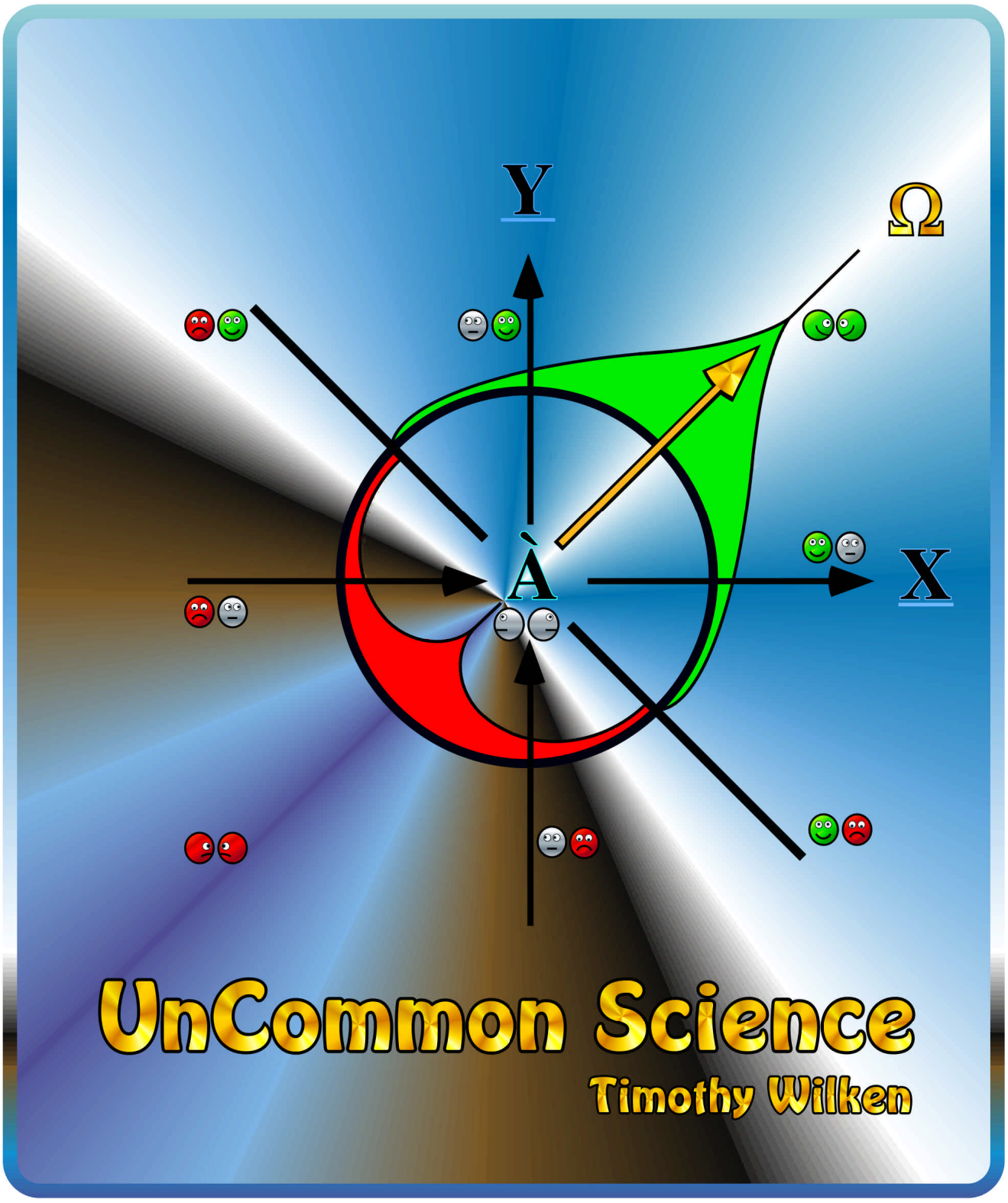
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UnCommon Science
Timothy Wilken

Published for The Time-binding Trust

by Timothy Wilken

UnCommon Science

is the second volume of the
UnCommon Sense Library.

Science^{2001}

Science is the most **powerful form of time-binding**. It is the search for the **truth**. It is that process that humans use to discover the **rules** that govern Universe—to discover the **laws** of Nature.

Those who search for the truth—those who desire to discover the rules that govern Universe—those who seek to discover the laws of Nature—are called **scientists**. **Kenneth Boulding** tells us that scientists can be divided into three groups:

> "Writers, thinkers, and scientists can no doubt be divided into three categories—those who are **behind** their time, those who are **with** their time, and those who are **before** their time. The first disappear into obscurity, the second become famous and fill the history books, and the third have to wait to be recognized."[1]

Issac Newton, **Charles Darwin**, **Louis Pasteur**, **Albert Einstein**, and more recently **Jonas Salk**, **Francis Crick**, and **James Watson** are examples of scientists who belong to the **second** category—those who are **with** their time. They are indeed famous and fill the history books.

UnCommon Science will present the ideas and discoveries of a number of scientists who fall into the **third** category—those who are **ahead** of their time.

It is painful for scientists to live and work ahead of their time. It usually means that they are not supported and end up sacrificing much of their personal life to the support of their own scientific work. Worse than this is the fact that they often work with no opportunity for scientific feedback. They are essentially without peers. Sometimes they will discover a few who understand their work, but often they work in scientific isolation. These scientists who work ahead of their time have no opportunity for **dialogue**.

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[1] **Mark Davidson**, Uncommon Sense —The Life and Thought of Ludwig von Bertalanffy, Jeremy P. Tarcher, Inc., Los Angeles, 1983

As **Harry Rathbun** writing in 1976 explains:

> "Discovery of truth, of reality, of what needs to be done to serve the goal, involves **dialogue**—asking questions, probing, investigating, testing. That is the essence of the scientific method which has brought us so far in discovering important relationships that exist in the physical world."[2]

Without benefit of scientific **dialogue**, scientists often create an eccentric language and personal semantics to describe their discoveries. These eccentric languages and personal semantics can make understanding their works even more difficult.

The history of science is filled with examples of later scholars trying to decipher and understand the words and discoveries of earlier scientists who worked **ahead** of their time. And far too often, important discoveries are simply discarded without understanding and lost forever.

Many of the scientists whose work I will be presenting in UnCommon Science lived and worked ahead of their time. And some of them created eccentric language and personal semantics to describe their discoveries. Therefore, I will occasionally play the role of **translator**, creating new metaphors and glossaries to serve as communication bridges for understanding their work.

Many Voices

UnCommon Science relies heavily on the work of many scientists. Time-binding by definition implies that all scientific works must to a large extent be **corroborations**. Therefore I have abandoned the practice of paraphrasing the writings of others, in favor of presenting their work in their own words.

This is accomplished through the liberal use of "**direct quotations**" from their original writings. This sometimes makes for long quotations, but does allow the reader the opportunity to experience the original concepts in voices of the scientists who made those discoveries.

Taking great care to avoid disturbing the meaning of the original writings, I have occasionally acted as **editor** making minor changes to increase clarity, or to

[2] **Harry J. Rathbun**, Creative Initiative: Guide To Fulfillment, Creative Initiative Foundation, Palo Alto, California, 1976

underscore the relevance of a particular quoted passage to my own work. I have sometimes added **bold** font or ***italics*** for my own emphasis.

Whenever and wherever, I have disagreed with a quoted scientist, I have made ***annotations** which are clearly demarcated by **copper colored font** preceded by an **asterisk**, or contained within **(parentheses)**. This distinction is made to insure that the integrity of the quoted passages remains intact and uncorrupted.

My presentation of these original works of earlier scientists should allow the reader a deeper understanding of the **process of discovery** and of **time-binding** itself. While some of the quotations are quite lengthy, your reading of them should not be considered as a replacement for reading the original works themselves. I have carefully **credited** and **referenced** all quotations to facilitate your finding the originals for your own independent examination.

Remember also that these quotations are themselves bound in **time**. They will all be **dated** so the reader is aware of the time **when** they were written. I will also use various mechanisms to demarcate when other scientists are speaking to aid the reader in keeping track of the flow of ideas.

My voice

My use of extensive quotations in this volume means that **here** I have often acted as an **editor** for others rather than as **advocate** for my own science. I am honored to serve as editor for these fine scientists, and hope that my presentation of their work will make them better known to their fellow humans, and allow them to receive the credit they deserve for the great understanding they have added to human **'**knowing**'**.[3]

However, this is not to say that this volume is only in the voices of others. I too will speak throughout adding my voice to this chorus of scientists.

Now as stated in the general Introduction to UnCommon Sense, I occasionally use redundancy to emphasize important points. **Redundant material** is demarcated in a **dark blue font**. Although some passages are redundant, they are always presented

[3] **'knowing'**—I use single quotes around any 'word' that has different meanings in different contexts. This is to avoid miscommunication. This convention was invented by Alfred Korzybski to alert the reader to **multiordinal terms**. See: **Alfred Korzybski**, Science and Sanity, The Colonial Press Inc., Clinton, Mass., 1933

in a **new context** which results in new and additional meaning. Those readers who examine the redundant material in light of this new context will gain the greatest understanding. My reason for designating the redundant material with a **special font color** is to avoid the confusion of ***deja vu***.

The next passage is our first redundancy. It is taken from the general Introduction to volume one of ***UnCommon Sense*** that was published as ***We Can All Win!—The Basics***:

Bootstrap to knowing

I entered medical school in 1966. In my first week, I would learn one of the most valuable lessons of my life.

A fellow classmate and I were in the medical library at our school. We had been reading some science papers assigned in an earlier class, when I noticed he was reading one paper, that I didn't have listed on my assignment sheet. He seemed much more interested in that paper than in those from our assignment sheet.

My classmate would read a paragraph or two and then hurry off to the big medical dictionary across the room. He made so many trips, I surmised the reading must be very difficult.

Finally ,my curiosity got the better of me, and I also was beginning to worry that I might have missed getting the assignment to read that particular paper, so I queried him.

First he responded by saying, "No, its not part of our assignment, I'm just reading this for myself. The author is a Nobel laureate."

He started to return to his reading, but then he paused for a moment to look me over and for some reason he decided to share his secret with me. "It's something more than that. It is a secret way to learn that my Father taught me."

I leaned closer and he continued: "**When you read and understand the work of a world's leading expert, you can become the world's second leading expert**."

At first I didn't know what to say. The thought was so foreign to me. I said nothing and

returned to my study of the assigned readings. Later that evening after class, my mind kept coming back to what my classmate had said, "When you read and understand the work of a world's leading expert, you can become the world's second leading expert."

Shortcut

Could it really be true? Could getting ahead be as simple as finding out who the experts were and studying their most advanced works.

To think that I could catch up to a world expert by spending a few hours in the library seemed an oversimplification, and somehow terrible at the same time. Science was supposed to be much harder than that. In the next few years, I would learn that science is much harder than that and yet discover for myself the deep truth of my classmate's lesson.

Science was hard, and as I began using the bootstrap I discovered there was nothing easy about understanding the advanced papers of experts. I had somehow missed the implication of my fellow student's repeated trips to the reference dictionary that morning in the library. Now I finally understood. There is a shortcut in science, but like most shortcuts, the path is a more difficult one.

You can learn fastest from the world's experts if you are ready to invest the effort to learn the expert's language, definitions and methods.

Since then, this lesson has served me well. I have saved years of study by using the knowledge of the world's leading experts to bootstrap myself to a position of better and more complete understanding. And always, with more understanding comes more control.

I have filled ***UnCommon Science*** with the understanding and wisdom of many of the world's leading experts. Please make their expert knowledge your own. Please invest a few hours in learning the language and methods of the experts and bootstrap yourself to a more powerful and positive future.

The nonscientist reader may find some parts of ***UnCommon Science*** difficult. Fortunately, it is not necessary to completely **master** this volume in order to participate in a synergic future.

However, those readers who do take the time to read and examine ***UnCommon Science*** carefully will receive great benefit. And, I predict that they will further discover that they **can** understand **synergic science**.

The synergic sciences are new to everyone including most of today's scientists. Most scientists are specialists and synergic science is not their speciality The trained scientist may have the advantage of thinking scientifically, but the material is equally new to all readers, and very likely not in most scientist's field of training. So please do your best. This science will be used throughout the rest of the book to analyze and understand our human past, to examine the crisis that faces us in the present, to discover the shape of a synergic future, and finally to develop the synergic mechanisms that can provide us safepassage to that synergic future.

Eventually,I believe that most humans **will** come to understand even the most advanced synergic science. That while all humans are not considered to be scientists, all humans are **time-binders**. Since science is simply the most powerful form of time-binding, I would argue that all humans to some degree are **scientists**.

All humans notice and react to the **changes** in their environment, scientists just do it more intensively and carefully. Scientists discover the laws of Nature by **observing** changes in their environment. By studying these changes, they come to **understand** them. The synergic sciences are "**science**".

