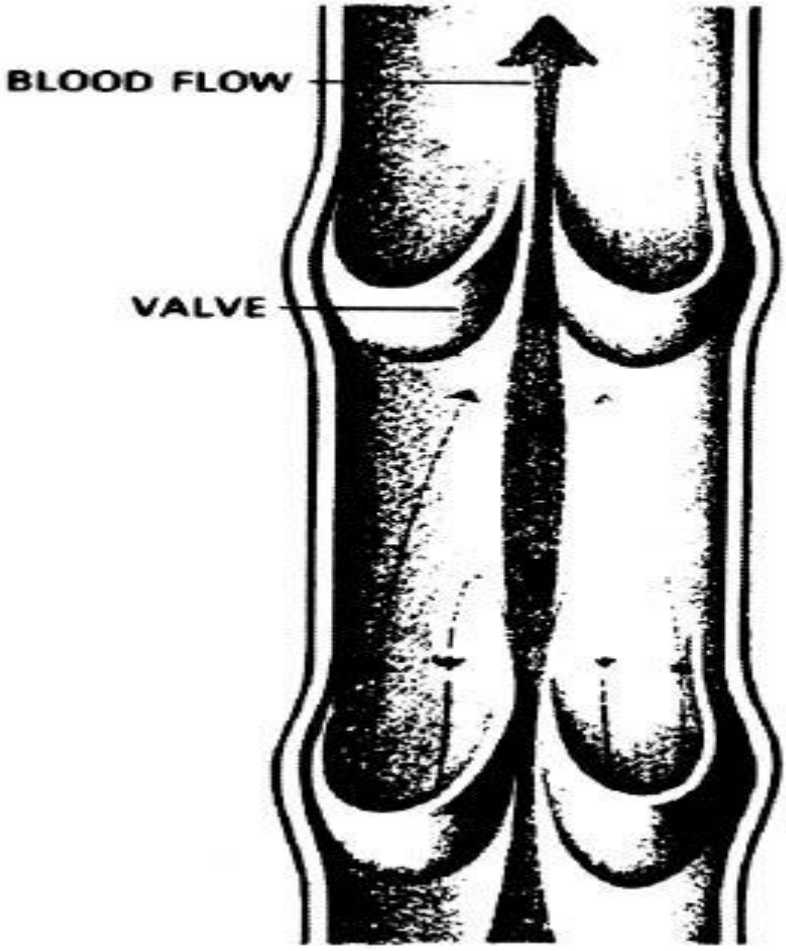
capillaries into the venules – small veins – with which they merge. The venules converge into larger veins and then into the two largest, the venae cavae, just above and below the heart. The blood empties into the right atrium, descends into the right ventricle, then moves out through a large artery – the pulmonary artery – leading to the lungs. The lungs supply the blood with fresh oxygen and send it, newly scarlet and reinvigorated, to the left atrium, to start its round of the body all over again.

The entire intricate, tortuous process – from first to second entry of the left atrium – takes the blood the incredibly brief time of about 20 seconds.

Moreover, the general circuit of the body – the systemic, so called – is only one of several routes which the blood tirelessly travels. Its route to and from the lungs, described above, is known as the pulmonary circulation, and is regarded as the other major circuit besides the systemic. The systemic circulation also has a number of special divisions, local but altogether essential, around which the blood simultaneously zips to aid in the function of particular vital organs. These local circulations include the renal (to the kidneys), the portal (to the liver), the cerebral (to the brain) and the coronary (to the heart itself.)

32 Occult Anatomy and the Bible, by Corinne Heline, the Rosicrucian Fellowship Press, Oceanside. Calif. U.S.A.

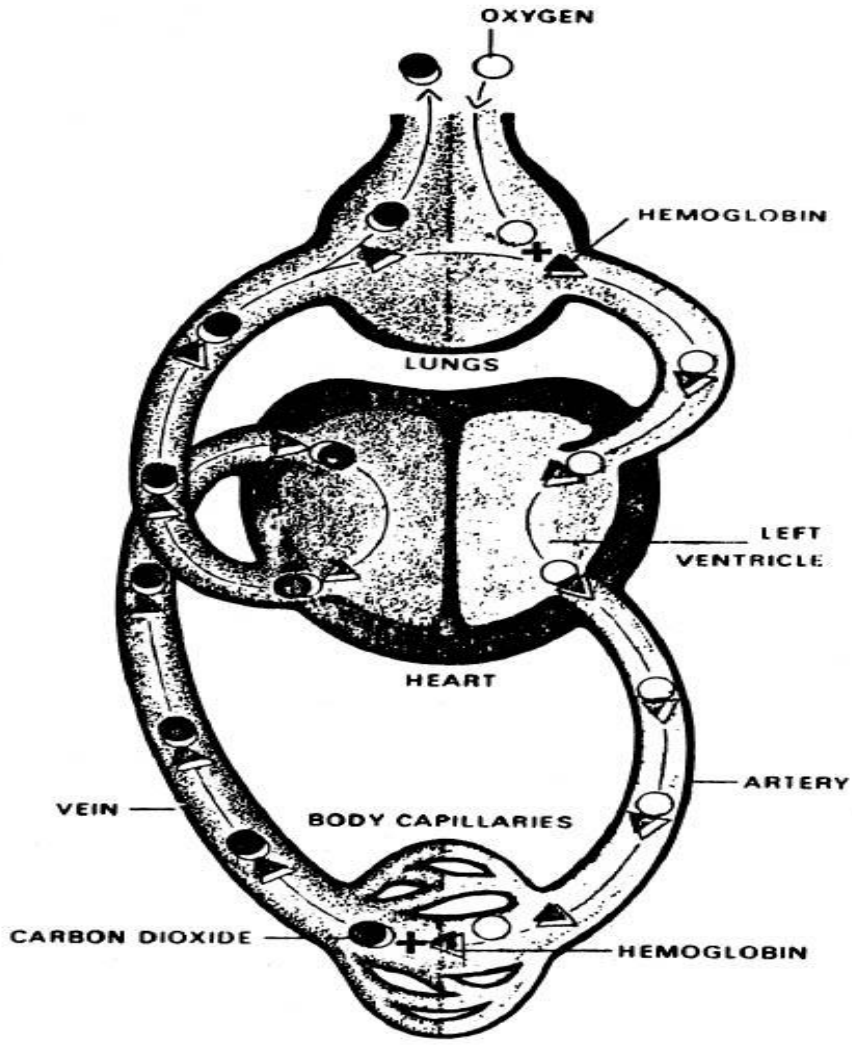
Figure XIII-7



VALVES TO REGULATE FLOW

If veins were simply long tubes, blood would rush into a person's feet every time he stood up. The blood flow in most veins is regulated by valves. When blood flows toward the heart, the valves allow it to pass. However, if the blood starts to go the wrong way (small arrows), the valves fill up and stop the backflow. Defective valves allow the pressure of an unbroken column of blood from the heart to distend blood vessels in the legs, causing varicose veins.

Figure XIII-8



A TRANSPORT SYSTEM FOR THE BODY

The bloodstream is a vast transport system that carries oxygen to the tissues and brings carbon dioxide to the lungs to be expelled. Oxygen laden blood is pumped from the left ventricle of the heart through the arteries and into the tiniest capillaries, where cells snatch up oxygen and turn over carbon dioxide to the red blood cells' hemoglobin. The blood flows back to the lungs, where the process begins again.

A CASE OF SUPPLY AND DEMAND

Fast as the heart pumps the blood under ordinary circumstances, the speed is markedly stepped up in response to special demand from some part of the body. A commuter dashes for a train; his leg muscles instantly require an extra surge of blood. They get it, thanks to capillaries elsewhere in the body which temporarily close because their need for blood is not so urgent. The capillaries of the stomach and intestine pass up their usual helpings of blood quite often on such occasions; on the other hand, they are likely to be more demanding than usual after a meal, when their own capacity is taxed to help in the digestive process. It is for this reason that we can be drowsy or sluggish after a meal; the blood is going to the digestive tract instead of to the brain.

During strenuous exercise, heavy physical labor or any kind of stress, the heart may pump eight times as much blood as in a period of relative relaxation – as many as 12 gallons a minute. To pump an equal amount of liquid, a hand pump considerable larger would have to work a lot longer. Yet the heart adapts to a short-term increase in work load without harm; it slows and rests when the demand falls off.

Even when the demand persists, the heart adjusts. Its muscles thicken, its chambers enlarge and it may actually double in size. The heart of a businessman with hypertension may fill half his chest cavity. In hypertension – high blood pressure – a variety of factors ranging from kidney malfunction to nervous strain may combine to create a resistance to the flow of blood through the arterioles, causing the heart to pump harder to surmount this obstacle. Whatever the cause, the heart, when forced into consistent overwork, pumps less efficiently. It tries to compensate by beating more frantically, until it cannot keep up, and fails.

A failing heart, however, can often be restored with almost miraculous dispatch by a potent chemical prepared from Digitalis purpurea, the common foxglove herb. The curative powers of this plant revealed themselves about 1776, through the ailing person of the principal of Brasenose College, Oxford. This gentleman suffered from dropsy – a waterlogging of the tissues, in part due to heart failure – until he abandoned orthodox remedies and tried a homemade formula for dropsy, a special tea brewed by an old woman of Shropshire. The results were so astonishingly good that word spread. Analyzing the beverage, a compound of some 20 of more varieties of herb, a local doctor, William

Withering, proved foxglove to be the active ingredient. Under its Latin name of digitalis, it has been one of the greatest boons to mankind in all the history of medicine.

The elements of blood itself have fascinated men ever since the microscope permitted a detailed look at them. One of the first to discover a blood component was Malpighi, not long after he spotted the capillaries which had eluded Harvey. Some 300 years later, for all the intervening refinements in detection techniques, many mysteries remain about the makeup of the blood and the function of certain parts of it.

The constant preoccupation of occultists with the subject of blood implies that, as Paracelsus once wrote: "Blood is a very special fluid". The white cells of the blood have special associations with the astral world. These links are emphasized in the relationships between the emotional nature of a person and his white blood cells. His white cells have astral sheaths, especially the polymorphonuclears. The latter reflect something of the loose and amoeboid structure of things astral. White cells may not increase in number or grow larger in size because of the intense feelings of the one in whom they live and move and have their being, but they do reflect those feelings in themselves. They become a reservoir of the particular emotional qualities being elaborated at an astral level. More than this, they are susceptible to the feeling of OTHERS, to the imperfections of others, especially where there is special rapport, or where there is blood relationship. This is particularly true of twins, and of parents and their children.

We have referred to the rapport that is maintained between a patient and the blood removed from him in that form of diagnosis and treatment called Radionics. This rapport is based on the continuum that exists between cell and Man, the fragment being a reflection of the whole. There is reflection into the cells of the blood not only the vital qualities of the patient but also his emotional and even mental states. These expressions are only possible because of the astral sheaths which permeate all cells, especially the polymorphs of the blood.

The organs through which the blood passes greatly affect it. Very special effects are created by the passage of blood through the four chambers of the heart. This must await explanation when the subject of the thorax is dealt with. Let it be sufficient merely to say that in passage through the heart the karmic qualities of the blood receive attention.

The role played by the red blood cells is quite different and not quite so clearly understood. That the red cells express vitality inherent in the grana that they bear, linked as it is to the oxygen molecules, is without doubt. But there is another function related to the erythrocytes. They provide a mechanism whereby every blueprint out of which an idea is elaborated can be maintained, projected or withdrawn. The intake of a breath favors the strengthening of any idea or concept held (in astral and mental essence) within the blood reservoirs of the brain and materialized into electrical formulae by the brain neurons. The held breath will maintain the thought in a state of dynamic equilibrium.

The blood supply of the brain has several features about it which makes it very different from the vesiculation of other organs. The two internal carotid arteries form the main blood supply to the brain, especially the forebrain where lies the seat of consciousness. In the first place, the common carotid artery has, where it bifurcates into its external and internal branches at the level of the upper border of the thyroid cartilage (Adam's apple) just below the angle of each jawbone, the carotid body closely applied to it. This organ is sensitive to changes of pressure in the blood of the carotid artery and is also a chemoreceptor to the level of the oxygen content of the blood. Its esoteric significance is through its immediate relationship and correspondence to the alta major chakra which, when awakened, rotates sagitally on an imagined axle formed between the two carotid bodies midway between the angles of the mandible or lower jaw.33

The internal carotid artery enters the skull through a bony canal in the petrous bone of the skull. Emanuel Swedenborg, the great mystic and seer was also an anatomist in the early part of his long life. In dissecting the carotid artery he observed how it took a tortuous path through this bony canal before entering the skull and the substance of the forebrain. He came to the conclusion that the artery was thus contorted in order to reduce the impact of the pulsating effects of pressure waves coming from the beating heart. He thought these would interfere with the thought processes of the brain. This observation, made in the early 18th century, is generally accepted by anatomists today. It is of considerable importance to students of esoteric anatomy, who know that for meditation to be possible at all, even the activity of the heart must be slowed. The brain's activity must be stilled and an organ throbbing with blood is an unlikely instrument of the higher mind.

Of the pathway taken through the petrous bone by the internal carotid artery, Gray's Anatomy states:-

It is remarkable for the number of curvatures that it presents in different parts of its course. It occasionally has one or two flexures near the base of the skull, whilst in its passage through the carotid canal and along the side of the body of the sphenoid bone it describes a double curvature which resembles the italic letters placed horizontally. These curvatures most probably diminish the velocity of the current of blood, by increasing the extent of the surface over which it moves and adding to the amount of impediment produced from friction.

There is also a plexus of sympathetic nerves closely woven around the internal carotid artery as it enters the skull. These come from the superior cervical ganglion which lies at the head of the sympathetic nervous system cord, about the level of the second and third cervical vertebrae. From this ganglion sympathetic nerves reach important structures in the head of esoteric significance, such as the pituitary gland and the pineal glands, themselves externalizations of the ajna and sahasrara chakras.

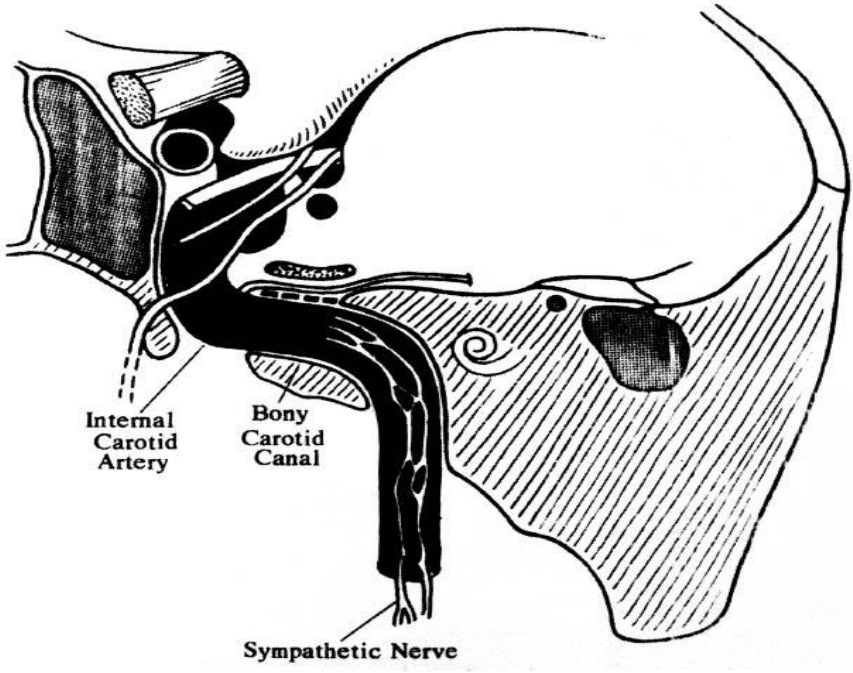
When the internal carotid artery enters the skull, it joins in a complex anastamosis of arteries on the base of the brain known as the Circle of Willis. It is here that the two vertebral arteries meet the two carotid reminiscent to the occultist of the crux ansatta, the sacred symbol of consciousness originating from the temples of initiation in ancient Egypt.34

CIRCLE OF WILLIS

This is the structure that supports consciousness, bringing prana (Life Force) in the blood supply, which is relatively greater in quantity than that supplied to any other organ in the body except the kidney. The blood is also the most oxygenated because the common carotid artery is one of the first branches given off from the "bridge of life", the arch of the aorta.

Figure XIII-9

THE INTERNAL CAROTID ARTERY ENTERING THE SKULL



On this sacred scaffolding, the Circle of Willis, lies the brain, the ultimate physical mirror for all mystical experience. This is the sacred table on which are placed the rare fruits, the sustenance and divine fare of the gods:-

Thou preparest a table before me in the presence of mine enemies (the five senses):

Thou annointest my head with oil (Fohat):

My cup runneth over... (state of Grace).35

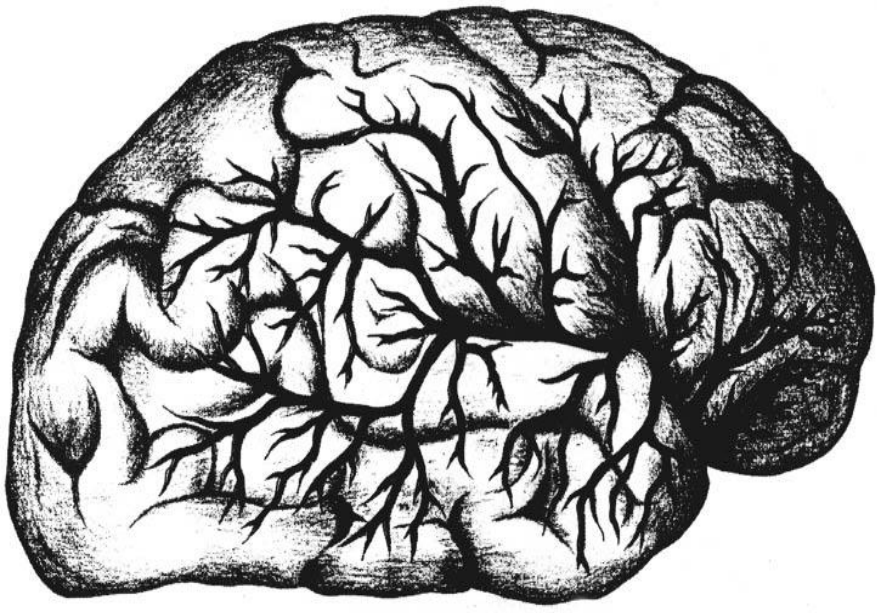
It is the table on which rests the sacred scarab...the symbol used by Egyptian initiates to signify the brain, the seat of consciousness.

The symbol of the blood has been used by many religions to indicate sacrifice and devotion. The heart, as the source of the blood, implies supreme love...the various disciplines are made through the supreme love of the divinity.

The aorta has been called the bridge of life because it carries all the blood the heart pumps out into the systemic circulation. From where it emerges

from the left ventricle, it ascends, then arches back and then descends, through the thoracic cage and the abdomen, giving off its life-giving arteries. Adding to its structure the left ventricle, we have a perfect bishop's crozier, a symbol of divine grace.

Figure XIII-10



DISTRIBUTION OF MIDDLE CEREBRAL ARTERIES ON THE OUTER SURFACE OF THE CEREBRUM

The great theosophist and clairvoyant, C.W. Leadbeater showed in his works that such sacramental devices were flooded with power when used correctly. Thus, it is easy to identify the aorta with the Rod of Power, each Man carrying within himself, as part of the whole, a symbol of the mighty extra-system force that produces evolution towards Truth, Beauty and Goodness.

From the Aorta there stem the four arteries, the legs of the divine table (circle of illustration) on which is laid the sacred fare of consciousness (the Brain) :-

Right and Left | Internal Carotid

Right and Left Right and Left

Internal Carotid Arteries

Vertebral Arteries

THE CROZIER

This is the pastoral staff of a bishop – a staff with its head curled round something in the manner of a shepherd's crook, from which some have supposed it to be derived. This ancestry is by no means certain. Another theory is that it is the descendant of the lituus or crook, which was one of the emblems carried by the Roman augur in pre-Christian days. Certainly the pastoral staff, as depicted in some of the earliest Christian monuments, is practically identical with this augur's wand, for the primitive crosier seems to have been much shorter in the stem than its modern equivalent. Indeed, the lengthening of the staff probably occurred only when it began to be made of materials so heavy that it was advisable to support its weight upon the ground. It is unquestionably one of the earliest external symbols which the Church prescribed for her officers, for crosiers have been found illustrated in the catacombs, and a staff alleged to be that of St. Peter is preserved in the cathedral of Trier or Treves.

33 See Meditation, The Theory and Practice, Vol. II, S.P.A.W., p. 39.

34 See also Esoteric Astrology, by Douglas Baker, p. 293.

35 Psalm 23

Figure XIII-11

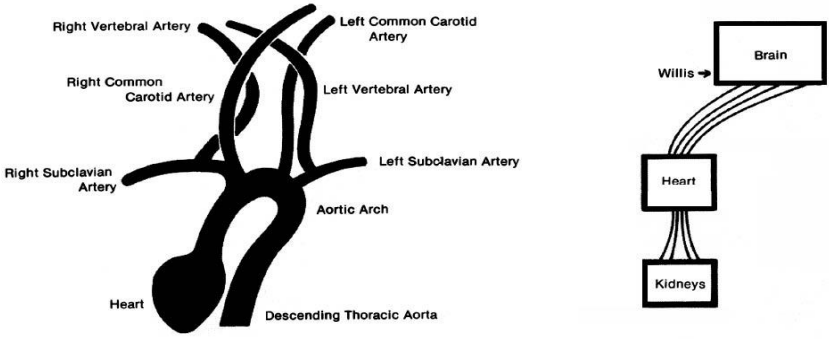
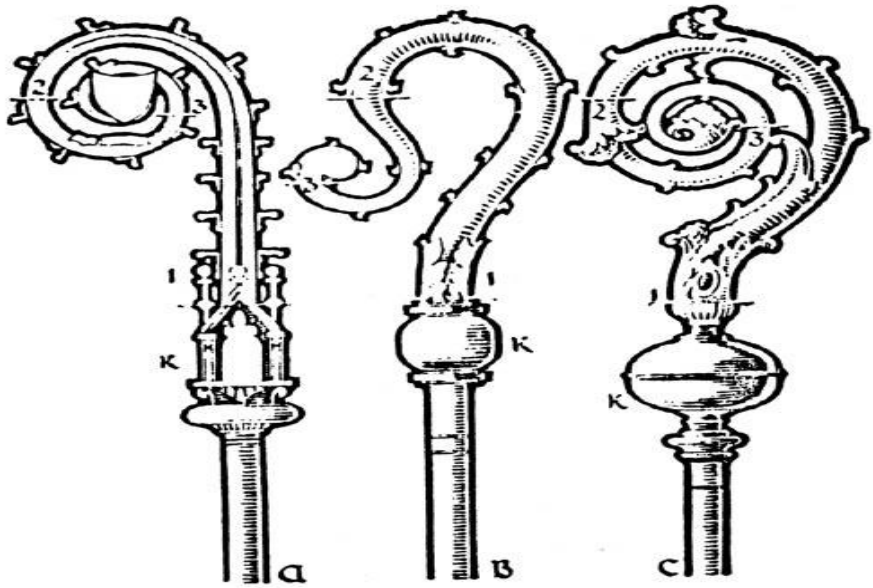


Figure XIII-12



The Crozier. Three styles of crozier beads are shown. The tiny, consecrated jewels are placed is the interior of the knob, marked K. The points on the crozier head where partitions of stone or of magnetized ether should be fixed are indicated by numerals. The first partition, 1, stops the flow of etheric matter, the second, 2, of astral matter and the third, 3, of lower mental matter.

Both the material of the staff and its shape have varied considerably. In the beginning it was a wooden rod, generally of cedar, cypress or ebony, often gilt or overlaid with silver plates. Soon the head began to be made of precious metal or carved ivory, and later the whole staff was of ivory or enameled metal. The Irish croziers were often bronze, decorated with wonderful interlacing knots or bands. In modern days the whole staff is usually of brass or silver, heavily gilt, and sometimes richly jeweled, though this is unnecessary.[36]

When we come to examine that part of the brain which is responsible for consciousness, for retaining that which is visualized, we find a special arrangement of the blood vessels. Whereas elsewhere, arteries end in capillaries and capillaries pass into veins, the fate of arteries which reach the cerebral cortex, where consciousness is seated, is different. These

terminate in "end arteries". Their blood is poured into very defined spaces which overlap each other only slightly. This has the one advantage of confining destruction of nerve tissue to a very small area if an artery is obstructed in some way. On the other hand, and this is significant to the occultist, the net result of such diffused blood is a fine mesh of constantly regenerated prana and oxygen, ideal for the sustaining of impressions received from astral, mental and even spiritual realms. The perceived quality is flashed on to the etherico-astral screen produced by such a blood "film".

These propositions may be hard for current anatomists and physiologists to accept, but time will tell. Blood has holistic qualities. Fragmentation of it means only that that which is currently being experienced by the WHOLE will be shared by the fragment. Seen in the light of earlier propositions and the seven postulates of Ancient Wisdom, the blood screen of the brain will not appear so fantastic or "way out". The subtler elements of the blood already described are the neutral ground between the seen and the unseen, where an inner experience is translated into a symbol that is acceptable to the brain and its computerizing effects. It is the place where an object for meditation can be visualized and maintained until the Higher Self is ready to accept it.

Figure XIII-13

Now, let us look at and study the body and its relationship to the Pyramid actually "in use". The Pyradome Series was chosen about four years ago by Dr. Lawrence Kennedy, located at 2996

Springwood Dr., South Lake Tahoe, California. Dr. Kennedy and his son, Chris, are world renowned for their ability to demonstrate and teach the Geller effect, Psychokinesis or the ability to bend metals or break glass at a distance using only mental concentration.

Dr. Kennedy has been conducting classes and teaching others to do this same feat not so much for the dramatic effect it created but more for teaching and making others aware of the healing energies we all possess. When I first met Dr. Kennedy, he had been conducting classes under a 7' meditation pyramid because he noticed people grasped the principle faster and it seems to accelerate their learning process. I suggested he use the Pyradome Series on an individual level and that it should increase the learning process even more. At first he was skeptical, but he tried our concept and it worked.

During the intense disciplines and studies, with over 500 students learning psychokinesis with Dr. Lawrence Kennedy, we noticed a series of patterns reoccurring time and time again as an effect of wearing the Pyradyne headgear series to accelerate the learning potential of Dr. Kennedy's students. During actual channeling and conscious effort required to bend a piece of metal using mental energies amplified by the respective pyramid worn, tremendous stress is placed on the body and mind, and inherent genetic weaknesses often emerge rather quickly during the channeling that, under normal circumstances of daily routines, lie dormant.

People wearing the Raydome for the first time find after several hours of wear, that their mental capabilities are greatly expanded, and their energy very high, but they are suffering from a headache. This is placed on the head in its stead. A second phenomenon that occurs is when a student wears the Raydome or Firedome until bedtime, but then feels unable to sleep and lies wide awake all night wondering where all their extra energy came from.

Actually these are not negative effects, but rather failure of each of the persons to study the various effects the headgear were designed to produce. In order to understand these effects, let us examine ourselves further.

Our feelings are determined on the physical level by the quality of air we breathe, the type of people we associate with, and the type of foods we consume. When we take a breath of Air (PRANA), we are breathing either positive or negative ions. Negative ions build cells in the body, (we cannot reproduce a single cell in the body without the presence of negative ions) and produce a feeling of euphoria or wellbeing. This is

important because the average person depletes their cell bank at the rate of 50 million cells a second.

Positive ions, on the other hand, cause feelings of depression, short attention span, irritability, fear, paranoia and anxiety, and often bring diseased conditions of a psychotic or respiratory nature. The air, which once consisted mostly of negative ions, is today two thirds positive ions.

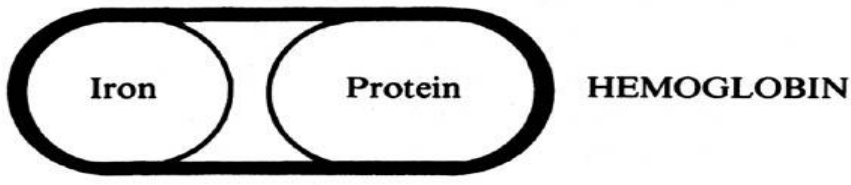
Since negative ions enter the body through the nose and charge the red blood cells (hemoglobin) in the lungs, wearing a Pyradome, Firedome, Raydome or Powerdome on the head (all of which produce the negative-ion effect in the presence of polluted air) means that the air is influenced by the pyramid's force field as it enters into the lungs. Another important fact often overlooked is that this has a very strong influence on our feelings and attitudes, as we consume a minimum of 2,500 gallons of air daily. Imagine how hard your conscious mind has to work to overcome the negative effect of positive ions (smog) with each breath we take. The American Medical Association has published statistics that one out of four Americans living today will contract cancer. And guess where most cancer occurs? Cancer of the lungs (bad air and smoking) and cancer of the colon (large intestine), from eating junk foods loaded with preservatives and insecticides.

The second aspect of our feelings deals with our endocrine system. There are seven major endocrine glands (CHAKRAS), in the body, which differ from other glands in that they secrete hormones directly into the bloodstream. If the arterial system is functioning correctly, these hormones reach the brain 15 seconds after secretion and produce feelings of energy (adrenal hormones), love (thymus hormones), concentration (pituitary hormones) or sexual arousal (gonad hormones). Negative feeling is usually only produced by one hormone (seratonin), which comes from the pineal gland. Its main purpose in the body is to prevent premature spiritual development by secretions of small amounts at a time into the bloodstream, but the presence of positive ions in the bloodstream causes large amounts of seratonin to be found in individuals in smog-laden areas. This produces a second aspect of negativity; the first being a general condition – poor air circulating throughout the body. Now let us examine in detail the working process of the pyramid and body functions.

We breathe air containing positive or negative ions into our lungs ... The air enters into the walls of the lungs in little membranes called villi, and mixes with the red blood cell hemoglobin.

Hemoglobin consists of iron, protein (574 amino acids), and trace amounts of copper. The iron picks up an electrical charge – either positive or negative depending on the quality of air – and this charge is carried in the blood, through the heart, from the heart via the carotid artery to the brain. The basic law of electricity that applies to physical action also applies to metabolism: like charges repel and unlike charges attract. So when the negatively charged red blood cells arrive at the brain and are circulated through the circle of Willis, and assuming you have negative ions on the brain, positive energy is attracted from the outside of the body and when positive energy is attracted to the brain it discharges or neutralizes and during this neutralization you have the feeling of consciousness and a positive mood swing, or euphoria. If, however, you breathe positive ions and they are transported to the brain, the circle of Willis (see Figure XIII-15) has a positive charge, you attract negative energy from the outside, once again receiving a discharge and feeling of consciousness, but now the resultant feeling is depression, fear, anxiety, paranoia, claustrophobia, asthma, etc. Another interesting thing research scientists have noted is that positive ions isolate iron, the electrical carrier, from the red blood cells, thus creating a feeling of suffocation or stuffiness so that when you breathe positive ions you literally suffocate from the inside out. For this reason, people with low oxygen-carrying blood count feel closed in or claustrophobic on smoggy days. This drops the electrical barrier and the person is now open for disease. Thus you begin to realize why people are wearing Pyradyne headgear. They may look strange at first but so did extended bumpers on automobiles, yet both serve a very necessary purpose in today's times of poor air, stress and tension.

Figure XIII-14



The second thing that Pyradyne products do is to cause a secretion of the various hormones depending on which dome is being worn, and this is determined by the precious metals used.

You will note in the drawing of man and his chakras Fig, XV-2, in the extreme left hand column that musical notes, planetary influence, color or pyramid energy have a direct bearing on the endocrine system, causing hormones to enter the bloodstream with a second influencing set of circumstances affecting our feelings. As you can see, the Raydome, Firedome and Powerdome stimulate the adrenals. When the adrenals are affected thusly, epinephrine (adrenalin) enters the system, giving you a feeling of energy or desire to work and move about. In addition to epinephrine, there are more than 20 other hormones called cortisone that enter the blood stream. These hormones perform many positive functions, aiding the respective individual's sense of wellbeing and, if you are arthritic, your swollen joints may be reduced to normal. If you remember, doctors often give cortisone shots to relieve arthritis in advanced cases. If you study the chart, you will begin to see the various affects produced by the Pyradome series. This chart was compiled after working with thousands of people all over the world using our products.

You will notice that on the same chart, the Raydome and Powerdome affect the adrenals, pancreas and the pineal and pituitary glands simultaneously. When there are multiple secretions occurring in this manner, the tract affect is called the Hypothalamic Loop or emotional brain mind. When this loop is stimulated with balanced energy from these domes, it causes the loop to balance, and this produces a feeling of satisfaction or loss of appetite in persons that are overweight. This is why people wearing these domes often experience a complete loss of appetite. This is good because most people eat way too much, usually out of frustration.

Now, with this basic understanding of the pyramids, let us examine the reason for a headache or loss of sleep. The Raydome, Powerdome, and Firedome are all detoxifiers and stimulants. The Pyradome is a tranquilizer. If you wear a stimulant too close to bedtime, you will have large amounts of adrenal hormones in the bloodstream. It takes the body about two hours to remove adrenalin (which is obviously necessary) in order to sleep. So, when wearing a stimulating dome, remove it at least two hours before retiring. The Pyradome puts you into alpha, balances the endocrine system, but does not stimulate anything. It only calms and

balances. To increase this effect, evening meditation and yoga can be added, along with a glass of warm milk or a glass of wine.

Now to examine why people get headaches after long sessions of wearing the Raydome or Firedome, look at Fig. XII-6 and Fig. XII-7. In Fig. XII-3 , we are showing hemoglobin and its constituents. You will notice that the main mass of hemoglobin contains over 574 amino acids. In toxic air or tobacco, for example, there are many poisons. These poisons are carried into the lungs along with the ions and attach themselves very readily to this large structure of proteins (aminos). If you follow the path of the arteries from the lungs to the brain, you will find a fairly large diameter artery until you pass through the carotid artery and reach the cerebellum. Here, the diameter is reduced to a very small passage and the cerebellum filters the toxins and poison out of the hemoglobin and deposits them on the brain. The actual location of the cerebellum is at the back of the head directly above the neck. Heavy smokers, for example, have a large toxic build-up here which partially unbalances the brain, causing a feeling of frustration which further aggravates the smoking habit. Another toxic build-up and storage area is in the colon or large intestine. Here, toxic preservatives and food additives are stored.

When the Firedome and Raydome are first worn, the body begins to go back to its natural state. The vibrations of the domes vibrate the colon and the cerebellum causing them to discharge toxins back into the bloodstream. This is normal. Next, the liver picks up these toxins (as the liver is a cleansing organ) and makes them ready to be discharged from the body through the urinary tract. But, the liver can be overloaded! So, the liver sends a signal directly to the carotid gland (see Fig. XIII-5) which allows blood pressure to rise in the head. High blood pressure in the head causes the vessels in the circle of the Willis network to be forced against the cranial cavity and an aching sensation is felt in the mind. This is normal. This is the body's way of telling us we are working our liver too hard. So now what do we do? Very simple.

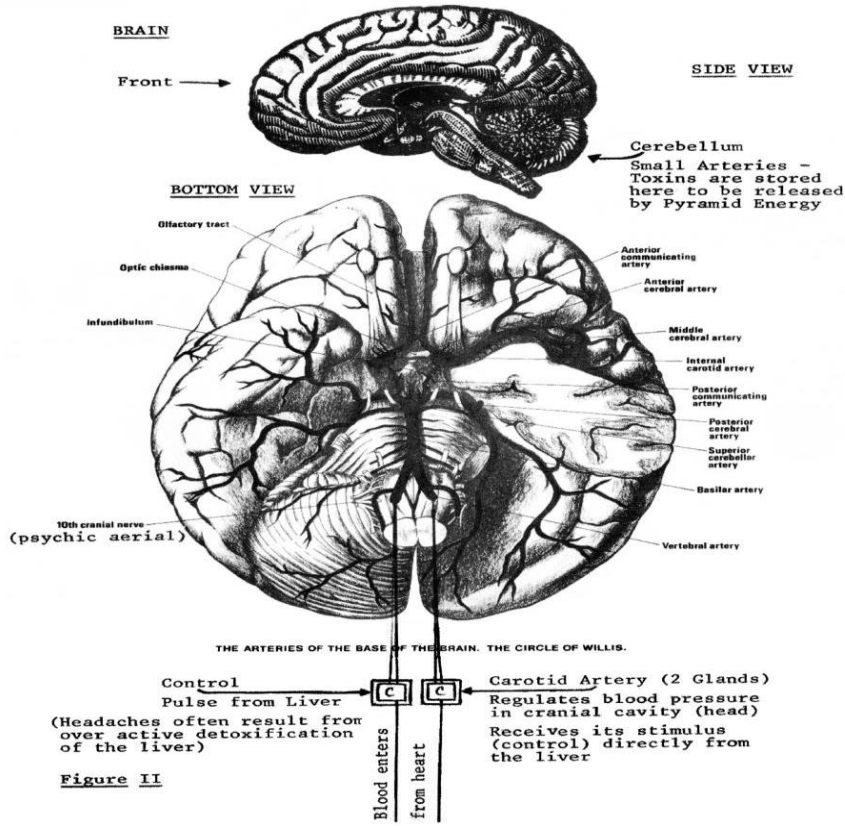
Remove the Firedome or Raydome (stimulants) and wear the Pyradome (relaxer), drink as much water as you wish and take a little vitamin C. The water and vitamin C combination forms a natural lubricant for the liver, and it is well-equipped to perform its detoxifying job. After a two- or three-hour elapse, you may again wear the Firedome or Raydome, and

gradually you will work through this toxic cycle, after which you can wear the stimulators as long as you desire.

Looking for a moment at the brain, and its subjectivity to toxic build-up, the first thing that is affected is, as already mentioned, the cerebral base or cerebellum. This is, in physical consciousness, the balance center. People smoking or abusing their bodies over long periods of time, gradually lose their physical balance. It is harder to ski or roller-skate or even ride a bicycle. All of these feats require physical dexterity of a balancing nature. Later, the mental balance is affected and the body slows down. Then the circulation is affected and gradually the entire arterial system is full of fats and toxins and we have arterial sclerosis, the greatest natural killer in society.

36 The Science of the Sacraments, by C.W. Leadbeater.

Figure XIII-15



This effect seems to reverse once a person discovers the pyramid principle and applies it in a conscious manner. I know it worked for me and I saw it work for others. Once I had gotten through the headache syndrome, my physical balance became as it was when I was in high school. My mental clarity soon followed and my memory today is ten times what it was even when I was in college. I speak with confidence, because I speak from true experience.

The last thing I would like to emphasize is about wearing the Raydome and the Powerdome. These both reduce the flow of serotonin. This stoppage causes a tremendous mental awareness. Most people, after leaving school are not used to using their minds so much, and the brain can be looked at as a muscle. If a muscle is not used, it goes into atrophy or becomes weak. In the case of a weak muscle, gradual exercise, a little each day, is the best way to recovery. The same is true of the brain. The Raydome and Powerdome exercise the brain through hormone action coupled with the negative ion effect. So, begin building this body, mind, and spirit action gradually and gracefully, not all in one day, and you will find amazing things happening to your life, as many others have.

CHAPTER XIV – THE VAGUS NERVE: OUR PSYCHIC BEGINNING

The tenth cranial nerve is called the vagus nerve. The name arose through the diffuse nature of its many parts. Anatomists could not trace its many fibers to their ultimate connections. Still to this day not all the nerve's ramifications have been located.

There are not more than ten structures in physical substance which are of great esoteric significance. Of these, the vagus nerve must be one of the most important. It is said to hold the physiological key to superconscious experience. It is the physical counterpart of the seven sacred planets. What the latter are to the Solar Logos, the vagus nerve is said to be the indwelling entity of a human body, i.e. the Soul. Just as the Solar Logos expresses outwardly his finest qualities through the Seven Spirits before the Throne, or Seven Planetary Logoi, so Man is able to express Soul qualities through this physical tissue more effectively than any other, except perhaps through the eyes, remembering that the eyes radiate energy of a high order from the optic nerves, which are the only part of the brain visible to the outer world.

The cells that make up the vagus have, like other cells of the body, minor lives in occupation. Unlike other cells, however those minor lives, which express themselves through the vagus tissue, are not involuting. They are evolving. The elementals of body tissue are related to the lunar pitris. To them, progressive emersion in material of denser and grosser structure constitutes spiritual development. Any expressions of rage, of loss of temper, of emotional instability in the human host represent experiences of a spiritual quality to such elementals. It should give us pause, on occasions of emotional effusion, to ponder on who at those times is controlling the body.

Equally, on other occasions – for instance in deep meditation – one could pose the same question, and hopefully, the answer in the latter instance is the Higher Self.

Vagus tissue is different. Solar devas make up the in-dwelling hosts of these nerve cells. They are responsive to Solar Fire, whereas other cells respond to the energy of the Fire by Friction as this wells upwards from the Muladhara Chakra.

The vagus nerve is an outpost of Solar Fire. When this is projected into the human aura, it is these cells, more than any which have the capacity to pass the fire down into the physical tissues, that transmute, through this splinter of divine alchemical gold, all that is in contact with it. It is truly said that every disciple must rebuild his physical temple so that the over-shadowing Lord, the human Soul or Overself may dwell therein increasingly. Many are the disciplines which aspirants undertake with this in view: vegetarianism, abstinence, celibacy. A few, a very, very few take heed of disciplines that excite or stimulate the vagus nerve. Not that such excitation would be of any value without the accompanying act of focus of the attention in the region of the brow.

"If thine eye be single, thy whole body shall be filled with light."

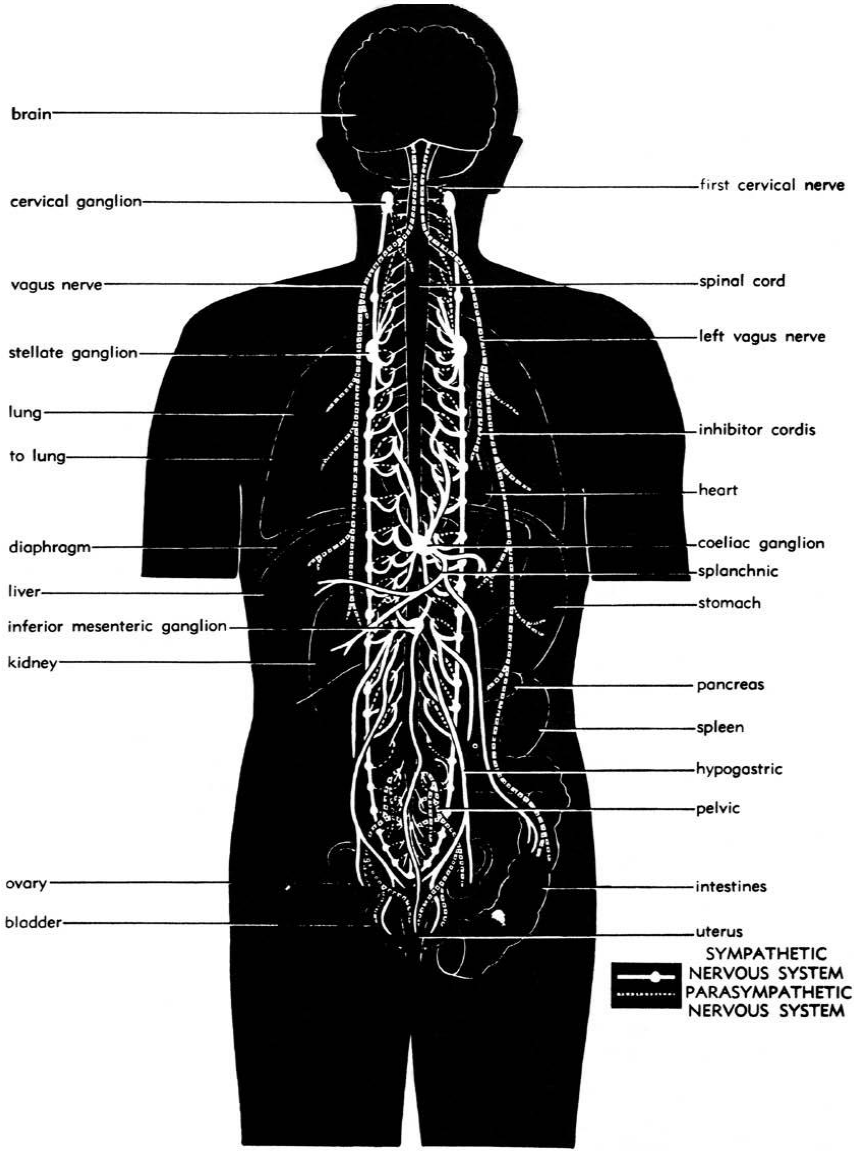
That which fills, which transmits the light achieved in making the eye single (and this can only be done in the region of the brow) deep down into the body tissues, is the vagus nerve.

The discipline concerning the progressive arousal and control of the vagus nerve itself is a stress mechanism. Everyone knows of the despoiling operation of vagotomy which destroys the vagus nerve supply to the gastric mucosa. Such an operation may well save the physical body from inconvenience but is hardly ever life-saving and therefore rarely justifiable in an esoteric person. The Soul might well, under the laws of karmic retribution be endeavoring to teach the disciple the quality of poise in the face of conflict. It might well regard the loss of a physical body as worthwhile if such a quality could be achieved. Vagotomy, seen from the perspective of the Soul is very rarely indicated.

We always associate the vagus nerve with the autonomic nervous system of which it is a part. The sympathetic nervous system, the counterpart of the parasympathetic nervous system, is the agent of the emotional body which will mercilessly exploit any emotional or astral instability. The whole process of Yoga and esoteric unfoldment in its early stages is directed towards control of the emotional nature, and, through it, the sympathetic nervous system. The latter is also a mechanism whereby arousal of Man's deepest psyche, his subconscious, can be set in motion. His animal instincts surface, and, with them, the most undesirable elements of the subconscious. A man who lives constantly in confrontation with his subconscious is not ready for the Path of Discipleship. The Tibetan Master often stated that the subconscious

should never be evoked. It should be allowed to subside, to withdraw progressively so that elements of a higher consciousness could take its place. Naturally, there are exceptions, rare exceptions to this esoteric maxim.

Figure XIV-1



The vagus nerve opposes the sympathetic nervous system and its "agent provocateur", astral instability. For this reason alone, it is worth knowing the anatomy and esoteric significance of the tenth cranial nerve. The nerve forms the major part of the parasympathetic nervous system and becomes excessively active when meditation is practiced or when the individual goes to sleep. All men are capable of some degree of extra-sensory perception during the sleep state. Few, however, retain that retention of awareness during sleep for this capacity to be of any use. Continuity of consciousness, 24 hours of every day, brings increasing control and use of the vagus nerve with its psychic side effects.

We begin to understand now why the nerve is referred to as the "psychic aerial". With Solar Fire flowing through it, it acts as an antenna for the input of energies from the realms of Atma-Buddhi-Manas.

VAGUS NERVE:– Unlike any other tissue of the body, the vagus nerve has close links with the brain and mental equipment, with the lungs and respiration, and with the heart and the blood circulation. We have seen that the three primary qualities underlying the Egoic Lotus and indeed, in the latter part of Man's evolution, thrusting strongly out from the lotus, are atma, buddhi and manas. These qualities arise through the expression of the Third outpouring of the Life-wave of the Solar Logos through His monads as they together form a chakra in his subtle body and now receiving His spiritual attention. The energies of these monads activate material on the three planes of Atma, Buddhi and Manas, where the appropriate atoms of those planes resonate to the qualities of the Monadic ray and are drawn towards its focal points within its permanent atoms. In turn, the triple energies of Atma, Buddhi and Manas seek expression in the three lower bodies. Thus, Atma expresses itself most effectively and harmoniously through the physical body; Buddhi through the astral body and Manas through the mental body. In advanced Man, the probationary disciple and the accepted disciple, the energies of Solar Fire are progressively brought down right into these three bodies as the soul takes a greater and greater hold on its vehicle, the personality.

When that personality is fully rounded out, when the Heart center, the Throat and the Head centers are fully awakened, coordinated, and radiate in unison, then, if the individual decides to align himself with his soul, to orient himself to spiritual matters, Solar Fire can be brought down, by

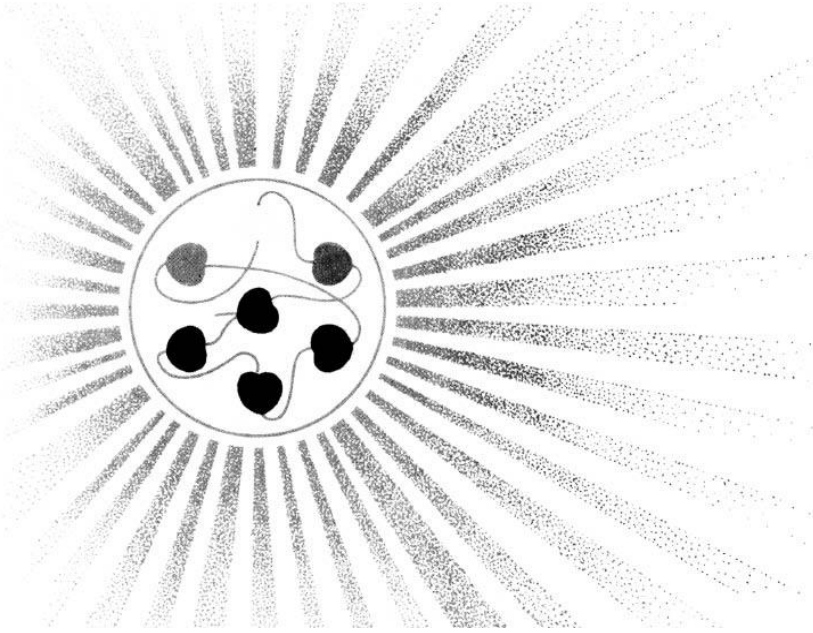
such a Prometheus, from the Mountain Top into the carefully prepared Temple of the Lord, the body of Man. When such a man, in truly heroic fashion, breaks the chains of many lives of anchorage to the primoridal images of the race's collective unconscious, when he frees himself from dogma, and above all, from the net of maya that bewitches his five senses, then he is ready for the fire of the gods. He affirms "Not my will, but Thy will be done" and he calls down the spiritual Fire of that will from his Father in Heaven, his higher Self, the Divine energy of his Monadic essence. Then, he is eligible for the third initiation. Like Abraham, he has borne his son, his most dearly beloved possession (his personality) to the mountain top (of initiation) and there, has offered him for sacrifice (placed his personality at the disposal of the planetary hierarchy of Masters). The offering becomes entirely the instrument of the inner government of the world. It is given some share of Their Plan for the planet.

And now, new equipment comes into operation in the initiate. The disciple is a spiritual embryo, and must grow, rapidly, new organs for perception of the inner worlds and for dealing with higher energies. The constant inflow of Fohat, of Electric and Solar Fire, must express itself or the disciple will be consumed... "My God is an all-consuming Fire". He must express that Fire and transcend it creatively at all levels, spiritually, mentally, emotionally and physically. In this respect, the disciple must develop deva qualities in himself, must emulate the capacities, in fact, of the Fire Deva. This is a desperate necessity, far more desperate than the huge tasks that he now undertakes as his fragment and share of the Plan. In this, the rounded-out personality is tested to the hilt but it relieves pressure on the Masters. He fires others to spiritual effort; he heals; he teaches; he guides; he consoles. He becomes naught but a channel for higher forces. All the time, the embryo grows. What physical organ bears the main brunt of these fiery intrusions, and assists, more than any, in turning them to creative use? It must be an organ that will express something of Atma, Buddhi and Manas as they flow into his Head, Heart and Throat centers opened and secured by the initiatory experience when the Rod of Initiation was applied on the Mountain Top. Only one tissue in the human body fulfils this function adequately, and that is the vagus nerve.

Through its origin in the medulla, it forms part of the brain as a cranial nerve and is thus closely related to the Head chakra, to the mental body

and to higher Manas. Through its ramifications in the roots of the lungs, it is related to the breath, to prana, to the peripheral nerves, to the etherico-physical body, to the Throat center and to Atma. Through its nerve endings in the heart, the vagus nerve is related to that organ, to the Heart chakra, to the circulation of the blood, to the blood elements (especially the leucocytes), to the astral body and thence, via the astral permanent atom, to Buddhi. As spiritual inflow progressively increases, changes occur continuously in all the bodies of the lower triad. Nerve endings ramify in the brain and all regions closely connected to or energized by the higher centers. The sutures of the cranium remain patent, even in old age, allowing the reshaping of the brain. The pineal and pituitary glands become highly activated as new tissues are brought out of atrophy into full function, resulting in inhibition of certain organs and etheric mechanisms above the diaphragm. The observations of John White in his book, The Highest State of Consciousness, are relevant here: "In terms of the brain, enlightenment seems to involve a repatterning of neural networks. Whereas before there were unconnected or 'compartmentalized' areas of the brain's nervous system, in enlightenment there is a breakthrough which results in an integration of the nerve pathways by which we think and feel. Our multiple "brains" become one brain. The neo-cortex (the 'thinking-intellect' part) and the limbic system and thalamus (the 'feeling-emotion' part) and the medulla oblongata (the 'intuition-unconscious' part) attain a previously non-existent — but always possible — mode of intercellular communication. A threshold is passed, probably explainable in terms of both cellular electrochemical change and growth of new nerve endings. However it is accomplished in neurophysiological terms, though the result is a new state of consciousness. This, in turn, creates a new mode of perception and feeling, which leads to the discovery of non-rational (but not irrational) forms of logic, which are multi-level/integrated/simultaneous, not linear/sequential/either-or."

Figure XIV-2



The Vitality Globule (The Heart of Pyramid Energy)

In highly developed Man, the vagus nerve takes on added functions of an esoteric nature. It attracts, through the initiating action of the physical permanent atom, material of the highest possible order but within the limits of the karma of the individual, into its structures which are numerous and ramify in many parts of the body. In initiates, these attracted atoms might even possess highly activated spirillae of the fifth and sixth order, which have qualities identical to the planes of Atma, Buddha and Manas, and with which they would be in resonance. Hence, the description of the vagus nerve as being "the psychic aerial or antenna". Of all the parts in the physical vehicle, this nervous tissue would be composed of more of such transformed atoms than any other. Furthermore, the region of the vagus would be the main site in nerve tissue where transformation of atoms of low order, under the stimulus of fohat, into atoms of high vibration, i.e. atoms with the highest orders of spirillae functioning, would occur.

Re-orientation, in terms of chakras, means transfer of energies from the last three sites mentioned and focus on a new triangle of: Throat chakra

to Alta Major chakra/Heat chakra to Brow chakra/and the Head chakra (is further opened). These three force centers must become increasingly opened simultaneously. They become "radioactive" and overlap. Where they do, a vortex of energy is created which resolves itself into the Third Eye (see The Opening of the Third Eye by Douglas Baker), or the Horn of the Unicorn, the organ of spiritual perception. These three chakras are symbolized as the three cusps in the Egoic Lotus described in Section Three of The Jewel in the Lotus, also by Douglas Baker, and the source of the information given here on the vagus nerve. The mechanism of opening the three chakras is related to the dedication – persistence, courage and detachment – which the disciple can muster in performing three essentials: Alta Major...Service to mankind; Brow center...Focus of the mind; Head center... Meditation.

THE VITALITY GLOBULE

The vagus nerve is the "open sesame" for the energy pathways that let into the etheric body, the vitality globule. Whether it is from the surface of the lungs, from the pores of the skin, from the surface of the skin over the openings to the alta major center in the neck, or from the skin region overlying the spleen, all such pathways of entry are widened in vagal stimulation. Ingress of the vitality globule is less inhibited at the moment of deep inhalation which results in the stimulation of the vagus nerve. Pressure on the eyeballs, leading to a slowing of the heart rate and stimulation of the parasympathetic nervous system and a number of other processes, some of which remain a secret of initiation, lead to the same results.

The esoteric disciplines of pranayama, which incorporate more effective uptake of the vitality globule, its breakdown and the transport of its energies in the nadis and in the ida, pingala and sushumna tracts, form a sound basis for the physical frame in the long trek to the mountaintop of Discipleship.

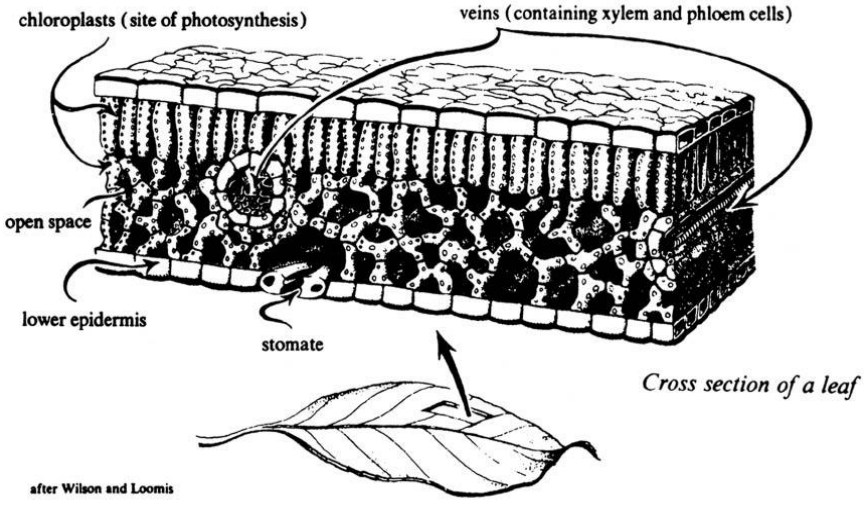
It should never be forgotten that the thyroid gland, monitored by the pituitary gland, affects oxygen uptake, and that the vitality globule is related closely to the oxygen molecule.

PRANA AND THE VITALITY GLOBULE:– The vitality globule comprises seven ultimate physical atoms. These are linked together with the energy of prana to form a radiating, light-emitting, vitality-endowing

vortex. C.W. Leadbeater describes in detail, in his brilliant classics The Hidden Side of Things and Occult Chemistry, how the prana emitted by the sun enters the myriads of anu in our atmosphere from higher dimensions. The author adds some further observations. It is energy from the second aspect of the "Heart of the Sun" and is, therefore, evolutionary in the sense that it is spiritually motivating as well as vitality-inducing to all forms that use it. When an anu is filled to its capacity it begins to glow. Each anu tends to manifest a preponderancy of one of the Seven Rays in its overall quality. Where an anu of the Second Ray of Love Wisdom emerges (the Ray energy of our Solar Logos), it attracts, by means of its inherent and enhanced magnetic qualities, six other anu to form the vitality globule. In this state it may become attached to an oxygen molecule and drawn into the body with the act of breathing, or it may be drawn directly into the body, unattached, through the spleen chakra, which like other chakras, lies on the surface of the physico-etheric body.

Figure XIV-3 Section of Green Leaf

The diagram shows the site of photosynthesis, little round beads of chloroplasts which fix the energy of sunlight used in making glucose: veins of the plant which carry away the glucose and prana from the spongy cells and open spaces: open spaces which store vitality globules singly, or in combination (like a mullberry): stomata, openings in the underside of the leaf which let in AIR and vitality globules.



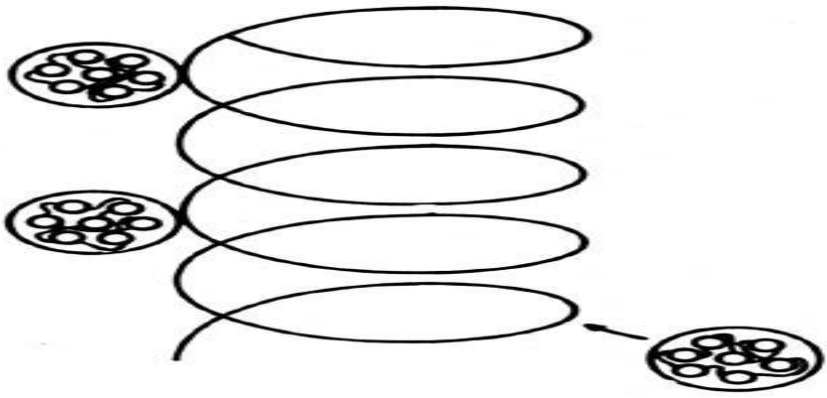
Reference to the second volume of The Seven Pillars of Ancient Wisdom, "Meditation, The Theory and Practice", will provide various diagrams to show how prana links together the seven ultimate atoms to form the vitality globule. This globule vitalizes the etheric structures of the physical body. The mechanism of metabolism, however, sustains the purely physical parts of those same organs. Very briefly, the biological process is as follows. By digestion, we break down food into its constituent molecules. These molecules are absorbed, through the wall of the intestine, into the blood. They are circulated around the body and cells of the various organs, e.g. kidneys, liver, muscles, etc., remove the molecules from the blood, and through a form of combustion they convert the food molecules into various forms of energy which they themselves use to drive their various cell processes. To release this energy, oxygen must be present. This is known as internal respiration. It is, as we see, an energy-releasing mechanism in which glucose is "burnt" in the presence of oxygen. The release of energy sustains the physical tissues. Prana released from the vitality globule sustains the etheric organs, and this is really the esoteric counterpart of what occurs exoterically in internal respiration. The storage of energy in the glucose molecule is the exoteric counterpart of the storing of energy in the vitality globule. Thus we find that six atoms of carbon, 12 atoms of hydrogen and six atoms of oxygen are brought together to make the glucose molecule. This process occurs in the green leaves of plants and is called photosynthesis, i.e., the putting together (synthesis) of glucose molecules through combining them with bonds energized by light energy (photos).

We see then that the sun plays the important role in supplying the energy in the exoteric process of forming the vitality globule and in the exoteric process of forming the glucose molecule. Vitality globules demand the presence of sunlight, as does the process of photosynthesis. It is the common factor. We begin to understand now the biblical expression that Man does not live by bread alone! Whereas the digestive organs and the arteries of the blood transport the glucose to the body tissues, there are special tracts and nadis which bring the elements of the vitality globules to the different chakras. The chakras, in their turn, extract vitality from the components of the vitality globule and transfer this vitality to the etheric parts of their neighboring organs. Any faults which lie in the pathways of these circulating and vitalizing forces, or any inhibition of the correct functioning of the chakras, will lead to devitalization of an

organ, with consequent attack by bacteria. Through this knowledge, the occultist ensures that these hidden forces flow freely, and many of the disciplines concerned with the treading of the Path are there to ensure such a free flow. Meditation brings immense energies, from higher levels down into the etheric body and, what is more important, ensures a more efficient assimilation of prana by all structures at all levels, i.e., mental, astral and etherico-physical. Meditation on these life-giving principles brings a sensitive and responsive health, capable of being highly creative as well as receptive. Robust health is not sought by Man on the Path, nor can he expect, it no matter what teachers of Yoga tell you.

Vitality globules also enter green leaves in great quantities. They pass through the openings or stomata on the underside of the leaf into the spongy mesophyll. There, in the huge open air-spaces, they lie in close opposition to the spongy cells which store the glucose made in photosynthesis. When the plant draws on its glucose (stored there as starch), prana is released from the vitality globules and accompanies the glucose (sap) as it passes to the growing points of the plant. The relevance here to Man on the Path is that live foods contain vast amounts of prana stored as vitality globules in green leaves. Cooking disperses much of this vitality but not all. Fire, in the form of heat, as we know it, does not have much effect on anu and their prana which exist on a much subtler sub-plane. (Quoted from Meditation, The Theory and Practice, Vol. II of S.P.A.W., by Douglas Baker.)

Figure XIV-4



OXYGEN ATOM With Vitality Globule

There are many pathways for the entry of prana into the etheric body and its gross physical counterpart. Which paths are used predominantly depends on the spiritual status of the individual and his control over his breathing equipment. The spleen tends to be used less in advanced groups, whereas it is still prominent as a center for uptake in the remnants of the Third Root Race and early sub-races of the Fourth Root Race. The region of the Alta Major becomes important to the integrated personality, and Man treading the Path (see section dealing with the Chakras). However, all pathways may be enhanced in efficiency through meditation, especially when the pathway forms part of the object for meditation.

PATHWAYS FOR UPTAKE OF PRANA FROM VITALITY GLOBULES

1. Through the Spleen Chakra directly.
2. From vitality globules attached to the oxygen molecule and circulated in the blood.
3. From air inhaled, especially under pressure, or retained (kumbhaka) which forces its way via the nadis mainly into three chakras of the pranic triangle which coincide with plexuses of nerves at the level of the diaphragm, the root of the lungs and in the throat. All the latter are linked to the vagus nerve.
4. Directly into Alta Major through "the winged wheel".
5. From the surfaces of the intestine, where vitality globules are released from fresh foods and taken up into the nadis and the blood supplying that area.
6. From the wall of the stomach, especially from water highly saturated with prana.

The roots of the vagus nerve arise from the medulla, the old part of the brain which contains many centers of nervous activity responsible for maintaining the body processes that lie below the level of normal awareness. Maintenance of breathing is one of these. The vagus nerve has a very close link with respiration from the very earliest age. It has been shown that the vagus nerve may even take over from the respiratory center of prematurely born children.

BREATHING TROUBLE IN PREMATURE LINKED TO VAGUS NERVE:– A Montreal newspaper quoted a Dr. A.C. Bryan as stating

that many premature babies have a primitive breathing mechanism that switches off inexplicably, perhaps causing some of the 2,000-odd crib deaths that occur annually in Canada. This report was made by a Toronto doctor to the Royal College of Physicians and Surgeons. Dr. Bryan, coordinator of respiratory research at the Hospital for Sick Children, discovered from studies that premature infants are likely to rely on a primitive breathing mechanism controlled by the vagus nerve in the chest and by the brain. These primitive reflexes sometimes fail to regulate breathing, and a child will die if not jostled or disturbed to start the breathing process again, Dr. Bryan said. He and his wife, Dr. Heather Bryan, have been studying the phenomenon for almost three years, and have seen the condition of primitive breathing persist for almost four months in some infants before the human's sophisticated, voluntary-control method of breathing develops in them. The situation might be particularly dangerous when a two or three-month-old infant changes over to the adult breathing technique. It is possible the transition is a period when the child is prone to breathing failure. The difference between vagal breathing and human breathing control is not obvious in an infant, making the condition particularly dangerous for premature babies who come home from hospital, Dr. Bryan said.

Premature babies in hospitals are watched continuously, and some have to be prodded or tweaked every few minutes because their breathing fails. Dr. Bryan said it had not been previously known that the infants stopped breathing because of a failure of the vagus nerve, or even that their method of breathing is based on another system. Of about 100 premature babies studied at the Hospital for Sick Children, more than half relied on vagal control of respiration. Some had to be hooked up to mechanical respirators. By comparison, full-term babies appear to rely on the vagus nerve to control breathing only for about 24 hours, then make the transition to normal breathing. Working with pathologists, the team headed by Dr. Bryan made the discovery of vagus nerve and brain control while studying the development of the lung and respiratory functions in infants. He said the research showed it is possible to identify high-risk babies so they can receive close care at home.

Another specialist in breathing, Dr. E.J.M. Campbell of Hamilton, said recent tests have shown that some persons, usually introverted types, are lazy breathers, while more extroverted persons tend to breathe more actively. Lazy breathing creates problems for persons taking sedatives or

those ill with respiratory infections who "don't fight hard enough for their breaths," said Dr. Campbell, chairman of McMaster University's department of medicine. On the other hand, the more active breathers are prone to experience distress that is disproportionate to the external situation.

In the evolution of Man, the vagus nerve once not only controlled respiration but, at a time when Man was just materializing a physical body and was still entirely dependent on prana and oxygen for his nourishment, the vagus nerve, through its ramifications in the abdomen, controlled the uptake of energy from the "tribal placenta". In the second part of this work, under the section on the thorax and abdomen, the matter is discussed further.

The origins of the vagus nerve lie behind the narrowing sphenoid bone and the inferior meatus of the nose. The latter lies below the inferior turbinated bone. The turbinates are folds in the lateral walls of the nose. They curve in such a way that air that is inhaled takes a spiraling path as it passes along the turbinates. Thus, a cone of air strikes the posterior wall of the pharynx as it passes through each of the nostrils. The air is moving very rapidly and its electrical particles have their charges enhanced by the spiraling effects. This produces stimulation of the nerve-endings of Cranial I, those of olfaction, but when breathing patterns associated with the science of pranayama are employed, the stream of electrical excitation affects the vagal nuclei of the medulla. (See Figure XIV-6)

In this way, the vagus nerve can be vivified and brought to immense efficiency. In moments of high meditation, the rapid intake of air through the nostrils, in what is called the "Bellows Breath" of yoga, makes the vagus nerve a beacon of great inner light, bringing down solar fire into the very substance of the tissues.

In etheric terms, the cones are the horns of plenty. Each is a cornucopia bringing supplies of prana from the universal reservoirs. The vagus nerve monitors the process.

Vagus nerve endings are found in the region of the soft palate. Indeed the uvula, called by some "the small tongue", at the back of the throat has a nerve supply from the vagus. When the doctor asks the patient to say "A a a a h", he watches the uvula. If it lifts during the pronouncement

then the physician knows that the vagus nerve is not damaged. If, however, the uvula pulls to one side, then it means there is damage to one of the two vagus nerves, right or left. The occult significance of this is that the sound made constitutes the opening vowel of the sacred word, the AUM or OM. The latter directly stimulates the vagus nerve and is used frequently as a preliminary to meditation or for the seating of oneself for some high act of mental focus. In the same way, the sounding of the second vowel of the Word produces effects on the pituitary area as the sphenoid sinus resonates to the sound.

The larynx or voicebox is another organ that is supplied by the vagus nerve. This is where the magic of sound is created. The effects of sound reach to the deva beings who are the builders of form.

Through the mechanism of mantras a language of communication can be established with the devas, who respond with their healing, building, creative or destructive powers. What we see, the devas hear. What we hear, the devas see. Sounds, to the devas, are forms. There is no more powerful visual approach to the elemental kingdom than that which can be established through the correct sounding of certain words of power or mantras, and the instrument of transmission is the vagus nerve, through its laryngeal connections. The sounding of any word necessitates the contraction of the intrinsic muscles of the larynx, which are innervated by the vagus. The sacred word need not even be actually sounded. It is merely sufficient to initiate the sound, moving the muscles without passing air through the larynx. It is not even necessary to move the muscles, but merely to make the sound mentally. All these will still bring the vagus into a state of stimulation. The vagus is the psychic aerial of the body.

The nerve can act as a warning device to the sensitized disciple. The soft palate has often given the author warning of impending upper respiratory infections. It becomes irritated, even "itching" at least 36 hours before any other signs present, thus giving sufficient warning to take palliative measures before the infection can develop.

In the tenth cranial nerve's innervation of the tongue may lie the cause of an unusual phenomenon that represents a signpost on the Path of Discipleship. In moments of danger, or of inner stress, there is occasionally an electrical discharge felt under the tongue. It seems to originate from the saliva there. It merely indicates that an advanced

degree of sensitivity has been reached in the unfoldment of psychic and spiritual faculties. It is interesting to note that the foramen caecum lies just below the uvula on the surface of the tongue. It is from this region, in embryo, that the thyroid gland makes its descent into the neck. We have seen, that with the pituitary and the pineal glands, the thyroid makes up a triangle of great occult significance.