Scientific method

The most powerful tool of science has been the **scientific method**. First, the scientist carefully studies some natural phenomenon or process—**observation**. Then the scientist thinks very carefully about what he has observed. He contemplates, he meditates, he **thinks**, when he sees a pattern, when he develops an insight, then the scientist states an **hypothesis—**a proposed model of reality. The scientist then makes predictions based on the hypothesis—based on his model of reality—and then develops a procedure to test those predictions—**experiment**. And finally the scientist gathers the results from the experiment and compares the experimental results with the predictions—**observation**. Again the scientist thinks very carefully about what he has observed. He contemplates, he meditates, he **thinks**, when he sees a clearer pattern, when he develops a better insight, he modifies his hypothesis and the **cycle** is repeated. This is the process of science, the scientific method is used over and over to

create evermore accurate hypotheses—evermore accurate models of reality.

When an **hypothesis** is found to be **exceedingly accurate** in predicting reality, and when **no exceptions** can be found to its description of a natural phenomenon or process, then and only then does it gain the **status** of **scientific theory**. A **scientific theory** sometimes called a **generalization** means a **principle** that has been found to hold true in every special case.

Scientific theories are **corroborated hypotheses**—they are the most accurate **models of reality** we have. When a scientist uses the word **theory**, he is talking about something much **more than an opinion**—much **more than an assumption**—much **more than a belief**. Scientific theories are near truths.

Near truth

We humans have used scientific theory to safely take us to the moon and to cure cancers. You can safely bet your life on scientific theory and you do – every time you walk onto an elevator or board an airplane. And while scientists have the highest respect for **scientific theory**, they know they are **not absolutes**. They understand that **scientific theories** are **models** of reality and not the reality itself.

In the past these models of reality were often confused with reality itself. Those scientific theories that survived continued human experience were thought to be **absolute truths**. They were thought to be **certainties**. They were given the most prestigious of names—**laws of Nature**.

In 1999, scientists know better. Today we know that human knowledge always grows with more experience. Scientific theory believed to be true today will be improved or shown to be incomplete later.

Today, we know better. No matter how certain our 'knowing' appears to be. No matter how **absolutely right** we think we are. Our theories are only '**models of reality'** and not reality itself. They are only **near truths**.

First voice

Our first voice will be that of one of those fortunate scientists, who lived and worked **in synchrony** with his time. One of the most famous and celebrated of modern

physicists **Richard P. Feynman** was born in 1918 in Brooklyn, New York. He received his Ph.D. from Princeton University in 1942 in the midst of WWII. Following graduation he joined the Manhattan Project at Los Alamos, New Mexico where he played an important role in the development of atomic weapons.

When Feynman joined the project at the age of 24, the head of the theoretical division was **Hans Bethe** who became somewhat of a mentor to Feynman, and the two developed a long lasting friendship. Feynman and Bethe were a good team; Feynman was fast, but made mistakes, and Bethe was slower because he double checked everything. One of Feynman's talents was his speed in solving equations in his head, and finding ways to take large and complex equations and split them into smaller and more manageable pieces. This was very useful with many of the massive formulas used in the project, but even the split up equations were time consuming. After the war, he went to work on his thesis with Hans Bethe, to solve the mysteries of quantum electrodynamics. To help solve the incredibly complex equations, which took weeks for a computer to solve, Feynman invented "***Feynman Diagrams***" for theoretical physics. Subsequently, he taught at Cornell University and at the California Institute of Technology.

In 1965 he received the **Nobel Prize** in Physics, along with fellow scientists Sin-Itero Tomanaga and Julian Schwinger, for his work in quantum electrodynamics. Two years before receiving the Nobel Prize, **Feynman**[1963] gave a series of lectures at the University of Washington. His words taken from those lectures[4] serve as an appropriate introduction to ***UnCommon Science***.

Feynman on ***"What is science?***

> "The word 'science' is usually used to mean one of three things, or a mixture of them. I do not think we need to be precise—it is not always a good idea to be too precise. Science means, sometimes, **a special method of finding things out**. Sometimes it means the **body of knowledge arising from the things found out**. It may also mean the **new things you can do when you have found something out**, or the **actual doing of new things**. This last field is usually called **technology**—but if you look at the

[4] **Richard P. Feynman**, THE MEANING OF IT ALL—Thoughts of a Citizen-Scientist, HELIX BOOKS – Addison-Wesley, 1998

science section in Time magazine you will find it covers about 50 percent what new things are found out and about 50 percent what new things can be and are being done. And so the popular definition of science is partly technology, too.

"I want to discuss these **three aspects** of science in reverse order. I will begin with the new things that you can do—that is, with **technology**. The most obvious characteristic of science is its application, the fact that as a consequence of science one has a **power to do things**. And the effect this power has had need hardly be mentioned. The whole industrial revolution would almost have been impossible without the development of science. The possibilities today of producing quantities of food adequate for such a large population, of controlling sickness – the very fact that there can be free men without the necessity of slavery for full production – are very likely the result of the development of scientific means of production.

"Now this power to do things carries with it no instructions on how to use it, whether to use it for good or for evil. The product of this power is either good or evil, depending on how it is used. We like improved production, but we have problems with automation. We are happy with the development of medicine, and then we worry about the number of births and the fact that no one dies from the diseases we have eliminated. Or else, with the same knowledge of bacteria, we have hidden laboratories in which men are working as hard as they can to develop bacteria for which no one else will be able to find a cure. We are happy with the development of air transportation and are impressed by the great airplanes, but we are aware also of the severe horrors of air war. We are pleased by the ability to communicate between nations, and then we worry about the fact that we can be snooped upon so easily. We are excited by the fact that space can now be entered; well, we will undoubtedly have a difficulty there, too. The most famous of all these imbalances is the development of nuclear energy and its obvious problems.

"Is science of any value?

"I think a power to do something is of value.Whether the result is a good thing or a bad thing depends on how it is used, but the power is a value.

"Once in Hawaii I was taken to see a Buddhist temple. In the temple a man said, "I am going to tell you something that you will never forget." And then he said, "To every man is given the key to the gates of heaven. The same key opens the gates of hell."

"And so it is with science. In a way it is a key to the gates of heaven, and the same key opens the gates of hell, and we do not have any instructions as to which is which gate. Shall we throw away the key and never have a way to enter the gates of heaven? Or shall we struggle with the problem of which is the best way to use the key? That is, of course, a very serious question, but I think that we cannot deny the value of the key to the gates of heaven.

"All the major problems of the relations between society and science lie in this same area. When the scientist is told that he must be more responsible for his effects on society, it is the applications of science that are referred to. if you work to develop nuclear energy you must realize also that it can be used harmfully. Therefore, you would expect that, in a discussion of this kind by a scientist, this would be the most important topic. But I will not talk about it further. I think that to say these are scientific problems is an exaggeration. They are far more **humanitarian** problems. The fact that how to work the power is clear, but how to control it is not, is something not so scientific and is not something that the scientist knows so much about.

"Let me illustrate why I do not want to talk about this. Some time ago, in about 1949 or 1950, I went to Brazil to teach physics. There was a Point Four program in those days, which was very exciting – everyone was going to help the underdeveloped countries. What they needed, of course, was technical know-how.

"In Brazil I lived in the city of Rio. In Rio there are hills on which are homes made with broken pieces of wood from old signs and so forth. The people are extremely poor. They have no sewers and no water. In order to get water they carry old gasoline cans on their heads down the hills. They go to a place where a new building is being built, because there they have water for mixing cement. The people fill their cans with water and carry them up the hills. And later you see the water dripping down the hill in dirty sewage. It is a pitiful thing.

"Right next to these hills are the exciting buildings of the Copacabana beach, beautiful apartments, and so on.

"And I said to my friends in the Point Four program, "Is this a problem of technical know-how? They don't know how to put a pipe up the hill? They don't know how to put a pipe to the top of the hill so that the people can at least walk uphill with the empty cans and downhill with the full cans?"

"So it is not a problem of technical know-how. Certainly not, because in the neighboring apartment buildings there are pipes, and there are pumps. We realize that now. Now we think it is a problem of economic assistance, and we do not know whether that really works or not. And the question of how much it costs to put a pipe and a pump to the top of each of the hills is not one that seems worth discussing, to me.

"Although we do not know how to solve the problem, I would like to point out that we tried two things, technical know-how and economic assistance. We are discouraged with them both, and we are trying something else. As you will see later, I find this encouraging. I think that to keep trying new solutions is the way to do everything.

"Those, then are the practical aspects of science, the new things that you can do. They are so obvious that we do not need to speak about them further.

"The next aspect of science is its **contents**, the **things that have been found out.** This is the **yield**. This is the **gold**. This is the **excitement**, the pay you get for all the disciplined thinking and hard work. The work is not done for the sake of an application. It is done for the excitement of what is found out. Perhaps most of you know this. But to those of you who do not know it, it is almost impossible for me to convey in a lecture this important aspect, this exciting part, the **real reason for science**. And without understanding this you miss the whole point. You cannot understand science and its relation to anything else unless you understand and appreciate the great adventure of our time. You do not live in your time unless you understand that this is a tremendous adventure and a wild and

exciting thing.

"Do you think it is dull? It isn't. It is most difficult to convey, but perhaps I can give some idea of it. Let me start anywhere, with any idea.

"For instance, the ancients believed that the earth was the back of an elephant that stood on a tortoise that swam in a bottomless sea. Of course, what held up the sea was another question. They did not know the answer.

"The belief of the ancients was the result of imagination. It was a poetic and beautiful idea. Look at the way we see it today. Is that a dull idea? The world is a spinning ball, and people are held on it on all sides, some of them upside down. And we turn like a spit in front of a great fire. We whirl around the sun. That is more romantic, more exciting. And what holds us? The force of gravitation, which is not only a thing of the earth but is the thing that makes the earth round in the first place, holds the sun together and keeps us running around the sun in our perpetual attempt to stay away. This gravity holds its sway not only on the stars but between the stars; it holds them in the great galaxies for miles and miles in all directions.

"This universe has been described by many, but it just goes on, with its edge as unknown as the bottom of the bottomless sea of the other idea – just as mysterious, just as awe-inspiring, and just as incomplete as the poetic pictures that came before.

"But see that the imagination of nature is far, far greater than the imagination of man. No one who did not have some inkling of this through observations could ever have imagined such a marvel as nature is.

"Or the earth and time. Have you read anywhere, by any poet, anything about time that compares with real time, with the long, slow process of evolution? Nay, I went too quickly. First, there was the earth without anything alive on it. For billions of years this ball was spinning with its sunsets and its waves and the sea and the noises, and there was no thing alive to appreciate it. Can you conceive, can you appreciate or fit into your ideas what can be the meaning of a world without a living thing on it? We

are so used to looking at the world from the point of view of living things that we cannot understand what it means not to be alive, and yet most of the time the world had nothing alive on it. And in most places in the universe today there probably is nothing alive.

"Or life itself. The internal machinery of life, the chemistry of the parts, is something beautiful. And it turns out that all life is interconnected with all other life. There is a part of chlorophyll, an important chemical in the oxygen processes in plants, that has a kind of square pattern; it is a rather pretty ring called a benzine ring. And far removed from the plants are animals like ourselves, and in our oxygen containing systems, in the blood, the hemoglobin, there are the same interesting and peculiar square rings. There is iron in the center of them instead of magnesium, so they are not green but red, but they are the same rings.

"The proteins of bacteria and the proteins of humans are the same. In fact it has recently been found that the protein-making machinery in the bacteria can be given orders from material from the red cells to produce red cell proteins. So close is life to life. The universality of the deep chemistry of living things is indeed a fantastic and beautiful thing. And all the time we human beings have been too proud even to recognize our kinship with the animals.

"Or there are the atoms. Beautiful—mile upon mile of one ball after another ball in some repeating pattern in a crystal. Things that look quiet and still, like a glass of water with a covered top that has been sitting for several days, are active all the time; the atoms are leaving the surface, bouncing around inside, and coming back. What looks still to our crude eyes is a wild and dynamic dance.

"And, again, it has been discovered that all the world is made of the same atoms, that the stars are of the same stuff as ourselves. It then becomes a question of where our stuff came from. Not just where did life come from, or where did the earth come from, but where did the stuff of life and of the earth come from? It looks as if it was belched from some exploding star, much as some of the stars are exploding now. So this piece of dirt waits four and a half billion years and evolves and changes, and now a strange

creature stands here with instruments and talks to the strange creatures in the audience. What a wonderful world!

"Or take the physiology of human beings. It makes no difference what I talk about. If you look closely enough at anything, you will see that there is nothing more exciting than the truth, the pay dirt of the scientist, discovered by his painstaking efforts.

"In physiology you can think of pumping blood, the exciting movements of a girl jumping a jump rope. What goes on inside? The blood pumping, the interconnecting nerves—how quickly the influences of the muscle nerves feed right back to the brain to say, "Now we have touched the ground, now increase the tension so I do not hurt the heels." And as the girl dances up and down, there is another set of muscles that is fed from another set of nerves that says,

"One, two, three, O'Leary, one, two, …" And while she does that, perhaps she smiles at the professor of physiology who is watching her. That is involved, too!

"And then electricity. The forces of attraction, of plus and minus, are so strong that in any normal substance all the plusses and minuses are carefully balanced out, everything pulled together with everything else. For a long time no one even noticed the phenomenon of electricity, except once in a while when they rubbed a piece of amber and it attracted a piece of paper. And yet today we find, by playing with these things, that we have a tremendous amount of machinery inside. Yet science is still not thoroughly appreciated.