Figure XIV-5

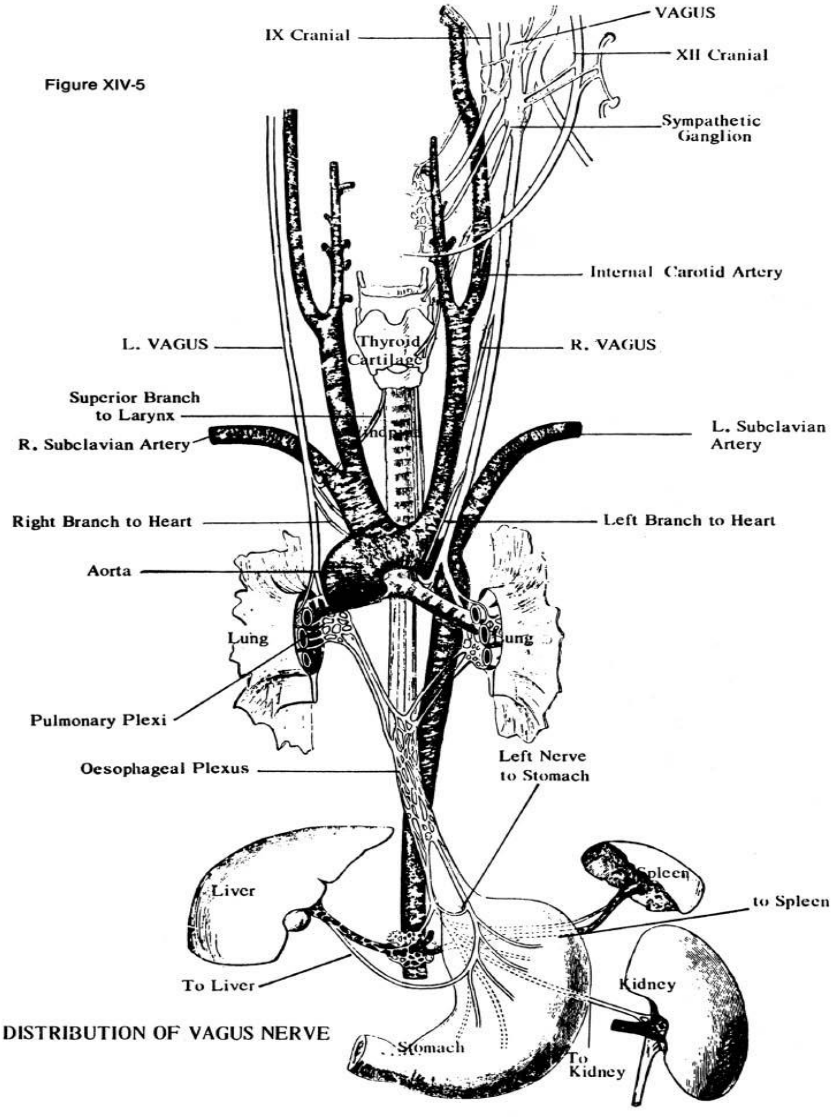
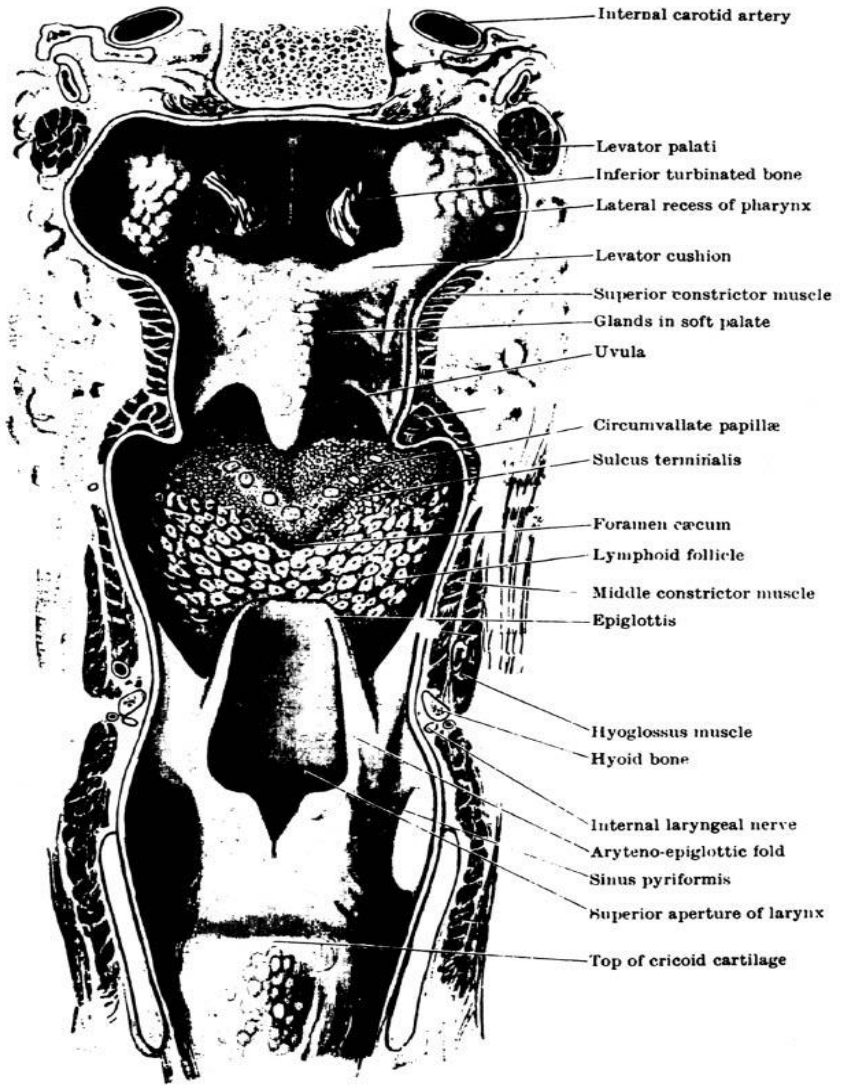


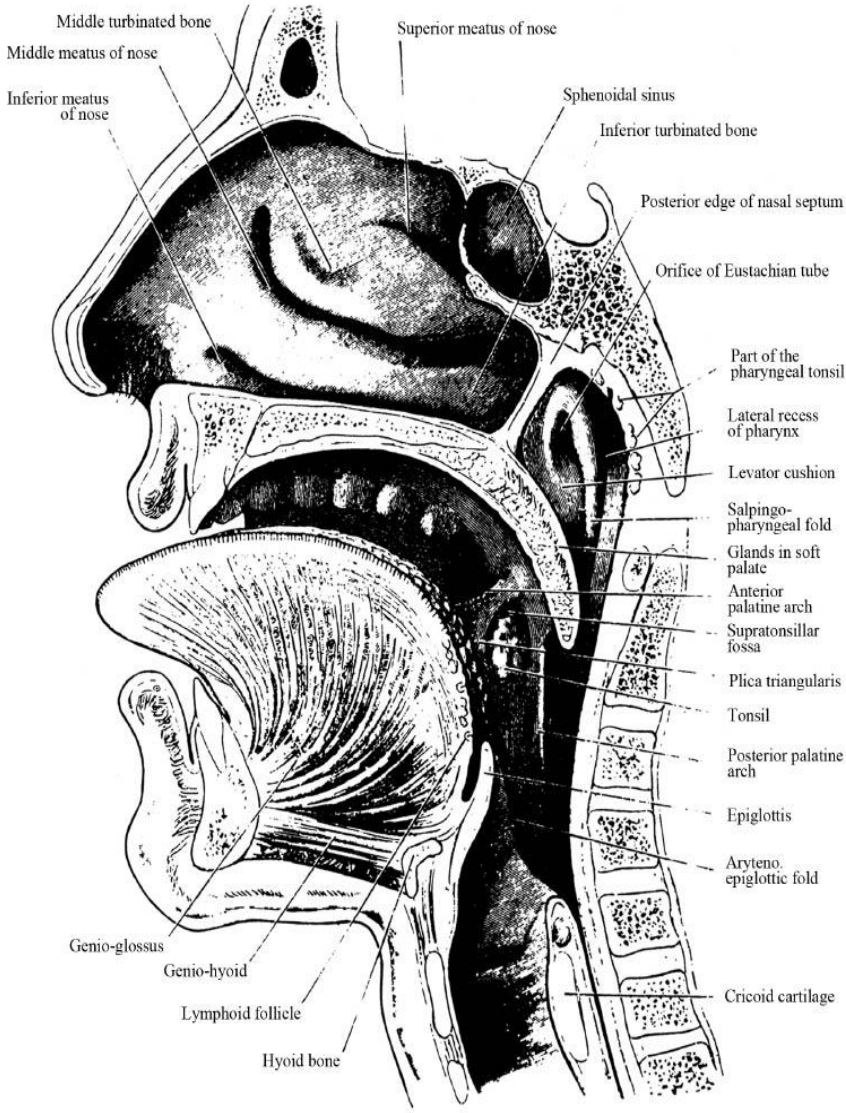
Figure XIV-6



THE PHARYNX AND ITS ORIFICES FROM BEHIND

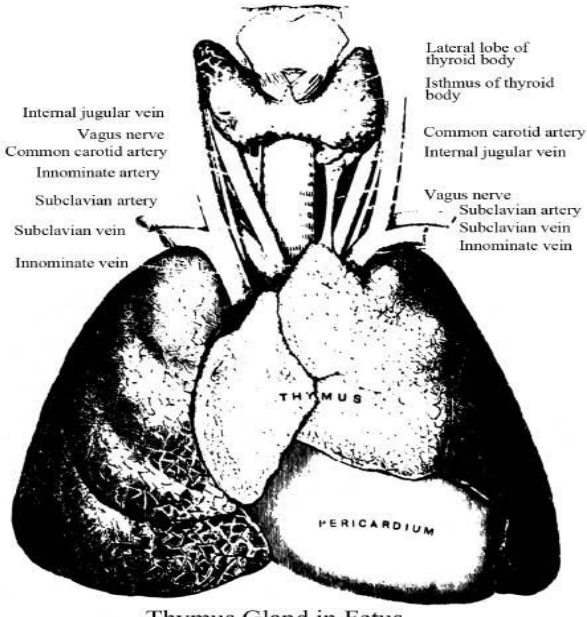
Note the opening of the nasal passages and the turbinated bones that let through the horns of plenty, the sun and moon breaths (see also Fig. 27) Note the glands of the soft palate, above the uvula, which are very sensitive to bacterial invasion of the upper respiratory system. Below the uvula is the foramen caecum.

Figure XIV-7

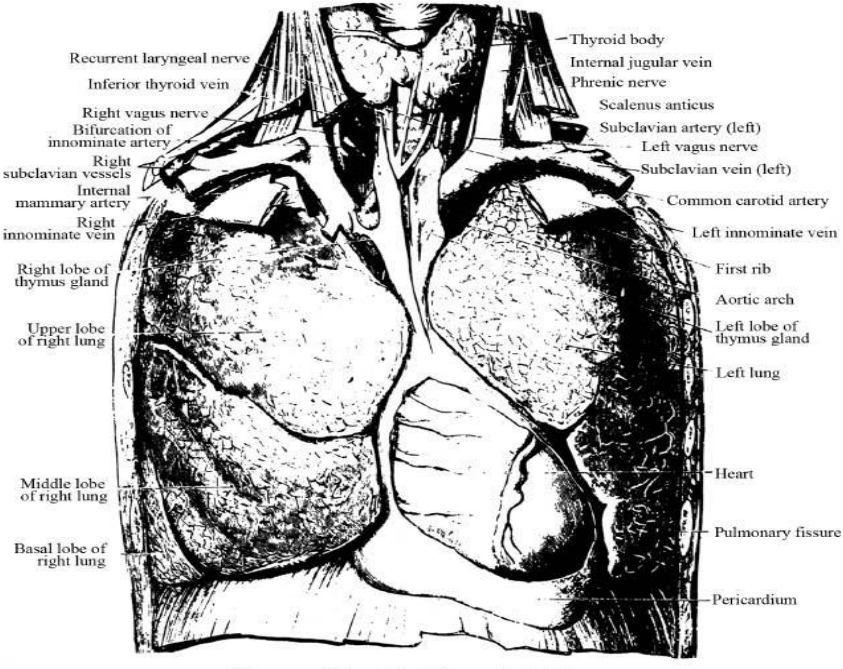


Sagital Section through Mouth, Tongue, Larynx, Pharynx, and Nasal Cavity.

Figure XIV-8

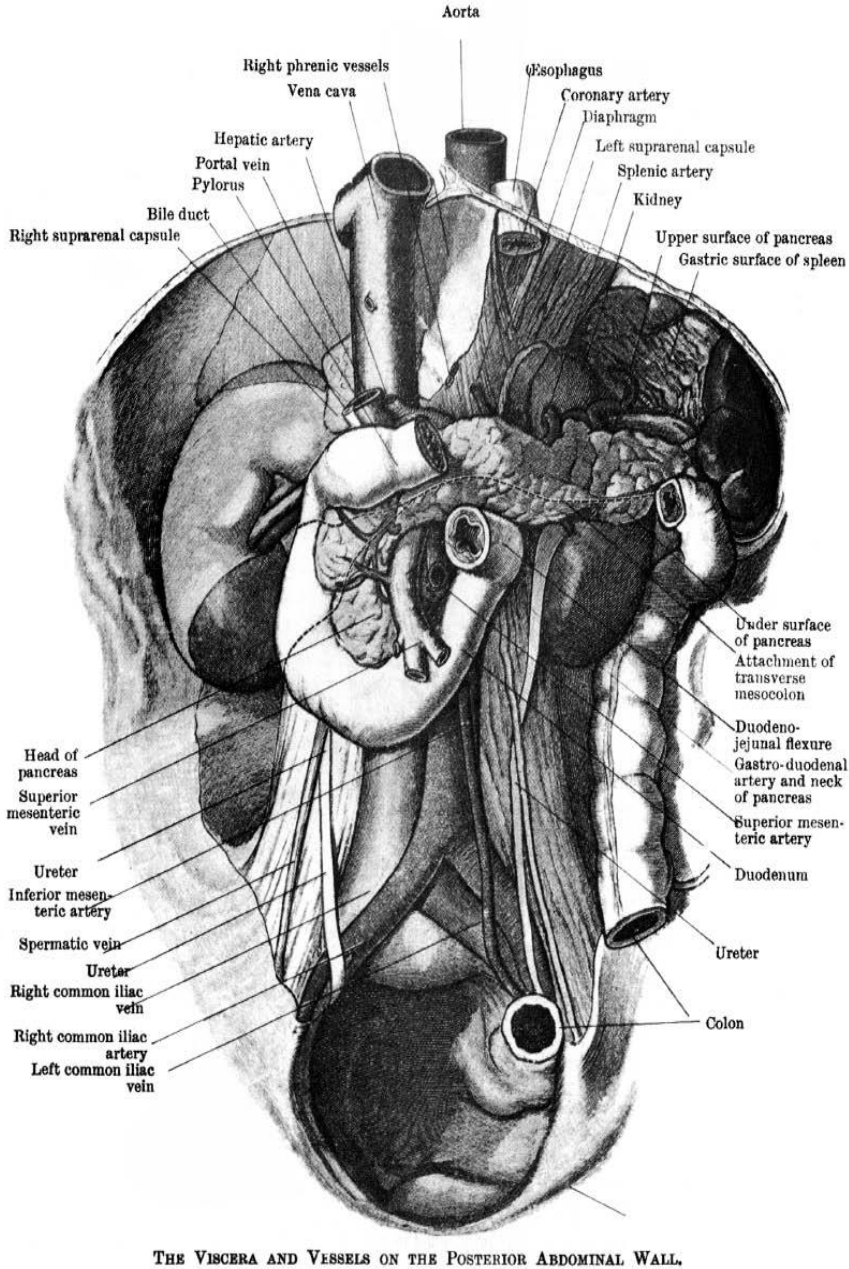


Thymus Gland in Fetus



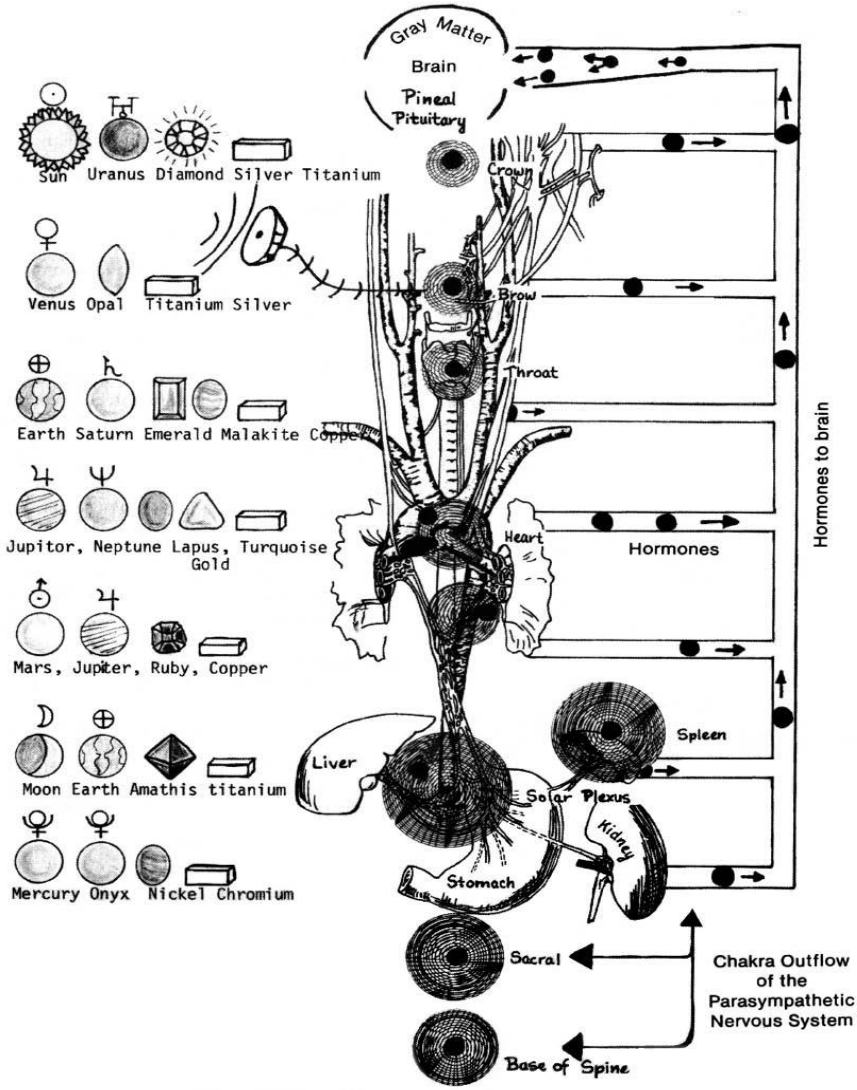
Thymus Gland in Normal Adult

Figure XIV-9



THE VISCERA AND VESSELS ON THE POSTERIOR ABDOMINAL WALL.

Figure XIV-10



THE VAGUS NERVE AND THE CHAKRAS

Whilst the nerve fibers of the vagus are both sensory and motor, at an etheric level, the nadis of both fibers are reactive to stimulation, and indeed produce many of the phenomena of extra-sensory perception. The "Voice of the Silence" or, that of the Master is heard, inwardly through the etheric effects of vagus fibers that originate in the skin

behind the pinna of the ears and from the posterior wall of the external auditory meatus.

Stretch organelles in the roots of the lungs produce vagal stimulation and through breathing processes, the whole psychic aerial can be set in motion, the heart can be slowed, sensations of inner light gained and solar fire brought down.

Though there is no evidence as yet that the thyroid gland is supplied with nerves from the vagus, time will show that this is so. Certainly the tenth nerve supplies the thymus gland and is responsible, in great measure, for its growth up until the age of two, whereafter it regresses into atrophy. We have already seen that the vagus nerve plays a part in the respiration of premature babies, and it will be discovered that its part in the growth and regression of the thymus gland is all-important.

The thymus gland, as an endocrine structure, is related to the Heart Chakra. Motor nerves to the spleen shown in red, see Figure XIV-10, bring the vagus nerve into intimate contact with the Spleen Chakra, which is the polar opposite to the cerebrum and the centers of consciousness. The spleen lies in contact with the tail of the pancreas, the latter being seen in Figure colored in yellow.

The vagus supplies nerves to the pancreas, itself the endocrine gland associated with the solar plexus and its chakra. The pancreas is also the lower magnetic pole of the axis formed between it and the hypothalamus. Great sensitivity of the vagus can produce hyperinsulinism and hypoglycemia. Associated with these conditions, voluntary forms of mediumship can ensue, whereas with the opposite effects, i.e. hyperglycemia (diabetes) unconscious mediumship is associated.

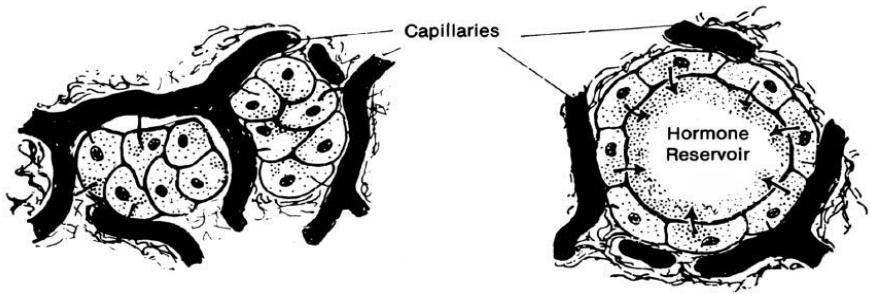
The vagus nerve supplies the mucosa of the stomach with nerves that produce the secretions of hydrochloric acid. Ingestion of sugar into the stomach can cause vagal stimulation and episodes of hyperinsulinism. These various factors involve the thorax and abdomen, which are the subject of part two of this work.

It should not be forgotten that the vagus is an integral part of the parasympathetic nervous system, and through the latter, its effects and its stimulation can be correlated to the sacral center, which is the target of attention of tantric yoga.

ENDOCRINE GLANDS

From a physical level, the walls of the endocrine glands are like muscles interpenetrated with capillaries, and are normally tense. When the signals pass through electricity, they relax and allow the trapped hormones to pass through into the bloodstream. This fact properly understood shows us how hypertension is so destructive, and meditation so important.

Figure XIV-11



HORMONE SECRETION and STORAGE

If a person is tense, the body cannot respond properly to the signals present for hormone balance. If you are relaxed, the signals easily balance the body.

The parasympathetic nervous system acts as the antenna for the endocrines. When a person raises their consciousness to a high degree of sensitivity, the parasympathetic system becomes more selective and the vagus nerve becomes the key element for the antenna. When people reach this awareness, they are called high-level sensitives.

Now let us study our endocrine glands as a system and see how they work. First ask yourself, what is reality? Where are you in conscious development? Remember that energy follows thought, and you are what you think. Good diet, good exercise, yoga – all these things only help us reach one specific goal: To always think positive and act positive in a direction that helps others develop, and also to share our feelings and experience with others who grow as we do. As the Earth turns once to the sun in 24-hour time periods, let us examine our thoughts and actions during any given 24-hour time period and average those actions for one week. Reality is what you perceive your relationship to your surroundings to be, and everyone has their own reality. As we move and work towards

service and betterment to all mankind, our experience and reality become universal. As we glide in better rhythm with our surroundings our bodies become attuned to the rhythm of balanced hormone secretions into our bloodstream, and patterns begin to form. A feeling only comes to mind after an endocrine gland-released hormone reaches our brain. Sexual feelings only follow the release of estrogen and testosterone into our bloodstream after sexual arousal of the sacral chakra by body contact, male-female magnetism etc.

PHYSICAL ENERGY is only felt when the adrenals release cortisones containing the neurohormone Ephinephrine and it reaches the heart and brain in perfect balance. Feelings must be balanced, too. Picture reality and a balance in a person's spiritual growth. Therefore the endocrines must work in pairs and trinities, and hormonal output matches in an exact manner.

Before going further, let us examine what causes an endocrine to function. Each endocrine has an antenna tuned to particular vibration peculiar to its function. When a frequency is received by the gland the iron in the blood resonates and relays the muscle cavity, which is normally tense, holding back the precious endocrine fluids. Vibrations of sound, light and color; vibrations of metal, planets and pyramids – all will stimulate an endocrine gland. For example, let us look at the solar plexus center containing the adrenal gland and the pancreas. These glands will release their hormones when the planets Mars, Jupiter or Mercury are transiting or in line with the Earth. When this happens you experience unexplained amounts of energy.

In modern medicine it is known that when cortisone, an adrenal extract, is injected into the bloodstream it fights off the effects of arthritis. But when you bypass an endocrine gland by an injection you put the gland to sleep (atrophy) and this can cause complications later on. The Japanese knew this and rather than inject cortisone they made copper bracelets to be worn on the wrist. When the blood flows by, its copper is modulated to the adrenal note and in a few seconds cortisone is secreted into the bloodstream naturally by vibration, and the arthritis is then affected and abetted. I knew this fully when I put copper over the gold pyradome and invented the first firedome. The firedome, it was found, gave physical energy to those who needed it, and because of the stimulating effect of epinephrine, those who had arthritis and wore the

firedome were relieved. It all boils down to understanding bodily functions.

The planet Uranus, or the metal silver, or the musical notes A and B, all stimulate the pineal gland, which influences creativity in the transcended person, or they stimulate the sexual hormones in the more emotional person. One is not better than the other, only a fact of evolution. Have you ever had a super rush of creative ideas or a craving for a sexual experience some evening? You can bet that during these times Uranus is transiting the earth, and in the case of the sex drive, the moon may also be full. The moon stimulates hormone production just as it creates the tides and influences the seas.

NOW before moving forward, let us regress and review briefly the story of the endocrine gland.

By definition, a gland is any cell or organ that secretes some substance. In this sense the liver, which manufactures bile, is a gland, although it plays a host of other roles as well. Basically, however, the body contains two types of glands, classified according to the way they secrete. One type is the exocrine gland, whose secretions move outward, usually by way of ducts, to some body surface, whether it be the skin itself or, for example, the lining of the digestive or respiratory tract. The second type is the endocrine gland, whose secretions move inward without the benefit of ducts, into the bloodstream.

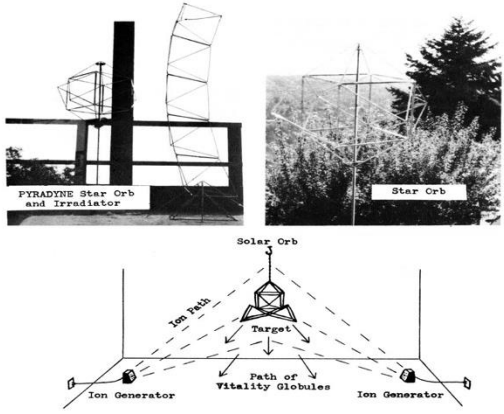


Figure XIV-12

The author has found that using a PYRADYNE Star Orb or Solar Orb in conjunction with an Ion Generator produces a full balancing effect on the body. The author prefers the Ion Generator called IONS FROM PARADISE for this configuration because the rate of vibration of this particular Ion Generator is resonant to the Solar Orb and the Human Brain Wave Frequencies, causing maximum distribution of ions in the room and assimilation of vital life

forces by the body. Remember, assimilation is the key for maximum benefit in hostile environments of poor air conditions.

Among the exocrines are the sweat and sebaceous glands, whose respective secretions of water and oil are evident on the skin; the mucous glands, whose mucus moistens the digestive and respiratory tract; the salivary glands, whose saliva softens food when it enters the mouth; and the mammary glands, which provide milk for the nursing infant . . .

The endocrines are the great chemical regulators of bodily function. It is to these glands that the layman unwittingly refers when he blames some sort of glandular mischief for his ills . . . The substances which are secreted by the endocrines, and which serve as their chemical messengers, are called hormones, from the Greek Hormon, meaning "arouse to activity". Hippocrates and his colleagues used the Greek version of the word to describe a "vital principal", which they believed was contained in certain body secretions and generally enlivened the body. The English version of the word is a relative newcomer to the medical lexicon . . . It was coined early in this century by two British physiologists, William Bayless and Ernest Starling, who launched the fledgling science of endocrinology on its way in 1902 when they discovered and described the workings of secretin, a hormonal substance manufactured in the lining of the small intestine.

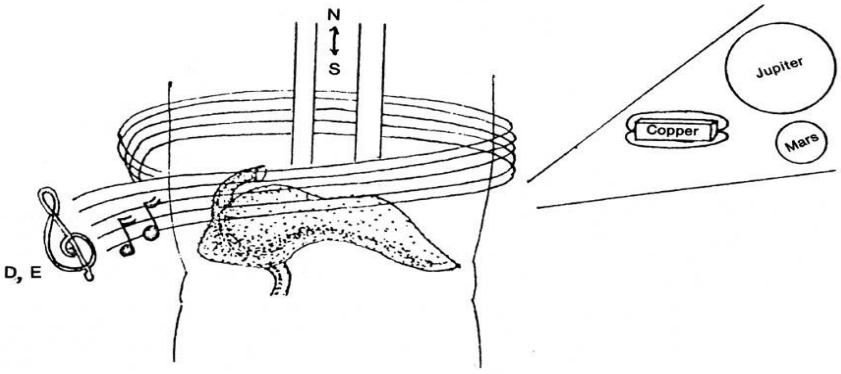
Along with the nervous system, the endocrine system serves as the major means of controlling the body's activities. The nervous system is, so to speak, built for speed; it enables the body to adjust its internal processes rapidly, as changes take place in the environment. The endocrines, on the other hand, regulate continuing processes of longer duration, including the body's growth, sexual maturation and ability to reproduce.

Only within the past century has any real understanding of the endocrine glands been achieved. Even today we are not certain how many there are. Some are well known: the pituitary at the base of the brain; the thyroid gland in the neck; the four parathyroids lying behind the thyroid; the adrenals, perched atop the kidneys like miniature peaked caps; the insulin-making Islets of Langerhans in the pancreas; the ovaries in the abdomen of the female; the testicles in the scrotum of the male. The placenta, which feeds the unborn child, also behaves like an endocrine, manufacturing special chemicals essential to successful pregnancy.

Recent studies have confirmed that the brain itself acts as an endocrine since it, too, produces hormones.

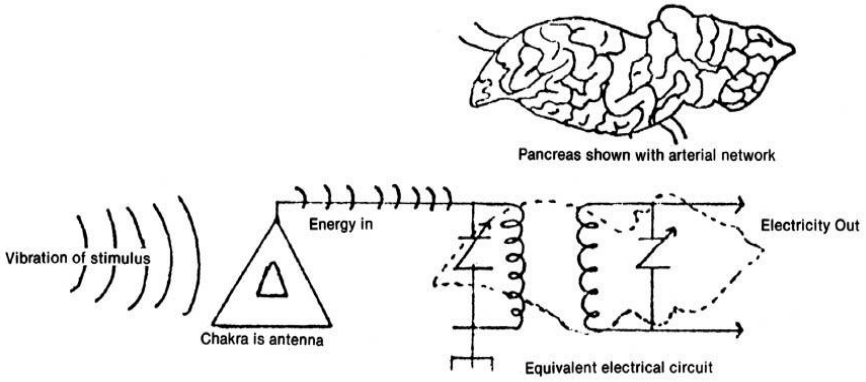
The endocrine system works on vibration. Energy comes from different sources: planets, stars, metals, sound, light and color; and when the vibration is precisely on the right octave, the gland responds.

Figure XIV-13



Take for example the pancreas. The pancreas is interpenetrated with thousands of small arteries for blood flow. If you remember that the hemoglobin in blood has iron and that iron is magnetic, then the path of iron through the pancreas would form a tiny electronic tank circuit resonant to a frequency common only to a pancreas. Each organ is individual in this way.

Figure XIV-14



Compared to such organs as the heart or the lungs, the endocrines seem ridiculously small and unimpressive. They are bits of tissue tucked away in obscure corners of the body. All of them together weigh no more than about five ounces. But in the widespread control they exercise over the body, they are little giants. The key to their extraordinary power lies in the hormones they secrete– among the most powerful and remarkable substances in the body.

All hormones regulate one or more chemical reactions in the body. But they seem to work in many different ways. One may alter cell membranes so that glucose from the blood can enter the cells more freely. Another may change the spatial relationship of enzymes, the chemical catalysts resident in the cells, in order to speed up metabolic reactions. Still others may stimulate production of other necessary chemicals within the cells. Precisely how any one hormone acts is still to be pinpointed: indeed, biochemists regard this problem as one of their major challenges. But this much has been established: hormonal activity must remain in delicate balance like salt in the stew, or the entire body will be thrown out of kilter.

The endocrine gland most familiar to the layman is the thyroid, a standard topic of bridge-table talk because of its effect on weight (which in fact is not as great as supposed). Located at the base of the neck just below the Adam's apple, this gland can be felt from the outside, and can thus be examined by the doctor more readily than any other; an enlargement or swelling of the thyroid may be apparent even by casual observation across a room. The hormone produced by the thyroid, an iodine-protein compound called thyroxine, exercises xintol over the rate at which food is converted into heat and energy in all the body's cells. Without sufficient thyroxine the individual feels constantly cold, drowsy, unable to do anything without considerable exertion. His respiration is slow, his heart rate sluggish, his appetite and sex functioning both below par; sometimes he will gain weight despite a distinctly meager diet. The opposite of this torpid syndrome of hypothyroidism is hyperthyroidism, produced by an excess of thyroxine. An individual with this condition is likely to be nervous, jittery and overactive, with a pounding heart and labored respirations, able to gorge yet lose weight, as though all the body fires were burning out of control.

Because it is relatively large and accessible, the thyroid has been known to physicians for centuries. It may have been the first endocrine gland to

be discovered. Among early notions as to its functions, one theory held that it lubricated and protected the vocal cords. Another suggested that it was designed to warm the throat, while esthetes insisted that it existed simply to beautify the neck. Not until 1859 were the real effects of the thyroid recognized; at that time a German anatomist, J. M. Schiff, discovered that animals whose thyroids were surgically removed developed symptoms of sluggishness and stupor. In 1891 a British physiologist, G. R. Murray prepared an extract of sheep's thyroid that relieved similar symptoms in human patients. Two years earlier a fellow Britisher practicing in France, Charles Brown-Sequard, had piqued the public's interest by reporting that he had successfully rejuvenated himself with extracts of animal testicular secretions. But the medical world doubted Brown-Sequard's claims, and Murray received history's accolade as the first man to cure a human endocrine disorder with a glandular extract. Today the use of such extracts to treat various malfunctions of the glands from which they originated – a procedure known as hormone replacement therapy – is common practice.

THE HARVEST OF HIDDEN ISLANDS

In sharp contrast to the easily approachable thyroid are the best hidden of all the endocrine glands: the tiny islands of insulin-producing cells scattered throughout the pancreas. Estimates of their number range from 250,000 to 2.5 million. Another German anatomist, Paul Langerhans, first noticed them in 1869, and they are called the Islets of Langerhans in his honor. Each of these minute clumps of cells acts as a diminutive endocrine; together they make up, as it were, an organ within an organ, busily manufacturing their hormones and generally disregarding the pancreatic cells all around them as though they were located in some completely different part of the body.

Langerhans did not, in fact, recognize what he was seeing when he observed these separate clusters of cells in his stained microscopic slides of pancreatic tissue. But nine years later a French physician, Etienne Lancereaux, detected a relationship between the pancreas and an age-old disease characterized by great hunger and thirst, wasting away of the body and ultimate death in coma. Because it was marked by the passage of excessive quantities of urine, this condition had been called "diabetes" by the ancients, after a Greek word meaning "siphon"; in 1670 Thomas Willis, physician to King Charles II of England, added "mellitus" (honey-sweet) to the name because of the quantity of sugar in the urine of

diabetics. By the end of the 19th century, medical scientists, following Lancereaux's lead, confirmed the fact that when the pancreas did not function properly one of the body's main fuels – the simple sugar glucose – was not utilized effectively, and instead passed out of the body in urine. But they could not ascertain the substance in the pancreas which facilitated the efficient use of glucose.

Today we know that hormones manufactured in the Islets of Langerhans – insulin and the more recently discovered glucagon – between them help regulate the amount of sugar available at any time for the cells to use for the production of heat and energy. We still do not know how insulin works. One theory is that it somehow subtly changes the cell membranes so that glucose from the bloodstream can move through them into the cells more readily. When insulin is in low supply or when its action is impeded by anti-insulin factors, diabetes mellitus develops.

In 1908 a German physician, Georg Zuelzer, prepared a crude pancreatic extract that could lower the blood-sugar levels in diabetics and make sugar disappear from their urine. This extract proved so toxic and unpredictable that its use had to be abandoned. Then, in 1921, at the University of Toronto, a Canadian surgeon, Frederick Grant Banting, teamed up with a professor of physiology J.J.R. Macleod, and with a 22-year-old medical student at the University of Toronto, Charles Herbert Best, to try to track down the pancreatic elements responsible for the presence or absence of diabetes.

THE ULTIMATE EXTRACT

In a series of classic experiments on dogs, Banting and Best tied off the ducts leading from the pancreas. In time the pancreatic cells which produce digestive enzymes shriveled and died, but the Islets of Langerhans continued to function. By extracting the secretions of the Islets, the two men isolated the hormone insulin. Ultimately, they extracted it from beef cattle in a form safe for use in the treatment of human diabetes. In 1923 Banting and Macleod were awarded the Nobel Prize for medicine for their work. Best was not so honored; perhaps because he was merely a student at the time. But today the world of medicine acknowledges that Banting and Best were equally responsible for one of the great medical breakthroughs of history. Diabetes is curable, but only under tremendous discipline.

Hormones of an equally vital if vastly different nature are produced by the adrenal glands. Each adrenal is in fact, two endocrine glands in one, and each secretes its own completely separate class of hormones. One type is manufactured in the central part of each adrenal, the adrenal medulla. Another type is manufactured in the outer shell of the gland, the adrenal cortex.

The hormones made in the adrenal medulla are epinephrine and norepinephrine. Both play a part in helping the body respond to emergency situations. Epinephrine, more popularly known as adrenalin, from the days when it was thought to be the only hormone produced by the adrenals, is a powerful stimulant, with effects throughout the body. In times of stress – when we become excited, frightened or angry – epinephrine can speed up respiration, raise the blood pressure, sharpen the reflexes and put the body on guard, or flee. Whatever the emotion involved, we experience the same chemical reaction as a result of the epinephrine poured into the bloodstream by the adrenals. Norepinephrine serves as an effective aide-de-camp to epinephrine at such times, causing an increase in the amount of blood flowing through the heart, and constricting the skin capillaries so that blood is forced out of them and shunted, by the action of the epinephrine, to the body's major organs.

CORTISONE AND COMPANY

The hormones manufactured in the adrenal cortex are comparatively recent discoveries. Like insulin, they were found in the course of the study of disease. In this instance, a rare one, Addison's disease. This condition, named after Thomas Addison, who first described it in 1855, is marked by muscular weakness, a peculiar bronzing of the skin, generalized apathy and collapse. Many victims of Addison's disease were found to have adrenal glands damaged by tuberculosis. Intensive research into the adrenals followed. In 1929 two biochemists experimented with dogs, and isolated the first known hormonal compound of the adrenal cortex. By 1938 Dr. Edward Kendall of Mayo Clinic and his co-workers had isolated no fewer than six different hormonal compounds which are made by the adrenal cortex, among them the now celebrated cortisone.

These hormones, unlike insulin or thyroxine, are not protein compounds, but substances which biochemists labeled steroids, after a

Greek word meaning "solid or firm" because they are manufactured by the adrenal cortex. They are called "adrenocorticosteroids" or "corticoids" for short. Since Kendall's pioneering, no fewer than 30 compounds, all of the same steroid family, have been discovered in the adrenal cortex.

The steroid hormones were soon shown to play a far greater role in the body than was first suspected. They help the kidneys regulate the critical balance of the salt and water content of body fluids inside and outside the cells. They also influence the body's ability to build up and break down the proteins, to form antibodies against bacteria and viruses, to repair damaged tissue, and to control inflammation. Indeed, because of their ability to suppress inflammation of joints and to reduce scarring of inflamed joint capsules, these hormones sometimes work almost miraculously to relieve pain and reduce inflammation. Corticoids also reduce inflammation in nephrosis and rheumatic fever, speed up the healing of skin wounds, and help in the treatment of gout.

A BONANZA IN BEEF CATTLE

Originally the steroids could be obtained only with great difficulty; one early researcher had to grind up a ton of the adrenal glands of beef cattle in order to secure less than a half ounce of one particular hormonal compound. But since that time a succession of steroids has been synthesized in the laboratory.

While in most cases the hormones manufactured by one endocrine gland differ considerably from those made by other endocrine glands, the adrenal cortical hormones are structurally very similar to those secreted by the sex glands – the female ovaries and the male testes. These hormones – testosterone and androsterone in the male; estrogen and progesterone in the female – are actually produced in both sexes. But the male sex hormones normally predominate in men, the female sex hormones in women.

During childhood, production of sex hormones is very low. As the male approaches sexual maturity, however, the testes secrete more and more of the male hormones. These substances effect striking growth changes with the development of the beard and muscles, the enlargement of the larynx (with a resulting deepening of the voice), the maturation of sex organs and the development of sexual urges. They are also believed to

stimulate sperm production in the testicles. In the female, the female sex hormones bring about the development of the hips and breasts, and other so-called secondary sex characteristics that mark the female of the species. In addition, they act to prepare the uterus to receive and sustain fertilized ovum. If conception does not occur when an ovum has been freed from the ovary, a soft blood tissue is cast off from the uterus; within a period of weeks, it is again prepared to receive and sustain the next ovum that is released, should it be fertilized by the sperm. In short, the cycle of menstruation experienced by all sexually mature females is a direct result of the waxing and waning of hormones on a more or less monthly schedule.

Despite the fact that hormones have widely different functions, and are produced in different parts of the body, they do not go their merry way independent of any regulation. Some higher form of control is required to determine, for example, when more thyroid hormone is needed and when production should slow down, when adrenal cortical hormones are needed and when not. The gland which fulfills this master role is the pituitary, one of the tiniest endocrines of all. It controls the hormonal output not only of the thyroid gland and adrenal cortex, but also of the sex glands.

The pituitary hangs from the bottom of the brain by a little stalk just above the nasal passage. Vesalius, who named it, mistakenly believed that it discharged mucus into the nose, and therefore he derived the name from the Latin word for "nasal secretion." The pituitary is insignificant in appearance – about the size of an acorn – but it packs an extremely powerful punch. Like the adrenals, the pituitary is actually two glands in one – posterior and anterior. Of the two, the posterior pituitary manufactures no hormones of its own, but stores and secretes two that are initially produced in a part of the brain called the hypothalamus. These hormones are oxytocin, believed to stimulate labor at the end of pregnancy, and vasopressin, which helps the body retain its fluids. The anterior part of the pituitary, however, is what gives this potent endocrine gland its major claim to sovereignty. One hormone secreted in the anterior pituitary controls the over-all growth of the body. Five more have the task of spurring hormone production in other endocrine glands.

THE QUIRKS OF GROWTH

The growth hormone, sometimes called somatoreopin, regulates the growth of bone muscle and other tissues from top to toe. In some individuals, fortunately only a few, underproduction or overproduction of somatotropin occurs during childhood. Either extreme causes growth abnormalities. Underproduction results in dwarfism; the pituitary dwarf almost never attains adult proportions or sexual maturity, although his I.Q. is normal. Overproduction results in gigantism; one of the most famous victims of this condition was Robert Wadlow of Alton, Illinois, who died in 1940. Wadlow towered 8 feet 11 inches high, weighed 495 pounds and had feet almost 20 inches long.

Most of us, happily, need have little concern with somatotropin, since its aberrations are the exception. Of considerably greater urgency for the average person are the anterior pituitary hormones which regulate other endocrines. One of these, the thyroid-stimulating hormone, TSH, signals the thyroid to manufacture thyroxine when the level gets too low. The adrenocorticotrophic hormone, ACTH, stimulates production of the steroid hormones by the adrenal cortex. Three other anterior pituitary hormones are vital to sex functioning. The follicle-stimulating hormone, FSH, stimulates the testes to produce sperm and the ovaries to secrete estrogen. The luteinizing hormone, LH, spurs hormone production in the sex glands of both men and women. Production of the female sex hormone progesterone, in particular, is abetted by the lactogenic hormone, LTH, which also stimulates the mammary glands to produce milk.

Endocrine control works both ways. Just as a thermostat, which fires a furnace into activity when the room temperature drops, is itself turned off when the temperature rises high enough, the production of each of the stimulating hormones in the pituitary is suppressed by the presence in the blood of the hormone which it stimulated. Thus, as the level of thyroxine drops, TSH is poured out to goad the thyroid cells into activity; but as soon as production has been speeded up, the very presence of thyroid hormone in quantity in the bloodstream blocks the pituitary's release of more TSH until thyroid activity slows down again. The result of this cycle is the maintenance of a remarkably steady balance of thyroid hormone in the bloodstream at all times. Such a feedback system serves to regulate levels of adrenal hormones and sex hormones in much the same way.

Certain of the cells of the body – the male sperm and the female ovum, or egg – are the seeds from which new and unique individual members of the species can grow.

For the first 24 hours after the egg is fertilized by the sperm it seems simply to rest, as if gathering strength for the difficult job ahead. Then it begins to divide rapidly into new cells. For several days the new cells appear precisely the same as the old, forming a round blob of tissue shaped like a hollow ball – the embryo. But then a few of the cells begin to vary from the others. The embryo dents in upon itself to form a tiny cuplike structure; the cup stretches out to become an elongated pouch. The cells lining the inside of the pouch begin to look taller and thinner than those on the outside. By the 12th day after conception, two distinct layers of cells – the inner and the outer – have formed. Next, a third layer of cells begins to appear between these two. By the middle of the third week the original ovum has produced three quite separate layers of so-called precursor cells – the ectoderm or outer layer; the endoderm or inner layer; and the mesoderm, or middle layer. Soon these begin to form the organs of a rudimentary human body.

By transplanting cells from one point to another on the embryos of chicks, experimenters have tried to pinpoint the moment when – and the reason why – the early cells from the fertilized ovum begin to vary and form percursor tissue. All they have learned to date is that up to a point the transplanted chick cells seem to melt back into the undifferentiated embryo, while beyond this point they proceed to form into the same precursor cells they would have formed into had they not been transplanted.

Soon after they appear, the precursor cells, too, differentiate. The endoderm elongates to become a primitive gut which then forms pockets, or buds, that develop into tiny air tubes: lung, liver and digestive organs. The ectoderm forms a crease along the back of the embryo which later differentiates into the nervous tissue of the spinal cord and brain; other parts of the ectoderm form the skin, hair, nails and sensory organs. From the mesoderm, bone and muscle and connective tissue begin to emerge; so do the kidneys and the blood vessels.

AUGURIES OF A MASTERWORK

By the end of three months the fetus – while still no more than three inches in length – has developed virtually every detail of its basic structure. The remaining six months are devoted almost solely to the growth and refinement of this new body. Fingerprints appear; lung tissue is perfected for later use in breathing; muscles grow and are exercised (which accounts for the lusty kicking which the pregnant woman frequently feels). When the baby is finally born we see a completely finished, loudly squalling human being with each of its many parts working perfectly, all arisen from a single living cell which has proliferated almost beyond belief.

The marvelous mechanism for reproducing the species assures us that these bodies of ours, with their complex structure and function, serve a continuing purpose. But is also presents us with an inescapable fact: it is nature, not man, that has devised this most amazing, delicate, powerful organism ever to appear on earth. Everything we have learned about the body has been learned with nature's sufferance. The most brilliant and imaginative researcher knows – or soon learns – that nature must be with him and not against him if his work is ultimately to succeed.

Above all, those who study the human body feel more and more wonder at this remarkable organism and its capabilities the more they learn about it. No man-made devices are ever likely to rival it either in complexity or efficiency. Recently Dr. Charles Bradford, a distinguished Boston orthopedist, summed up the feelings that must regularly inspire those entrusted with the body's care: "The doctor observes the anatomical perfection of the hand, and the stabilizing microphones of the ear, and the television screens of the retina, and the multiple batteries of electronic computers in the brain, and from all these he gains a new reverence for the incomprehensible power that created man, so anxiously and so wonderfully wrought."

CHAPTER XV – THE PERSONALITY AS A SYSTEM OF INDIVIDUAL FEELINGS

Now, from the previous chapters we have seen that the pyramid provides Vitality Globules just as they come from the sun, and that these globules connect themselves to oxygen, and that the combination is called Prana. We have seen that prana is abundant in negative-ion environments and scarce in positive-ion environments. We have further noted that attitude is determined by the polarity of the brain when the oxygen discharges into the brain synapses, attracting energy of the opposite potential from outside the body, and the mutual discharge of internal and external energies produces the feeling we call consciousness. Negative ions make us feel positive and positive ions make us feel negative. This is attitude, not personality. We can have a personality and view it as negative or positive, depending once again on attitude.

Now, let us talk about feelings and personality as they apply to form (our body), the proving ground of the soul.

Notice in Figure XV-2, the chakras, the endocrines and the endocrine flow to the brain. Any stimulus on any chakra will release hormones and produce a feeling. If it is the adrenals, it is energy. If it is the gonads, it is sexual sensations. Now remember our discussion on reality, and remember that energy follows thought. If you are constantly, in a 24-hour period, thinking about sex, then you will always be channeling your energies to have a sexual experience. This constant dwelling on sense gratification is not normal with the patterns of man and will gradually isolate you from that gratification until you learn to balance that feeling with others I will mention shortly. A person constantly dwelling in the sacral area is very emotional, highly excitable and usually not very rational. These people will react, not cope with, real encounters 12 different ways until the pain of the experience teaches them another way. This is where the science of Astrology gains its acclaim, because an emotional being is constantly down, and very subject to the hormone flow produced by the planets. The universe literally masters them.

Finally, when time passes, along with many experiences, each similar to the last in outcome, an emotional person at last realizes the spiral is better than the circle and begins to let off and kick back and think before acting. Now the sexual act is enjoyed even more than before, but the frequency

will probably be less. I think I can speak from experience as many years ago in my bachelor days, I recall three days in bed with a pretty lady, and this cycle repeating with someone new every month. After a while, the faces all looked the same and a feeling of emptiness came, which in time grew stronger than the sexual satisfaction and lasted longer than the memory of each girl I saw. The experience was necessary, though, to progress to higher consciousness.

As man moves out of the lower chakras into the higher, he comes to the solar plexus center. Now, instead of being emotional, he is compassionate. He places others before himself and forgives others for their mistakes as he was forgiven by others still for his own. This is the feeling of brotherhood and the true place for the beginning of the feeling of peace within. The diaphragm part of the solar plexus center has grey matter on it just like the brain.

The next time you feel uptight, or an argument coming on, STOP – I repeat, STOP – and take three deep breaths and release the air slowly after each breath. Then argue. This is the Holy Breath technique, and was taught to me years ago. The arguments it kept me out of made me a wise middle-aged man.

Now, our emotional, compassionate man moves on, and after a while, from his peaceful perch of compassion, he begins to want to share peace with others. He becomes a healer and asset to the universe and consciousness moves up again into the heart chakra. The heart is the seat of the soul, and herein lies the key to immortality, the beginning of life more abundant. Immortality is not human placenta shots; immortality is not rationalizing God in a high-level conversation with some intellectual giant. Immortality is a feeling locked up deep inside us all. It is one secret a man cannot discover alone. One pilgrim seeking the light shall find only darkness, two or more shall find the light, and when two or more gather in My name, I am present always.

If immortality is dormant in all of us, who holds the true key to that feeling? If you cannot answer readily, it is someone often overlooked. Someone small in size. Someone who is ignorant to the facts of aging and stress until you teach them to live the life of illusion. Give up? If you guessed right away, you need not read another word in this book, for you have found the hidden way. Children.

After time is spent in the heart with the action of love, we move again. Now to the throat chakra energy. So far, we have learned emotion, compassion, love and now energy. The throat is the doorway between the Hi-Self and Low-Self, between the soul and the personality. It is used by people like Uri Geller and Dr. Lawrence Kennedy for mind-over-matter demonstrations. People like Vernon Craig (the Great Komar) use it for fire-walking, and I use it myself when I hold hot coals in my hands without receiving burns. Simply speaking, the throat center is a doorway to the head centers containing the pineal and pituitary glands.

When you reach the head center, the feeling there is wisdom. You see the action of God in every movement of every person, every breeze blowing on a blade of grass, every bird that flies by and every deer that crosses your path. This is the place of self mastery – the ones who see themselves only as the center of the universe, the ones whom planets do not influence – yet they are in constant service to others who have not yet reached the mountaintop or the apex of the pyramid. The words I use to best describe a being who has attained the lofty God Consciousness is he that humbles himself to become exalted – but the exalted shall always be humbled.

To evolve to a space where I could write a book such as this, I had a lot of help from others, and the pyramids definitely were of a great service. I continue to breathe smog, and often I am in a place where the food and water are of poor quality. I find as others do, that the best thing to do is to take one day at a time, and wear the pyramid as much as possible, wearing the right pyramid for the right occasion. Now, I will give a brief description of what the occasions are.

The Raydome and Powerdome are best worn in the morning, especially for the combined stimulation of the head and solar plexus centers. A good idea is to use them to project what you want to accomplish and hold that projection throughout the day. Do not try to force the universe to comply to your wishes, only find yourself a direction to pursue. At the end of the day, use the Pyradome to sort out and analyze what really happened in contrast to what you wanted to happen. In time, you will be able to predict accurately what the day will be about, but this attunement takes time.

The Firedome is a good detoxifier and physical energizer and I usually wear it on weekends to energize the adrenals but not the head center.

The reason for this is that I wash the car, clean the house thousands of times over the period of years and these jobs are so routine that I let my mind sleep while my body works. Maybe in the evening, like on a Saturday night, I will wear a mental stimulator because I may find myself at a gathering of friends and intense discussions.

On smoggy days, I know that smog increases the seratonin production, and seratonin is a downer, and that monamine oxidase, an enzyme in the body will counteract the seratonin when I wear the Raydome or Powerdome, so it becomes obvious which is preferable.

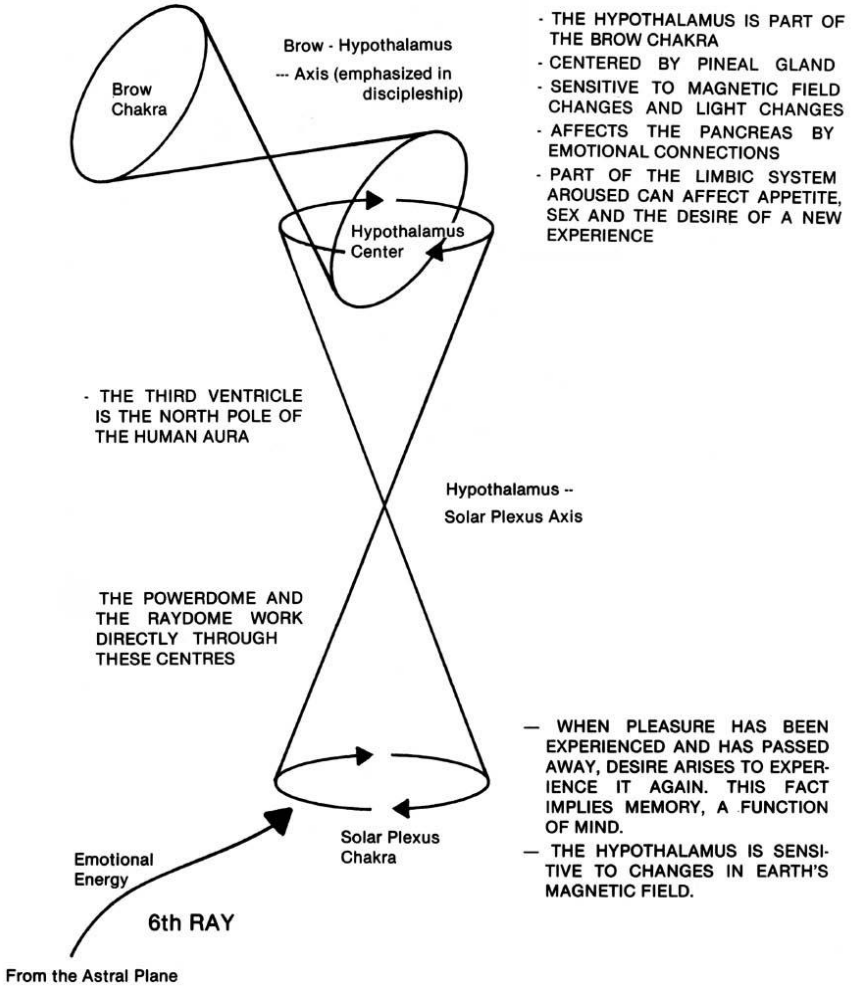
Now, let us look at appetite control, but first let us examine again the brain and nervous system.

The center of the brain is called the thalamus. The cavity around the thalamus which includes the pineal and pituitary glands is called the third ventricle. This area is the highest seat or center of consciousness of the entire body, and is also the site of the "North Pole" of our Aura. The south pole is located at the base of the spine. Because as aforementioned, magnetism is always found at right angles to the passage of electricity, it stands to reason that with all the wires (axons) conducting electricity in our bodies, we will possess a large amount of magnetism. The sum total of the addition of this magnetism, called mutual induction, constitutes a body or shape that is polarized, having a north and south pole respectively. The same is true of our Earth, with billions of people, each with a magnetic body, once again by mutual induction forming a North pole located in the Arctic region, the Earth's third ventricle, and the South pole located in the Antarctic region. So you can see by simple reflective meditation the micro (man) and the macro (Earth) relationship of the anatomy of man and his environment.

The small area at the base of the brain is called the cerebellum. It maintains balance and posture in our imaginations. Below this, connection into the top of the spine is the medulla. The mcontrols involuntary activities such as respiration, and connects directly into the autonomic nervous system briefly described. The top of the brain is called the cerebral cortex. This part is the highest echelon, giving us our awareness of sight and sound as well as delicate sensations of weight, texture and form. It also makes possible the experiencing of emotions such as fear and anger, and enables us to feel pleasure or pain. Here also is the appetite center upon which we will expound further.

Having viewed our body and mind from a component point of view, let us examine how these parts function together to produce our feelings.

Figure XV-1



THE EMOTIONAL AXIS

First of all we have seen seven major seats of consciousness in our forms. As time passes, I will expound on each and every level. At present, let us examine the Hypothalamus. The top of this center is located in the

organs around the third ventricle, and the bottom is located in the area around the pancreas. One of the functions of the hypothalamus is appetite control. We are too often aware of how unpleasant sensations or emotional upsets can trigger flushing, sweating, nausea and urinary frequency. These result from the stimulation of the hypothalamus and the passage of impulses down the sympathetic system leading to the physical signs just mentioned. As we become aware more of ourselves, there should be emotional stability, producing a cyclic and rhythmical rotation of the axis between the head and pancreas which integrates and coordinates the flow of energy from the Astral plane with somatic (physical) and autonomic (automatic) activities enabling the body to maintain stable internal conditions (homeostasis) despite changes in the outer and inner (spiritual) environments.

The hypothalamus is part of the diencephalon (thalamus) of the forebrain and contains a number of nerve nuclei (neurons and dendrites), which control the visceral (internal organs) activities of many organs, such as the metabolism of sugar and fat, water balance, heat regulation and secretion of the endocrine glands. It is the center for integrating the sympathetic and parasympathetic activities. The hypothalamus is often called the emotional mind, and you can see we need to properly understand this vital center in order to maintain a balanced attitude. When this center is out of balance, we become frustrated, and when we are frustrated we have a tendency to go to the kitchen and begin eating. To eat out of frustration only compounds the problem, and excess weight soon follows.

Let us see what we can do to bring our emotions under control.

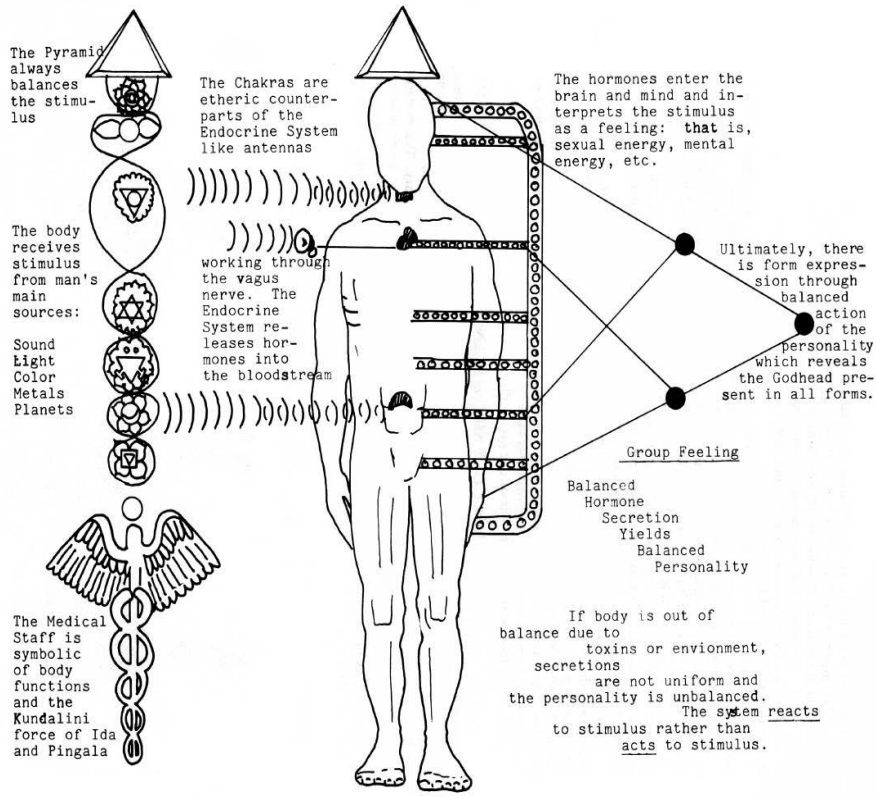
As energy follows thought, and thought directed over a period of time brings about action, this will hold true to correct body function. With the Powerdome and Raydome worn on the head, the hypothalamus is automatically receiving the balanced energy effect which begins to center our whole nature. The pineal and pituitary glands begin to secrete their hormones in perfect balance, and subsequently the pancreas begins to become centered also. This causes a good feeling which curbs another factor which leads us into frustration: desire. Excessive expression of a gluttonous desire for carbohydrates, cream cakes and candy in a child leads to Frohlichs Syndrome, a condition that leads to loose fat deposits (adiposity) and astrophy (deteriorization of sexual organs). This, as you can well imagine, can compound frustration many times.

As in the higher nature Will is the impelling power, so in the lower nature desire is the impelling power. Will power is the creative motivating force that drives us into experiences which lead us to maturity. Desire is will dis-crowned, the captive, the slave of matter. It is no longer self-determined, but it is taking us away from our goals into some glamorous sidetrack. When Will is feeble our whole nature is feeble in its reaction to the world. The effective force, that which we have accomplished, is measured by will power – job completed; or desire power – job started but not finished because of diversion. You pick the one that feels the best. One is not better than the other, only a fact of evolution. There is truth underlying the popular phrase, "The greater the sinner the greater the Saint". The mediocre person can be neither greatly good nor greatly bad; there is not enough of him for more than petty virtues or petty vices. The strength of the desire nature in us is the measure of our capacity for progress, the measure of motor energy whereby we press onwards into accomplishment.

In terms of our physical body, activation of the corticothalamic tracts (brain cortex, pancreas and connecting nerves) and maintenance of their dominance over the hypothalamus leads to the transmutation of all desire into will. This means our body functions through meditation and directing our consciousness from our highest centers. Let us explore the relationship between desire and emotion.

When a pleasure has been experienced and has passed away, desire arises to experience it again. This fact implies memory, which is a function of mind. If the sensation was unpleasant, we are forced to think about the comparison, and this is the birthplace of reason. If we have an exceptionally good experience, the mind plans, schemes, drives the body into action in order to satisfy the cravings of desire, and similarly, in an unpleasant experience, strives to avoid reoccurrence. Such is the relation of desire to thought. The mind in its early stages is the slave of desire, but as maturity makes us aware, the desire is curbed and we thus are forced to think before we react.

Figure XV-2



Emotion is not a simple or primary state of consciousness, but a compound made up by the interaction of two aspects of self: Desire and intellect. The play of intellect on desire gives birth to emotion; it is the child of both, and shows some of the characteristics of its father, intellect, as well as its mother, desire. Virtues are simply permanent moods of right emotion.

So you can see that as we recognize our weaknesses, so they can be corrected, and this path of recognition takes us out of frustration.

Emotional stability is a very important factor as consciousness rises into the higher centers. The key to this is a perfectly functioning pineal gland with a large amount of seratonin reduction.

In the Aerospace field, two space capsules are launched at different times to reach or rendezvous at a mutual point at the same time, maybe two

or three days after launching. Each ship will travel over 25,000mph, getting into space, rotate a dozen times around the Earth and finally meet each other in deep space as gently as a feather. What is their secret? Why don't they crash into each other like we do at 50mph on the freeways? The secret is that both are electronically connected to a cesium beam atomic clock located somewhere on the earth, and the clock is transmitted by telemetry to each ship like the heart signals the pulse in our bodies.

This is precisely the way the pineal gland works in respect of the rest of our endocrine system. It is the master clock that dictates to the pituitary, and the pituitary is the master switch whose tropic hormones travel to the rest of the body, giving directions. And once again, smog and dirty air are constantly putting dirt and grime into our delicate clock. Is it any wonder people are so emotionally disturbed today? Without proper warning, they have no chance to stabilize or balance themselves. This is one of the main reasons I had to write this book.

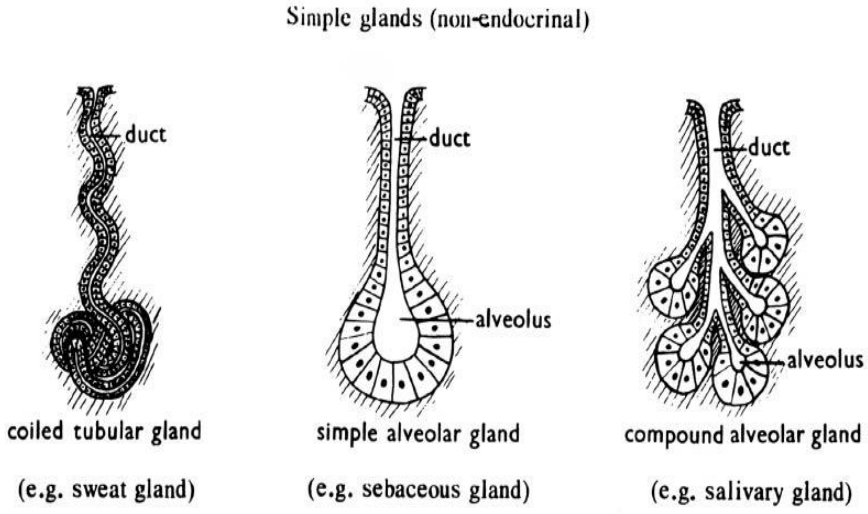
Now, let us look at the mystical side of our personality.

THE OCCULT SIGNIFICANCE OF PITUITARY ACTION

From our study of the development of the pituitary we saw that the anterior lobe of the pituitary derived from the roof of the mouth and would probably have a very different function from that of the posterior lobe, which derived directly from the nerve tissue of the diencephalon of the brain.

There are at least six hormones known to be produced by the anterior pituitary. The esoteric sciences forecast the discovery of many more hormones, and of factors elaborated there which produce actions similar to hormones. One not yet discovered is the hormone that, in the face of a diet low in protein, stimulates the uptake of nitrogen by the endothelial cells of the walls of certain arteries, especially those in the thorax.

Figure XV-3



This should be the place to emphasize again that endocrine glands, like the pituitary, have one essential difference from other glands. Whereas the latter pour their secretions out through ducts into body cavities, e.g.: -

gall bladder – – – – bile duct – – – – duodenum

HORMONE SECRETION AND STORAGE

An endocrine gland secretes its hormones directly into the blood which, therefore, must always be in intimate contact with the endocrine cells – a fact of occult importance.

A hormone is a secretion from an endocrine gland which acts on a distant organ to alter its growth or functions.

From the way in which endocrine cells clump together and sometimes form distinct follicles, we can understand how they arise from the energy emissions of tiny chakras which, in turn, are a part of a larger force-center.

ENDOCRINE CONTROL

Stimulation of the endocrine glands is not well understood from an orthodox point of view. Figure shows that the secretion of Follicle

Stimulating Hormone (FSH) by the pituitary stimulates testes or ovaries so that the former will secrete more testosterone, the masculine hormone, into the blood and, in the case of the female, estrogen. In the case of the thyroid, the pituitary hormone that stimulates it to produce its own hormone, thyroxin, is TSH (Thyroid Stimulating Hormone). If there is a high level of thyroxin in the blood this will inhibit the secretion of TSH by the pituitary. This is called "feedback inhibition" and operates in most endocrine glands.

The contribution of the esoteric sciences to this matter is as follows: Although the presence of nerve fibers in the endocrine glands has rarely been demonstrated, it is asserted by esoteric teachers that the parasympathetic system reaches the endocrine glands, especially the vagus nerve. It is also maintained that the chakras play an important part in the stimulation and inhibition of endocrine glands related to them. The Ancient Wisdom teaches that, in spiritual individuals especially, the inner environment plays a vastly important part in the regulation of endocrine glands because the etheric chakras that underlie them are themselves susceptible to inner experiences, and particularly those induced through acts of Will (the Brow Chakra, see Figure XV-1), and through practices like meditation (the Head Ceners, Figure XIV-10 and Heart Center, Figure XV-4) and service on behalf of mankind (Throat and Alta Major Centers, Figure XV-4).

The growth of spirituality brings into play a planetary energy, which, until that time has been concealed in the Muladhara Chakra (see Figure XV-4). Thereafter, increasing passage of the energy, called kundalini, up the spine, opens chakras above the diaphragm and brings extensions of consciousness with it.

There are as many correlations between endocrine glands and chakras as there are schools of Yoga, but the author, from 15 years of experience in the subject, recommends the following:–

Muladhara – Suprarenal Cortex Svadhishthana – Gonads Manipura – Pancreas Anahata – Thymus Vishuddha – Thyroid Ajna – Pituitary Sahasrara – Pineal

The human spine in higher consciousness is like a linear accelerator. A linear accelerator is a long tube with a vacuum in the center of the tube.

At one end of the tube is a particle source. At the other end is a target. Along the perimeter of the tube are a series of Klystron oscillators.

Figure XV-4

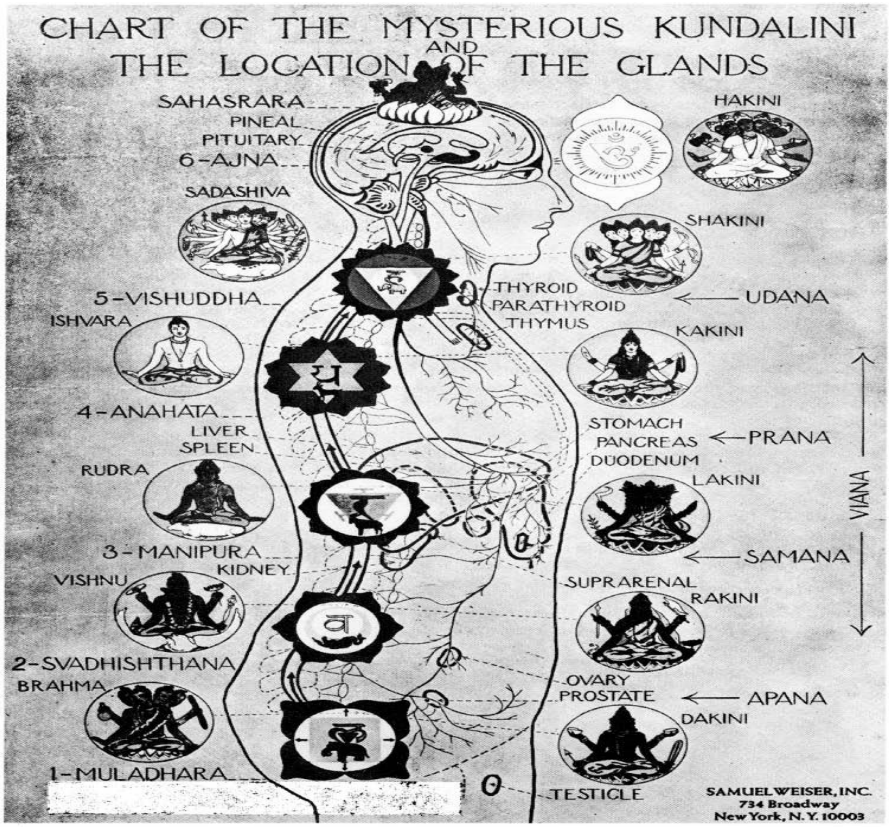
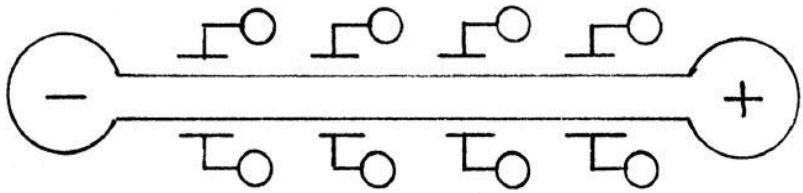


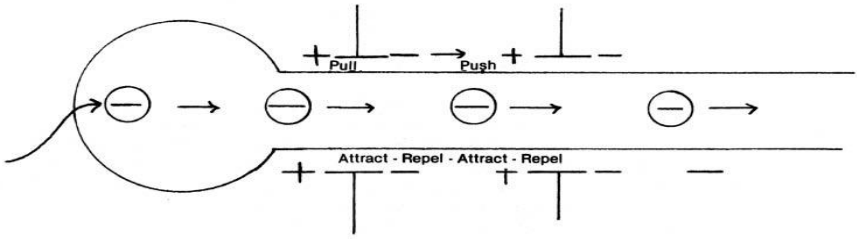
Figure XV-5



Particles are injected into the source and given a negative charge. First, the Klystron oscillator goes positive and the particle is attracted to it. But just as the particle reaches the first plate, the Klystron switches the plate

negative and repels it onto the second plate which is more positive than the first plate.

Figure XV-6

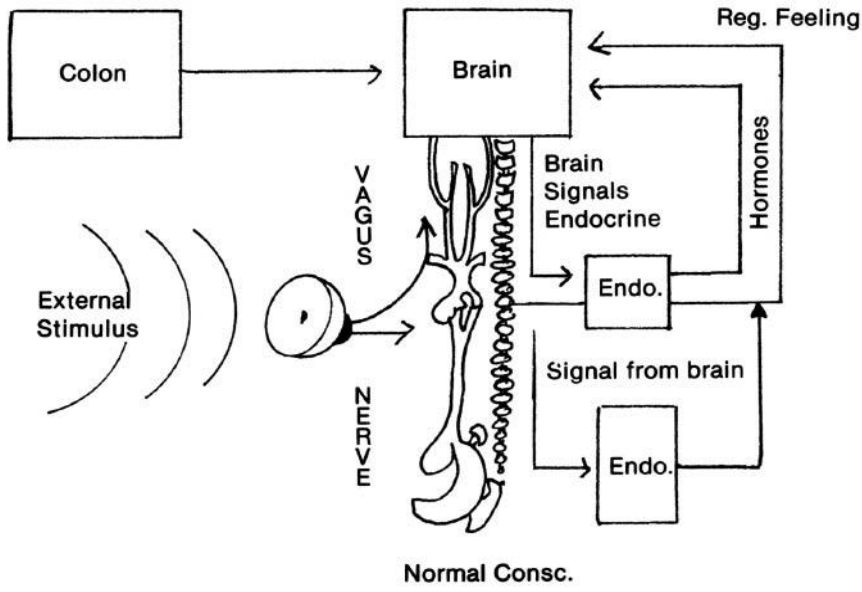


This push-pull action accelerates it to the opposite end and it crashes into a target which creates new matter (isotopes) and energy. In the spine, each vertebra is a plate, and the nervous network is the wiring, and the endocrine system is the Klystron oscillator, and the brain is the target.

When a person takes the Kundalini energies (thought-controlled electrons which ionize chemical reactions) and directs it up the spine, his body releases a great force. The target is the Head centers and the particle that is bombarded is the particular hormone that the individual has directed into his or her bloodstream and brain and held there by concentration. When the Kundalini energy enters the brain, the hormone is bombarded with energy, and great thoughts and feelings are exploded in the person's consciousness. Thus the Kundalini is a great expander of energies and the individual should learn mental before it is practical.

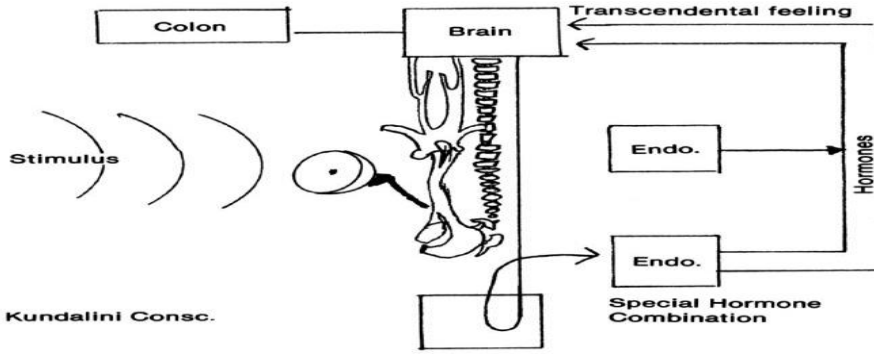
In normal consciousness, the colon picks up minerals and deposits them in the brain. The brain sends signals through the spine downward to various branches of the endocrine system after metabolizing the minerals left by the bloodstream in mitochondrion of each brain cell. The endocrine in turn balances the brain signals from the autonomic nervous system with the signal coming from the outside of the body via the vagus nerve and related chakras, and the combined signals stimulate hormones into the bloodstream. These re-enter the brain, produce a feeling and action, and the personality is thus formed.

Figure XV-7



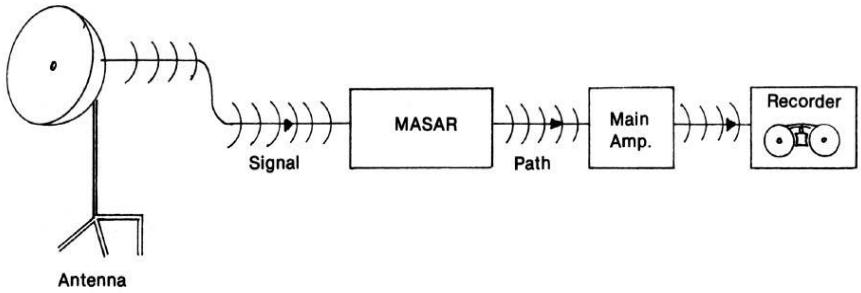
In the Kundalini, the first action of colon minerals is the same but the signals do not go directly to the endocrine glands. They first are sent to the base of the spine, which causes the cerebral-spinal fluid to physically rise into the vertebral column. When this happens, the brain signals are conditioned in the fluid bath, and filtered or balanced. Then they are sent into the endocrines on a higher wavelength, and the endocrines only secrete a select combination of hormones which allows the feeling or conscious mind of the master to see into the super physical world. The vision is often like someone on a large dosage of LSD but it is under full conscious control.