"To give an example, I read Faraday's Chemical History of a Candle, a set of six Christmas lectures for children. The point of Faraday's lectures was that no matter what you look at, if you look at it closely enough, you are involved in the entire universe. And so he got, by looking at every feature of the candle, into combustion, chemistry, etc. But the introduction of the book, in describing Faraday's life and some of his discoveries, explained that he had discovered that the amount of electricity necessary to do performic electrolysis of chemical substances is proportional to the number of atoms which are separated divided by the valence. It further explained

that the principles he discovered are used today in chrome plating and the anodic coloring of aluminum, as well as in dozens of other industrial applications. I do not like that statement. Here is what Faraday said about his own discovery: "The atoms of matter are in some ways endowed or associated with electrical powers, to which they owe their most striking qualities, amongst them their mutual chemical affinity." He had discovered that the thing that determined how the atoms went together, the thing that determined the combinations of iron and oxygen which make iron oxide is that some of them are electrically plus and some of them are electrically minus, and they attract each other in definite proportions. He also discovered that electricity comes in units, in atoms. Both were important discoveries, but most exciting was that this was one of the most dramatic moments in the history of science, one of those rare moments when two great fields come together and are unified. He suddenly found that two apparently different things were different aspects of the same thing. Electricity was being studied, and chemistry was being studied. Suddenly they were two aspects of the same thing—chemical changes with the results of electrical forces. And they are still understood that way. So to say merely that the principles are used in chrome plating is inexcusable.

"And the newspapers, as you know, have a standard line for every discovery made in physiology today: "The discoverer said that the discovery may have uses in the cure of cancer." But they cannot explain the value of the thing itself.

"Trying to understand the way nature works involves a most terrible test of human reasoning ability. It involves subtle trickery, beautiful tightropes of logic on which one has to walk in order not to make a mistake in predicting what will happen. The quantum mechanical and the relativity ideas are examples of this.

"The **third aspect** of my subject is that of science as a **method of finding things out**. This method is based on the principle that **observation** is the **judge of whether something is so or not**. All other aspects and characteristics of science can be understood directly when we understand that **observation** is the ultimate and final **judge** of the **truth** of an idea. But "prove" used in this way really means "test," in the same way that a

hundred-proof alcohol is a test of the alcohol, and for people today the idea really should be translated as, "The exception **tests** the rule." Or, put another way, "The **exception proves** that the **rule is wrong**." That is the principle of science. If there is an exception to any rule, and if it can be proved by observation, that rule is wrong.

"The exceptions to any rule are most interesting in themselves, for they show us that the old rule is wrong. And it is most exciting, then, to find out what the right rule, if any, is. The exception is studied, along with other conditions that produce similar effects. The scientist tries to find more exceptions and to determine the characteristics of the exceptions, a process that is continually exciting as it develops. He does not try to avoid showing that the rules are wrong; there is progress and excitement in the exact opposite. He tries to prove himself wrong as quickly as possible.

"The principle that observation is the judge imposes a severe limitation to the kind of questions that can be answered. They are limited to questions that you can put this way: "if I do this, what will happen? " There are ways to try it and see. Questions like, "should I do this?" and "what is the value of this?" are not of the same kind.

"But if a thing is not scientific, if it cannot be subjected to the test of observation, this does not mean that it is dead, or wrong, or stupid. We are not trying to argue that science is somehow good and other things are somehow not good. Scientists take all those things that **can** be analyzed by observation, and thus the things called science are found out. But there are some things left out, for which the method does not work. This does not mean that those things are unimportant. They are, in fact, in many ways the most important. In any decision for action, when you have to make up your mind what to do, there is always a "should" involved, and this cannot be worked out from "if I do this, what will happen?" alone. You say, "Sure, you see what will happen, and then you decide whether you want it to happen or not." But that is the step the scientist cannot take. You can figure out what is going to happen, but then you have to decide whether you like it that way or not.

"There are in science a number of technical consequences that follow from

the principle of observation as judge. For example, the observation cannot be rough. You have to be very careful. There may have been a piece of dirt in the apparatus that made the color change; it was not what you thought. You have to check the observations very carefully, and then recheck them, to be sure that you understand what all the conditions are and that you did not misinterpret what you did.

"It is interesting that this **thoroughness**, which is a virtue, is often misunderstood. When someone says a thing has been done scientifically, often all he means is that it has been done thoroughly. I have heard people talk of the "scientific" extermination of the Jews in Germany. There was nothing scientific about it. It was only thorough. There was no question of making observations and then checking them in order to determine something. In that sense, there were "scientific" exterminations of people in Roman times and in other periods when science was not so far developed as it is today and not much attention was paid to observation. In such cases, people should say "thorough" or "thoroughgoing," instead of "scientific."

"There are a number of special techniques associated with the game of making observations, and much of what is called the philosophy of science is concerned with a discussion of these techniques. The interpretation of a result is an example. To take a trivial instance, there is a famous joke about a man who complains to a friend of a mysterious phenomenon. The white horses on his farm eat more than the black horses. He worries about this and cannot understand it, until his friend suggests that maybe he has more white horses than black ones.

"It sounds ridiculous, but think how many times similar mistakes are made in judgments of various kinds. You say, "My sister had a cold, and in two weeks … " It is one of those cases, if you think about it, in which there were more white horses. Scientific reasoning requires a certain discipline, and we should try to teach this discipline, because even on the lowest level such errors are unnecessary today.

"Another important characteristic of science is its objectivity. It is necessary to look at the results of observation objectively, because you, the experimenter, might like one result better than another. You perform the

experiment several times, and because of irregularities, like pieces of dirt falling in, the result varies from time to time. You do not have everything under control. You like the result to be a certain way, so the times it comes out that way, you say, "See, it comes out this particular way." The next time you do the experiment it comes out different. Maybe there was a piece of dirt in it the first time, but you ignore it.

"These things seem obvious, but people do not pay enough attention to them in deciding scientific questions or questions on the periphery of science. There could be a certain amount of sense, for example, in the way you analyze the question of whether stocks went up or down because of what the President said or did not say.

"Another very important technical point is that the more specific a rule is, the more interesting it is. The more definite the statement, the more interesting it is to test. If someone were to propose that the planets go around the sun because all planet matter has a kind of tendency for movement, a kind of motility, let us call it an "oomph," this theory could explain a number of other phenomena as well. So this is a good theory, is it not? No. It is nowhere near as good as a proposition that the planets move around the sun under the influence of a central force which varies exactly inversely as the square of the distance from the center. The second theory is better because it is so specific; it is so obviously unlikely to be the result of chance. It is so definite that the barest error in the movement can show that it is wrong; but the planets could wobble all over the place, and, according to the first theory, you could say, "Well, that is the funny behavior of the "oomph." "

"So the more specific the rule, the more powerful it is, the more liable it is to exceptions, and the more interesting and valuable it is to check.

"Words can be meaningless. If they are used in such a way that no sharp conclusions can be drawn, as in my example of "oomph," then the proposition they state is almost meaningless, because you can explain almost anything by the assertion that things have a tendency to motility. A great deal has been made of this by philosophers, who say that words must be defined extremely precisely. Actually, I disagree somewhat with this; I think that extreme precision of definition is often not worthwhile, and

sometimes it is not possible—in fact mostly it is not possible, but I will not get into that argument here.

"Most of what many philosophers say about science is really on the technical aspects involved in trying to make sure the method works pretty well. Whether these technical points would be useful in a field in which observation is not the judge I have no idea. I am not going to say that everything has to be done the same way when a method of testing different from observation is used. In a different field perhaps it is not so important to be careful of the meaning of words or that the rules be specific, and so on. I do not know.

"In all of this I have left out something very important. I said that observation is the judge of the truth of an idea. But where does the idea come from? The rapid progress and development of science requires that human beings invent something to test.

"It was thought in the Middle Ages that people simply make many observations, and the observations themselves suggest the laws. But it does not work that way. It takes much more imagination than that. So the next thing we have to talk about is where the new ideas come from. Actually, it does not make any difference, as long as they come. We have a way of checking whether an idea is correct or not that has nothing to do with where it came from. We simply test it against observation. So in science **we are not interested in where an idea comes from**.

"There is no authority who decides what is a good idea.

"We have lost the need to go to an authority to find out whether an idea is true or not. We can read an authority and let him suggest something; we can try it out and find out if it is true or not. If it is not true, so much the worse so the "authorities" lose some of their "authority."

"The relations among scientists were at first very argumentative, as they are among most people. This was true in the early days of physics, for example. But in physics today the relations are extremely good. A scientific argument is likely to involve a great deal of laughter and uncertainty on both sides, with both sides thinking up experiments and offering to bet on the outcome. In physics there are so many accumulated observations that

it is almost impossible to think of a new idea which is different from all the ideas that have been thought of before and yet that agrees with all the observations that have already been made. And so if you get anything new from anyone, anywhere, you welcome it, and you do not argue about why the other person says it is so.

"Many sciences have not developed this far, and the situation is the way it was in the early days of physics, when there was a lot of arguing because there were not so many observations. I bring this up because it is interesting that human relationships, **if there is an independent way of judging truth**, can become **unargumentative**.

"Most people find it surprising that in science there is no interest in the background of the author of an idea or in his motive in expounding it. You listen, and if it sounds like a thing worth trying, a thing that could be tried, is different, and is not obviously contrary to something observed before, it gets exciting and worthwhile. You do not have to worry about how long he has studied or why he wants you to listen to him. In that sense it makes no difference where the ideas come from. Their real origin is unknown; we call it the imagination of the human brain, the creative imagination—it is known; it is just one of those "oomphs."

"It is surprising that people do not believe that there is imagination in science. It is a very interesting kind of imagination, unlike that of the artist. The great difficulty is in trying to imagine something that you have never seen, that is consistent in every detail with what has already been seen, and that is different from what has been thought of; furthermore, it must be definite and not a vague proposition. That is indeed difficult.

"Incidentally, the fact that there are **rules** at all to be checked is a kind of **miracle**; that it is possible to find a rule, like the inverse square law of gravitation, is some sort of miracle. It is not understood at all, but it leads to the possibility of prediction—that means it tells you what you would expect to happen in an experiment you have not yet done.

"It is interesting, and absolutely essential, that the various rules of science be **mutually consistent**. Since the observations are all the same

observations, one rule cannot give one prediction and another rule another prediction. Thus, science is not a specialist business; it is completely **universal**. I talked about the atoms in physiology; I talked about the atoms in astronomy, electricity, chemistry. They are **universal**; they must be **mutually consistent**. You cannot just start off with a new thing that cannot be made of atoms.

"It is interesting that reason works in guessing at the **rules**, and the rules, at least in physics, become reduced. I gave an example of the beautiful reduction of the rules in chemistry and electricity into one rule, but there are many more examples."[5]

—Richard Feynman[1963]

Nothing to do with where it came from

Richard Feynman gets us off to a good start. In the following chapters, I will be presenting the work of a number of scientists who are not famous and who do not fill the history books. Their scientific works are little known and mostly unrecognized. And, I will also be presenting some original scientific work of my own.

My work and that of these other unknown scientists will be presented in context with with the work of better known and more recognized scientists. I realize that this places us in **exceptional** company.

It may seem presumptuous to mix unknown work with that of well known and established scientists. However as Feynman says, "We have a way of checking whether an idea is correct or not that has nothing to do with where it came from. We simply test it against observation."

Later

Scientific theory believed to be true today will be improved or shown to be incomplete later. Newton's scientific theories, published in 1687, formed the scientific basis for the Industrial Revolution. Thought to be absolute "**laws of Nature**", they were shown to be incomplete by Einstein's scientific theories published in 1915. Einstein was not necessarily smarter than Newton. He was simply **later**.

[5] **Richard P. Feynman**, THE MEANING OF IT ALL, 1998, ibid

As **Newton** is quoted as saying,

"**If I have seen farther than others, it is because I have stood on the shoulders of giants**."

Einstein was 230 years later than Newton. Einstein was standing on Newton's shoulders as he created a more accurate model of reality. Humans will always seek to know more. Humans will always seek more accurate models of reality. Humans will always seek the laws of Nature.

Today^{2001}, human science is more humble. It accepts the fact that today's knowledge is incomplete. It accepts the fact that human science will always know more **later**. This is the nature of science—this is the nature of **time-binding**.

I claim no special privilege or intellectual superiority. I simply have the great fortune to be **later**. I too am **standing on the shoulders** of giants, and occasionally the **vantage** from that position has allowed me to see farther.

Knowing 2001

Knowing is a distinctly human activity. This ability to know results both from our unique human **awareness** of **time** and **GOD**'s great gift of a world that is **knowable**.

Nature is comprehensible. Nature is orderly. Nature follows the rules. Nature makes sense. Humans use their time-binding power to discover the **'**laws**'** of Nature. And these 'laws' of Nature do not stand in isolation. They fit together like pieces in a jigsaw puzzle.[6]

Fuller's Principle of Cosmic Integrity

Nature is **honest**. She plays by the rules. **R. Buckminster Fuller** called this the **Principle of Cosmic Integrity**[7] which he described as the first 'law' of Nature. Writing in 1975, **Fuller** explained:

> "The more we know the more mysterious it becomes that we can and do know both more and less. The unique characteristic of life is awareness—which develops gradually into human comprehension only to become aware of how inherently little we know. But that little we know or may come to know additionally is ever subject to further exploration, discovery, and comprehension.
>
> "That there is an unknown is proven by the succession of revelations of additional generalized principles all of which are discovered as implicit in Nature. It is also retrospectively manifest that this amplifying knowledge, discovered by intuition and mind was discovered from the previously unknown.
>
> "There is in Universe a vast order. It never forsakes. I throw a coin in the air, and it returns and hits the floor **every** time. Nature is never at a loss about

[6] **Author's Note**: Just a reminder that I have adopted Korzybski's convention of using single quotes to denote multiordinal terms and alert the reader that the enclosed term may have different meanings.

[7] **R. Buckminster Fuller**, SYNERGETICS—Explorations in the Geometry of Thinking, Volumes I & II, New York, Macmillan Publishing Co, 1975, 1979

what to do about anything. Nature never vacillates in her decisions. The rolling oceans cover three-quarters of Earth. Along the beaches, the surf is continually pounding on the shore. No two successive local surf poundings have ever been the same nor will they ever be the same. They typify the infinitude of individualism of every special-case event in the Universe.

"Weightless, abstract human mind reviews and from time to time discovers mathematically reliable and abstractly statable interrelationships existing between and amongst any of the special-case events. When a long-term record of testing proves the relationship to persist without exception, it is stated as a scientifically generalized principle.

"The **cosmic intellectual integrity** manifest by Universe—the orderly interaccommodation of all the generalized principles constitutes a design. **Design as a concept of ordered relationships is apprehendable and comprehendable exclusively by intellect.** As the human mind progressively draws aside the curtain of unknownness the great design laws of eternally regenerative Universe are disclosed to human intellect.

"Science has been cogently defined by others as the attempt to set in order the facts of experience. When science discovers order subjectively, it is pure science. When the order discovered by science is objectively employed, it is called applied science. The facts of experience are always special cases. The order sought for and sometimes found by science is always eternally generalized; that is, it holds true in every special case. No generalized principles have ever been discovered that contradict other generalized principles. **All the generalized principles are interaccommodative**. The scientific generalizations are always mathematically statable as equations with one term on one side of the equation and a plurality of at least two terms on the other side of the equation.

"**NATURE** (**N**) –def–> The totality of both all that is **known**—**Universe** (U), and all that is **unknown** (**O**), or **N = (U + O)**.

"Nature is the integral of all the integrities always manifest in the progressively discovered generalized eternal principles. **Nature then is all that we think we do know, plus all that we don't know, whether or**

not we know that we don't know. Whatever nature permits is **natural**. If nature does not permit it, it cannot and does not occur.

"Universe is all the **known**. Universe is the aggregate of all of humanity's all time, consciously apprehended and communicated experiences, including both the explicable and the as-yet unexplained. Human awareness first apprehends, then sometimes goes on to comprehend."[8]

Fuller defines 'Universe' as the smaller term contained within 'Nature'. '**Universe**' is what humanity **knows** of '**Nature**'. '**Universe**' is then the **sum** of all discovered 'laws' of Nature from the beginning of human thinking to the present. The sum of all discovered scientific theories—the sum of all models of reality. 'Universe' is then as complete a model of 'Nature' as total humanity^{2001} can create. We should then use Korzybski's convention of **dating** to identify which model of 'Nature' we are talking about. **Universe**^{1763} is not **Universe**^{2001}.

And the human **need** to know and understand **Nature**, results in a mind always seeking—always searching. The human mind must continue to explore, to discover, to differentiate, and to comprehend. As **Harry J. Rathbun**^{1976} explains:

"The process of science is to discover and formulate the functioning relationships in any specific area under investigation. The key word is **discover**. Science deals with reality. And by reality we mean "the way things are". Instead of "functioning relationships" we more commonly speak of "cause and effect", but either way we are talking about the same thing.

"Science rests on the basic faith that we live in an **orderly** Universe. It holds that there are **dependable relationships** in the structure of reality. It holds further that these can be discovered by patient, honest, detached investigation. Such investigation involves the formulation and testing of hypotheses. Hypothesis is a proposed model of reality based on the scientist's observation of the relationships under study. The hypothesis is then tested to find out whether it matches the real world. If it does, we say that a scientific law—a law of nature—has been discovered. Science is the process of reducing mystery to knowledge.

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[8] **R. Buckminster Fuller**, SYNERGETICS, 1975-1979, ibid

"Discovery of truth, of reality, of what needs to be done to serve the goal, involves **dialogue**—asking questions, probing, investigating, testing. That is the essence of the scientific method which has brought us so far in discovering important relationships that exist in the physical world. But scientists find that the more we learn, the more there is yet to be discovered.

"Further mystery seems always to lurk behind our discoveries. Inevitably, if we push far enough, we come up against **ultimate mystery** beyond our present human power to understand."[9]

Nature is comprehensible. Nature is orderly. Nature follows a set of rules. Nature makes sense. When we humans use reason to discover these rules, we can improve our lives by living by the rules—by living in harmony with the 'laws' of Nature. As long as humanity survives human knowing will grow without end. Thus 'Universe' our model of 'Nature' will grow evermore accurate—evermore complete—evermore near to the '**Truth**'.

"Seek and ye shall find. Ask and ye shall receive. Knock and it shall be opened unto you."

Jesus of Nazareth

"The most incomprehensible thing about the Universe is that it is comprehensible."

Albert Einstein

Another synergy scientist **Arthur Young** writes on the search for truth in 1974:

"Both religion and science have a common origin in the search for truth, but have approached this goal differently. Religion depends on revelation or inspired teachers, science on experiments and theories. The investigations I have made into these subjects indicate that these two quite different endeavors tell the same story, reach the same conclusions. The agreement to which I refer is to be found between the ancient myths and the most recent finding of quantum physics.

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[9] **Harry J. Rathbun**, Creative Initiative: Guide To Fulfillment, Creative Initiative Foundation, Palo Alto, California, 1976

"In earlier times there were those who went into the desert to discover within their own depths, or to the mountain top to commune with GOD, and returned with a teaching for their followers. But that is all past. Twentieth century humanity has come of age. It is not to be led, but must draw out of itself the wisdom it needs. That is why I say we must look at what we already have in the earliest and undistorted traditions. It needs no new doctrine because the printed word makes available today the accumulated wisdom of all ages and of all teachings, which with the help of science, we can now sort out and interpret. By science, I do not mean cultural anthropology but the ontology provided by quantum physics.

"In short, we have no need for more "isms" and schisms, movement to left or right. These divisions are the cause of our splitting up and can hardly lead to its cure. We need a new, integrating direction, but we cannot discover an integrating and unitary theory common to science and religion without postulating the **unity** of all things.

"In sum, then, our thesis is: We inhabit a **Universe**, and this implies **one universal set of principles** or of truth. To discover these principles or truth, we must enlist both religious and scientific inquiry, and, recognizing the variety of expressions of both, be prepared to seek out the **unity** in its true implication and significance.

"While science as it is presently represented is fragmented into a number of disciplines, and these disciplines seem not necessarily to indicate a common truth, we must look for their connection. Likewise, religions, which for thousands of years have been manufacturing schisms often merely to justify self-determination, need that overall survey that can see them as the various expressions of **one truth**.

"For just as the world with its oceans, continents, and nations presents many facets, yet is one body of matter, so does our culture with its religions, and sciences present many facets, yet is one body of life. Our task then is to seek out this **unity**."[10]

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[10] **Arthur Young**, Quoted by: Frank Barr, M.D., The Theory of Evolutionary Process as a Unifying Paradigm, The Institute for the Study of Consciousness, Berkeley, 1974

Universe as **Unity**

Knowing[2001] reveals that 'Universe' is a unity—that 'Universe' is a whole. Unity is always plural and at minimum two. That within this unity are other unities and within those unities still others.

We humans have a propensity to be '**part**' oriented. Our human intellect divides everything into parts in its search for meaning.This is the basis of our analytical power—our power to understand. And yet, we live in a Universe of '**wholes**'.

Understanding 'Universe' as a unity—understanding 'Universe' as a whole—is essential to our understanding of ourselves and our place in 'Universe'. Without this understanding, we are at odds with ourselves. Without this understanding, we are divided from each other. And it is this division that is the source of most of our problems.

Korzybski's **Principle of Non-Elementalism**

If Universe is a **unity**—if Universe is a **whole**—if all the 'things' in universe are also unities—if all the 'things' in Universe are also wholes—then these 'things' cannot be broken down into basic 'elements'. Alfred Korzybski called this the Principle of Non-Elementalism[11]. Writing in 1933, **Korzybski** explained:

> "The history of human thought may be roughly divided into three periods, each period has gradually evolved from its predecessor. The beginning of one period overlaps the other. As a base for my classification I shall take the relationship between the observer and the observed. …
>
> "The first period may be called the Greek, or Metaphysical, or PreScientific Period. In this period the observer was everything, the observed did not matter.
>
> "The second period may be called the Classical or Semi-Scientific—still reigning in most fields—where the observer was almost nothing and the only thing that mattered was the observed. This tendency gave rise to that which we may call gross empiricism and gross materialism.

[11] **Alfred Korzybski**, Science and Sanity, The Colonial Press Inc., Clinton, Mass., 1933-48

"The third period may be called the Mathematical, or Scientific Period. … In this period mankind will understand (some understand it already) that all that man can know is a joint phenomenon of the observer and the observed. …

"Someone may ask, How about "intuitions," "emotions," etc.? The answer is simple and positive. It is a fallacy of the old schools to divide man into parcels, elements; all human faculties consist of an inter-connected whole. …

"If we decide to face empirical 'reality' boldly, we must accept the Einstein-Minkowski four-dimensional language, for 'space' and 'time' cannot be separated empirically, and so we must have a language of similar structure and consider the facts of the world as series of interrelated ordered events, to which, we must ascribe 'structure'. Einstein's theory, in contrast to Newton's theory, gives us such a language, similar in structure to the empirical facts as revealed by science 1933 and common experience."

"It is quite natural that with the advance of experimental science some generalizations should appear that contain serious structural, epistemological and methodological implications and difficulties. One such generalization that becomes of unusual importance states: **that any organism must be treated as-a-whole**; in other words, that the organism is not an algebraic **sum**, a linear function of its elements, but always **more** than that. It is seemingly little realized, at present, that this simple and innocent-looking statement involves a full structural revision of our language, because that language, of great pre-scientific antiquity, is **elementalistic**, and so singularly inadequate to express **non-elementalistic** notions. The problems of structure, '**more**' and '**non-additivity**' are very important and impossible to analyse in the old way.

"We cannot split the reactions of humans verbally and elementalistically into separate 'body', 'mind', 'emotions'. 'intellect', 'intuitions', etc., but must examine ourselves from **an organism-as-a-whole-in-an-environment** (external and internal) point of view. This parallels the Einstein-Minkowski space-time integration in physics, and both are necessitated by the modern evolution of sciences.

"If we accept this new generalization, then we see that '**emotion**' and '**intellect**' cannot be divided, that this **division** structurally violates the

Generalization of Organism-as-a-Whole-in-an-Environment. And something similar can be said about the distinction of '**body**' versus '**soul**', and other verbal splittings which have hampered any sane advance in the understanding of ourselves, and have filled for thousands of years the libraries and tribunes of the world with hollow reverberations."[12]

Korzybski's **Generalization of Organism-as-a-Whole-in-an-Environment** or the **Principle of Non-elementalism**1933 can now be seen to be an earlier statement of what we now call the **Principle of Synergy.**

Fuller's *Principle of Synergy*

Synergy can be defined as the working **together** of two or more things to produce an effect greater than the sum of their individual effects. Examples include a group of muscles working together in an olympic athlete or several medications combined to treat multiple symptoms in a sick patient. The following is **requoted** from ***UCS•1—We Can All Win!***. **R. Buckminster Fuller** writing in 1975 explained:

"Synergy means behavior of whole systems unpredicted by the behavior of their parts taken separately. Synergy means behavior of integral, aggregate, whole systems unpredicted by behaviors of any of their components or subassemblies of their components taken separately from the whole. Synergy is the only word that means this. The fact that we humans are unfamiliar with the word means that we do not think there are behaviors of "**wholes**" unpredicted by the behavior of "**parts**".

"Synergy can best be illustrated I think, by **chrome-nickel-steel**—chromium, nickel, and iron. The most important characteristic of strength of a material is its ability to stay in one piece when it is pulled – this is called tensile strength, it is measured as pounds per square inch, PSI. The commercially available strength of iron at the very highest level is approximately sixty thousand PSI; of chromium about seventy thousand PSI; and of nickel about eighty thousand PSI. The weakest of the three is iron.

"We all know the saying, "a chain is only as strong as its weakest link". Well, experiment on chrome-nickel-steel, pull it apart, and you will find that it is

[12] **Alfred Korzybski**, Science and Sanity, 1933-48, ibid

much stronger than its weakest link of sixty thousand PSI. In fact it is much stronger than the eighty thousand PSI of its stronger link. Thus the saying that a chain is as strong as its weakest link doesn't hold. So, let me say something that really sounds funny: Maybe a chain is as strong as the sum of the strength of all its links. Let's add up the strengths of the components of chrome-nickel-steel and see. Sixty thousand PSI for iron and seventy thousand PSI for chromium and then and eighty thousand PSI for the nickel, that gives you two hundred and ten thousand PSI. If we add in the minor constituency of carbon and manganese we will add another forty thousand PSI giving us a total of two hundred and fifty thousand PSI.