Figure XV-8



This filtering action of the spinal fluid is like a MASAR amplifier in a radio telescope. When scientists listen to the stars, they receive a lot of noise with their signals, so they use liquid helium bathed in amplifiers to cool down the spurious noise, and only the clear intelligence comes through.

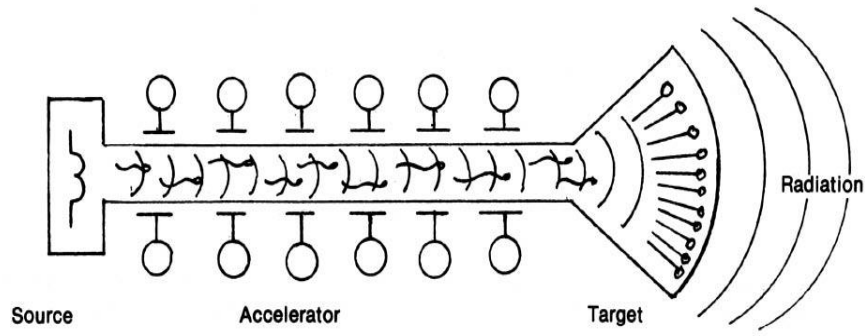
Figure XV-9



The same thing happens in Kundalini when the spinal fluid conditions the mood to a high degree of perfection.

The final point I want to make in this chapter is about the combination of the spine and the brain in Kundalini and the impact this force has on the mind both your own and the universal mind.

Figure XV-10

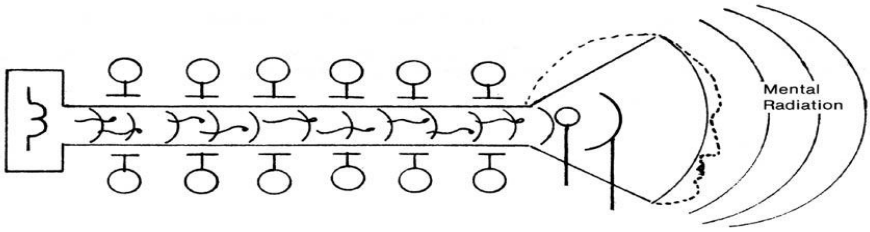


If you connect a linear accelerator to a chamber full of radioactive gas, you will get a tremendous radioactive effect.

The particles will accelerate through the accelerator, enter the chamber and collide with the outer wall. Hard X-rays will penetrate the outer walls and these X-rays are devastating to anyone near the outer wall.

If you practice Kundalini without proper training and proper preparation, you will become a chain reaction out of control. Remember that the spine is the accelerator, the hormones in the endocrines are the source and the target and the brain is the target chamber.

Figure XV-11



In an unbalanced state, the radiation on the outer wall can produce insanity in a few million seconds and unconsciousness in a second. This affects the universal mind and can influence others. So play it safe. Take each day as it comes, do not look for new teachers. They will find you when you are ready. Serve God by helping others who do not know what you know and are struggling to find a simple truth, one that you may have found.

CHAPTER XVI – DRUGS: MAN'S STALEMATE AGAINST HIMSELF

A holy man sits upon the mountainside and ingests the sacred mushroom. Deep in an Amazon jungle, a Jivaro hunter sends a tiny missile from a blow gun tipped with curare into his prey, a small monkey.

In a few hours, the holy man is deep into a nirvanic trance. Questions will be answered and later the newly acquired knowledge will be shared with the monks in a nearby lamasery.

The monkey jumps at the prick of the dart, chatters a few moments, sways and falls from its perch. In less than five minutes, it has stopped breathing.

The brownish gum that killed the monkey is curare – one of the most toxic natural substances known. In purified form it is also a valuable adjunct to surgery: injected in minute does, it relaxes the muscles of the abdomen (even as it first relaxed and then paralyzed the monkey's muscles) so that the surgeon can operate on his patient without fear that an involuntary muscular spasm will complicate his task.

These two anecdotes show two things about drugs. They can be used as a sacrament or as a poison depending on the individual's ability to understand, cope or resist their results.

It is no accident that the words "poison" and "potion" come from the same root, or that the Greek word pharmakon, which we find rooted in our own words "pharmacy" and "pharmacology", originally meant both a healing draught and a deadly one.

In the broadest sense, a drug – or a poison – is any chemical that can affect an alteration in the function or structure of living tissue. (A bullet, striking the body at high velocity, can unquestionably alter its functioning – but does so mechanically rather than chemically, and therefore could not be classed as a drug.)

As commonly used, of course, the word "drugs" implies medicinal chemicals – those substances that, in carefully regulated doses, produce desirable changes in the human body, counteracting disease or relieving distress. These beneficial poisons have nearly wiped out some diseases and can at least alleviate the impact of most of the rest. They can speed

a flagging heart or slow a racing one, raise the blood pressure or lower it, stimulate the kidneys to excrete more or less, and perform scores of other medically useful tasks.

They can alter the functioning of the nervous system: anesthetics can blot out the pain of the surgeon's knife: tranquilizers can allay the anxieties of the neurotic or psychotic. But their action on the nervous system is not always for the better. Alcohol can induce euphoria – or comatose stupor; the opiates can relieve pain – or "hook" addicts. Hallucinogens such as LSD or psilocybin may perhaps expand the consciousness on occasion, and they may also warp the mind to the point of insanity.

The ambiguous qualities of these central nervous system drugs point up a basic truth about all drugs: improperly used, or sometimes even properly used, they become poisons without qualification, producing unwanted reaction ranging from temporary nausea to death. Even the most beneficial drugs notoriously possess adverse effects. Some experts estimate that perhaps one American hospital patient in 20 lands in the hospital as a result of reactions to drugs. The best one can say of any drug is that its beneficial effects outweigh its harmful ones – for most patients, most of the time.

The search for drugs that will do more jobs more effectively and more safely has occupied men for millennia. The quest has taken them to strange places: to the South American jungles, where curare originated: to the brews of medicine men and "wise women" skilled in the use of herbs, which have yielded at least a score of useful drugs: and, increasingly, into the sub-microscopic labyrinth of molecules, whose complexities are slowly yielding clearer answers to the questions of why drugs do what they do and how they can be made to do it better.

DISTILLED WATER, SMOG AND THE KITCHEN LABORATORY

However, for the pharmacologist, the scientist who specializes in the study of drugs, and indeed, for people of all sorts, the "drug problem" is far broader than the search for new and better medicines, broader even than the widespread medical and social dilemmas that stem from the abuse of some drugs. Substances that can affect us chemically are all about us, constantly entering our bodies though we may never let a pill

pass our lips. Thus, the soaps, rinses, deodorants and depilatories in the family bathroom are drugs: so are the detergents, cleaners and metal polishes in the kitchen. The do-it-yourself homeowner works with paints and their solvents. The farmer and home gardener have chemical fertilizers, pesticides and weed-killers. With every breath we draw, we inhale carbon monoxide, hydrocarbons and oxides of nitrogen from automobile exhausts, sulfur dioxide and soot from smoking chimneys – drugs, every one of them. If we smoke, we inhale several hundred more. Indeed there is not one substance in our environment that cannot, under certain circumstances, act as a drug. Even the purest distilled water consumed in large enough quantities, can leach enough salt out of the body to produce a condition akin to heat exhaustion. Children who have swilled down a gallon of water have died of water poisoning.

In today's world, non-medicinal drugs are far more numerous, far less avoidable and for the most part considerably less well understood than the medicinal drugs. Yet a better understanding of environmental drugs is no less essential to civilized man than is knowledge of medicines. We are just beginning to comprehend some of the ways in which our environment – which most emphatically includes the drugs in it – can make us healthy or unhealthy, vigorous or debilitated. Without a deeper comprehension of drugs, civilization stands an excellent chance of poisoning itself with its vast array of chemical and industrial by-products.

If drugs in the broad sense are conspicuously products of civilization, in the narrow medical sense, they almost surely antedate civilization. "The desire to take medicine," quipped the noted Canadian physician, Sir William Osler, "is perhaps the greatest feature which distinguishes man from the animals." The evidence suggests that there is a good deal of truth in Osler's witticism. Nearly all of the still-primitive peoples use at least one or two drugs. The Australian aborigines, for example, usually classed as the least civilized culture on earth, chew the pituri plant for its narcotic effect. They use the same drug to poison fish.

It is a reasonable guess that our prehistoric ancestors employed similar potions 10,000 or even 50,000 years ago. Indeed, some degree of pharmacological sophistication was a condition of man's survival, for his palate, when he is hungry enough, is notoriously unchoosy. Even the most apelike primitives must have distinguished, by instinct, intelligence or unhappy experience, between nutritious berries and poisonous ones,

between roots that would maintain life in time of famine and those that would end it in agony.

Whatever we may guess about pre-civilized man, we know quite definitely that the first civilized men were medicine-takers. The Sumerians, who built the earliest civilization along the valley of the Euphrates and Tigris rivers 5,000 years ago, compounded medicines from salt and salt-peter, cassia, myrtle, asafetida and thyme; from the seeds, roots or bark of the willow, fir, pear, fig and date trees. Scratching on tablets of damp clay, their doctors set down prescriptions such as this: "The seed of the carpenter plant; gum resin of markhazi; thyme. Pulverize. Dissolve in beer. Let the man drink." Unfortunately, the Sumerian physicians failed to give specific quantities in their recipes, or to identify the complaints for which they were intended. Today, we can only guess at their efficacy.

Judging from the much more comprehensive and precise medical documents of the ancient Egyptians, the therapeutic batting average of their early prescriptions could not have been high. Many, indeed, contained substances that we can identify as drugs, but in all except a few instances the effects of the drug, or its quantity, or its method of application were quite inappropriate to the complaint.

DRUGS OF THE ANCIENT WORLD

The earliest record of man's use of drugs is a 4,000-year-old clay tablet, on which an unknown Sumerian listed a dozen remedies for unspecified sicknesses. About 500 years later, an Egyptian physician recorded about 800 remedies containing more than 700 drugs. One of his prescriptions, administered to children for excessive crying, contained poppy seeds – the source of the opium contained in paregoric – and the excrement of flies. The priestly physicians of Egypt administered drugs in at least 14 different forms, from pills to poultices, and special ointment kitchens mixed drugs with animal fat to produce medicinal salves.

The logical Greeks, among the first to attempt a practical evaluation of medical treatments, discarded many of the drugs they had inherited. Hippocrates limited himself to only 260 types, including squill, an effective but now outmoded heart stimulant. The Greeks also scoured the Mediterranean world for drugs, like highly touted silphium from North Africa.

Rome brought its genius for organization to the gathering, preparation and sale of Greek drugs. Detailed prescriptions calling for precise quantities of specific ingredients, were scrupulously compounded.

Far beyond Rome's world, other great civilizations had also evolved extensive pharmacopoeias. The legendary Chinese Emperor Shen Nung, who ruled perhaps 48 centuries ago, put together the Pen T'sao, in which he rated 365 herbs as superior, mediocre or inferior. One of the best was a shrub now known as Ephedra sinica, used for lung ailments. It is the source of ephedrine, effective against asthma and other allergic conditions.

Less is known of the drugs used by pre-Columbian civilizations in America, but at least one – the painkilling coca leaf – is still chewed by Peruvian Indians as their Inca ancestors did 14 centuries ago.

The oldest prescriptions were inscribed in an angular cuneiform writing on a clay tablet by the Sumerian physicians of the third millennium B.C.

THE CONTRIBUTION OF DIOSCORIDES

The knowledge of drugs accumulated by the Greeks and Romans reached Arabia during the Middle Ages largely through the works of Dioscorides. He was a Greek who served with the Roman legions during the First Century and traveled the Roman Empire from Spain to Asia Minor. Wherever he went, Dioscorides investigated the properties of local plants that might be useful as drugs. This information was eventually published in his five-volume work, De Materia Medica, which became the basic catalog of drugs and their effects for the next 15 centuries.

With the fall of Rome, the heritage of Dioscorides traveled eastward, first to Byzantium and then to the Near East, where Arabic translations helped make Moslem physicians supreme in the Middle Ages. Baghdad became the world's leading medical and drug center, and the Arabian Nights, describing the ample stock of one of the city's drug shops, listed "precious flasks . . . balms . . . salves . . . powders . . . syrups held in crystal . . . pomades made up of the sap of three hundred rare kinds of herbs."

NEXT ARABIAN NIGHTS

As Arab alchemists brought their technical skills to bear on the old remedies of Greece and Rome, the art of drug-making began to evolve into the science of pharmacology. During the golden age of Arabian drugs, the 8th to the 13th centuries, these skilled men produced a new constellation of extracted, distilled and fermented drugs that provided concentrated, purified medicines. One of these potions was prescribed "for catarrhs, coughs, swelling of the belly, and loosening of the stomach". The ingredients – myrrh, iris, white pepper and anise – are pounded to powder, tied in a rag and left to soak and ferment for three days in a jug of wine. The wine is then strained out and "drunk after exercise."

While the Arabian experiments provided effective new formulas, they also produced many nostrums as impractical as the worst of the Egyptian remedies. For example, Avicenna, the great Arab physician who successfully used mercury ointment for skin diseases, prescribed thin coatings of gold or silver on his pills – an elegant but hardly therapeutic addition. Nevertheless, medicine owes much to the Arab pharmacopoeia of more than 2,000 drugs, which became available to Western physicians as Europe emerged from the Middle Ages.

THE FIRST PHARMACIES

The introduction of Arab drugs into Christian Europe late in the Middle Ages brought into being a new specialist – the pharmacist – to prepare and dispense them. As early as the 13th century, Venice was studded with tiny, open-fronted shops, where a man suffering from a bad cough or dysentery could obtain a soothing draught of medicine prepared to the exact formula devised by the Arabs.

During the 14th and 15th centuries, the drug shops evolved into the larger enclosed pharmacies that became the centers of medical practice in European cities. Doctors met their patients at the local pharmacy. There, also, the ailing could seek remedies from a pharmacist – who often prescribed the drugs he dispensed.

Not all physicians were willing to accept the independent pharmacist as a reliable supplier of drugs. The brilliant 14th-century French surgeon, Guy de Chauliac, urged physicians to compound their own medicines, and to carry some with them when they visited the sick. De Chauliac included a private herb garden and pharmacy in his Paris clinic.

The prescription book appeared on the pharmacist's counter by the end of the 15th century, and formalized a relationship between prescriber and dispenser that still exists. Then, as now, physicians used Latin shorthand to specify drugs that might range from terra sigillata – "sacred earth" brought from the isle of Lemnos for use against diarrhea – to such weird concoctions as spiritus antepilepticus sanguinis humani. A liquid distilled from human blood mixed with angelica water and a solution of peony blossoms, it was frequently prescribed as remedy for asthma, apoplexy, palsy and epilepsy.

"Heal the sick, cleanse the lepers, raise the dead, cast out the devils."

Matthew 10:8

These were the recorded instructions of Christ to his disciples, which had a major effect and infusion on early as well as modern medicine. As early as the 6th century, the monasteries had become the repositories of medical knowledge in Europe. Using bits of information gleaned from salvaged Greek and Roman texts, the monks produced excellent drugs from such homegrown herbs as peppermint, fennel and mustard. By the 14th century every sizable monastery had not only its own hospital and physician, but often a well-equipped pharmacy as well. The monk-pharmacists were the first to distill liqueurs like the famous Benedictine for digestive and respiratory ailments.

The strong link between religion and medicine, still evidenced by religion-affiliated hospitals, medical missionary groups and nursing orders of nuns, was forged during the Middle Ages. Some of the best physicians of that period were bishops, who could prescribe both physical and spiritual remedies. For believers, both were potent medicines: reflecting this conviction, drugs of the spirit are prominent in ancient portrayals of Christ as a pharmacist, a decoration found in many European pharmacies up to the 18th century.

ANCIENT DRUGS – A HERITAGE

Even in this age of man-made miracle drugs, medicine is still using effective drugs derived from ancient herbs like the ones talked about on these pages, each linked with its present-day role.

Some of these drugs once had sinister reputations. The Roman Emperior Claudius was poisoned with belladonna, Hamlet's father with

henbane and Romeo with aconite. But mild dosages of belladonna and henbane are now valued for their muscle-relaxing effects, while aconite has been used as an ointment to relieve the acute pain of ailments like neuralgia and rheumatism.

Another ancient poison was meadow saffron, known to the Romans as Colchicum autumnale (autumn crocus). From it comes colchicine, useful in treating gout and arthritis.

In medieval times, physicians knew that squill, an onionlike plant found near the Mediterranean seashore, was a good heart tonic. They did not know they had an even better heart stimulant, digitalis, employed chiefly as an external remedy for skin conditions until the 18th century, when it was first used to treat heart disease.

One of the best of the old drugs is cinchona which, like ipecac, was introduced into Europe from South America in the 17th century. The powdered bark of a Peruvian tree, cinchona was exported in large quantities once colonists realized its remarkable ability to halt the recurrent high fevers of malaria. Not until the 19th Century did scientists isolate from cinchona one of its active ingredients, quinine, prescribed for malaria today.

There are modern-day alternatives to drugs. Aspirin contains salicylates which is used as a pain killer. Aspirin itself, however, is toxic because of the artificial hydrocarbons that constitute the bulk of the product. Almonds contain salicylates. Chewing four or five almonds to alleviate minor pains will accomplish the same effect as minor pain killers. The reaction time is a little longer, but the side effects are alleviated.

ALCOHOL: KING OF DRUGS – QUEEN OF MISERY

The drug that is most used and abused is alcohol. Alcohol has been produced and consumed by man since before the dawn of civilization. Every civilized or uncivilized people on earth today that lives by farming produces some form of alcoholic beverage. These potables are fermented from grain (beer, whiskey), potatoes (vodka), fruit juices (wine, cider), honey (mead) and half a dozen more exotic substances. Even food-gathering tribes ferment alcoholic beverages, and some anthropologists have suggested that the very invention of agriculture may have been stimulated as much by a desire for alcohol as by the need for a more copious food supply.

Certainly in the earliest civilizations, alcohol was accorded a place little, if at all, inferior to that of the basic food, bread. The very first written documents that have been found, a collection of clay tablets dug from a mound in Mesopotamia and dating from about 3000 B.C., include alcohol in a wage list. What seems to be a series of proper names is followed by the notation, "Bread and beer for one day". In the tomb inscriptions of ancient Egyptian notables, one of the commonest boasts is "I gave bread to the hungry, beer to the thirsty. . ."

There is no country in the world today – including those where alcohol is officially forbidden or frowned on – in which the drug is not consumed. Americans imbibed some 212,245,000 gallons of alcohol in 1965 – 2.27 gallons (equivalent to 182 quarts of beer or 36 pints of 100-proof whiskey) for every man and woman over 16.

Alcohol is literally the vehicle in which the old Piscean Age forces express themselves, through human error and action, usually after some harmful act, brought about while under the influence. Below is a chart showing where the world money expenditures go. Note the prominence of alcohol in the United States. Also, on the Yearly U.S. Expenditure list, Health Care, which is listed as third on the Yearly Global Expenditure list, is not even mentioned.

Figure XVI-2

WHERE THE WORLD'S MONEY GOES

Yearly Global Expenditures	Billions of Dollars
Military Arms and Armaments	$400
Education	320
Health Care	207
Alcoholic Beverages	100
Foreign Aid	20

Yearly D.S. Expenditures	Billions of Dollars
Alcoholic Beverages	$24.7
Tobacco Products	14.8
Radios, Televisions, Records, etc.	14.6
Cleaning Supplies	13.0
Non-durable Toys and Sports Equipment	8.6
Jewelry	6.3
Barber Shop, Beauty Parlor Services	4.3
Foreign Aid	4.0

Figures supplied by the Overseas Development Council, Washington, D.C.

In the case of alcohol, general answers to these questions are simple to find. Its direct actions in the body seem to be limited strictly to one organ: the brain, which controls the body's other activities. On this organ, it acts as a depressant, not as the stimulant it is commonly believed to be. Unlike true stimulants, such as caffeine or amphetamine, alcohol retards rather than accelerates the brain's control mechanisms. Its depressant action, depending on the dose, can cause mild or serious mental disorganization, loss of muscular control (most conspicuous in the inebriate's slurred speech and staggering gait), sleep, coma and even death.

For a more precise picture of what alcohol does in the body, it is necessary to examine the question of dose. A doctor, in prescribing a drug, obviously needs to know how much of it will produce the desired effect on the patient, how much more will make him seriously ill, how much more will kill him. But the answers to these questions are seldom unequivocal. The effects of a given amount of a given drug will depend on the size, physiology and state of health of the person receiving it, and on other things as well.

The simplest measure of dosage is furnished by the bloodstream, because alcohol, like most drugs, is carried to its target in the body by the blood. Moreover, the effects of varying amounts can usually be related to the concentration of alcohol in the blood.

The effects of alcohol become noticeable, at least in the drinker's behavior, at a concentration in the blood of around .05 per cent – five parts of alcohol to ten thousand parts of blood. At .10 per cent, intoxication is noticeable in the form of loud or slightly slurred speech and uncertain equilibrium: at .15 per cent, the drinker is legally defined as "under the influence of alcohol", meaning that his ability to drive a car safely is considered to be significantly impaired: at .20 per cent, he will be staggering: at .30 per cent, he may be unable to stand. By .40 per cent, if not sooner, he will probably be unconscious – and will therefore hardly be in a position to raise the level further. However, a few determined drinkers have managed this – often with fatal results.

The route followed by alcohol is, of course, indirect. It is swallowed and reaches the bloodstream by way of the gastrointestinal tract, its first stop

being the stomach. There, part of it passes into the blood vessels of the stomach wall. How much is absorbed in this way, and how fast, depends mainly on how dilute the alcohol is. A glass of beer (4% or more alcohol) or a dilute highball (10 to 20%) are absorbed much more slowly than a straight shot of whiskey (43%) and therefore produce far less of an immediate effect.

The greater part of the alcohol is not absorbed in the stomach at all, but must wait until it passes into the small intestine. There, its absorption, in the words of one writer, is "rapid, constant and complete". Thus a major factor in how rapidly ingestion is followed by intoxication is how rapidly the alcohol passes from the stomach to the intestine.

One organ often affected and irritated is the pyloric valve which acts as a gate between the stomach and the small intestine. On consuming highly concentrated or high-proof alcohol, its action is restricted and it remains closed, further slowing down the body's absorption of alcohol.

Alcoholic content of a beverage may he determined by the "proof rating". Two hundred proof is pure ethyl alcohol. Just divide the proof by two and you have the ethyl content. For example, 100 proof is 50% ethyl alcohol.

Carbon dioxide, on the other hand, speeds up the passage of alcohol into the intestine. It is dissolved CO2 that gives champagne its extra kick and makes whiskey mixed with carbonated soda more immediately potent than a whiskey and water highball.

The final complication in assaying the dose of alcohol comes from the fact that once it gets into the blood it immediately begins to be removed from the body. When straight whiskey is swallowed on an empty stomach, nearly all the alcohol is absorbed in a matter of minutes, almost before the body has time to begin eliminating it. The same amount of alcohol diluted in beer might he consumed and absorbed over an hour or more – during which time a sizable proportion of it would be eliminated.

Since the dose of alcohol depends on the drinker, the drink and the circumstances, the effects on an individual of a given amount of drinking cannot he predicted with accuracy. But much more is known about how those effects are produced. Alcohol's action is highly selective. Even in stupefying concentrations, it seems to exert no direct effect on any organ

except the brain. And even there, its effects are selective. Small concentrations of alcohol depress the reticular activating system, the part of the brain that alerts the cerebral cortex – the thinking and learning portion of the brain that integrates its activities. Freed from control, the cortex begins to function in a less organized manner. Activities requiring alertness, such as driving, or concentration, such as adding a column of figures, are carried out less efficiently. At the same time, ideas and images may flow more freely, but less coherently.

Also affected at this point are two other portions of the brain; those controlling the blood vessels and the kidneys. In the circulatory system, alcohol causes the capillaries that are located just under the skin to dilate so that they can carry more blood. The skin, flushed with warm blood, feels warmer. So does the drinker – but this, like many effects of alcohol, is an illusion. In fact, body temperature does not rise but falls, because much internal heat is carried by blood to the skin and dissipated there. Despite the folklore of the St. Bernard dog who brought comfort with his keg of brandy to travelers marooned in snowdrifts, alcohol has never kept anyone warm in cold weather. Indeed, in really cold weather it can lead to dangerous chilling. In hot climates, by contrast, the loss of body heat can be a boon.

Heavy drinking also dilates the capillaries on the skin, producing permanent changes in complexion. Next, it depresses the thalamus area of the brain, which normally slows the kidney's excretion of water. The result is reflected in the famous remark of the comic porter in Shakespeare's Macbeth, who described drinking as a provoker of "nosepainting, sleep and urine".

In slightly higher concentrations, alcohol extends its domain in the brain to the cortex itself. In the words of a standard text, "the finer grades of discrimination, memory, concentration and insight are dulled and then lost. Confidence abounds, the personality becomes expansive and vivacious, and speech may become eloquent and occasionally brilliant. Mood swings are uncontrolled, and emotional outbursts frequent."

THE STAGGERING EFFECT OF HEAVY DRINKING

Still higher concentrations of alcohol depress more resistant parts of the brain. When the drug reaches the cerebellum, which controls muscular coordination, the tippler's speech becomes garbled and his gait

uncertain. The next victims are the brain centers that control consciousness – at which point the drinker blacks out. The deepest and most primitive portions of the brain, which keep the heart and lungs operating, are fortunately almost unaffected by any reasonable concentration of alcohol. Only the most determined and suicidal drinkers have managed to ingest enough of the drug to court death from heart or respiratory failure.

While alcohol is fogging the brain into intoxication, it is simultaneously being removed from the body. At one time, it was believed that elimination occurred entirely through the lungs, skin and kidneys, which disposed of the drug unchanged. This theory was exploded more than a century ago in a historic series of experiments by the great German scientist Justus von Liebig, one of the founding fathers of physiological chemistry. He showed that the drug combined with oxygen in the body, and was ultimately transformed into carbon dioxide and water. Moreover, he pointed out, since this change, which is called oxidation, is always accompanied by the production of energy, alcohol is a food as well as a drug. In fact, we now know that a martini has about the same caloric value as a baked potato.

Subsequent experiments have shown that von Liebig was not completely correct. A small portion of the alcohol does leave unchanged in urine, sweat and exhaled air, but all the rest is, indeed, oxidized. The organ that begins this job – on alcohol and some other drugs – is the liver.

The first step in the transformation of alcohol in the liver is the drug's conversion into the compound acetaldehyde. This is even more toxic than alcohol. But luckily, acetaldehyde is itself transformed almost immediately into a harmless compound, acetic acid (the same substance that makes vinegar sour). At this point the liver's job ends, for acetic acid can be utilized by almost any cell of the body. But the liver remains the bottleneck, since it is only there that the crucial first steps can take place. Any excess of alcohol – the overload that the liver cannot transform – continues to circulate with the blood, eventually causing intoxication.

The body can under no circumstances eliminate more alcohol than the liver can handle – about one fourth of an ounce an hour. If a person limited his alcohol intake to this amount – about half a shot of whiskey or half pint of beer per hour – he could drink indefinitely without getting drunk – if he enjoyed that kind of activity. But an intake even slightly

exceeding the liver's capacity will, sooner or later, build up to intoxication.

The liver's sluggish chemistry cannot be substantially accelerated by any of the traditional treatments for insobriety – vigorous exercise, cold showers or sweat-inducing Turkish baths. The only effective remedy for intoxication is time. But some symptoms of intoxication – such as sleepiness – can be alleviated by counteracting alcohol's depressant effects with a stimulant, thus fighting one poison with another. Most common of the stimulants is caffeine, in the form of strong coffee; the amphetamines ("pep pills") are also used.

The nausea that frequently accompanies a hangover is apparently due partly to alcohol but also to its "congeners" – chemicals of various sorts that become incorporated into alcoholic beverages during their manufacture. Liquors high in congeners, such as bourbon whiskey, are widely – and probably correctly – considered to have a greater "hangover potential" than congener-poor gin and vodka.

The thirst that develops the day after drinking is because alcohol evaporates in the presence of oxygen very quickly. Thus in the walls of the gastrointestinal tract when there are large amounts of oxygen present, water is removed in abnormal amounts to the lymphatics, causing the dehydration in the intestines themselves. So it is a natural body function to replace the water. This type of thirst should be quenched with mineral water.

THE POISON EFFECT

Oddly enough, the interaction of alcohol with another chemical has been used to treat the most serious problem associated with the drug. Some 20 years ago, two Danish physicians were studying the compound disulfiram as a possible cure for intestinal worms. As part of their testing program, they dosed themselves with small quantities of the compound. Attending a cocktail party soon after, they suddenly found themselves flushed, dizzy and violently nauseated, with splitting headaches. On recovery, they suspected and soon confirmed that disulfiram was to blame. This substance, it turns out, inhibits the liver's transformation of alcohol. It blocks the second step in the process, in which acetaldehyde is transformed into acetic acid, thereby quickly producing a toxic pile-up of acetaldehyde in the body.

Anyone who has taken disulfiram (known commercially as Antabuse) cannot drink even a single glass without becoming violently ill. Unfortunately, as a treatment for alcoholism, disulfiram is seldom successful: the alcoholic usually finds he can give up disulfiram more easily than alcohol.

THE "SPIRITS"

The Spiritual ramifications of alcohol are many. Remember that all atoms and cells possess consciousness. When there are many groups working together, they form group archetype patterns.

These patterns respond to forces. There are two major forces at work today, Light and Dark. Because alcohol, when taken in larger dosages becomes harmful, it is a very common tool for the Dark Forces to work through. How many times have you seen someone do stupid and violent acts while under the influence, and the next day fail to remember any of these actions? Someone or something was very awake and conscious, using their body while they were spiritually asleep. The Karma or result of their bad actions then becomes their responsibility and thus they are locked deeper in form, usually the opposite of what was intended.

In Dante's, Divine Comedy, the actors portray a trip through Hades or the Inferno of Hell which exists as an energy barrier on the Sixth Astral Plane. History has long portrayed the Karmic effects of alcohol on civilization. Look at the Fall of Rome.

Also affected is the Etheric Body. One of the functions of the Etheric Body is to slow down the impact of energies coming from the Emotional or Astral Plane long enough for the individual to sort out the useful from the destructive forces. Alcohol and tobacco both anesthetize this delicate network so that often the person affected becomes violent in nature. The conscious network in the brain is designed to process a marginal amount of information at any given time. To exceed the processing rate puts the overall form and body processes into undue stress, which then causes a gradual degenerative effect. In time, it can lead to any number of things, from heart attack to sclerosis of the liver.

BRAIN-MIND INTERACTION

Now that we have had an introductory glimpse of the more common drugs, let us take another look at the brain and the nervous networks so

that we may begin to understand the more complex action of brain, enzyme, hormone and drug behavior.

The brain is a tissue composed of cells. These cells, although highly specialized, fall into the behavior patterns of the laws of all cells. Do not confuse the brain with the mind. The brain is the cellular blueprint of the universe patterned after the mind, which is the energy field of the universe. The mind grows as the universe grows, holding a semi-total of all universal interactions. The brain grows as the individual becomes aware of his or her interaction with the mind.

The number of nerve cells or neurons in man's three pounds of brain is in the order of l0 x 1011 of a hundred billion. This is also the numerical correspondence to the number of stars in our surrounding universe. These neurons are surrounded by and nourished by glial cells. The size of a neuron ranges from 5 to 100 micrometers.

An axon is found next to each nerve fiber, and coming from an axon are dendrites. Figure XI-21 in Chapter XI covers and illustrates this relationship. The brain is spiritual, electrical and chemical in nature. When spirit, the energy or cause behind an action, goes into motion, the Spirallua within the nucleus of the neurons emit vibrations of a lower order, which cause the transmitter substances to go into an inhibiting or excitatory effect on the neurons. There are some 30 different substances known to be transmitters, each of which release or capture hormones on the receptor points of the brain. In this way, we reach the chemical nature of the brain. The various combinations of chemicals either transmit electricity (excitatory) or receive electricity transmitted (inhibitory) from some other place in the body, such as a stimulus from the eyes, ears, nose, fingertips or any sensory area.

As we link up our consciousness in a greater measure of attunement to the mind, body and spirit, then the conscious response at the neuron junctions becomes greater. We move up in frequency, always in balanced octaves, to a higher inner-standing so that spirit can have a truer influence on our thought patterns than ego, which can only provide us with an under-standing.

Looking at neurons electrically, we find that neurons, in spite of their differences in size and shape, all use the same two kinds of electrical signals: graded potentials and action potentials.

The entire neuron – the cell body, its long axon and its branching dendrites – is polarized so that the inside is about 70 millivolts negative with respect to the outside. Two properties of the cell membrane are responsible for this "resting potential". First, the membrane actively transports ions, extruding positively charged sodium ions from the cell and bringing in positively charged potassium ions, so that the concentrations of the two kinds of ions are quite different inside the cell and outside it. Second, the ease with which ions flow through the membrane is quite different for sodium versus potassium.

It is changes in the resulting outside-to-inside resting potential that constitute the electrical signals of nerves. A change in the transmembrane voltage anywhere on the cell or its processes tends to spread quickly in all directions along the membrane, dying out as it spreads; a few millimeters away there is likely to be no detectable signal. This is the first kind of electrical signal, the graded potential. Its main function is to convey signals for very short distances.

The second type of signal, the action potential, conveys information for greater distances. If the membrane is depolarized (its potential decreased) to a critical level – from the resting level of 70 millivolts to about 50 millivolts – there is a sudden and dramatic change: the normal barriers to the flow of sodium and potassium ions are temporarily removed and there ensues a local flow of ions sufficient to reverse the membrane potential, which reaches about 50 millivolts positive inside and then is reversed again to restore the normal resting potential. All of this happens within about a millisecond (a thousandth of a second). Meanwhile the first reversal (to inside-positive) has produced a powerful graded signal that spreads and brings the adjacent region of the membrane to its critical level; that leads to a reversal in the next segment of membrane, which in turn leads to a reversal in the next segment. The result is a rapid spread of the transient reversal in polarity along the nerve fiber.

This propagating action potential, which travels the entire length of the fiber without attenuation, is the nerve impulse. All signaling in the nervous system over distances of a millimeter or more is in the form of impulses. Regardless of the type of fiber and whether it is involved in movement, vision or thought, the signals are virtually identical. What varies in a given nerve fiber under particular circumstances is simply the number of impulses per second.

When an impulse arrives at an axon terminal, the neuron next in line is influenced in such a way that its likelihood of in turn generating impulses is modified. A chemical transmitter substance is released from the presynaptic membrane of the terminal, diffuses across the narrow space separating the two cells and affects the postsynaptic membrane on the far side of the synapse in one of two ways. In an excitatory synapse the transmitter leads to a lowering of the postsynaptic-membrane potential, so that the postsynaptic cell tends to generate impulses at a higher rate. In an inhibitory synapse the effect of the transmitter is to stabilize the postsynaptic-membrane potential, making it harder for excitatory synapses to depolarize the postsynaptic cell and thereby either prevent new impulses from increasing or reducing their rate.

Whether a given synapse is excitatory or inhibitory depends on what chemical transmitter the presynaptic cell makes, and on the chemistry of the postsynaptic cell's membrane. Almost every neuron receives inputs from many terminals, usually many hundreds and sometimes thousands, some of which are excitatory and some inhibitory. At any instant some inputs will be active and some quiescent, and it is the sum of the excitatory and inhibitory effects that determines whether or not the cell will fire and, if it does fire, the rate at which it does so. In other words, the neuron is much more than a device for sending impulses from one place to another. Each neuron constantly evaluates all the signals reaching it from other cells, and expresses the result in its own rate of signaling.

This rate and ease of signaling is constantly being determined by several factors:

1. What time zone in consciousness the individual is focusing his energies in, i.e., meditation, conversation, exercise, etc.
2. Chemical influences – mineral presence
3. Drug influences
4. Amounts of toxins stored within the confines of the brain.
5. Stress factors – Is the individual trying to meditate in a non-harmonious environment?
6. Astrological factors – Are the planets in a favorable position to increase or decrease the resonance of electrical patterns?
7. Endocrine and body balance – hormone abundance or deficiency.

The neurons are the building blocks of the brain. Like a snowflake, no two are ever the same shape, but they fall within only a few categories and most neurons share certain structural features that make it possible to distinguish three regions of the cell: the cell body, the dendrites and the axon. The cell body contains the nucleus of the neuron and the biochemical machinery for synthesizing enzymes and other molecules essential to the life of the cell. Usually the cell body is roughly spherical or pyramid shaped. These shapes act as the antennas and can be controlled by or gated on and off by outside influences such as bursts of energy from pyramid spherical antennas or entire systems of pyramids arranged in a circular manner, which we will discuss further on.

A typical neuron may have anywhere from 1,000 to 10,000 synapses, and may receive information from something like 1,000 other neurons. Although synapses are most often made between the axon of one cell and the dendrite of another, there are other kinds of synaptic junction: between axon and axon, between dendrite and dendrite and between axon and cell body.

At a synapse the axon usually enlarges to form a terminal button, which is the information-delivering part of the junction. The terminal button contains tiny spherical structures called synaptic vesicles, each of which can hold several thousand molecules of chemical transmitter. On the arrival of a nerve impulse at the terminal button, some of the vesicles discharge their contents into the narrow cleft that separates the button from the membrane of another cell's dendrite, which is designed to receive the chemical message. Hence information is relayed from one neuron to another by means of a transmitter. The "firing" of a neuron – the generation of nerve impulses – reflects the activation of hundreds of synapses by impinging neurons. These synapses are excitatory. As the dendrite leaves the neuron site and moves in alternate clusters along the axon passageways throughout the body, it is encapsulated by a cell called the Schwann cell.

All axons appear to be jacketed by Schwann cells. In some cases the Schwann cells simply enclose the axon in a thin layer. In many cases, however, the Schwann cell wraps itself around the axon in the course of embryonic development, giving rise to the multiple dense layers of insulation known as myelin. The myelin sheath is interrupted every millimeter or so along the axon by narrow gaps called the nodes of Ranvier. In axons that are sheathed in this way the nerve impulse travels

by jumping from node to node, where the extracellular fluid can make direct contact with the cell membrane. The myelin sheath seems to have evolved as a means of conserving the neuron's metabolic energy. In general, myelinated nerve fibers conduct nerve impulses faster than unmyelinated fibers.

The neuron membrane, like the outer membrane of all cells, is about five nanometers thick and consists of two layers of lipid molecules arranged with their hydrophilic ends pointing toward the water on the inside and outside of the cell and with their hydrophobic ends pointing away from the water to form the interior of the membrane. The lipid parts of the membrane are about the same for all kinds of cells. What makes one cell membrane different from another are various specific proteins that are associated with the membrane in one way or another. Proteins that are actually embedded in the lipid bilayer are termed intrinsic proteins. Other proteins, the peripheral membrane proteins, are attached to the membrane surface but do not form an integral part of its structure. Because the membrane lipid is fluid, even the intrinsic proteins are often free to move by diffusion from place to place. In some instances, however, the proteins are firmly fastened down by a sub-structure.

The membrane proteins of all cells fall into five classes: pumps, channels, receptors, enzymes and structural proteins. Pumps expend metabolic energy to move ions and other molecules against concentration gradients in order to maintain appropriate concentrations of these molecules within the cell. Because charged molecules do not pass through the lipid bilayer itself, cells have evolved channel proteins that provide selective pathways through which specific ions can diffuse. Cell membranes must recognize and attach many types of molecules. Receptor proteins fulfill these functions by providing binding sites with great specificity and high affinity. Enzymes are placed in or on the membrane to facilitate chemical reactions at the membrane surface. Finally, structural proteins both interconnect cells to form organs and help to maintain subcellular structure. These five classes of membrane proteins are not necessarily mutually exclusive. For example, a particular protein might simultaneously be a receptor, an enzyme and a pump.

Figure XVI-3

WORLDS "WITHIN THE BRAIN"

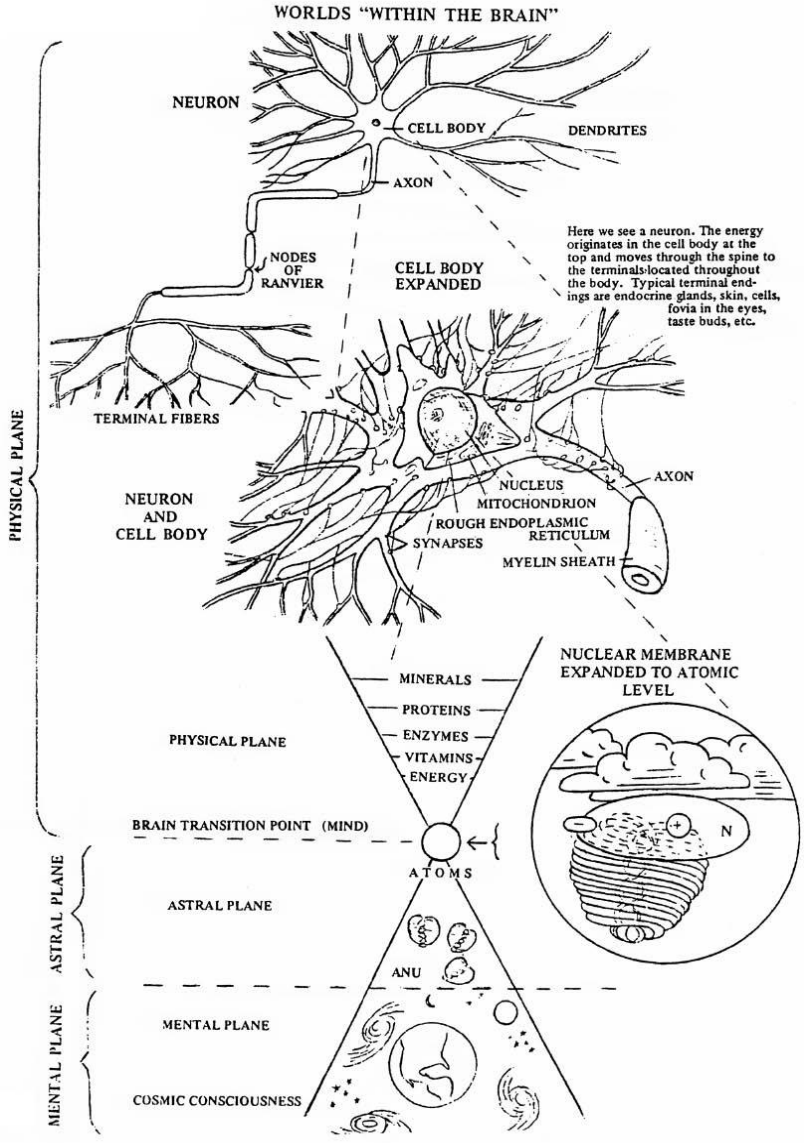
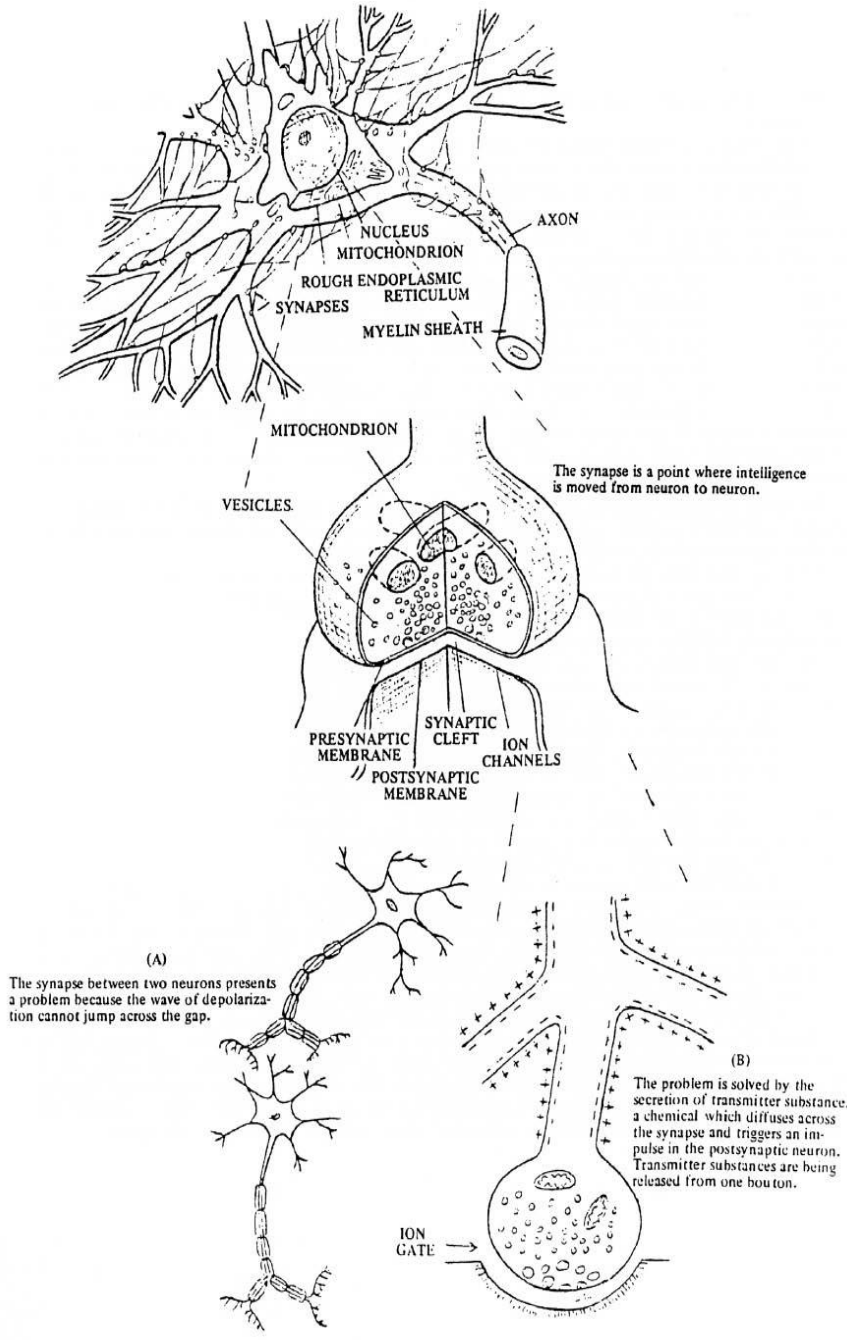


Figure XVI-4



CONDUCTION BETWEEN NEURONS

Neurons are associated with one another to form circuits or pathways, as demonstrated by the reflex circuit which has been discussed. A message must be transmitted from one neuron to the next in the sequence, but the wave of depolarization stops when it reaches the end of an axon because the two neurons are separated from each other by a tiny space, the synapse. Instead, information is relayed from one neuron to the next by a chemical messenger that diffuses across the synapse.

The neuron, like all cells, is able to maintain a fluid within itself, a fluid that differs markedly from that of the fluid outside it.

The difference is particularly striking with regard to the concentration of the ions of sodium and potassium. The external medium is about 10 times richer in sodium than the internal one, and the internal medium is about 10 times richer in potassium than the external one. Both sodium and potassium leak through pores in the cell membrane, so that a pump must operate continuously to exchange sodium ions that have entered the cell for potassium ions outside it. The pumping is accomplished by an intrinsic membrane protein called the sodium-potassium adenosine triphosphatase pump, or more often, simply the sodium pump.

The protein molecule (or complex of protein sub-units) of the sodium pump has a molecular weight of about 275,000 daltons and measures roughly six by eight nanometers, or slightly more than the thickness of the cell membrane. Each sodium pump can harness the energy stored in the phosphate bond of adenosine triphosphate (ATP) to exchange three sodium ions on the inside of the cell for two potassium ions on the outside. Operating at the maximum rate, each pump can transport across the membrane some 200 sodium ions and 130 potassium ions per second. The actual rate, however, is adjusted to meet the needs of the cell. Most neurons have between 100 and 200 sodium pumps per square micrometer of membrane surface, but in some part of their surface the density is as much as 10 times higher. A typical small neuron has perhaps a million sodium pumps, with a capacity to move about 200 million sodium ions per second. It is the transmembrane gradients of sodium and potassium ions that enable the neuron to propagate nerve impulses.

The various pyramids we have developed help teach the brain to get ready to function on the higher (super-physical) vibrational wavelengths,

and devices like the Pyradyne Receptor and the Pyradyne Systems actually enact the synaptic transmission potentials to function at sub-light speeds.

The gating mechanisms that regulate the opening and closing of membranes within the synapses are of two types. The first is called voltage-gated and the second type is said to be chemically activated. Both gating mechanisms are still electrical and resonant in nature because voltage is a function of Electromotive Potential (EP) and in chemical gating. Ionization takes place, which is a function of the second part of electricity, current (I).

Chemically gated channels are usually found to be in the receptive membranes of synapses, and are responsible for translating the chemical signals produced by the axon terminals into ion permeability changes during synaptic transmission. It is a custom to name chemically gated channels according to the normal transmitter. Thus you speak of acetylcholine activated channels or GABA (gamma-amino-butric acid) activated channels. The enzyme acetylcholine was one of the first transmitter substances found, of which there are now over 30 known, by modern medicine. This type of protein commonly changes shape as it functions in the body. These alterations of shape are known as conformational changes and are responsible for cell motion within nerve and brain cells. A slight movement can block or unblock a pore, and thus serves to gate a substance.

The enzyme adenylate cyclase helps regulate the intracellular substance. Cyclic Adenosine Monophosphate (cyclic AMP) activates specific enzymes in the target cell called protein kinases.

These enzymes then act to catalyze the incorporation of phosphate groups into special proteins in the neuron membrane, altering the permeability of the membrane to ions, thereby changing the level of excitability of the target cell. Because the second-messenger system works relatively slowly on the time scale of neuronal events, it is best-suited for mediating the longer-lasting actions of transmitters in the brain such as slow shifts in membrane potential, and perhaps the formation of long-term memories. Once cyclic AMP has relayed its message, it is inactivated within the cell by the enzyme phosphodiesterase. Drugs that inhibit this enzyme therefore raise the level of cyclic AMP within the target cells and enhance the effect of the transmitter.

Neurons are able to generate nerve impulses over a wide range of frequencies, from a few cycles per second on up into very short wave lengths approaching the light frequencies. This is dependent on several factors, such as how spiritually developed an individual is, how balanced is the distribution of various transmitting and receiving nutrients, the amount of mental-physical disciplines practiced and so on. The bulk of humanity, however, has only developed his or her brain to function at a maximum potential of a few hundred cycles per second.

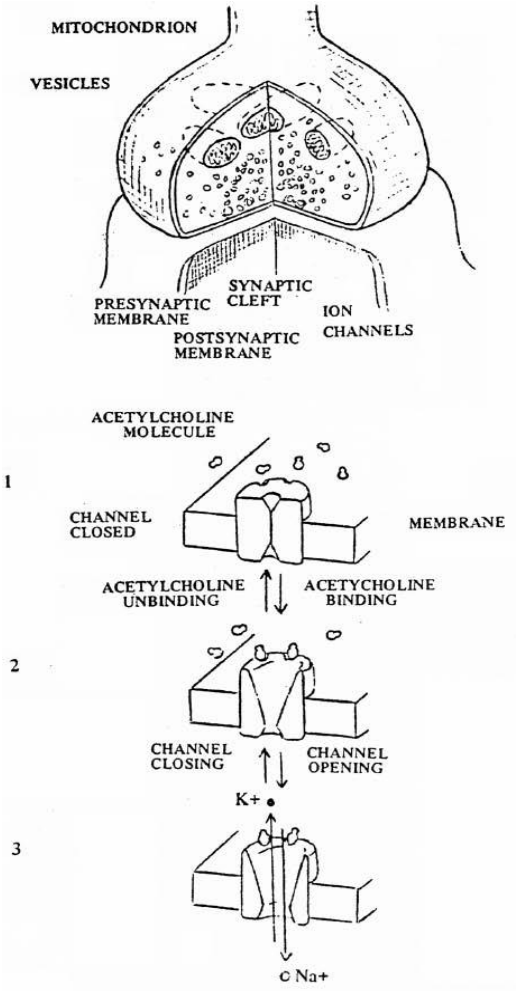


Figure XVI-5

Acetylcholine channel in a postsynaptic membrane is opened by acetylcholine molecules discharging into the synaptic cleft. The drawing shows the acetylcholine receptor at the frog neuromuscular junction. Two acetylcholine molecules bind rapidly to the resting closed channel to form a receptor-acetylcholine complex (1.2). The complex undergoes a change in its conformation that opens the channel to the passage of sodium and potassium ions (3). The time required for conformational change in the complex limits the speed of the reaction. The channel remains open for about a millisecond on average, and then reverts to the receptor-acetylcholine complex. While it is open the channel passes about 20,000 sodium ions and an equal number of potassium ions. The acetylcholine rapidly dissociates and is destroyed by the enzyme acetylcholine esterase.

BRAIN CHEMISTRY

As the years go by, considerable progress goes on with mapping the distribution of transmitter substances throughout the brain. Such research has revealed that the behavioral effects of many drugs and neurotoxins arise from their ability to disrupt or modify chemical transmission between neurons. It has also been shown that in mental illness, there are defects in the functioning of specific transmitter substances in the brain.

Remember from previous chapters that oxygen in a continuous flow to the brain is always necessary. A ten second interruption can cause cellular damage because of the interruption of ionic potentials constantly taking place. Thus it is critical to always be in the presence of negative air ions.

The weight of the brain, although representative of only 2% of total body weight, is offset proportionally on the energy level by the fact that it consumes over 20% of the oxygen intake to sustain neuronic potential. Neurons adjust the rate at which they take up glucose to fulfill their metabolic needs at the time.

As cells go, neurons are exceedingly sensitive: their function can be disrupted by toxic substances that find their way into the bloodstream, and also by small molecules that are normally present in the blood, such as amino acids. This sensitivity may explain why the brain is isolated from the general circulation by the selective filtration system known as the blood-brain barrier. The blood-brain barrier has important consequences for the design of drugs that act directly on the brain: if such substances are to cross the barrier, their molecules must be either very small or readily soluble in the fatty membranes of the glial cells. A few select regions of the brain are not shielded by the blood-brain barrier; they include structures that are specifically responsive to blood-borne hormones or whose job it is to monitor the chemical composition of the blood.

The axon is a transport system with the neurons, and carries nutrients and gating chemicals back and forth throughout the brain.

The neurons of the adult brain are seldom replaced, and must last a lifetime, so there must be mechanisms to renew all their components. This requirement calls for the synthesis by the cell of enzymes and other complex molecules, and such synthesis can proceed only in the region

of the cell nucleus, that is, in the cell body of the neuron. Therefore replacing the components of the axon requires a means of transporting components substantial distances within the cell. Indeed, there is a constant movement of proteins and other components from the cell body down the entire length of the axon.

The axoplasm is a jelly-like substance inside the axon that transports the axon and all nutrients. Within the axoplasm are several different systems that are involved, including a slow-transport system in which material flows away from the cell body at a speed of about a millimeter a day, and a faster-transport system in which material flows in both directions at speeds of between 10 and 20 centimeters a day. The slow-transport system represents a bulk flow of axoplasm carrying components important for the growth and regeneration of the axon; the faster-transport system represents the flow of more specialized cellular components, including some of the enzymes involved in the manufacture of transmitters.

As you can see here, we are again dealing with time and its relationship to the thought process. As you well know, when certain mind drugs such as LSD or Phencycladine are ingested, the switching time at the synapse points is altered, specifically the neuron switching speed. Normally this speed is geared to the real-time events of the everyday world. Thus when a person is in tune with this everyday realm on a brain-mind-action balance, he is thought to be normal. But when a psychoactive substance is injected, this timing relationship becomes altered. The brain then begins to search for a new time frame to center itself on. This at first is difficult until the drug reaches full potential, and brain speed stabilizes at a higher or lower potential. Once the drug stabilizes itself and the "rush" is over, the brain ceases its search for a stable reference point in mind. Mind as you remember is a part of consciousness, and the brain can scan up and down its frequencies. The Astral Plane is part of mind, as it is below the Mental Plane. The first, second and third Ethers are higher sub-planes of the Physical, and are also a part of mind. Both are on a vibrational level higher than the everyday Physical.

When LSD or mushrooms (psilocybin) are taken, the brain-mind frequency eventually stabilizes on some level of the Astral Plane, depending on how well the individual has prepared himself. If fasting has been observed first to release all toxins, which cause a bad trip, the higher sub-planes of the Astral Plane are easily reached, and the

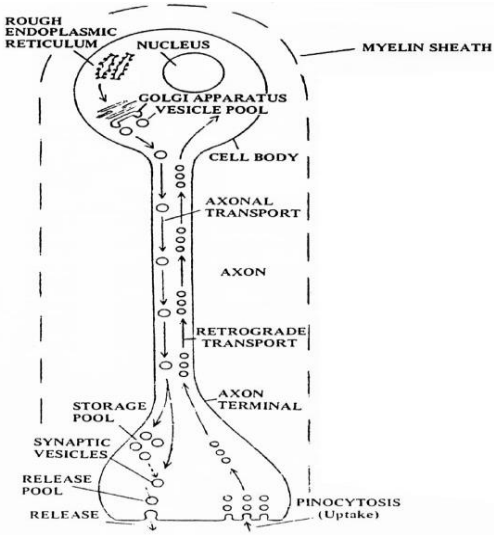
individual is in tune with a higher realm of reality. Clear perception, however, is difficult, unless you are in a clear vibratory place such as a sacred mountaintop, a remote desert or some other spiritual setting. On this level, because you are still in a physical body, toxins can be distracting sounds, angry people, smog or a variety of things that are not in harmony with the high Astral Plane.

Phencyclidine (PCP) on the other hand is not as high in frequency as LSD, so it takes you into an etheric level: one usually to which recently deceased or disembodied souls have departed. This is a relatively easy space to reach, as Bardo existence is just beyond the visual range in slums, ghettos of large cities and places of extreme conflict. In these realms also exist spirit guides, both good and evil. Many an unsuspecting individual will ingest PCP, and because they are poorly prepared, become easy prey for possession by lower entities. These fiendish demons can easily gain control of the tripper's brain and then guide the physical vehicle into many demonic acts! PCP is usually smoked like a cigarette, and its effects take hold in a matter of minutes. This means that because there is such a fast time shift created, the unsuspecting individual goes easily into a state of temporary shock. Later, when the drug wears off, the person can often barely remember the actions committed. Alcohol, previously mentioned, has similar effects, but they are much slower, and it takes years to do what PCP does in minutes. It is easy to see why the establishment, with no knowledge of the higher realms, is completely mystified and dumbfounded by PCP, and it is currently considered our most dangerous drug. If you remember, this was the same attitude taken to LSD ten years ago.

Let us now take another look at the axoplasm. Because it transports nutrients and also drugs at various potencies over various times, it is easy to see how some people can have flashbacks or reoccurring drug trips hours or weeks later. If a person has a slow metabolism, he is more likely to have a reoccurring experience, because all axoplasm operation depends on the rate of electrical response.

Figure XVI-6

AXOPLASM AND TRANSPORT



When the body becomes deficient in Lecithin, Calcium and Phosphorus, a disease known as Multiple Sclerosis sets in, leaving scar tissue along the pathways of the neurons. This further interrupts the passage of electrical conductivity, slowing down even more the Axonal Transport System.

Axoplasm Transport is responsible for moving cellular components such as vesicles and enzymes from their site of manufacture in the neuronal cell body to the axon terminals, which may be millimeters or centimeters away.

Toxic substances such as drugs can easily be caught in the passageways, causing flashbacks. The speed of the overall system depends on resonance.

In this case, the resonance factors are:

1. Quantity of transmitter and receptor substance

2. Amount of minerals present

3. Amount of fats and triglycerides present

4. Amount of body toxicity

5. Environment individual is in

6. Amount of stress at any given moment

7. Birth or Astrological sign and time of day

8. Planetary Alignment

Many nerve terminals break away from their axons and form intact closed particles called synaptosomes. These synaptosomes contain the mechanisms of synthesis, storage release and transmitter inactivation associated with the nerve terminals.

The brain is divided into various departments, and each department performs a particular function related to the rest of the body. Transmitter substances such as the monoamines, norepinephrine, dopamine and serotonin, are located in the cluster of neurons in the brain stem known as the locus coeruleus.

The axons of these neurons project to diverse regions, such as the hypothalamus, the cerebellum and the forebrain. The norepinephrine system has been implicated in the maintenance of arousal, in the brain system of reward, in dreaming sleep and in the regulation of mood.

The neurons containing the monoamine transmitter dopamine are concentrated in the regions of the midbrain known as the substantia nigra and ventral tegmentum. Many of the dopamine-containing neurons project their axons to the forebrain, where they are thought to be involved in regulating emotional responses. Other dopamine fibers terminate in the region near the center of the brain called the corpus striatum. In the corpus striatum, dopamine appears to play a crucial role in the control of complex movements. The degeneration of the dopamine fibers projecting to this region gives rise to the muscular rigidity and tremors of Parkinson's disease.

The monoamine transmitter serotonin is concentrated in the cluster of neurons in the region of the brain stem known as the raphe nuclei. The neurons of this center project to the hypothalamus, the thalamus and many other brain regions. Serotonin is thought to be involved in temperature regulation, sensory perception and the onset of sleep.

Many other transmitters have been identified, some of which are designated "putative" because their involvement in synaptic transmission in the brain is still somewhat equivocal. For example, several amino acids – the building blocks of proteins – appear to act as transmitters. The common and abundant amino acids, glutamic acid and

aspartic acid, exert powerful excitatory effects on most neurons and may well be the commonest excitatory transmitters at brain synapses. The simplest of all amino acids, glycine, is known to be an inhibitory transmitter in the spinal cord.

When one practices hard forms of Yoga such as Kundalini, which centers the consciousness of the brain-mind on the spinal cord, glycine in that individual would be exhausted quicker, creating an imbalance at the transmitter sites. This is why when such practices become a lifestyle, diet has to be adhered to on a stricter level.

The commonest inhibitory transmitter in the brain is gamma-aminobutyric acid (GABA), an amino acid that is not incorporated into proteins. GABA is unique among amino acids in that it is manufactured almost exclusively in the brain and spinal cord. It has been estimated that as many as a third of the synapses in the brain employ GABA as a transmitter.

Chemical transmission requires a series of steps, transmitter synthesis, storage, release, reaction with receptor and termination of transmitter actions. Each of these steps has been characterized in detail, and drugs have been discovered that selectively enhance or block specific steps.

This again reflects in psychoactive drugs, and shows how defects in the synaptic mechanism can relate to mental disorders.

The first step in chemical transmission is the synthesis of the transmitter molecule in the nerve terminal. The transmitter molecules are not manufactured but modified from a precursor molecule, usually an amino acid, through a series of enzymatic reactions.

The manufacture of a transmitter may require one enzyme-catalyzed step (as in the case of acetylcholine) or as many as three steps (for norepinephrine). In the synthesis of norepinephrine the starting material is the amino acid tyrosine, which is taken up into the nerve terminal from the bloodstream. Tyrosine is first converted into the intermediate substance L-DOPA: a second enzyme then converts L-DOPA into dopamine (a transmitter in its own right): a third enzyme converts dopamine into norepinephrine.

After the molecules of the transmitter have been manufactured they are stored in the axon terminal in the tiny membrane-bound sacs called

synaptic vesicles. There may be thousands of synaptic vesicles in a single terminal, each of which contains between 10,000 and 100,000 molecules of the transmitter. The vesicles serve to protect the transmitter molecules from enzymes inside the terminal that would otherwise destroy them.

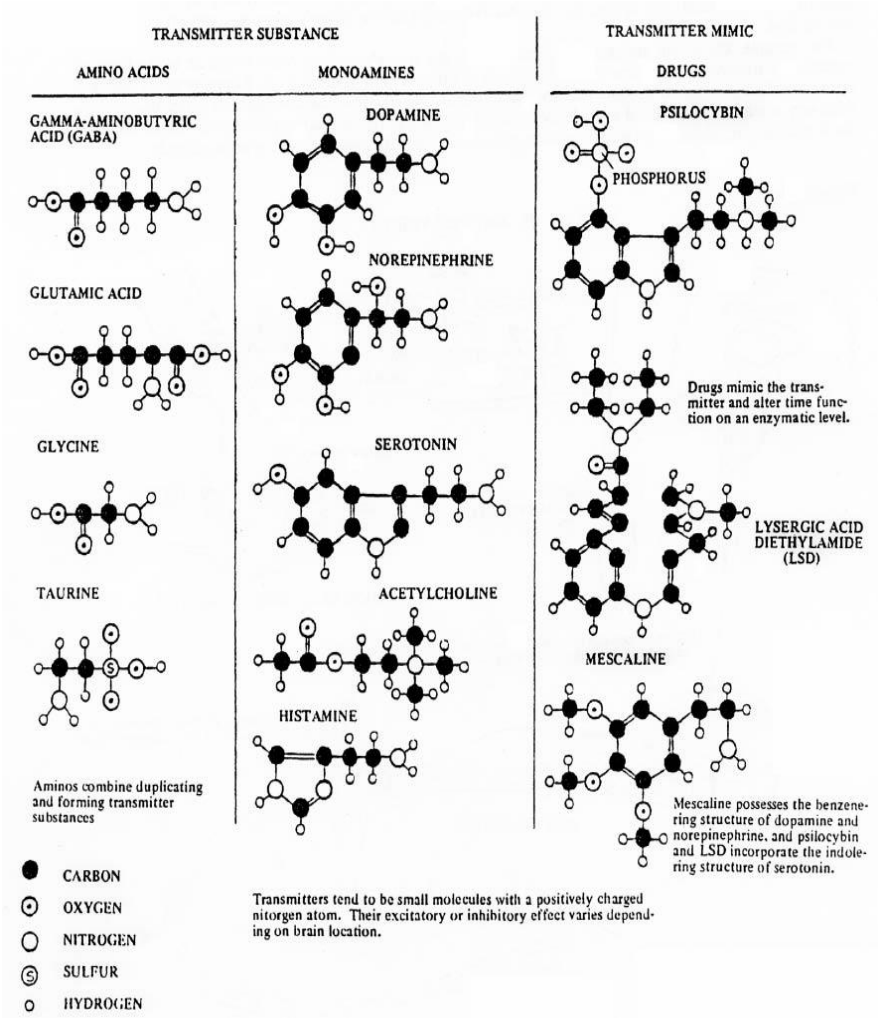
The arrival of a nerve impulse at an axon terminal causes large numbers of transmitter molecules to be discharged from the terminal into the synaptic spaces. The transmitter molecules are shaped precisely and fill the receptors, barriers in lock and key fashion.

The interaction of the transmitter with its receptor alters the three-dimensional shape of the receptor protein, thereby initiating a sequence of events. The interaction may cause a neuron to become excited or inhibited, a muscle cell to contract or a gland cell to manufacture and secrete a hormone. In each case the receptor translates the message encoded by the molecular structure of the transmitter molecule into a specific physiological response. Some of the responses, such as the contraction of voluntary muscle, take place in a fraction of a second: others, such as the secretion of a hormone, require a span of minutes and sometimes hours.

Figure XVI-7

AMINO ACID – HORMONE – DRUG STRUCTURAL COMPARISON

LSD and other hallucinogens are thought to enhance the activity of norepinephrine and dopamine while inhibiting the depressing effects of serotonin. Information coming through the Reticular Activating System (the diffuse network of neurons in the brainstem that regulates consciousness) is diffused, causing an alteration in the perception of time on the physical plane. This inhibition then causes a bombardment of the cerebral cortex, of energies from higher planes, to move its focus from the subconscious memory to the conscious mind.



Once a transmitter molecule has bound to its receptor it must be rapidly inactivated; otherwise it would act for too long and precise control of transmission would be lost. Nerve fibers can conduct several hundred impulses per second only if the postsynaptic membrane recovers its resting voltage within a fraction of a millisecond. Some transmitters are inactivated by enzymes situated in the synaptic space. For example, acetylcholine is destroyed by the enzyme acetylcholinesterase, which can cleave 25,000 molecules of the transmitter per second.

Norepinephrine, once released from the axon terminal, is rapidly pumped back inside the terminal button. Then the recaptured

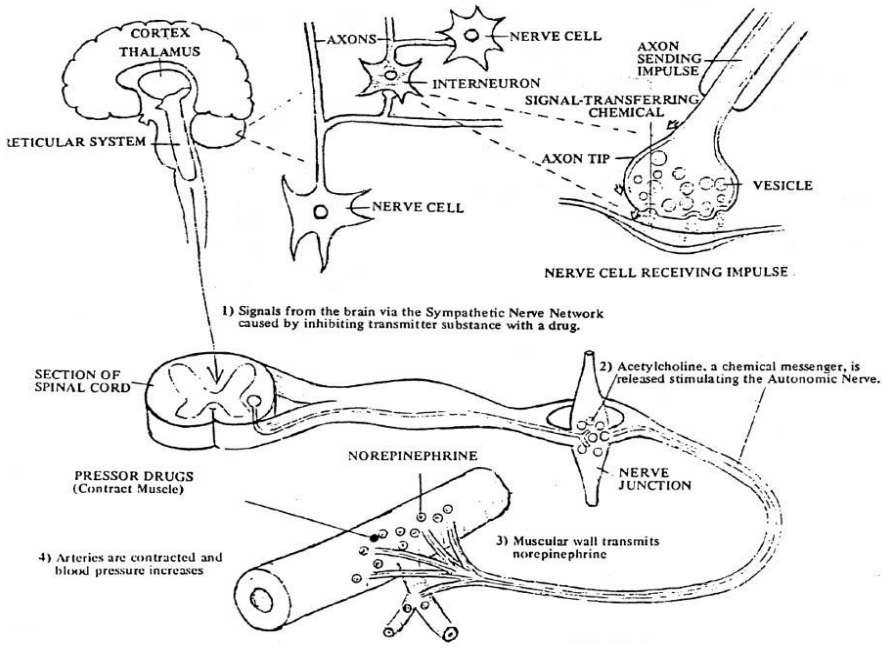
norepinephrine molecules are either destroyed by enzymes such as catechol-o-methyltransferase (COMT) and monoamine oxidase (MAO) or are recycled back into the synaptic vesicles. The same thing happens with serotonin, dopamine, GABA and others.

Psychoactive drugs exert their effects by either enhancing or inhibiting the release of the particular transmitter from the axon terminals. This is, then, the chemical explanation of the author's previous comment on the alteration of time.

For example, the potent stimulant amphetamine triggers the release from nerve terminals in the brain of dopamine, a transmitter associated with the arousal and pleasure systems in the brain. Excessive use of amphetamine by addicts can lead to disruption of thought processes, hallucinations and delusions of persecution, symptoms very similar to those found in some forms of schizophrenia. This and other evidence has led to the hypothesis that an overactivity in the brain dopamine systems may underlie the symptoms of schizophrenia.

Figure XVI-8

ACTIONS OF AMPHETAMINES



PCP, although a tranquilizer at first, after excessive usage breaks down the protein barriers in the brain and thus prevents transmitter substances from returning to the synaptic vesicles and begins now to speed up thought processes. This induces a paranoiac schizophrenic response also.

Amphetamines such as Benzedrine, Dexedrine and Methedrine are widely used as stimulants. They are commonly referred to as pep pills, speed and uppers. Cocaine falls into this class, but differs widely because it affects other parts of the body such as the vagus nerve, thymus gland, pituitary and pineal glands and the liver. Cocaine in its natural state of a plant contains 19 other alkaloids besides the white powder commonly referred to as snow, flake or coke. If properly used, cocaine can successfully treat arthritis, arteriosclerosis, endocrine atrophy, infections, senility, and in addition is a powerful chelation ingredient. But misused by a drug society, its healing abilities have never been utilized in this country. Other nations, and the Indians in South America, however, have been successful with its proper usage.

I am neither for nor against drugs. They are helpful when we have not observed natural laws and have put ourselves in physical jeopardy. Also, to overcome time, they can be used sparingly. Once the individual is out of an immediate danger, they should be discontinued completely.

To show the abuse in America, 12 billion amphetamine tablets were produced in 1971. Fifty per cent of these reached the black market (street). This caused stricter measures to be placed on production in 1972 by legislative action. Today, there is ten times this amount of speed on the streets. Why? Because the legislative action in 1972 brought about amateur home laboratories, which is a further threat because here there is little if any quality control.

Amphetamine withdrawal produces symptoms of depression because of B vitamin depletion, sleepiness because of adrenal depletion, muscular cramps and severe gastrointestinal disturbances because of interference with protein synthesis, and sometimes even loss of life in the case of excessive use of speed. Speed, over a period of time, will turn the grey matter of the brain into a liquid mass of jelly.

Caffeine is another form of stimulant often overlooked as a drug. A single cup of coffee contains up to 150 milligrams of caffeine. Excessive

use can cause insomnia, mild delirium, abnormal heart rhythms and other symptoms.

Drugs such as coffee and teas are called methylxanthine drugs. The methylxanthine drugs, such as caffeine and theophylline, are thought to exert their effects by acting through the second-messenger system. Specifically they inhibit the enzyme phosphodiesterase, which degrades cyclic AMP, so that they ultimately increase the amount of cyclic AMP that is generated in response to the transmitter. As a result these drugs exert a general mild stimulant action on the brain. Caffeine is the principal active ingredient of coffee and tea; the weaker stimulant theophylline is found primarily in tea. Billions of pounds of coffee and tea are consumed each year, making the methylxanthines among the most widely used drugs.

In addition to triggering the release of transmitter substances, there are drugs that slow down the transmitter substances previously released. These drugs are said to block the transmitter degradient at the synapse.

One such group of drugs is represented by iproniazid (Marsilid) and other drugs that inhibit the enzyme monoamine oxidase which degrades norepinephrine, dopamine and serotonin. As a result of the blockage of this enzyme, the arousing effects of these monoamines are enhanced, accounting for the antidepressant actions of the drugs. A second group of antidepressant drugs, the tricyclics, also amplify the effects of norepinephrine and serotonin in the brain. These drugs, of which the best-known are imipramine (Tofranil), amitriptyline (Elavil) nortriptyline (Aventyl) and tranglycpromine (Parnate), block the reuptake of norepinephrine and serotonin from the synapse: the stimulant drug cocaine appears to work by the same mechanism. Such observations have suggested that depression may be associated with low levels of amine transmitters at brain synapses, whereas mania may be associated with excessively high levels of these transmitters.

PAIN KILLERS

There is another group of chemical messengers in the brain known as the neuropeptides. These molecules are chains or amino acids (ranging from two to 39 amino acids long) that have been localized within neurons and are considered to be putative transmitter substances. Some of them were first identified as hormones secreted by the pituitary gland

(ACTH, vasopressin), as local hormones in the gut (gastrin, cholecystokinin) or as hormones secreted by the hypothalamus to control the release of other hormones from the pituitary gland (luteinizing-hormone releasing hormone, somatostatin).