"Now the fact is that under testing, chrome-nickel-steel shows three hundred and fifty thousand PSI—or one hundred thousand PSI more than the combined strength of all the links.

"This is typical of Synergy, and it is the Synergy of the various metal alloys that have enabled industry to do all kinds of things that man never knew would be able to be done based on the characteristic of the parts."[13]

Fuller's ***Principle of Synergic Attraction***

Today[2001], we now know that what we call gravity or mass attraction is itself a synergic phenomena. This relationship of synergy to gravity has been discovered only recently.

As you will see, **Issac Newton's** choice of "**inverseness**" in his statement of the **Principle of Gravitation**[1687] made "**synergy**" invisible to science for nearly 300 years until **R. Buckminster Fuller** restated the **Principle of Gravitation** as the **Principle of Synergic Attraction**[1975]. **Fuller** explained:

"The most extraordinary example of **synergy** is what is called mass attraction. Examine the solar system. One great massive sphere and another sphere hung by tension members are attracted to one and other.We find there is nothing in one sphere, in its own right, that predicts that it's going to be attracted to the other sphere. You have to have the two. The behavior of these two together is unpredicted by either one by itself. There is nothing that a

[13] **R. Buckminster Fuller**, SYNERGETICS, 1975-1979, ibid

single massive sphere will or can ever do by itself that says it will both exert and yield attractively with a neighboring massive sphere and that it yields progressively: every time the distance between the two is halved, the attraction will be fourfolded. This unpredicted, only mutual behavior is **synergy**. Synergy is the only word in any language having this meaning.

"Issac Newton's **Principle of Gravitation** was in fact a discovery of ***synergic attraction***. He overlooked this when he described the mathematical gain in mass attraction as an **inverse relation**. This "**inverseness**" led him to speak in terms of progressive diminution of the attraction: as the distance away was multiplied by two, the attraction **diminished** by four; ergo, he could speak of it as "squared". If he had been sensitive to synergy he would have stated that the attraction of one mass for the other **increased** as the second power of the rate of increase of their proximity to one another: halve the distance and the interaction is fourfolded.

"Our senses are easily deceived because mass attraction is not explained and cannot be predicted by any characteristic of any one massive body considered alone. Arthur Eddington, one of our greatest astrophysicists, explained, "We often think that when we have completed our study of one we know all about two, because two is one and one. We forget that we have still to make a study of ***and***.""[14]

It is synergy then that binds the Earth to the the Moon. **Synergy** is the associated behavior of **'wholes',** not predicted by examination of the **'parts'**.

All that is known comes in wholes and is a unity of at least two parts. Universe is a whole—a unity—an integrity. Universe is not a part—not a diversity—not a component—not a thing. Nor is it composed of parts, diversities, components, nor things. Universe is composed of other wholes—other unities—other integrities, which in turn are composed of other wholes, other unities, other integrities.

As we examine Universe carefully, we will discover that what we have called Light, Particles, Atoms, Molecules, Plants, Animals, and Humans are themselves all wholes—they are all unities—they are all integrities. That they like all unities are plural and at minimum two. That while they appear to contain other so called

[14] **R. Buckminster Fuller**, SYNERGETICS, 1975-79, ibid

'components' or 'parts', or 'things', these 'components', 'parts', or 'things' are in fact really other **wholes**—other **unities**—other **integrities**. **Fuller**[1975] continued:

> "There are progressive degrees of synergy, called synergy-of-synergies, which are complexes of behavior aggregates wholistically unpredicted by the separate behaviors of any of their subcomplex components. It is manifest that Universe is the maximum synergy-of-synergies, being utterly unpredicted by any of its parts."[15]

*Fuller's **Principle of the Whole System***

Unity is what allows Nature to be **comprehensible**. Unity makes sense—whole systems make sense. **Fuller**[1975] explained:

> "There is a **corollary** of the **Principle of Synergy** known as the **Principle of the Whole System**, which states that the known behaviors of the whole plus the known behaviors of some of the 'parts' may make possible discovery of the presence of other 'parts' and their behaviors, kinetics, structures, and relative dimensionalities. As example, the known sum of the angles of a triangle plus the known characteristics of three of its six parts (two sides and an included angle or two angles and an included side) make possible to determine the others."[16]

It is Nature's commitment to **unity—wholes rather than parts—**that allows humans **to know**. Universe is comprehensible because it is a unity—because it is a whole. This is what makes understanding possible. This is what makes Universe meaningful. This is what makes our world 'knowable'.

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[15] **R. Buckminster Fuller**, SYNERGETICS, 1975-79, ibid

[16] **R. Buckminster Fuller**, SYNERGETICS, 1975-79, ibid

A Limit to Knowing

But, no matter how long the human species may survive, our model of 'Nature' will **never** be complete. While '**GOD**' has granted us the gift of knowing, we humans cannot know **ALL**.

Korzybski's Principle of Non-Allness

Alfred Korzybski[1933] called this limit to human knowing the **Principle of Non-Allness**[17]. Korzybski felt that knowledge of this 'law' of Nature was so fundamental and important to all humans, that he developed a lesson especially for children. **Korzybski** explained:

"Children, today we want to learn **all** about the apple."

He places an apple in view of the children, "Do you children know about the apple?"

"I do!", "I do!", "Yes, I know about apples!"

"Good" Korzybski moves to the blackboard. , "Come, tell me about the apple?"

"The Apple is a fruit.", "The apple is red.", "The apple grows on a tree."

Korzybski would list the characteristics described by the children on the blackboard. The children continue, "An apple a day keeps the Doctor away."

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[17] **Alfred Korzybski**, Science and Sanity, 1933-48, ibid

Korzybski continues listing the childrens answers until they run out of ideas then he would ask, “Is that **all** we can say about the apple?”

When the children answered in the affirmative, Korzybski would remove his pocket-knife and cut the apple in half, passing the parts among the children.

“Now, children can we say **more** about the apple?”

“The apple smells good.” “The juices are sweet.” “The apple has seeds.” “Its pulp is white.” “Mother makes apple pie.”

Finally when the children had again run out of answers, Korzybski would ask, “Now, is that **all** we can say about the apple?” When the children agreed that it was all that could be said, he would again go into his pocket only this time he removed a ten power magnifying lens and passed it to the children. The children would examine the apple, and again respond:

“The apple pulp has a pattern and a structure.” “The skin of the apple has pores.” “The leaves have fuzz on them.” “The seeds have coats.”[18]

Thus Korzybski would teach the children the lesson of **Non-ALLness**.

Now we could continue to examine the apple—with a light microscope, x-ray crystallography, and eventually the electron microscope. We would continue to discover more to say about the apple. However, we can never know **ALL** there is to know about anything in Nature. We humans have the power to know about Nature, but not to know **ALL**.

Knowing is without limit, but knowing is not total. Universe is our human model of Nature. Our ‘knowing’ can grow evermore complete. It can grow closer and closer to the ‘Truth’, but it cannot equal the ‘Truth’. It must always be incomplete. We are not ‘GOD’. We cannot see and know **ALL**.

Harry Rathbun[1976] on the permanence of the unknown and mystery:

“The truly scientific spirit is one of openness to **truth.** It demands the

[18] **Charlotte Schuchardt Read**, From private conversations with Ms. Read in 1980. Ms. Read worked with Alfred Korzybski at the Institute of General Semantics from 1939 until his death in 1950.

willingness to pursue truth relentlessly, and to follow wherever it leads at whatever cost. The cost includes letting go our prejudices and preconceptions, and especially the precious opinions and hypotheses that we believe to be fresh and wonder insights into reality. The scientific venture demands the attitude of detachment. We have seen that this is attainable only by commitment to a value so high as to demand one's total loyalty. In the case of science this value is abstract **truth**. a necessary accompaniment of that attitude is its corollary, **humility**. This is the willing acceptance of the fact that we are totally subject to something greater than ourselves. It also requires acceptance of the fact that there are mysteries which presently are, and may always be, beyond our human powers of understanding."[19]

The Uncertainty of Science

Richard Feynman1963 again speaking at the University of Washington[20].

"I come now to an important point. The old laws may be wrong. How can an observation be incorrect? If it has been carefully checked, how can it be wrong? Why are physicists always having to change the laws? The answer is, first, that the laws are not the observations and, second, that experiments are always inaccurate. The laws are guessed laws, extrapolations, not something that the observations insist upon. They are just good guesses that have gone through the sieve so far. And it turns out later that the sieve now has smaller holes than the sieves that were used before, and this time the law is caught. So the laws are guessed; they are extrapolations into the unknown. You do not know what is going to happen, so you take a guess.

"For example, it was believed—it was discovered that motion does not affect the weight of a thing—that if you spin a top and weigh it, and then weigh it when it has stopped, it weighs the same. That is the result of an observation. But you cannot weigh something to the infinitesimal number of decimal places, parts in a billion. But we now understand that a spinning top weighs more than a top which is not spinning by a few parts in less than a billion. If the top

[19] **Harry J. Rathbun**, Creative Initiative: Guide To Fulfillment, Creative Initiative Foundation, Palo Alto, California, 1976

[20] **Richard P. Feynman**, THE MEANING OF IT ALL – Thoughts of a Citizen-Scientist, HELIX BOOKS – Addison-Wesley, 1998

spins fast enough so that the speed of the edges approaches 186,000 miles a second, the weight increase is appreciable—but not until then. The first experiments were performed with tops that spun at speeds much lower than 186,000 miles a second. It seemed then that the mass of the top spinning and not spinning was exactly the same, and someone made a guess that the mass never changes.

"How foolish! What a fool! It is only a guessed law, an extrapolation. Why did he do something so unscientific? There was nothing unscientific about it; it was only **uncertain**. It would have been unscientific **not** to guess. It has to be done because the extrapolations are the only things that have any real value. It is only the principle of what you think will happen in a case you have not tried that is worth knowing about. Knowledge is of no real value if all you can tell me is what happened yesterday. It is necessary to tell what will happen tomorrow if you do something—not necessary, but fun. Only you must be willing to stick your neck out.

"Every scientific law, every scientific principle, every statement of the results of an observation is some kind of a summary which leaves out details, because nothing can be stated precisely. The man simply forgot—he should have stated the law "The mass doesn't change **much** when the speed isn't **too high**." The game is to make a specific rule and then see if it will go through the sieve. So the specific guess was that the mass never changes at all. Exciting possibility! It does no harm that it turned out not to be the case. It was only uncertain, and there is no harm in being uncertain. It is better to say something and not be sure than not to say anything at all.

"It is necessary and true that all of the things we say in science, all of the conclusions, are **uncertain**, because they are only conclusions. They are guesses as to what is going to happen, and you cannot know what will happen, because you have not made the most complete experiments.

"It is curious that the effect on the mass of a spinning top is so small you may say, "Oh, it doesn't make any difference." But to get a law that is right, or at least one that keeps going through the successive sieves, that goes on for many more observations, requires a tremendous intelligence and imagination and a complete revamping of our philosophy, our understanding of space and time. I am referring to the relativity theory. It turns out that the tiny effects

that turn up always require the most revolutionary modifications of ideas.

"Scientists, therefore, are used to dealing with doubt and uncertainty. **All scientific knowledge is uncertain**. This experience with doubt and uncertainty is important. I believe that it is of very great value, and one that extends beyond the sciences. I believe that to solve any problem that has never been solved before, you have to leave the door to the unknown ajar. You have to permit the possibility that you do not have it exactly right. Otherwise, if you have made up your mind already, you might not solve it.

"When the scientist tells you he does not know the answer, he is an ignorant man. When he tells you he has a hunch about how it is going to work, he is uncertain about it. When he is pretty sure of how it is going to work, and he tells you, "This is the way it's going to work, I'll bet," he still is in some doubt. And it is of paramount importance, in order to make progress, that we recognize this ignorance and this doubt. Because we have the doubt, we then propose looking in new directions for new ideas. The rate of the development of science is not the rate at which you make observations alone but, much more important, the rate at which you create new things to test.

"If we were not able or did not desire to look in any new direction, if we did not have a doubt or recognize ignorance, we would not get any new ideas. There would be nothing worth checking, because we would know what is true. So what we call scientific knowledge today is a body of statements of varying degrees of certainty. Some of them are most unsure; some of them are nearly sure; but none is absolutely certain. Scientists are used to this. We know that it is consistent to be able to live and not know. Some people say, "How can you **live** without knowing?" I do not know what they mean. I always live without knowing. That is easy. How you get to know is what I want to know.

"This freedom to doubt is an important matter in the sciences and, I believe, in other fields. It was born of a struggle. It was a struggle to be permitted to doubt, to be unsure. And I do not want us to forget the importance of the struggle and, by default, to let the thing fall away. I feel a responsibility as a scientist who knows the great value of a satisfactory philosophy of ignorance, and the progress made possible by such a philosophy, progress which is the fruit of freedom of thought. I feel a responsibility to proclaim the value of this

freedom and to teach that doubt is not to be feared, but that it is to be welcomed as the possibility of a new potential for human beings. If you know that you are not sure, you have a chance to improve the situation. I want to demand this freedom for future generations."[21]

—Richard Feyman

The Uncertainty of Human Knowing

Jacob Bronowski[1976] speaking in his famous public television series the ***Ascent of Man***[22]:

"One aim of the physical sciences has been to give an exact picture of the material world. One achievement of physics in the Twentieth Century has been to prove that that aim is unattainable. There is no absolute knowledge and those who claim it, whether they are scientists or dogmatists, open the door to tragedy. All information is imperfect. We have to treat it with humility. This is the human condition; and that is what Quantum Physics says. I mean that literally.

"Let us examine an object with the best tool we have today, the electron microscope, where the rays are so concentrated that we no longer know whether to call them waves or particles. Electrons are fired at an object, and they trace its outline like a knife-thrower at a fair. The smallest object that has ever been seen is a single atom of thorium. It is spectacular.

And yet the soft image confirms that, like the knives that graze the girl at the fair, even the hardest electrons do not give a hard outline. The perfect image is still as remote as the distant stars.

"We are here face to face with the crucial paradox of knowledge. Year by year we devise more precise instruments with which to observe nature with more fineness and when we look at the observations, we are discomfited to see that they are still fuzzy, and we feel that we are as uncertain as ever.

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[21] **Richard P. Feynman**, THE MEANING OF IT ALL, 1998, ibid

[22] **Jacob Bronowski**, The Ascent of Man, Little, Brown & Company, New York, 1976

"We seem to be running after a goal which lurches away from us to infinity every time we come within sight of it.

"The paradox of knowledge is not confined to the small, atomic scale; on the contrary, it is as cogent on the scale of man, and even of the stars. Let me put it in the context of an astronomical observatory. Karl Freidrich Gauss' observatory at Göttingen was built about 1807. Throughout his life and ever since (the best part of 200 years) astronomical instruments have been improved. We look at the position of a star as it was determined then and now, and it seems to us that we are closer and closer to finding it precisely. But when we actually compare our individual observations today, we are

astonished and chagrined to find them as scattered within themselves as ever. We had hoped that the human errors would disappear, and that we would ourselves have God's view. But it turns out that the errors cannot be taken out of the observations. And that is true of stars, or atoms, or just looking at somebody's picture, or hearing the report of somebody's speech.

"Our understanding of the indefinite nature of Universe and the paradox of knowledge came to fruition in the sleepy university town of Göttingen, Germany. In 1920, the link between Göttingen and the outside world was the railway. That was the way the visitors came from Berlin and abroad, eager to exchange the new ideas that were racing ahead in physics. It was a byword in Göttingen that science came to life on the train to Berlin. Because that is where people argued and contradicted and had new ideas. And had them challenged too.

"In the years of the first world war, science was dominated at Göttingen as elsewhere by Relativity. But in 1921 there was appointed to the chair of physics Max Born who began a series of seminars that brought everyone interested in atomic physics here. It is rather surprising to reflect that Max Born was almost forty when he was appointed. By enlarge, physicists have done their best work before they are thirty (mathematicians even early, biologists perhaps a little later). But Born had a remarkable personal, Socratic gift. He drew young men to him, he got the best out of them, and the ideas that he and they exchanged and challenged also produced his best work. Out of that wealth of names, who am I to choose? Obviously Werner Heisenberg, who did his finest work here with Born. Then, when Erwin Schrodinger published a different form of basic atomic physics, here is where the arguments took place. And from all over the world people came to Göttingen to join in.

"It is rather strange to talk in these terms about a subject which, after all, is done by midnight oil. Did physics in the 1920's really consist of argument, seminar, discussion, dispute? Yes it did. Yes it still does. The people who met here, the people who meet in laboratories still, only end their work with a mathematical formulation. They begin it by trying to solve conceptual riddles. The riddles of the subatomic particles—of the electrons and the rest—are mental riddles."

"Think of the puzzles that the electron was setting just at that time. The quip among professors was (because of the way university time-tables are laid out) that on Mondays, Wednesdays and Fridays, the electron would behave like a particle; on Tuesdays, Thursdays and Saturdays it would behave like a wave. How could you match those two aspects brought from the large scale world and pushed into a single entity, into this "Lilliput" ***Gulliver's Travels*** world of the inside of the atom? That is what the speculation and argument was about. And that requires, not calculation, but insight, imagination—if you like, metaphysics. I remember a phrase that Max Born used when he came to England many years after, and that still stands in his autobiography. He said: "I am now convinced that theoretical physics is actually philosophy."

"Max Born meant that the new ideas in physics amount to a different view of reality. The world is not a fixed, solid array of objects, out there, for it cannot be fully separated from our perception of it. It shifts under our gaze, it interacts with us, and the knowledge that it yields has to be interpreted by us. There is no way of exchanging information that does not demand an active judgement. Is the electron a particle? It behaves like one in the Bohr atom. But de Broglie in 1924 made a beautiful wave model in which the orbits are the places where an exact, whole number of waves, close round the nucleus. Max Born thought of a train of electrons as if each were riding on a crankshaft, so that collectively they constitute a series of Gaussian Curves, a wave of probability. A new conception was being made, on the train to Berlin and the professorial walks in the woods of Göttingen: that whatever fundamental units the world is put together from, they are more delicate, more fugitive, more startling than we catch in the butterfly net of out senses.

"All those woodland walks and conversations came to a brilliant climax in 1927. Earlier that year Werner Heisenberg gave a new characterization of the electron. Yes, it is a particle, he said, but a particle which yields only limited information, that is, you can specify where it is at this instant, but then you cannot impose on it a specific speed and direction at the setting-off. Or conversely, if you insist that you are going to fire it at a certain speed and certain direction, then you cannot specify exactly what its starting-point is—or, of course, its end-point.

"That sounds like a very crude characterization. It is not. Heisenberg gave it

depth by making it precise. The information that the electron carries is limited in its totality. That is, for instance, its speed and its position fit together in such a way that they are confined by the tolerance of the quantum.

"This is the profound idea: one of the great scientific ideas, not only of the Twentieth Century, but in the history of science.

"Heisenberg called this the ***Principle of Uncertainty.*** In one sense, it is a robust principle of the everyday. We know that we cannot ask the world to be exact. If an object (a familiar face, for example) had to be **exactly** the same before we recognized it, we would never recognize it from one day to the next. We recognize the object to be the same because it is much the same; it is never exactly like it was, it is tolerably alike. In the act of recognition, a judgement is built in – an area of tolerance or uncertainty.

"So Heisenberg's principle says that no events, not even atomic events, can be described with certainty, that is, with zero tolerance. What makes the principle profound is that Heisenberg specifies the tolerance that can be reached. the measuring rod is Max Planck's quantum. In the world of the atom, the area of uncertainty is always mapped out by the quantum.

"Yet the ***Principle of Uncertainty*** is a bad name. In science or outside it, things are **not** uncertain; our knowledge is merely confined within a certain tolerance. We should call it the ***Principle of Tolerance***. And I propose that name in two senses. First, in the engineering sense. Science has progressed step-by-step, the most successful enterprise in the ascent of man, because it has understood that the exchange of information between man and nature, and man and a man, can only take place within a certain tolerance. But second, I also use the word passionately about the real world. All knowledge, all knowledge between human beings can only be exchanged within a play of tolerance. And that is true whether the exchange is in science, or in literature, or in religion, or in politics, or even in any form of thought that aspires to dogma. It is a major tragedy of my lifetime and ours that, here in Göttingen, scientists were refining to the most exquisite precision the ***Principle of Tolerance***, and turning their backs on the fact that all around them tolerance was crashing to the ground beyond repair.

"The ***Principle of Uncertainty***, or in my phrase, the ***Principle of Tolerance***

fixed once for all the realization that **ALL** knowledge is limited."

*Heisenberg's ***Principle of Uncertainty*** or Bronowski's ***Principle of Tolerance*** is what Korzybski called the ***Principle of Non-Allness***. Interestingly, Eddington called it the ***Principle of Indeterminacy*** by which he meant reality is not uncertain, rather the observation is indeterminate.[23] Bronowski continues:

> "It is an irony of history that at the very time when this was being worked out there should arise, under Hitler in Germany and other tyrants elsewhere, a counter-conception; a principle of monstrous certainty. When the future looks back on the 1930s it will think of them as a crucial confrontation of culture as I have been expounding it, the ascent of man, against the throwback to the despots' belief that they have **absolute certainty**."[24]
>
> **—Jacob Bronowski**

Because we humans don't know that we don't know, we embrace the attitude of **certainty**. Certainty is **ignorance of ignorance**, and there is no greater arrogance than that produced by a belief in **certainty**. If we humans become aware or our ignorance, then we have knowledge of ignorance—with knowledge of ignorance, we can learn from our mistakes and protect ourselves in the future.

The ***Principle of Non-Allness*** does not mean that we can't know reality. This is not what Korzybski and Bronowski are telling us. They are saying that our knowledge is incomplete, we can know a great deal about reality, but Nature is constructed in such a way that she will not reveal **ALL** her secrets. We humans can never know **ALL** there is to know about anything.

To help his fellow humans understand the importance of the ***Principle of Non-Allness*** as Korzybski called it, he invented a device called the "***Structural Differential***"[25].

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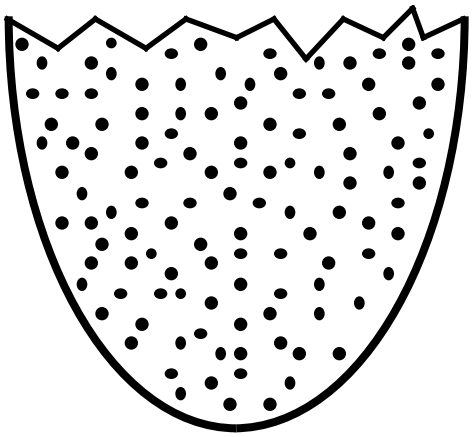
[23] **Author's *(annotation)**

[24] **Jacob Bronowski**, The Ascent of Man, 1976, ibid

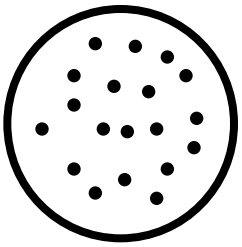
[25] **Alfred Korzybski**, Science and Sanity, 1933-48, ibid

Let's make use of the Structural Differential to re-examine the apple. We can represent our scientific '**real**' apple as a parabola.



'reality'
'event'

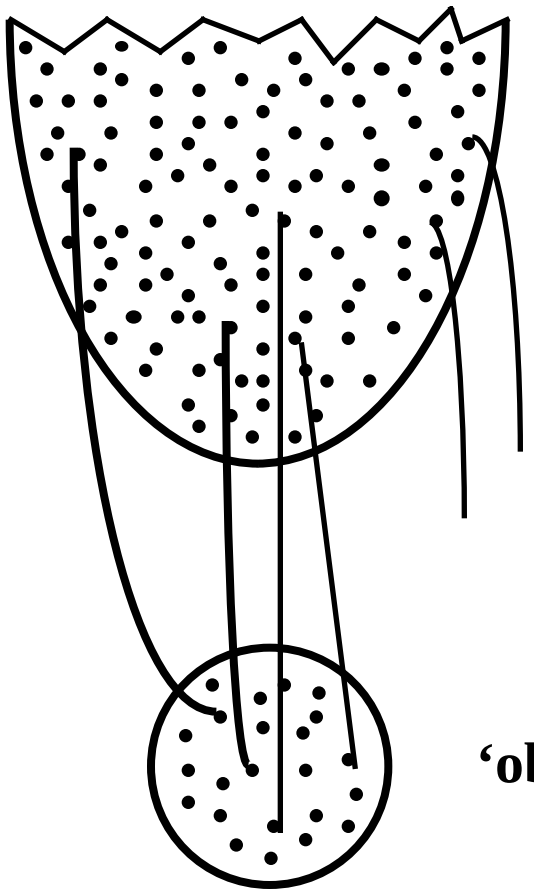
The black dots on our parabola represent all the characteristics of the '**real**' scientific apple. The parabola can represent any '**real**' object or event in Universe. The parabola would extend indefinitely into space. Korzybski closed the top of the parabola with a broken line—as if the parabola was broken off— to remind us that this is an indeterminate reality. But when you and I observe the apple, we do not see the indefinite reality, we see a sharp, crisp, juicy apple, a **definite** apple, a finite illusion. Korzybski represented this '**object**' as a finite circle.



'object'

The black dots within the finite circle represent the characteristics that we can know. The information that our human brain can perceive and discern from its senses. That which the observer can determine. because, what we can know is always less than what there is to know—the characteristics of our '**object**' are less than the characteristics of the '**reality**'.

Korzybski demonstrated this by linking some of the characteristics of the '**real**' apple with some of the characteristics of the '**object**' apple. He also showed that some characteristics did not connect.



These were represented as hanging strings to remind us that our 'object' apple—the apple we know through our senses does not and cannot contain **ALL** the information of the '**real**' apple.