Two of these neuropeptides are the enkephalins and the endorphins, both brain chemicals that bear a striking resemblance to morphine, the narcotic drug derived from opium in the poppy. These areas of the brain are called opium receptors. Enkephalins are chains of five amino acids, and contain the protein groups of methionine and leucine. When these neuropeptides are released into the brain and spinal cord, they act as pain reducers. Acupuncture, Acupressure and our own Pyradome are natural ways to enact this system of pain reduction.

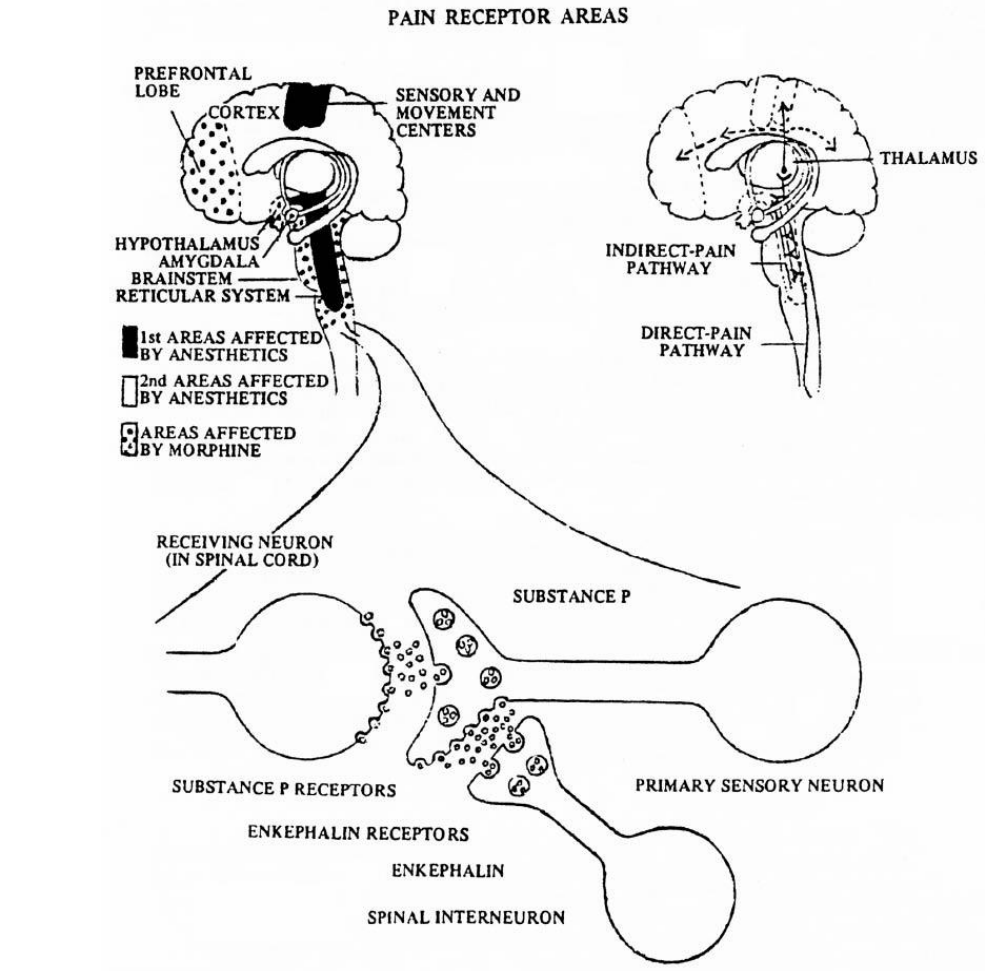
PAIN TRANSMITTERS

One of the strongest pain transmitter conductors is substance "P", a chain of 11 amino acids. It is present in a number of specific neuronal pathways in the brain and also in primary sensory fibers of peripheral nerves. Some of these sensory neurons, whose cell bodies lie in sensory ganglia on each side of the spinal cord, contain substance P, and release it from their axon terminals at synapses with spinal-cord neurons. Because substance P excites those spinal neurons that respond most readily to painful stimuli, the substance has been suggested to be a sensory transmitter that is specifically associated with the transmission of pain-related information from peripheral pain receptors into the central nervous system.

Substance P is not the only putative transmitter shown to be localized in sensory neurons; the others so far identified include angiotensin, cholecystokinin, somatostatin and glutamic acid.

Figure XVI – 9

PROGRESS AND AREAS AFFECTED BY PAIN KILLERS



The gating mechanism at the first synaptic relay in the spinal cord regulates pain transmission to and from the peripheral pain receptors in the brain. In the dorsal horn of the spinal cord, interneurons containing the peptide transmitter enkephalin make synapses onto the axon terminals of the pain neurons, which utilize substance P as their transmitter. Enkephalin released from the interneurons inhibits the release of substance P, so that the receiving neuron in the spinal cord receives less excitatory stimulation, and hence sends fewer pain-related impulses to the brain. Opiate drugs such as morphine appear to bind to unoccupied enkephalin receptors, mimicking the pain-suppressing effects of the enkephalin system.

Figure XVI – 10

PROTEIN BUILDING CHART

Proteins in chains become hormones, peptides, polypeptides and neuropeptides.

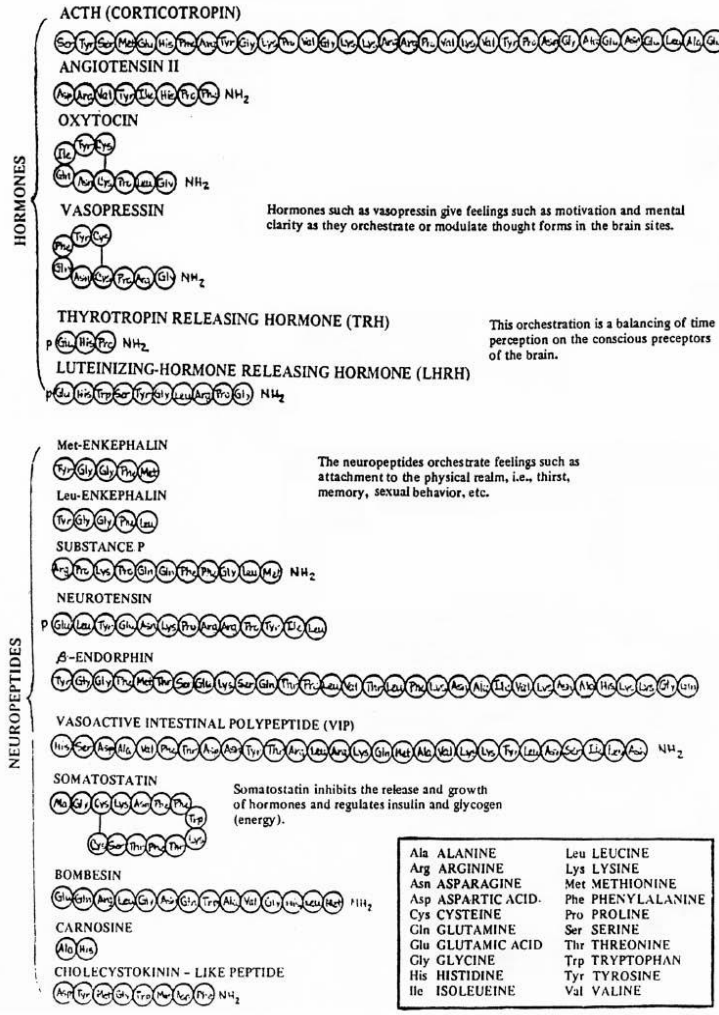
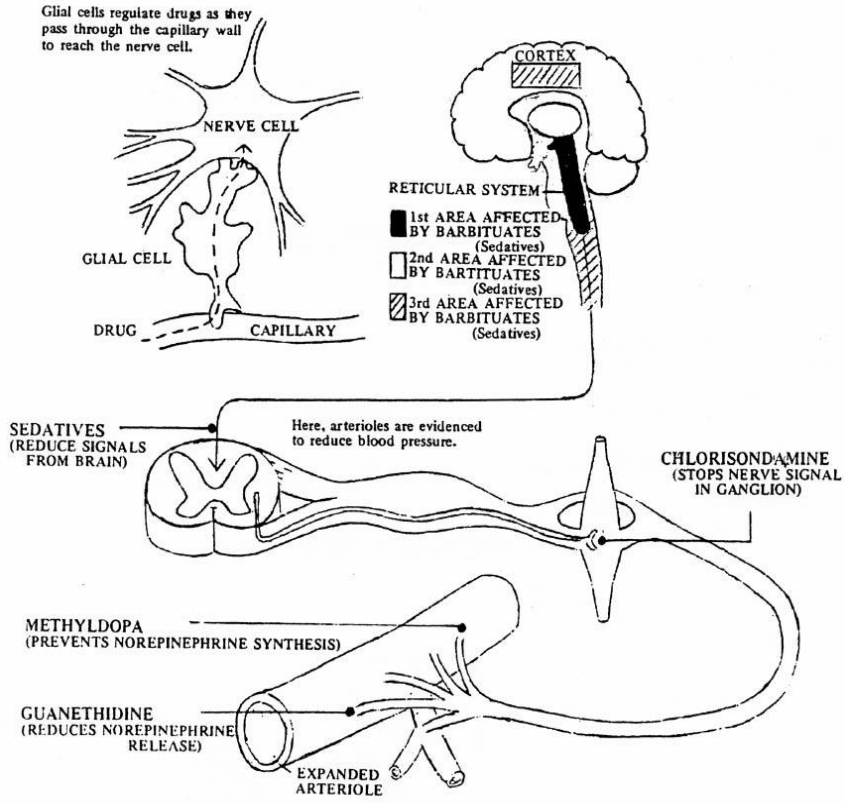


Figure XVI – 11

DEPRESSANTS, SEDATIVES AND TRANQUILIZERS

Barbiturates such as Nembutal and Seconal, as well as milder tranquilizers, relax the central nervous system, and are commonly prescribed as sedatives and sleeping pills. When taken in overdose they can be dangerous. Barbiturates account for an estimated 20% of acute poisonings admitted to hospitals, 6% of suicides, and 18% of accidental deaths. Often the user becomes confused, forgets that he has already taken his pills, and ingests an additional amount. Ingestion of 3g or more by an adult may be fatal because the drug depresses vital metabolic activities such as respiration. Alcohol and barbiturates have an additive effect, so the combination of the two drugs is especially dangerous and is a common cause of toxicity.

Methaqulone (Qualude) works in an area of the brain between where opium affects the brain and barbiturates affect it. This synthetic opium has become one of the most abused drugs.



Drugs and opiates when used as pain killers mimic the neuropeptides in such a way as to fool the brain and thus hide the pain from the conscious mind. Strangely enough, in the early part of the 20th century, opium was so popular that one out of every 400 Americans was addicted to it or one of its derivatives. Thus in 1914, the Harrison Narcotic Act was passed to place opiate products under strict controls.

Valium is another abused drug, representing a $4 billion market in the U.S. The greatest abuser of valium, representing one out of every four Americans, is the American housewife.

Valium withdrawal is one of the worst of the withdrawal symptoms I have seen. Huge skin eruptions covering major parts of the body are quite common as its stored toxins are released. Hospitalization is quite common in valium withdrawal.

BIRTH CONTROL

The female hormones in our systems are called estrogens. They are carried in the ovaries of a female, but regulated by a follicle stimulating hormone (FSH) in the pituitary gland, which has a receptor for the estrogens and is therefore sensitive to the levels of the estrogens in the blood. When the estrogen levels are low, a hormone is released that ultimately results in stimulation of the ovaries, which results in the production of and release of estrogen. Birth-control pills contain synthetically produced estrogen, and a progesterone called progestin to prevent conception, largely as a result of the actions of these receptors in the hypothalamus.

The main female organs are the ovaries, the fallopian tubes, the uterus and the vagina. Eggs (ova) develop in the ovary, and every 28-45 days are released into the fallopian tubes called fimbriae and move into the uterine cavity. If the ovary has been fertilized by a sperm, usually in the fallopian tube, it implants itself in the body of its uterus, where it develops into a fetus and placenta.

Time once again becomes a prevalent factor in the reproductive cycle. At first, there is a low level of estrogen and progesterone so that the hypothalamus begins to release two hormones, FSH-releasing factor (FSHRF) and LH-releasing factor (LHRF). These hormones move in the bloodstream from the hypothalamus to the pituitary gland, where they induce the release of follicle-stimulating hormone (FSH) and luteinizing

hormone (LH). In response to FSH, the ovarium follicles begin to enlarge, and in five or six days, one of these follicles becomes greatly enlarged and the ovum begins to mature. The maturing ovum release small quantities of estrogen into the blood and this inhibits further secretion of FSHRF from the hypothalamus, which in turn inhibits FSH from the pituitary gland. This causes regression in the lesser developed follicles. The one maturing follicle reaches peak growth in about 14 days.

Near the end of this preovulatory phase, LH is released from the pituitary gland under the stimulus of LHRF and prepares the ovarian follicle for ovulation by stimulating it to grow rapidly and swell to the point where it eventually ruptures and the developed ovum is released. This is referred to as the time of ovulation. LH is necessary for the final preovulatory development of the follicle and subsequent ovulation. Without LH (even with large quantities of FSH), the follicle will not rupture and ovulation in inhibited. (The pharmacological importance of this will be seen below.)

After ovulation, the ovum is gathered by the fimbriae into one of the fallopian tubes, where fertilization by sperm is generally conceded to occur. The ovum (whether fertilized or not) then enters the uterine cavity. The follicle from which the ovum was released changes and becomes a structure called a corpus luteum, which secretes both progesterone and estrogens. These hormones released from the corpus luteum maintain the uterus in a state that is conducive to the receipt of a fertilized ovum. This is accomplished by the maintenance of a highly vascular endometrial lining (or endometrium) on the wall of the uterine body. In addition, the estrogens and progesterone released from the corpus luteum act on the hypothalamus to inhibit the release of FSHRF and LHRF. During the next 10 days, the corpus luteum regresses, and within about 12 days ceases to function. Estrogens and progesterone being no longer released by the corpus luteum, menstruation begins and a new sexual cycle follows if fertilization did not occur. If the ovum were fertilized and implanted, the endometrium begins to secrete large quantities of hormones that act to maintain pregnancy and prevent menstrual sloughing.

BIRTH-CONTROL DRUGS

If estrogens and progesterone are admitted externally, this interferes with the natural hormonal cycle and inhibits ovulation. The amount

administered has to be properly balanced to minimize side effects. Excessive amounts can cause excessive menstrual bleeding and minimum amounts fail to inhibit the release of FSHRF and LHRF from the hypothalamus.

As a result, there have been developed low-dose combination pills containing 30 μg of ethinyl estradiol under trade names such as Zorane, Lo/Ouval and Loestrin. Besides blocking the hypothalamus, there are drugs that act on the uterus to produce an endometrium that is hostile to implantation of a fertilized ovum. These drugs have higher amounts of progesterone, which thickens the mucous discharge of the cervix so that sperm cannot gain access to the fallopian tubes. These drugs are under brand names such as Norinyl, Ortho-Novum and Ovulen.

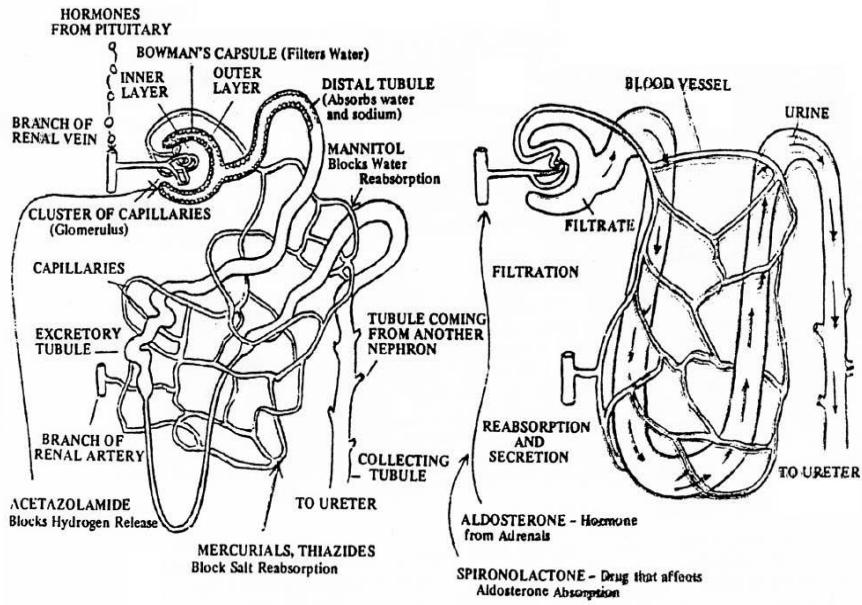
WATER BALANCE

When the mid-range minerals become deficient, we have a water balance problem. Here, one of the main areas affected are the kidneys. These twin organs get rid of wastes through the urine and then reabsorb the excess water.

Urine passes through two stages. First it contains acids and alkalines, salts and water. Within the kidneys are tiny filters called nephrons that reclaim the salt and water and dump the wastes into the urinary tract. Nephrons filter about 180 quarts of water a day. Common problems arise when too many toxins pass through and diseases such as heart failure occur when too much salt and water are reabsorbed into the blood. A condition such as this is called dropsy, and is treated with diuretic drugs.

Figure XVI-12

ACTION OF KIDNEYS



Some diuretics such as Mannitol block water reabsorption. Mercury is sometimes used to inhibit enzymes involved in the reabsorption of sodium with the nephron. Neohydine, Thiominine and Mercuzanthine are drugs in this class.

In addition to organ-related drugs, there are those that deal with infections. Sulfur drugs such as fanzil, diasil and pyrimal work primarily on the nephron level. Just as some drugs mimic hormones in the body, such as the previously mentioned psychoactive actions of LSD, drugs can work another way and compete with each other. In the formation of the nutrient folic acid, we combine glutamic acid and para-amino-benzoic acid (PABA), and this acts as food for higher cells. Alien bacteria readily attaches to these higher cells and the result is a disease virus spreading through the body. Sulfomamides (Sulfa drugs) work by substituting for PABA in the formation of folic acid. When this modified folic acid is absorbed by the virus it is toxic to the virus and the virus dies. These are gradually being replaced by antibiotics such as penicillin. Penicillin acts by blocking synthesis of the bacterial wall.

When using antibiotics such as penicillin and tetracycline, you should fast on juices and water for a few days first to make them effective. Then use them only briefly, because they destroy all friendly and unfriendly flora and fauna in the body. Immediately after the period of their usage and after the infection is gone, take a healthy dose of acidophilus to restore the body back to its normal bacteria level.

The main thing to do is to prevent disease by maintaining and supporting the many natural defense barriers we were given by God. The skin filters out dangerous ultraviolet rays, prevents internal tissues from drying out in the air, cools the body by evaporation from sweat glands, and eliminates waste products from the pores. It also helps make vital body chemicals and vitamins and exudes a protective oil called sebum.

If germs do invade the skin barriers, the body produces an anti-virus particle called the interferon. Interferon acts indirectly, taking advantage of a quirk in virus reproduction. An invading virus cannot multiply until it enters a body cell, where it can safely shed its outer jacket, thus freeing the genetic molecules inside. Then the molecules reproduce so wildly – up to 10,000 times in seven hours – that they seize control of the infected cell. They force the cell to make jackets for the newly reproduced virus molecules, which then become ready to attack other cells in the body.

If the body's frontier defense network is overcome, and infection and swelling occur, the white blood cells (phagocytes) search out and destroy the hostile cells. New research shows that the debris of dead microbes and phagocytes is drained and expelled by the lymphatic system. The thymus gland and the tonsils are some of the organs directly related, as well as the liver and kidneys. Drugs that are spent inside the body are removed in this fashion.

Now at the conclusion of this chapter we have studied how the body utilizes and produces various enzymes, proteins and hormones, and how when they are out of balance drugs are brought into play. Let us, in the final chapter discuss a solution.

CHAPTER XVII – ACT III, SCENE 1: PASSING OF THE PISCEAN AGE- THE SOLUTION – ENTER AQUARIUS

Did you ever ask yourself why children turn to drugs at high-school ages? What are the real long-term effects? What are the solutions?

If we turn again to the fact that man has a mental body, an emotional body, as well as a physical body, and realize that these bodies must be appreciated as well as understood, we begin to realize the true insight to the problems at hand. Our modern day so-called orthodox learning institutions make no mention of the different bodies, and continue blindly with educational programs that are more than a century old. To further complicate this, we are subject to an environment of smoke, smog and poisons that have a great deterring effect on the proper development of young people. Thus the spiritual side of man's development is all but forgotten. Religion is a poor substitute, and forcing children to Sunday school after five days of institutionalized exposure leaves the children no time for themselves.37 With this as a normal way of life, how can the child ever find his or her personal identity?

Today, we live in a mental environment. Mental energies combined with present stress cause a vast depletion of hormones related to the functioning of the mind, such as vasopressin, oxytocin, adrenalin, norepinephrine and so on.

The feeling upon exhaustion of these hormones is usually detachment, rejection, lack of motivation for self-betterment and a host of other negative feelings that children and young adults feel, and thus begins a search for an alternative measure.

They usually do not have to look too far, for greed-motivated drug pushers that are society-supported by anti-drug laws. They readily supply drugs of all natures at a substantial fee to ease the pains of growing up and the lack of motivation.

But the drugs are only temporary, and as energy seeks its own balance, cults begin to form of children and adults addicted to the same drug type. Hence, you hear of dust freaks, acid heads, pot heads, heroin addicts and an endless list of nonconformists. Many of these cults eventually reach

the limitations of drugs and seek a second solution, whereby they- move from the city's rural areas and form remote communities. This is in effect the beginning of the solution, for drugs are harder to come by in remote rural areas.

Next, these new-founded communities begin some farming and ecology work and eventually the holistic approach begins. The solution begins to solidify itself by natural laws and not the laws of an ignorant, overbearing society.

Let us return now and examine the problem on a dietary level.

1. AVERAGE DIET. The usual diet in the United States is composed somewhat as follows (adult men):

Carbohydrates	about 1,700 calories
Proteins	about 350 calories
Fats	about 1,200 calories
Minerals and Vitamins	0 calories
Total	3,250 calories

2. CARBOHYDRATES. a. Supply a ready source of fuel for the body's energy requirements, and certain items for synthesis.
   b. Provide about 50% to 60% of the dietary calories. Of these about two-thirds come from cereals and about one-third from sugars.

3. PROTEINS. a. Supply materials for synthesis and energy.
   b. Provide about 10% to 20% of the dietary calories. Actual protein need, however, is only about one-half of this amount, i.e., in the neighborhood of 45 gm daily.
   c. The following essential amino acids are required for protein synthesis:

tryptophane	250 mg per day	valine	800 trig per day
phenylalanine	1,100 mg per day	methionine	1,100 mg per day
lysine	800 mg per day	leucine	1,100 mg per day
threonine	500 mg per day	isoleucine	700 mg per day

4. FATS. a. Supply richest energy source to the diet.
   b. Contribute up to 40% of the calories in the usual diet.
   c. Usually about 70% animal fat.

Here we see what is average. But what is not shown is that we live in an unbalanced environment. This means our soil is deficient in minerals, our air rich in smog. The only way we can balance our bodies on a metabolic basis in this unbalanced environment is to find our individual deficiencies and then compensate for them. Testing used to find these deficiencies includes Iridology, Kirlian Photography, Kinesiology, Urine-Saliva testing, Hair Analysis and a variety of New Age counter-measures.

The two most common drugs on the street are cocaine and marijuana. Cocaine is used to stimulate, and substitutes for a deficiency of vassopressin on the receptor sites of the brain, and it stops the flow of serotonin. Marijuana is usually connected to a substantial mineral deficiency.

Vasopressin is made up of lysine and arginine with an absence of tryptophane, a key ingredient used in the production of serotonin. So why not formulate a special protein powder that consists of high amounts of lysine arginine and contains no tryptophane? Then add a time release enzyme such as mono-amino oxidase which will insure digestion in the small intestine and guarantee a high natural amount of vasopressin and a low production of serotonin. Furthermore, this special protein powder should be made from all organic natural substances. We have done just this and administered it to people with heavy cocaine habits. Guess what? In a few short weeks, they lost their desire for the pleasures of cocaine because, for the first time in the lives of many, their bodies became balanced.

The next thing we tried was to give large amounts of minerals grown in plant cultures such as those made by Eden Ranch and Shiloh Farms to marijuana users. Also, we supplied large amounts of B-complex to both groups, and our marijuana group lost their desire for marijuana. Those in the groups that stayed on the protein powder and the B-complex began to lead productive lives again.

Eventually, when time permits, we at Pyradyne will produce this special protein powder and make it available to the public. Algae and spiral plankton from the sea are also becoming a substitute for drugs. Plankton, rich in minerals, when taken in a liquid form through the nasal membrane produces a natural high that lasts for several days. Remember, a natural high is only a conscious perception of the balance of all forces (spiritual, electrical, metabolic) in harmony with the surrounding universe.

Now that we have had a strong nutritional, metabolic and spiritual focus in previous chapters, let us study the intermediate stage of development, the electrical systems.

Genetic mutation is all right in its proper place. The children of tomorrow will be of super-human physical and mental strength. Science fiction becomes science fact. In Tibet, for example, super-human sports such as tumo (melting ice with concentration) are indeed a reality today.

In our quest to reach the super-conscious state of being, we must alter our hormone structures to produce a hormone that, when released into the receptor sites of the brain, allows the synaptic messengers to unlock

secret codes of energy that lie hidden in the folds of nature. There are various methods to achieve this, but it all takes time.

As you know by now, in most people, the body is over-producing the hormone serotonin due to a polluted atmosphere. This condition of air pollution added to polluted, poor food and water supplies has slowed down natural processes of what could be considered a steady evolutionary growth that takes place in all living things.

Just when we are about to receive our Go- given rights and fully recognize that we are all sons and daughters of God, we have interfered with the temple of expression, our brains and bodies.

This, however, does not stop the natural law of progression. Our universe is evolving faster and faster every day, every hour, every minute and every second towards a natural synthesis of all planes of consciousness into becoming aware and conscious that we are all unified into a God-given plan. Because man as a whole is drifting away from perfection, this divide between the universe and mankind is creating a site for the enactment of Armageddon. Armageddon will sweep the physical plane clean of debris and unclean actions. Those souls who remain will carry on God's plan and those who are removed will bear witness to the New Age. After a time known as the White Throne Judgment Day, those who are removed will be allowed to reincarnate again with a better appreciation for Divine Order. During the Judgement Day, however, there will be a cessation of all heaven world activities so that all souls will bear witness to Divine Order and the Second Coming.

If there is a resistance to this, as part of the plan, a second choice will be made apparent. This choice will be that creation ceases to exist and the universe and all beings in it will go into a state of Prayalaya or non-existence. You may ask yourself at this point, "How can we all help instill natural change to occur again within forms, and thus eliminate a future point of conflict on any level?"

We do not pretend to have all of the answers. We do know, however, that the various pyramidical shapes we have developed do in fact help a lot of people through dramatic changes. Over the years, we have had hundreds of very positive letters telling of results from people using our components, systems and dietary suggestions. Every pyramid we have developed was field-tested first by impartial, uninformed people, and

none had any guidelines as to what to expect. It was only after the results were in that we explained and formulated the conclusions written upon these very pages. The various clinics involved were given only rudimentary guidelines to follow, relying mainly on their own expertise and training to reach their conclusions.

"Where are we now?" you may ask, "And where are we going?"

The answer to these questions are multi-leveled. First, we have new headgear we are constantly experimenting with. One unit is called the Christlyadome (pronounced Chris-sil-a-dome). The Christlyadome uses a Powerdome base with a layer of pure diamond dust and fused quartz on its surface. This combined layering appears to cause the minerals present on the brain receptor and effector sites to switch at much higher speeds and color octaves than is normally possible under polluted conditions. This effect, over a period of time, can cause a change in the utilization of protein to form hormones throughout the various endocrine centers within the body that will further bring on a super-conscious state of being. This form of Space Medicine we feel is necessary for the working out, building and manning of Star Ship Systems Technology. I am sure it will have significant consequences in the medical world when it is finally presented to that domain.

The systems technology we have developed is explained later in this chapter. We do not know how far out systems technology will go. One example of how far it is at this time is our development of a device similar to one called the Depolar-ray designed by Thomas Colson and Fred Hart. The original Depolar-ray was used in 1947, operating at various frequencies in the 47 Mega hertz region, to help speed up cellular and tissue healing throughout the body.

We now are developing a modern-day version of this device called by Pyradyne, the X-1 Healing Machine. This device will allow the body tissues to heal in a matter of minutes, damage that would normally take weeks or even months to repair itself. Remember that when we overcome time at the cellular level, with technologies such as ours, this type of device is well within our grasp and utilization.

THE RECEPTOR

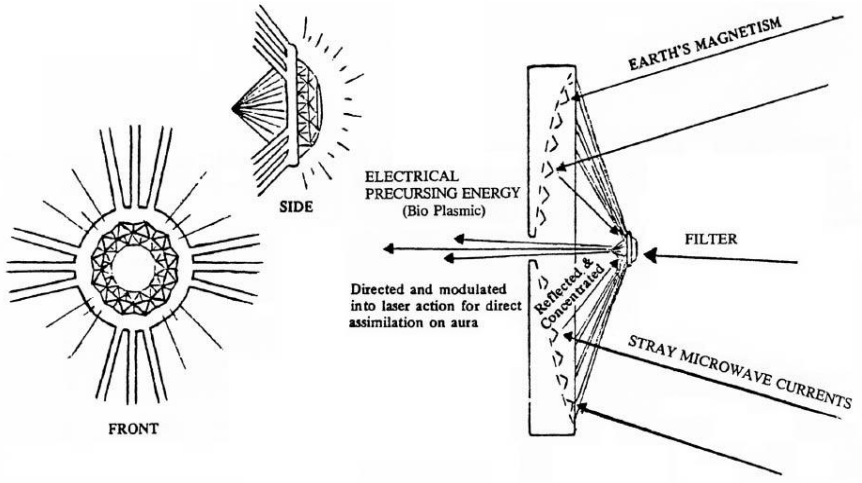
Another one of the alternative ways of directing the expansion of consciousness is with the Pyradyne Receptor. Just as the various

headgears mentioned in previous chapters have a balancing and stimulating effect on the body's energy centers or chakras, the Receptor works directly through the vagus nerve, directing the Seven Rays of Lite Force Energies into the Aura. The Receptor combines the Seven Pyramid Energies (Fohat) and processes these into a form of physical (positive polarity) and spiritual (negative polarity) by using a concave dish design which allows some of the pyramids located on its surface to maintain a vertical and horizontal position in respect to the earth's gravity and magnetic field as it is worn in a gold chain around the neck.

Also, incorporated into the design of the Receptor are various gemstones which modulate the Fohatic Force into any one of seven basic frequencies, these frequencies being determined once again by the particular stone used. (See the chart in the back of the book.) Once the energy is gathered by the receiving dish, processed into its proper positive-negative polarity and conditioned by the gemstone, it is directed in a small laser-like beam through a small hole in its center to the Aura of the particular individual wearing this unit.

The polarity of the beam is of a circular nature as it enters the Aura, and by gazing directly at the front of the Receptor, you can see the byoptical comparison, which is the arrangement of the grooves through the centers of each pyramid. The Fohatic Force is brought into a concentric spin which when projected into the body, alters in minute amounts the inner energy coming from the higher planes. At the precise moment it separates from the Astral Plane to the first ether of the Physical, the force is "stepped up" or stimulated by the Receptor. This kicked-up force is pumping energy at a precise rate over a given measure of time, so that as each new cell is formed by mitosis in the body, the electrons spinning about the cell will conform to and be attuned to the new Aquarian Age frequencies.

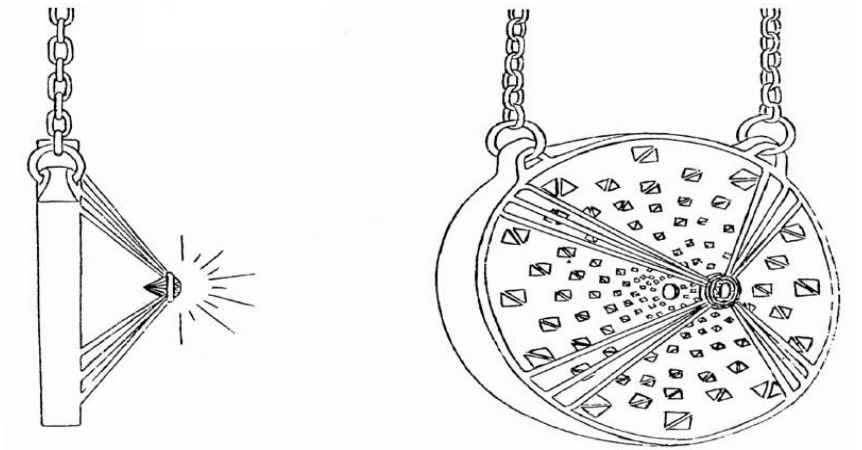
Figure XVII – 1



THE RECEPTOR allows any given individual to experience changing external environmental conditions with a new inner-standing and a clairvoyant view of the cause or causation behind the change as it occurs. This is in effect a naturally balanced way to deal with changes in the universe without a need for drugs.

Remember, our environment is becoming ever more stressful because of toxic waste products formed by an ignorant sociological technology and corrective technical tools like the Receptor are fast-becoming necessary.

Figure XVII – 2



THE SOLUTION CONTINUES

I have explained pyramid energies on a component level, shown how my associates and myself have integrated the present-day technologies into a vehicle whereby a positive usage is attainable and presented an in-depth study of means to expand our capabilities far in excess of our present potential.

In our brief glimpse of the Receptor, we saw how to bend and shape energy and integrate it with time. Now let us look in even greater depth at field potentials, and begin our journey into time and finally space. Each step must be examined, contemplated and experienced separately because we are on the fringes of Time and Space Travel. This is the final goal of our journey into the ever-expanding field of potential called the Universe. My staff and I have taken the holistic approach to prepare our temple, the body, for its journey into the mind. Only by following the basic dictates of spirit can we ever conquer the vast distance of space through its governing medium – Time – and the eternal presence of Now.

AN INTRODUCTION TO PYRADYNE SYSTEMS

Studies of ancient glyphs and various pyramidical designs appearing in different configurations all over the world have provided us with further information about travel into deep space. Our ancestors were well-versed in the practical application of Time and Space, Science and Technology. As our sun rotates around the Central Spiritual Sun, Alcyone, located in the Pleiades, every 25,827.5 years, a tremendous inflow of universal inner knowledge is released to the outer brain of man. This outflow occurs every 12,914.7 years. This is the length of our cosmic solar day. We are just now leaving the solar night period of rotation as the Piscean Age represented the final hours of darkness and the early hours of morning.

Just as when you wake up in the morning, it takes time to get moving and prepare for the new day ahead, so does it take time to get moving in the New Age. Our bodies, minds and spirits must be synchronized and brought to a balance never before necessary if we are to tune in to the sounds of the New Age. This means a balanced home and business environment as well as stable relationships in between.

We have by now recognized that in order to achieve balance on the physical level, the electrical nature of the body has to be balanced first. This involves the science of Shape Energy. As we are all aware, we have electrical auras that are produced by man's metabolization of minerals in the brain and shaped by the pattern of its nadis in the nervous system. The aura is intensified by mutual induction or the harmony of one bridge of nerves to another.

The Earth, too has an ever-changing aura. Its minerals, when struck by the thoughts and actions of man, release tremendous amounts of electricity into the space around us, further influencing our own auras as well as setting up a magnetic field in a north-south direction about the planet's surface. The Akashic Records, containing all actions of man throughout Space and Time, are physically stored in the Mineral Kingdom. This is Earth's memory. When we attune ourselves to these vibrations, all the secrets of the universe become our own. The true meaning of alchemy is in the Philosopher's Stone.

The author, knowing that part of attunement lies in the hidden meaning of Shape Energy has developed Systems Equipment that greatly accelerates man's ability to reach a super-conscious state of being. The Pyradyne Meditation and Environmental Equipment is now being commercially accepted because of its successful track record in improving the physical and mental conditions of many businesses all over the world.

Our Systems IIIs have also found their way all over the country, and produce a variety of altered states of consciousness. Spending time in them is mandatory before moving into something like our T-700 Time Travel Transposer. Because the magnetic and electrical conditions are so intensified in Time Travel, unless you have prepared yourself for the experience, you may become sick or disoriented for a period after the journey.

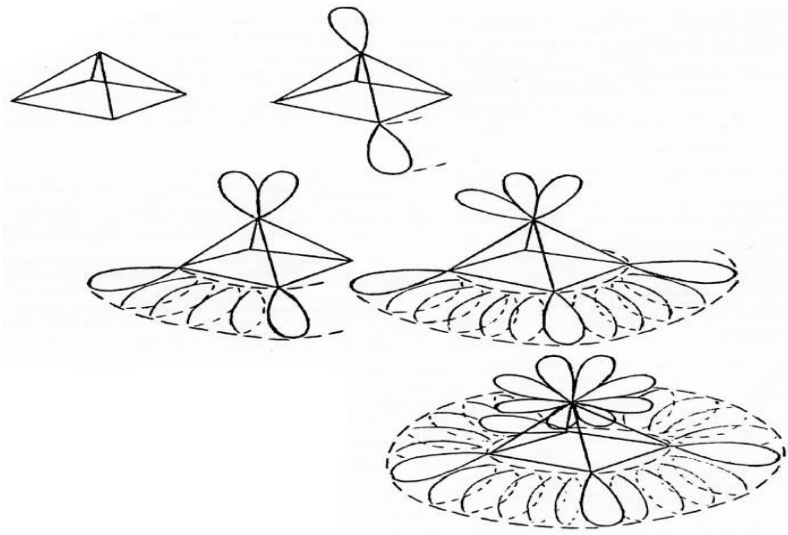
Pyradyne, besides being a holistically oriented company is primarily directed towards Astrospace development. The holistic approach was necessary as part of a Space Medicine Program. In the Aerospace industry, Space Medicine was a prime ingredient towards successful moon landings, because the vehicles used there were only as good as the builders and operators who were their creators and pilots.