Since we humans make all our decisions based on the '**objects**' in our world, we make all decisions without **ALL** the information. This discovery leads to a major revelation if we can but see the higher truth in it. We humans live in a world where all our decisions, all our choices are made without **ALL** the information. We humans can know but we cannot know all. We humans make mistakes, not because we are bad, not because we are stupid, not because we are incompetent, not because we are lazy, nor even because we are careless. We humans make mistakes because we are **ignorant**.

Let me repeat that, **we humans make mistakes because we are ignorant**.

We can never know all there is to know about anything—this is a fundamental 'law' of Nature. This in fact is the only cause of mistakes.

Korzybski teaches us that every human belief is an assumption. We can never know for sure. We can never know **ALL**.

As you sit in your chair reading this book, you assumed the chair would hold you. You did not check under the chair to see if it had broken since its last use. When you ate lunch at your favorite restaurant last week, you assumed the waitress had washed her hands. You assumed the cook did not have hepatitis. If you had assumed otherwise, you would not have walked into that restaurant. You would not have eaten your lunch. We humans assume. Herein lies our **uncertainty**—that's all we humans can do. There is nothing wrong in our assuming, we are simply obeying a fundamental 'law' of Nature.

Ignorance is the word that best describes the human condition. Korzybski's ***Principle of Non-Allness*** means that we humans make all of our decisions with incomplete and imperfect knowing. We make every choice without all the information. All humans live and act in state of **ignorance**.

We humans have always believed that mistakes are **bad**. We have always believed that those who make mistakes are **bad**. They are stupid or careless—lazy or incompetent—just no damn good. If they were good, they wouldn't make mistakes. Everyone knows that. Decent people don't make mistakes. This is nearly a universal belief.

mistakes = badness

And this is a belief that results from our spacial intelligence which evolved in the world of space-binding and is not sensitive to time. We humans share the animal's body, and we also share their spacial intelligence. Recall my discussion of space-binding from ***We Can All Win!***:

Space-binding

The power of space-binding is **mobility**—the ability to **move about in space**. This is not the simple motion of plants. This is **mobility—**running, jumping, leaping, swinging, swimming, creeping, stalking, crawling, diving, and flying.

The space-binder moves towards a specific and attainable goal—water, food, a mate, shelter—and in any direction. The mobility of the space-binder is not just motion, it is controlled motion. The space-binder moves in search of food. For grazing animals the quest is continuous; for predators, occasional but more strenuous. And all animals are under constant threat from natural enemies. The animal, therefore, requires sense awareness – awareness of the space in which he lives. The space-binder uses his awareness to find food and to warn him of the approach of enemies. A deer may be motivated by thirst to go to a waterhole, but if it senses a lion, it will refrain. It must continuously evaluate conflicting stimuli and choose between alternatives, alternatives of pleasure or pain, alternatives of good space or bad space. Space-binders are aware of space, they are aware and they think, they think and they decide – constantly making controlled choices as to where and when to move.

Thinking for the space-binder is **wholistic**. The animals base their decisions on the whole situation. When the rabbit hears a sound in the thicket, he must react instantly, "fight or flight" and the decision must be made **now**, based on the **whole** situation. There is no time for analysis. Only wholistic thinking has the rapidity and flexibility to allow survival in the adversary world of space-binders. The power to allow animals move instantly towards **good space**—space that enables one to survive, and away from **bad space**—space that produces injury or death.

Space-Mind[26]

Human intelligence is greater than animal intelligence, but it includes animal intelligence. It includes the **space-mind**. The **space-mind** is responsible for **survival** in **space**. The space-mind also controls your body in space. The space-mind dances. The space-mind walks. The space-mind jumps. If you are an bird the space-mind flies. The space-mind crawls. The space-mind leaps through the trees. The space-mind controls motion and behavior in space.

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[26] **Author's Note:** ***Space-Mind*** is excerpted from The Synergetic Theory of Space-Time Intelligence, to be published by the author in Volume 6 of ***UnCommon Sense—SafePassage,*** ~2002

The **space-mind** is in charge of **survival** and focused on '**being**'—"To **be** or not to be" is a question of survival.

'Being' — How do I feel?

'Being' — Am I surviving well? The **space-mind** focuses on the **process** of life. How am I **being** treated? How does reality **feel**?

In humans, the **space-mind** processes the multi-dimensional sense data that makes up its pictures of reality. These include the ten dimensions of of our external senses—**vision** in **stereo** and **color**, **hearing** in **stereo**, plus **smell**, **taste**, **touch**, **temperature**, and **vibratory** sense. Space-mind makes a multi-dimensional sense **picture** of the **here** and **now**. It also includes all the **internal** sense data, I am experiencing at the moment of perception.

> "In addition to the 10 dimensional external sense image, there are very important internal senses as example those produced by the vestibular organs—semi-circular canals and otolith organs. The semi-circular canals sense rotation and angular acceleration in three orthogonal planes. The otolith senses linear motion, linear acceleration, and perhaps gravity."[27]

Other internal sense data includes—kenesthetics—muscular tension in all muscle groups, position of all limbs, state of fatigue, etc., as well as feelings of hunger, thirst, and also the emotional tone—feelings of anger or fear, etc., etc., etc..

All this multi-dimensional data—external and internal—are **associates** of the present **now** moment that is being **perceived** by the space-mind.

In the animal world there is no **past->present->future**. Reality is experienced as one single —**now**— moment. All sensory components of the **—now—** moment are equal. The perception has length, width, depth, color, directional sound, smell, taste, touch, temperature, and vibration, and tightly bound to this same **percept** are all internal sensations of complex motion, state of the organism, and emotional tone.

I sense the odor of Lion. I instantly search my memory for that smell and its associates all comes back in a flash.

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[27] **N. Arthur Coulter**, Private letter August 12, 2000

My memory returns with the **whole** picture.

Smell=Lion=Death=Fear=Run=Now

Spacial intelligence is **associative**. **Space-mind** perceives reality by looking for sameness. It creates its multi-dimensional picture of reality. All components of the "**percept**" are equal to all other components. It searchs its memory for sameness, what memories are the same as the —now— moment.

Imagine you are driving your automobile, ahead is a traffic signal. The traffic light turns red. To the associative **space-mind** "Red **IS** stop". The red light **equals** STOP. Red is **identical** with stop.

A=B=C=E=R=T=Y=F=H=D=G, and just as well G=D=H=F=Y=T=R=E=C=B=A

Space-mind associates. It does this by searching its memory banks of all past Percepts for **sameness**. If it finds any sameness, it recalls that memory as a whole.

The **space-mind** generates a **Percept** of the NOW moment. It orders its multi-dimensional sense data into a WHOLE and calls every part of that Percept equal to every other part of the Percept. Functionally, the **space-mind** is a **Space-Associative Perceiver** synthesizing sense data into wholes, synthesizing: SAMENESS INTO WHOLES.

Part 1 = Part 2 = Part 3 = Part 4, and just as well Part 4 = Part 3 = Part 2 = Part 1.

All is symmetrical. All is equal in that moment in time called NOW. The **Space-Associative Perceiver** places an equal sign (=) between each part of the Percept. The Percept is the multi-dimensional **sense-image** of the moment called NOW. The **space-mind** of animals and humans perceive this moment as **simultaneous** and **local**.

What is **local** and **simultaneous** is **here** and **now**. 'Percept' is a multi-dimensional snapshot of the here and now.

Summing up, we see:

Space-Mind

Synthesizing wholes in order to survive.
BEING—To be or not to be is a question of survival.
A = B, and B = A
IDENTITY
SYMMETRICAL
PERCEPT

Comparing station for SAMENESS.

WHOLE IS DEFINED AS ANY EQUALITY==>
A = B, and equally valid B = A

SYMMETRICAL
HERE and NOW
LOCAL and SIMULTANEOUS

In the world of space-binding **cause** and **effect** can not be distinguished from each other. They are the **same—**they **equal** each other—they are **identical**. If the **effect** of a mistake is **bad**, then the **cause** of a mistake is also **bad**. All humans have a **space-mind**. It is a powerful and often dominant part of our human intelligence. As children the space-mind is primary. The **time-mind** doesn't even begin to become operational in children until they reach the age of four.

So our human belief that mistakes are '**bad**' is legitimate. Most of us learn about mistakes as small children. If I stumble while running, I get hurt and that **is** bad. If an animal is running for its life and stumbles, it dies and that **is** bad. For space-binders, mistakes are a part of **bad space**.

In the world of **space-binding**, a mistake can cost not only the life of the individual space-binder, but also the lives of others in the group—pack, pride, herd, or troop. Therefore the result of a mistake was often **bad**, and not just for the individual, but for others in the group as well. Since 99.9% of all human history has been **adversary**—99.9% of our history dominated by space-binding, it is no wonder that we humans have believed for countless centuries that mistakes **are** bad.

The belief in the badness of mistakes was further reenforced and given devine sanction by our human religions. God is **good**. God is **omniscience—ALL knowing**. God makes no mistakes. He is perfect. We humans are admonished to be as God-like as possible. If making no mistakes is '**good**', then obviously making mistakes is '**bad**'. Our religions institutionalized the adversary processing of mistakes—Sin, Hellfire, and Damnation.

Science has also added credence to the 'badness' of mistakes. The world view created by the 'objective science' of Galileo, Kepler, Hooke, and Newton was a 'perfect' Universe. Newton's System of the Worlds described a precision clockwork perfection that controlled all in Universe. If the Universe is perfect, then humans too must evolve towards perfection.

Dealing with badness

Since mistakes are bad, when one occurs, we **investigate** to determine who is at fault. Who made the mistake? Once that is determined, we **blame** those responsible. Following blame, we are ready to **punish**. More pain and suffering has been inflicted on humankind for making mistakes than for any other cause. This should not surprise us.

Punishment is the proper way to deal with '**badness**'. And,if we are anything, we are fair. So when we are the one who made the mistake, we **self-punish**. Self-punishment is called "**guilt**". Humans are the only class of living systems that feels guilty. The only class of living systems that teaches their pets to feel guilty.

MISTAKES = Badness

INVESTIGATE

BLAME

PUNISH —> self punish

"Guilt"

Now let us recall my discussion of time-binding from ***We Can All Win!***:

Time-binding

We humans are Time-binders. We possess the power to **understand** and through that understanding to **control** and dominate planet Earth.

The power of Time-binding is to **understand—to observe and remember change over time**. Understanding comes from the **awareness of time**—an awareness that allows **humans to experience time as sequential or linear**.

Tomorrow follows today as today followed yesterday. Time always moves from the past to the present, from the present to the future. Change is bound in time. And time-binders understand change in space because they are aware of time.

Time-binding is a new way of thinking—analytical thinking. The Time-binder can make decisions based on understanding changes in his environment over time. Time-binding analysis is **sequential analysis – linear analysis –** focused on the **parts** rather than the **whole**.

Analytical thinking recognizes cause and effect. Time-binders are the masters of cause and effect. When humans understand cause and effect, they make scientific discovery. They make knowledge. When humans make choices based on knowledge, they make inventions. They make technology. Time-binders are the creators of knowledge and technology. When knowledge is incorporated into matter-energy, it becomes a tool. Humans are above all else **toolmakers**. Most of our knowledge is embedded in our tools. Human knowledge grows continuously and without limit. As we incorporate our evermore powerful knowledge into tools. We produce evermore powerful tools.

Time-binding is also that unique human ability to pass that 'knowing' from one generation to the next generation. Both animal and human offspring begin their lives in nearly total ignorance. The differences that exist between them are small, but what advantage in knowing that does exist belongs clearly to the animal. While the animal seems to begin life with a greater store of inherited knowing, it possesses little ability to learn from its parents. The animal is condemned to rediscover over and over, every generation must discover anew the knowings of its parents. The wise old owl may know a great deal, but he has no way to pass what he knows to his offspring and they have no way to receive it. We humans are very different in that respect. We can and do pass our knowing from one generation to the next. Alfred Korzybski explains:

> "Human beings possess a most remarkable capacity which is entirely peculiar to them – I mean the capacity to summarise, digest and appropriate the labors and experiences of the past; I mean the capacity to use the fruits of past labors and experiences as intellectual or spiritual capital for developments in the present; I mean the capacity to employ as instruments of increasing power the accumulated achievements of the all-previous lives of the past generations spent in trial and error, trial and success; I mean the capacity of human beings to conduct their lives in the ever increasing light of inherited wisdom; I mean the capacity in virtue of which man is at once the inheritor of the by-gone ages and the trustee of posterity. And because humanity is just this magnificent natural agency by which the past lives in the present and the present for the future, I define **humanity**, in the universal tongue of mathematics and mechanics, to be the **time-binding** class of life."[28]

We humans bind time and are bound together in time. The record of our time-binding is everywhere. It is in all that activity that we so innocently call progress. It is the very motor of obsolescence. It is imbedded in just about every thing associated with humans and yet most humans are unaware of the very power that makes them human. We humans catalogue and store our various knowings in libraries, universities, colleges, data banks, and information services. We store our knowing in many formats – books, tapes, films, movies, newspapers, magazines, video, microfilm, photos, computer files, etc., etc., etc. We are time-binders and the mark of human power is everywhere.

We humans, are the only class of living systems that can understand that we have made a mistake. We are the only class of living systems capable of consciously choosing to be responsible.