Pyradyne will be among the first of the New Age companies to build the starships that will travel far beyond the Barrier of Light. These ships are already on our drawing boards, and the concept models are being built in our shops. Time Travel is part of the program, and we are currently taking orders for our T-700 Time Machines. The T-700 is not a catalog item as of yet, but we are processing all inquiries.

THE COMPONENTS OF A SYSTEM

37 The author is not opposed to Sunday school or other forms or religious training, but feels that children should be gradually introduced to the training on a daily basis rather than cramming it into an already overcrowded schedule.

Figure XVII – 3



Here we see the lines of force building upon one another until the entire force field is present. This is the total component force field of a Pyradome.

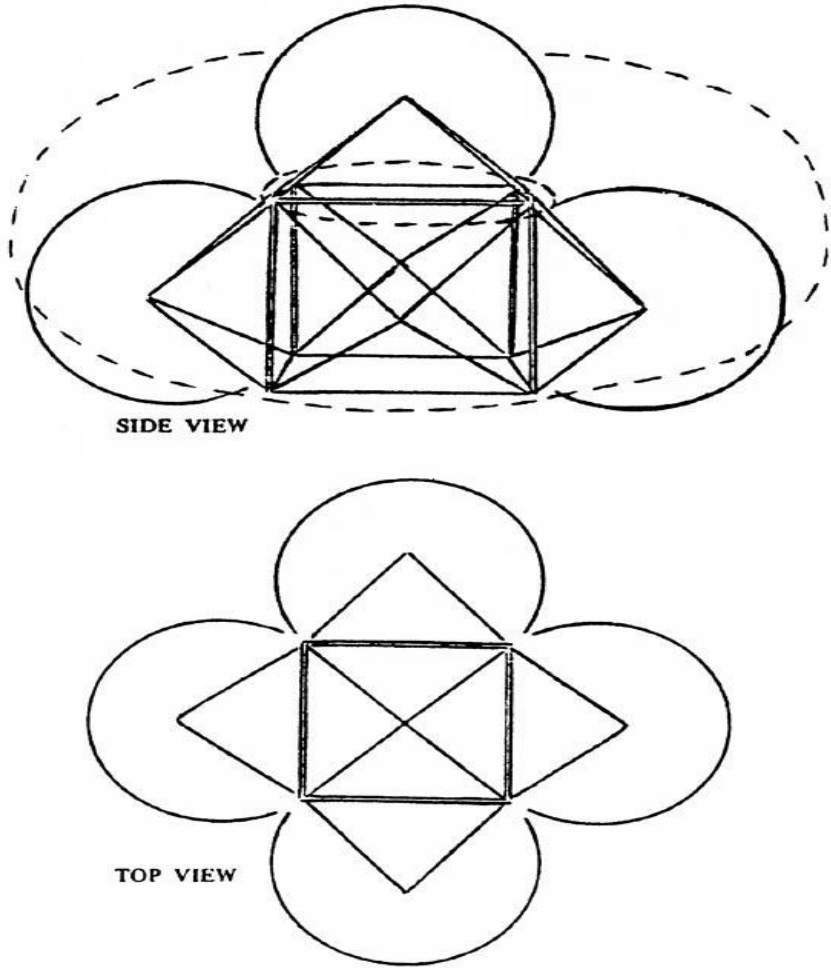
As we have seen in previous chapters, each individual line of fohatic force builds itself by induction, forming an overall energy field that conforms on the physical plane to the pattern of a "P" orbital. When one pyramid is placed adjacent to another, there is a combined effect

which builds and shapes the force field to greater and different proportions. The path or zone of this field can be polarized positive or negative depending upon the positioning of the apex-base relationship of the pyramid and the surface of the earth.

All of our systems equipment takes full advantage of these principles, along with the orgone layerism and negative ionization.

THE ORB

Figure XVII-4



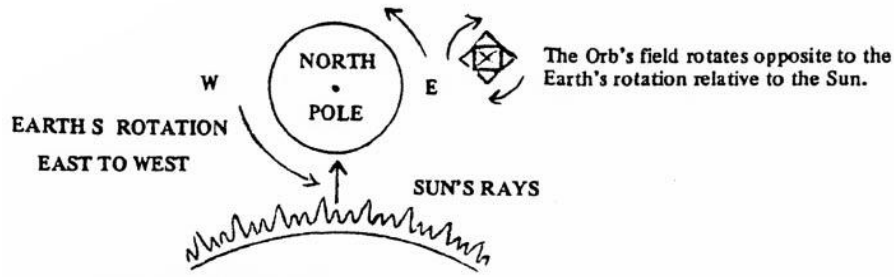
One of our first pieces of systems equipment was the Orb. The Orb produces a lotus-shaped field whose vibratory rate can be determined by what type of mineral is placed in its center. If a tranquilizing effect is desired, a blue stone (sensitive to heart chakra) such as turquoise or aquamarine is placed into the central cavity. If you would desire a physical energy response (adrenals), a ruby or diamond would be used. (See chart in the back of the book.)

Each Orb has a field pattern shaped like a four-petal lotus. This pattern pulsates from its central or core vibration. If nothing is in the center, it reverts to the frequencies of the basic metals involved in the construction of the pyramids themselves. The overall field pattern of the Orb rotates opposite to and in conjunction with the earth. If you were in space viewing the earth from a stationary point, and further, for the sake of clarity, you could see the energy fields of the Orb and the earth, they would appear to turn their energy fields much like the gears in a clock.

It is important to understand the field relationships and their basic interactions when dealing with systems that produce time and space warp capabilities. Without this as a consideration, it would be easily possible to be lost in space and time.

The Orb, when used with the Irradiator, will pulse the field of the Irradiator, forming a diamond shape when viewed from above. The body responds to this vibration in that transmutation becomes possible: Genetic (physical), Electrical (mental) and Siddhic (spiritual). This fact was also implied in ancient texts when man had magical powers due to the application of the Philosopher's Stone (diamond).

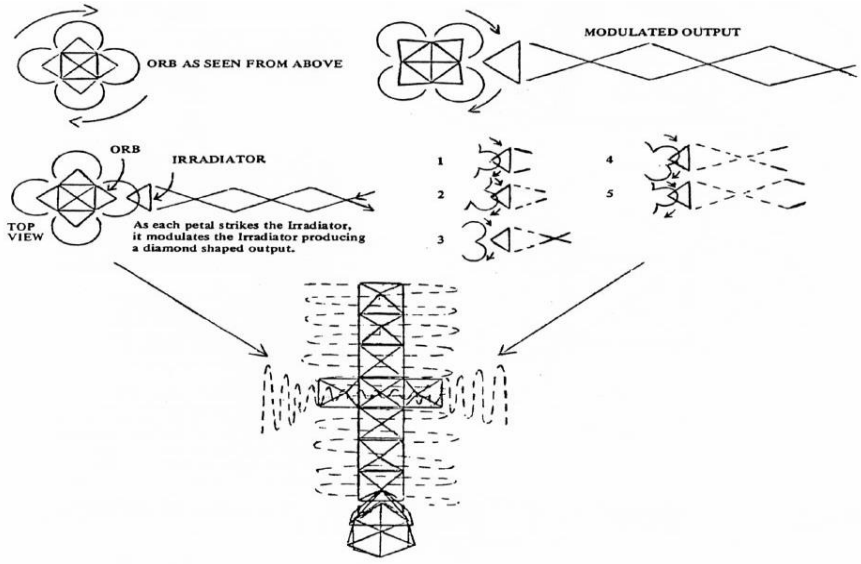
Figure XVII –5



ORB – IRRADIATOR RELATIONSHIP

Shown here is the relationship of the Orb combined with the Irradiator. The Irradiator is placed on top of the Orb, and the drawings here depict a vew of the energies shown from the top.

Figure XVII – 6



THE STAR ORB, THE DEVASTAR AND THE CAPSTONE

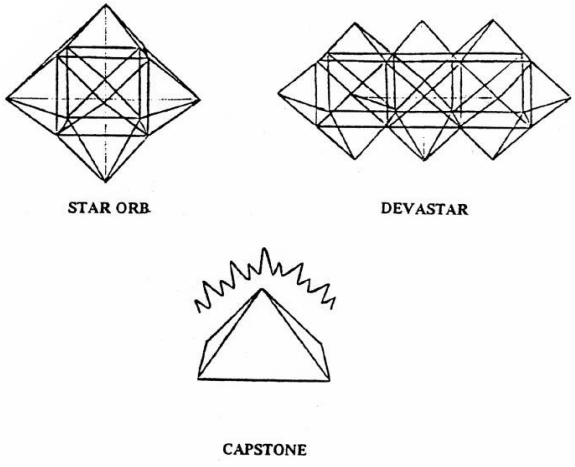


Figure XVII – 7

Each Pyradyne Orb has a definite purpose. The Septagrid Orbs are used as negative-ion distributing units. The Solar Orb when placed over a desk or work area provides a constant source of energy. The regular Orb and the Solar Orb can be modulated (the energy directed into the mental centers for mental activities, physical

centers for physical activities and so on). See the chart in the back of the book.

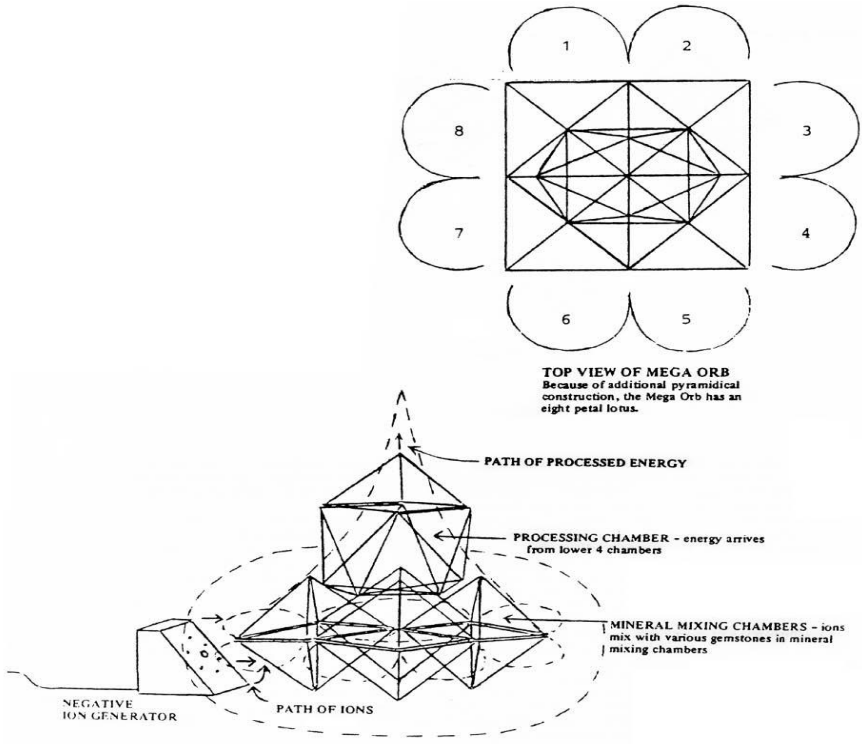
Unlike the other Orbs, the Star Orb and the Devastar cannot be modulated. This is because we use stainless steel circuitry in their core network. The properties of stainless steel are of such a nature that it tends to dampen stray energy vibrations. This means that sound such as noisy mufflers, street noise and other acoustical annoyances can be neutralized when combined with pyramidical forms such as the ones in the design of the Star Orb and the Devastar. Random and negative psychic energy can also be neutralized. This type of equipment is in use by different governmental agencies worldwide to protect their high-level officials who are relied upon for major decisions that affect people, property and freedoms.

The Star Orb is used usually in small areas such as lobbies, waiting rooms, bedrooms and other such areas where a high level of calming is desired. The Devastar is used in large buildings such as high rises, department stores, or auditoriums where hundreds and even thousands of people are subtly affected by the Devastar to help them achieve a more harmonious state of being.

The Gold Capstone increases the calming and tranquilizing effects of the Portamids. It utilizes a large amount of pure 24K gold over a solid surface area that reflects the apex energy down to the base of the Portamid. This gives a Portamid an increase of about 10 times the available energy and power. Usually when an Irradiator is used in conjunction with a Portamid for controlled Astral Projection, the Capstone will be found on top of the Portamid. In this way, we are preventing energy leakage.

MEGA ORB

Figure XVII – 8



The Mega Orb is a second-generation Orb that will handle multiple numbers of gemstones and includes a processing chamber where the horizontal eight-petal lotus field is polarized vertically and sent directly into the Irradiator column. The processing chamber is necessary because the addition of negative-ion generators greatly accelerates the speed of the electron cloud formed in the lower chambers. A quartz or diamond crystal is used as a processing gem.

The Mega Orb was especially designed for use only with the Irradiator. The reason for its conception was that when an ordinary Orb was used, with only one chamber, it severely limited the output capacity of the Irradiator column. The regular Orb can be used by itself for an effect, whereas the Mega Orb can only be used in conjunction with an Irradiator column, as all of the stainless steel circuitry is of a closed loop design.

THE IRRADIATOR

The Irradiator works much like a laser in that the energy is raised to a high velocity and projected out of the base in one direction only. Let us look briefly at the Laser.

The action of the Laser (Light Amplification of Stimulation of Emissions of Radiation) is similar to the generation of electricity, except that instead of a rotating magnetic field being the source of motion, we use random light as our source of motion. See Chapter I. The random light separates itself inside of a medium, and depending on the medium used (ruby rod, helium argon gas, etc.), filters itself into one frequency. This frequency, being one of the seven primary colors, then leaves the crystal in a high-energy beam.

In the irradiator, we feed in processed energy from one of the Orb bases, step it up, focus it into a vertical beam and project it outward in a very tight pattern. One of the secrets in the projection of fohatic force over a vast distance via a pyramidical structure, lies in grounding the apex of the pyramid with the feed wire coming up from the Orb column, which is placed at the base of the Irradiator column.

Figure XVII – 9

ENERGY PATTERNS OF THE IRRADIATOR

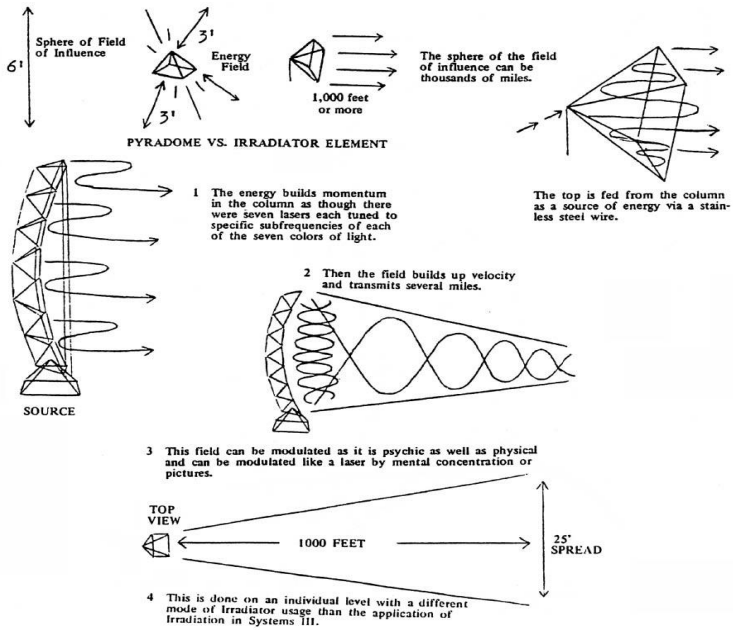
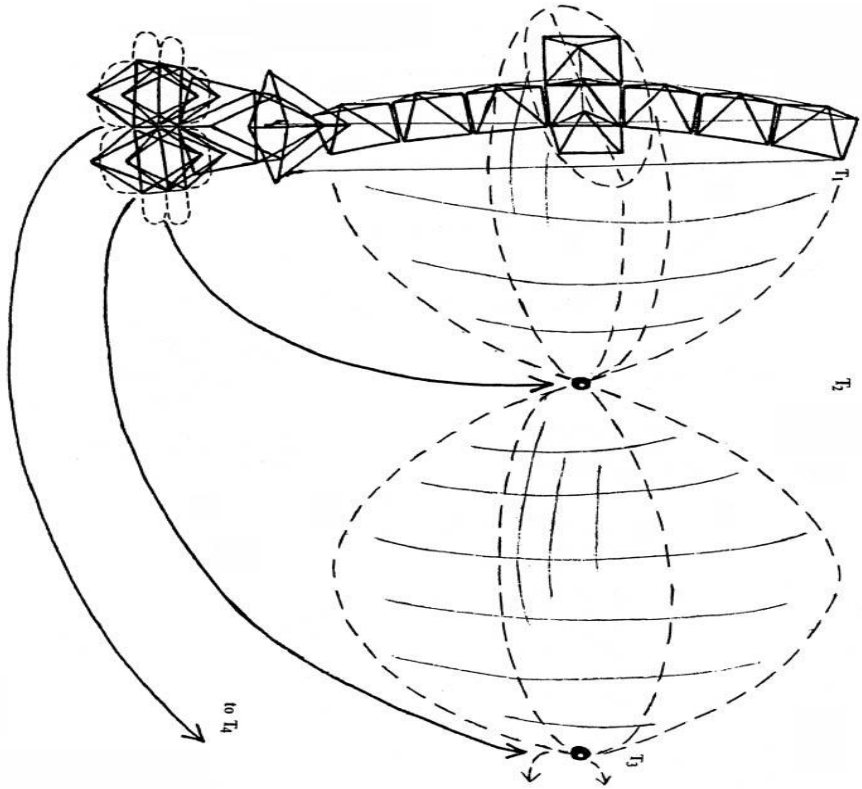


Figure XVII – 10

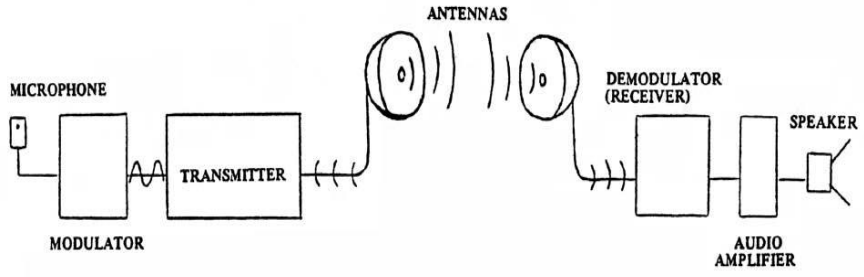


Here we see the horizontal-vertical relationship of the Mega Orb – Irradiator combination. Zones T1, T2, T3 and T4 (occurring at the next node not shown) are determined specifically by what gemstones and negative-ion sources are used to modulate combined outputs.

ANTENNA SYSTEMS – SECOND FUNCTION

Normal Antenna Systems consist of a transmitter or receiver and an antenna.

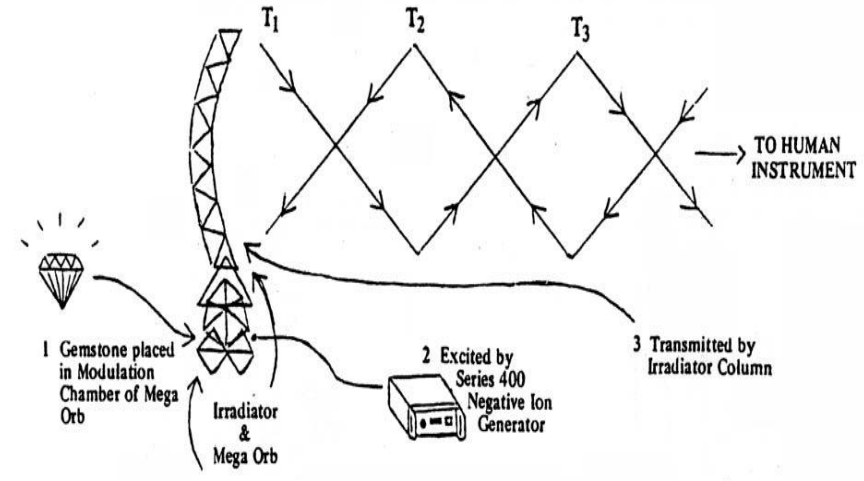
Figure XVII – 11



Electrical energy is stored in the transmitter until it reaches peak potential, then it is carried by a co-axial wire or wave guide, depending on the bandwidth, and delivered to the antenna. When it reaches the antenna, it propagates itself off the antenna and is dispersed into the surrounding environment. In its most common usage – radio and TV communications – the intelligence is received as electrical energy and converted back into audio and visual information and then heard on a speaker or seen on a screen. See previous chapters.

In the case of the Pyradyne Antenna Systems, the phenomenon is the same but the universe is the transmitter and the human instrument becomes the receiver. Or vice-versa.

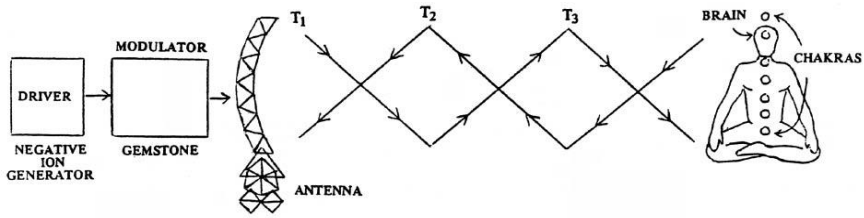
Figure XVII – 12



In the case of a complete Irradiator System, we place a gemstone or series of stones into the Mega Orb transmission cavity. Then the cavity is excited by the raising of the electron rings in the gemstone by the addition of negative ions (electrons). The rate of transmission is determined by the frequency of the stone used. The human instrument responds to seven different octaves of sound, light and color.

Once ionization takes place, the energy, now exact intelligence, is sent up the feed-wire on the back of the Irradiator column and transmitted through space and time by the actual column of the Irradiator itself.

Figure XVII – 13

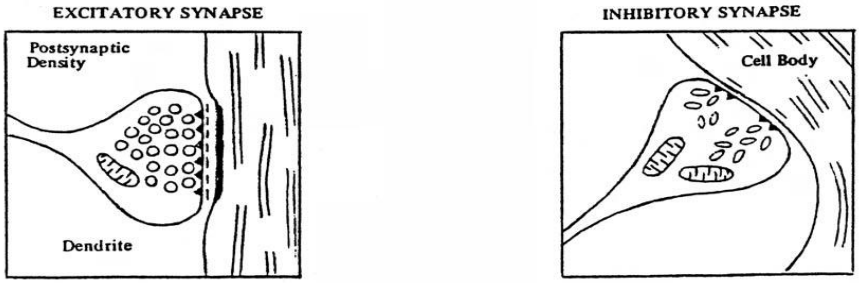


Notice the arrows signifying the directions of the energy flow. In a normal electrical wave transmission; there is a positive and a negative component of a propagation wave. The interaction between the polarity of negative and positive crests gives the wave its propagational qualities. In the case of an Irradiator System, the wave differs in that one component is sent to the receiver or person and the second component is fed back to the antenna. This completes an interdimensional loop-transmission through the Astral Plane and thus the term Irradiation comes into being. A complete understanding of this is necessary when designing. Time Travel Equipment. The distance between crests is signified by T1, T2, T3 etc. This distance changes with the different gemstones used. It is called the peak modulation distance.

On the receiving end, the chakras or nerves of the parasympathetic nervous network respond by stimulating or blocking hormone uptake to the brain. The brain responds at the sympathetic junction of the sensory neurons. Here through enzyme action, a release on the transmitter sites takes place at the neurons. The transmitters are either excitatory or inhibitory, depending on the type of transmission release. Such synapses have been distinguished morphologically in the electron microscope; excitatory synapses tend to have round vesicles and inhibitory synapses

tend to have flattened vesicles. Thus you can easily see how Shape Energy in biochemical transmission and reception is extremely critical and effective.

Figure XVII – 14



Next, of course, our feelings and thoughts are affected and we are lifted into a super-conscious state of being. In the super-conscious state, all things become possible.

SYSTEMS ORIENTATION

Systems III and Systems III-2 are capable of allowing human perception of time and space to increase not only in consciousness but also in form. When the directions herein are adhered to, time can be reversed or advanced and gravity overcome.

Each column in the System will modulate a specific organ when used with corresponding gemstones as shown in the table in the back of the book. When seven or more columns are used simultaneously, seven sets of modified, superficial behavior patterns can result. This allows the operator to reach a state of consciousness called Siddhi. Siddhi then acts as a doorway for all psychic and super-physical activity.

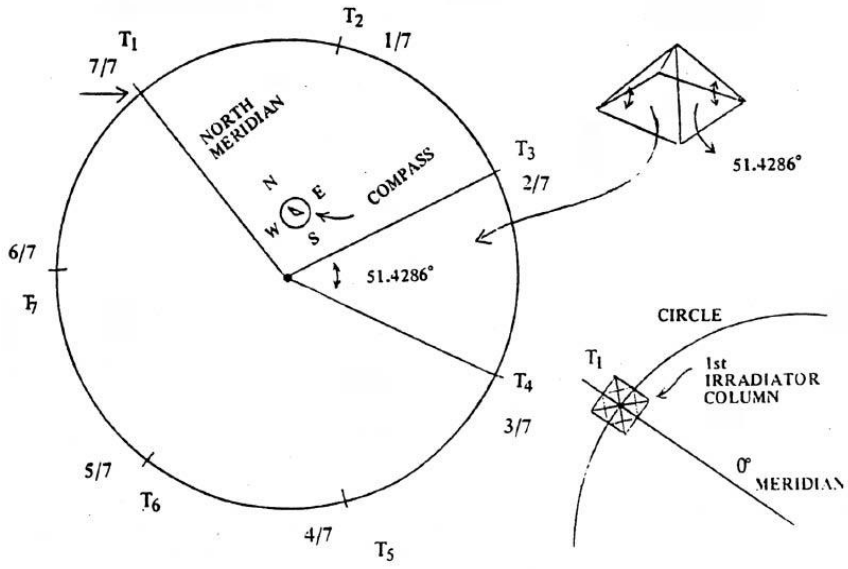
A TYPICAL SYSTEMS SET-UP PROCEDURE

1. Select a relatively open room with a smooth floor surface.
2. Draw a large circle on the floor at least ten feet or more in diameter.
3. Place a compass in the center of the circle. Next, construct an imaginary line from the center of the circle to the first intersecting meridian of the circle as-the compass points to the

North. This is the position of the first Irradiator column and is called the Key Column. In the drawings, it is referred to as T1.

4. Next, from the center of the circle, use a protractor and draw a line exactly 51½° of arc from the first line on the Magnetic North meridian and where it intercepts the circle, place the second column. This intersection is T2. Continue this procedure until all seven columns are exactly 1/7 equal distance from one to another and are facing the center of the circle.
5. Once all of the columns are positioned equal distance around the circle, place the seven Orbs under the Irradiator columns. Allow three days for room vibrations to settle before moving into Phase II. Also, note that the side angle of a pyramid is 51½° and seven times this has equaled a circle. Your seven columns positioned in sevenths have formed a perfect circle mathematically expressed.

Figure XVII – 15



PHASE II

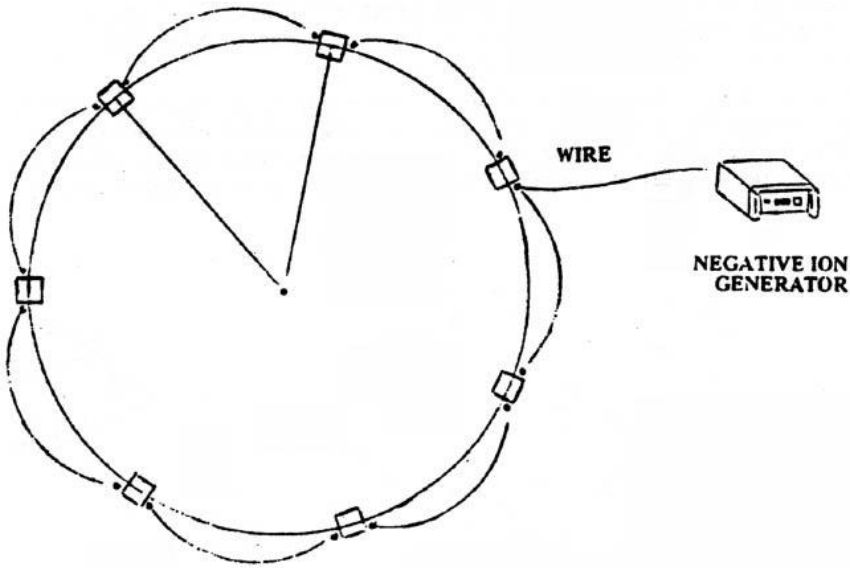
6. Refer to the back of the book.
7. Place a corresponding gemstone for the top organ, the pineal gland, in T1. Then place a gemstone for the pituitary gland in T2

and continue in a clockwise order with the proper stone in each time zone so that T2 has the proper gemstone for the gonads or sacral chakra. Arranged thus in a clockwise direction, you are ready for forward time travel. In the reverse order starting with the gonad stones in T1, you will achieve reverse time travel effects.

PHASE III

Connect the Pyradyne Negative Ion Generator to each of the Mega Orb and Irradiator columns. Make sure that each column is properly insulated from ground potential.

Figure XVII – 16



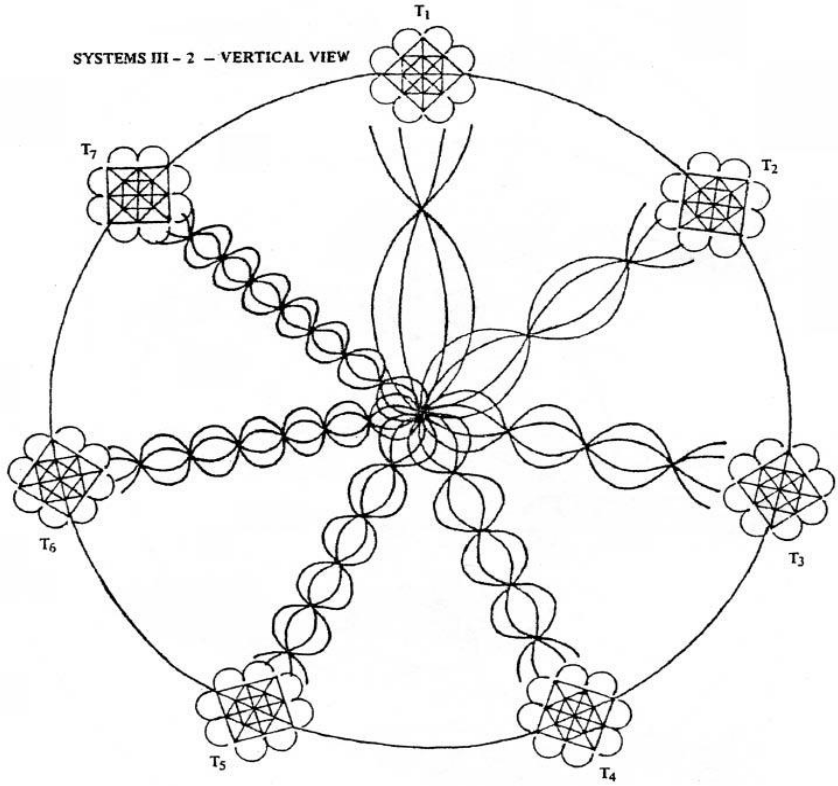
SYSTEM ACTIVATION

Clear the room of pets, plants and small children. Activate the Negative Ion Generator to 20KVA. Place yourself in the center of the System's circle. Hang on, you are going for one wild ride. As you balance yourself on the higher realm, you can begin to experiment with higher voltage settings. Do not go too fast, as at first the body will release many toxins.

In the next drawing, you will have a vertical view of a seven-column system. It is operating at a lower frequency, approximately 1/7 that of

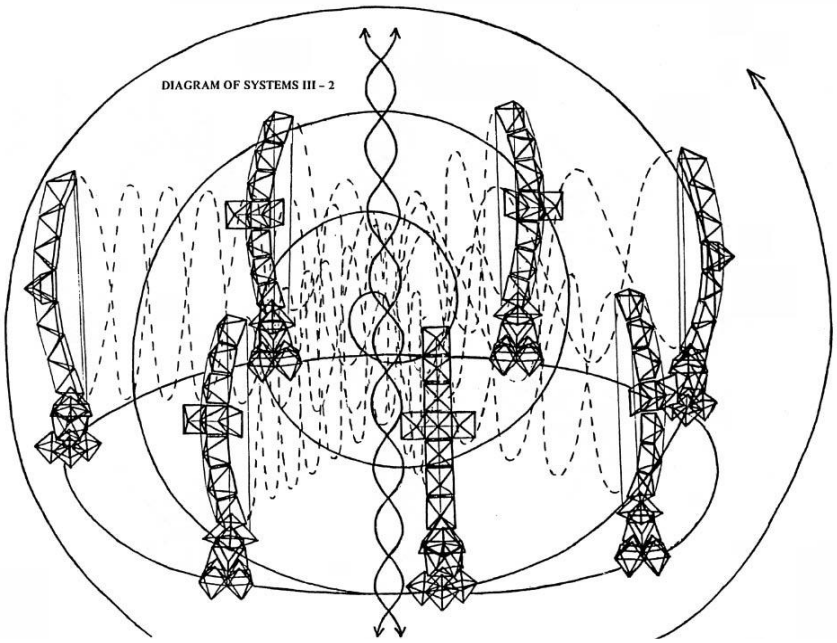
T7. T2 is operating at an octave twice that of T1. T3 is operating at a frequency that is the total of T1 and T2 added together. T4 would be at the frequency of T2 added to T3 and so on. This number of octaves concurs with the harmonies of the previously mentioned Fibonacci series or natural growth patterns. In this case however, we are dealing with a conscious growth factor (CCF).

Figure XVII – 17



This drawing of the seven-column Systems III – 2 shows the system's energy patterns from above.

Figure XVII – 18



Shown here is Systems III-2 and its energy patterns from the side. Systems III-2 consists of seven Irradiators placed on top of seven Mega Orbs. The Systems III, instead of using Mega Orbs, uses the regular omnidirectional Orb.

As time moves on we will be writing of further systems experiences as well as the next stage of energy development currently under way now within our laboratories. This book is only meant to scratch the surface of what lies ahead in the New Age. Our next book will go into great detail on New Age developments.

We hope this book serves its purpose in fulfilling a gap or building a bridge in your own personal quest towards reaching the inner heights of a journey we all share on spaceship Earth. A journey with a common point in destiny: going home to a new Beginning and the eternal light of Peace.

In closing, I say, "Bom Shankar", which means, "May I salute the nature of God within you, my Brothers and Sisters."

THE SEVEN RAYS CORRESPONDENCES

RAY	I	II	II	IV	V	VI	VII
QUALITIES	Will and Power	Love Wisdom	Active Intelligence	Art and Harmony thru Conflict	Concrete Knowledge Science	Devotion and Idealism	Ceremonial Order and Ritual
COLOURS	Scarlet White	Indigo	Green	Yellow	Orange	Blue Rose	Violet
ZODIACAL SIGNS	Capricorn ♑ Leo ♌ Aries ♈	Gemini ♊ Virgo ♍ Pisces ♓	Libra ♎ Capricorn ♑ Cancer ♋	Scorpio ♏ Sagittarius ♐ Taurus ♉	Aquarius ♒ Leo ♌ Sagittarius ♐	Sagittarius ♐ Virgo ♍ Pisces ♓	Aries ♈ Cancer ♋ Capricorn ♑
PLANETRY RULERS	*Sun **Uranus	*Jupiter **Neptune	*Earth **Saturn	*Mercury **Mercury	*Venus **Venus	*Mars **Jupiter	*Moon **Earth
FOODS	Protein	Fats	Carbo–hydrate	Fruit	Vitamins	Water	Mineral Salts
NOTES	B	F	G	C	A	E	D
POLITICS	Fascism	Democracy	Socialism	City State	Oligarchy	Theocratic Despotism	Communism
GASES	Nitrogen	Oxygen	Hydrogen	Carbon–dioxide	Ammonia	Incense laden	Nitrous Oxide
SENSES	Sight	Intuition	Hearing	Taste	Concrete Touch	Pain	Smell
PLANE	Adi Atmic	Logoic	Mental	Buddic	Manasic	Astral	Physico Etheric
NERVOUS EQUIPMENT	Cerebrum	Mid-Brain	Medulla	Cerebellum	Peripheral	Sympathetic	Para-Sympathetic
ENDOCRINES	Pineal	Thymus	Thyroid	Adrenals	Pituitary	Pancreas	Gonads
NATION'S SOUL	India China	U.K U.S.A	South America	Germany Austria	France	Italy Spain	Russia
NATION'S Personality	U.K Germany	Brazil	China France	India Italy	Austria	U.S.A Russia	Spain
SHAPES	Circle	Triangle	Square	Circle Squared	Sphere (lens)	Cube	Pyramid
CHAKRAMS	Head	Heart	Throat	Base of the Spine	Brow	Solar Plexus	Sacral
KINGDOMS	Shamballa	Hierarchy	Deva	Humanity	Animal	Plant	Mineral
METAL	Silver	Gold	Copper	Nickel	Titanium	Copper	Titanium
GEM-STONE	Diamond	Lapis Torquoise	Emerald Malakite	Onyx	Opal	Ruby	Amethyst

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