Time-Mind[29]

Human intelligence is much more than animal intelligence. It includes the **space-mind**, but has the addition of the **time-mind**. The addition of a second mind has given humans the gift of enormous intelligence. Saying that humans are more intelligent than animals, is as much an understatement as saying that animals are more

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[28] **Alfred Korzybski**, The Manhood of Humanity, E. P. Dutton & Company, 1921

[29] **Author's Note:** ***Time-Mind,*** The Synergetic Theory of Space-Time Intelligence, to be published in ***UnCommon Sense—SafePassage,*** ~2002.

intelligent than plants.

The secret of the time-mind's power is that it thinks in words. Words are simply a **sequence** of complex sounds created by the human throat, tongue, mouth, and vocal cords to represent, or **symbolize** the **'percepts'** of reality created by the **space-mind**. Recall from our earlier discussion. An **'event'** is occurring in the **'real'** world.

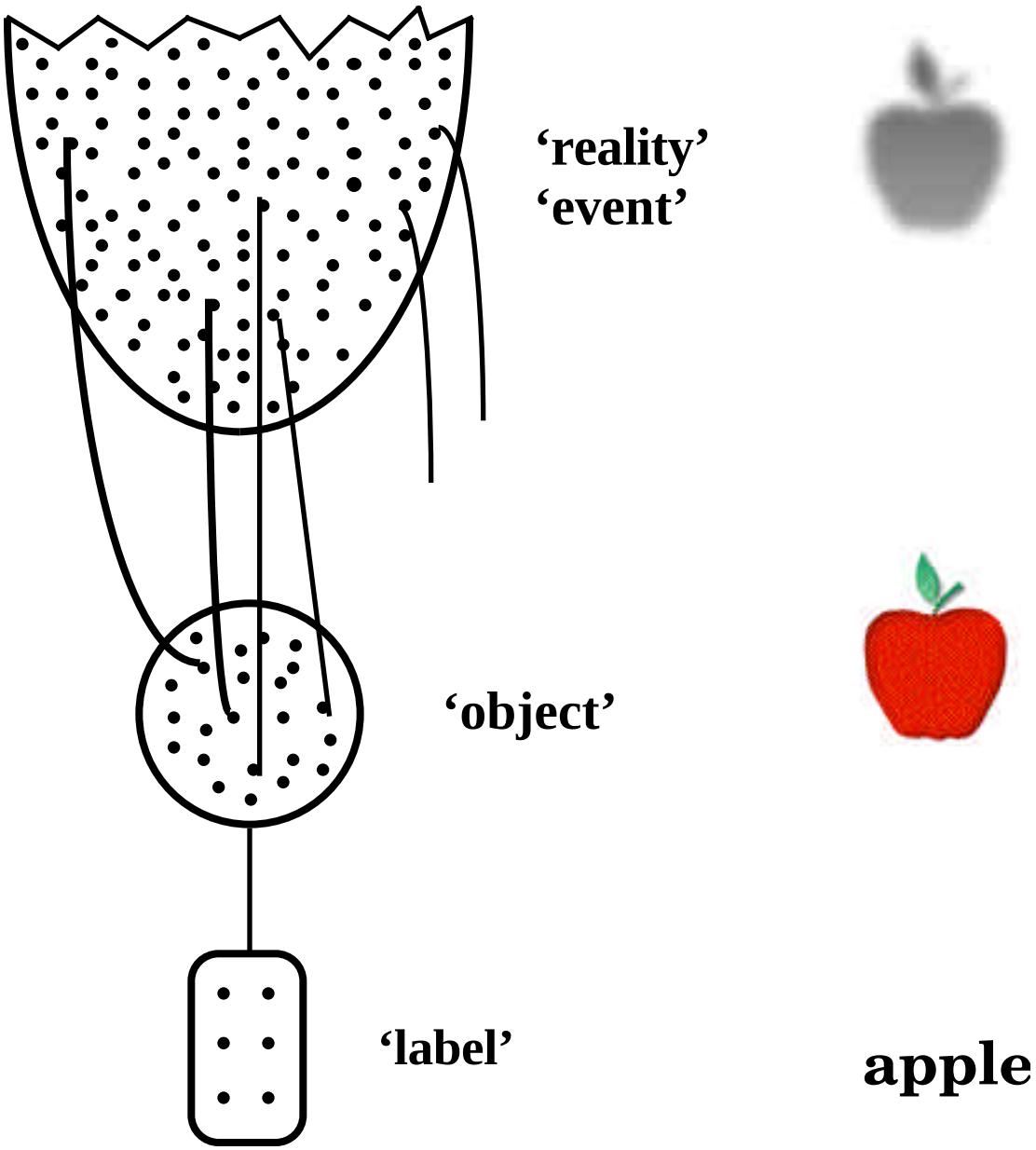
My **space-mind** neurologically **abstracts** information from its multi-dimensional sense data about that event and forms a **picture** of **'reality'**—this is our scientific **'object'**, or in the language of human intelligence science a **'percept'**.

My **time-mind** then uses a sequence of sounds—a spoken word, or in written form a sequence of letters—a written word to **'label'** that **'object'.**

apple

A **word** is our scientific **'label'**, or in the language of human intelligence science a **'concept'**.

Using Korzybski's structural differential[30] we see:



This **symbolic** representation of **'percepts'** with a sequence of complex sounds, or a sequence of written letters is of great utility to the **time-mind**. It allows the time-mind to think about things. And, since the space-mind is capable of survival all by itself, the time-mind has 'time' on its hands to think about things—to figure things out.

30 **Alfred Korzybski**, Science and Sanity, 1933-48, ibid

The **time-mind** is in charge of **understanding**. It can understand because it is aware of **time**. It is aware of changes that occur over time. Through it's **awareness of time** it has developed the ability to **analyze** reality. By noticing the changes that occur over time, it has the ability to figure things out. It can notice what comes before what. It can determine what events cause what effects. It can notice what events precede other events in what sequences.

The **time-mind** generates analytical thinking. We can understand that cause and effect are sequential. We can analyze an event and discover that cause and effect are **different**. Sequence is meaningful to our **temporal intelligence**—sequence is meaningful to a **time-binder**.

Our **time-mind** thinks in words. It understands the past, present, and future. Why? Think about words. Spoken words are a sequence of sounds, and written words are a sequence of letters.

w»o»r»d»s

Words have a beginning, a middle, and an end. Think about sentences. If I were to turn my head and speak a sentence, imagine you could see those words as they emerged from my mouth. You would see a string of words:

The»quick»brown»fox»jumped»over»the»lazy»dog.

1»2»3»4»5»6»7»8»9»10» … ∞

A»B»C»D»E»F»G»H»I» … Z

Past»Present»Future

Awareness of TIME—awareness of Past»Present»Future—is simply awareness of sequence. First A then B then C then D» Etc.»Etc.. **Sequence** is an **ordered** linear chain. And awareness of sequence allows Time-mind to comprehend **duration**—time. Our human sensitivity to **sequence** allows us to analyze process. This leads to the concept of **causality**. An event that consistently occurs **before** a **following** event is thought to **cause** the following event. This is not to say that all preceding events are

the causes of all following events. Sometimes the proximity of events in time are just coincidents. However, often an event that consistently precedes a following event is the cause of that following event. First something causes an effect then that effect becomes the cause of another effect and so on and so on. Thus, the time-mind comes to understand process through its temporal analysis of sequence.

This ability to **sequence** is the secret of our human ability to **understand**. The human mind has the ability to analyze sequence and determine cause and effect relationships and thus come to understand. This leads to the ability to make predictions.

$Cause_1$»$Effect_1$
$Cause_2$»$Effect_2$
$Cause_3$»$Effect_3$
$Cause_4$»$Effect_4$
$Cause_n$»$Effect_n$

So when I see $Cause_1$, I can predict $Effect_1$, when I see $Cause_n$, I can predict $Effect_n$. And if I know the larger sequence, when I see $Cause_1$, I can predict $Effect_4$.

Time-mind orders Percepts by difference. All Parts are **unequal** to each other. Time-mind builds **concepts** to explain Reality. Concepts are asymmetrical models of the mechanism of Reality—models of process.

$Percept_1$->$Percept_2$->$Percept_3$->$Percept_4$->.....$Percept_n$

All is asymmetrical. All differs from moment to moment. The Time-Analytical Conceiver places an arrow (**->**) between Percepts and/or Parts of Percepts. Concept is the one dimensional symbolically-coded list of Percepts stored as to their order of occurrence.

$Percept_1$->$Percept_2$->$Percept_3$->$Percept_4$->.....$Percept_n$.

All moments are experienced and ordered as Past->Present->Future. This is temporally sequential and linear. What is temporally sequential is THEN and THEN and THEN. Concept is a one-dimensional algorithmic of THEN and THEN and THEN.

Imagine you are driving your car. Then the light turns red. The Red light **means** STOP.

Because the ANALYTICAL **time-mind** is SYMBOLIC. The ANALYTICAL **time-mind** understands that "Red **MEANS** stop." That the red light is symbol representing the recommended action. On the other hand, the ASSOCIATIVE **space-mind** believes that"Red **IS** stop". The ASSOCIATIVE **space-mind** often makes errors in processing related to IT'S **identic** nature. Alfred Korzybski's discovery of the error in the IDENTIC representation of Reality is of importance here.}

Order is very important to the ANALYTICAL **time-mind**. It understands that:

A->B->C->D->E->F->G->H, but H does not precede G.

I study nature. Plant seeds->water and care->harvest the plants->cook the plants-> eat the plants. But I can not eat bread, I have not made.

Asymmetry is the Rule.–This ability to order difference allows the Time-Analytical Conceiver to sense Time. To be aware of Past->Present->Future. To sense change over time and eventually to control change over time. This leads to the main power of the Time-Analytical Conceiver—the ability to conceptualize reality. This leads to mastery of cause and effect.

c->e
c->e
c->e
c->e
c->e
Etc.
Etc.

And if you know how a phenomenon is generated you can create a future with that phenomenon changed or eliminated.

$Percept_1$ is different from $Percept_2$ is different from $Percept_3$ is different from $Percept_4$. Concepts are asymmetrical models of how reality evolves.

The»quick»brown»fox»jumped»over»the»lazy»dog.

1»2»3»4»5»6»7»8»9»10» … ∞

A»B»C»D»E»F»G»H»I» … Z

Past»Present»Future

The Time-Analytical Conceiver analyzes **Percepts** into **parts**, distinguishes **differences** and sequences these **parts** into **Concepts**.

It analyzes. It does this by searching its memory banks of all past Percepts for **difference**. When it finds difference it asks what are the Cause-Effect chains that will explain those differences? If I can understand the Cause-Effect sequence that produced this NOW. I can then be much more effective at making choices that will make that Particular NOW more or less likely to occur in the Future. Depending on whether I perceive that particular NOW as good for me or bad for me.

Time-Mind

analyzing PARTS—In order to **understand**
BECOMING—To become or not to become is a question of meaning.
PARTS — -> A -> B ->
DIFFERENTIATION
ASYMMETRICAL
CONCEPT

Comparing station for DIFFERENCE.

PART IS DEFINED AS ANY DIFFERENCE==> -> A ->
ASYMMETRICAL
ANYWHERE in the PAST->PRESENT->FUTURE
GLOBAL and SEQUENTIAL

Korzybski's Error of Identity

When humans rely only on their spacial intelligence, they see cause as being identical to effect. They are in essence **time-blind**, and so they confuse cause with effect.

Korzybski explained that when humans see things as being **identical** that are not identical, they are making an **identification** that is false to facts. Korzybski called this the ***Error of Identity***.[31]

When we confuse cause with effect, we are making the error of identity. Today most humans make this error. We assume without analysis that cause and effect are the **same**—that they are **equal**—that they are **identical**. If the effect of a mistake is bad then the cause of that mistake must also be bad. We don't analyze the event for sequence. We don't use our time-binding power to understand.

And so,we act without hesitation, without doubt on our belief. We act in **certainty**. And, certainty as explained earlier by **Korzybski**, **Heisenberg**, **Eddington** and **Bronowski** is **not possible**, because knowing is **uncertain**.

Certainty

We humans always act without all the information. We humans are always **assuming**. If we are **unaware** that we are **assuming**, then we are **ignorant** of our **ignorance**. Certainty means that we don't know that we don't know. We cannot seek knowing when we believe our ignorance is knowing. Ignorance of ignorance is leveraged ignorance—ignorance masquerading as knowledge. Ignorance of ignorance is **certainty**.

When we are certain, we are surprised and disheartened by our mistakes. This attitude toward human error is the most damaging of human ignorances. We humans make mistakes because, we make all our decisions without **ALL** the information. This is a major point that all humans must understand. The **only cause** of mistakes is **ignorance**.

We humans must become aware of our ignorance. When we humans have knowledge of our ignorance, we can learn from our mistakes and protect ourselves in the future. When an individual knows he doesn't know, he is wise. Wisdom is the **opposite** of **certainty**. The **knowledge** of our **ignorance** is **wisdom**.

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[31] **Alfred Korzybski**, Science and Sanity, 1933-48, ibid

To error is the human condition

This **truth,** whether we call it the ***Principle of Non-Allness***, the ***Principle of Uncertainty***, the ***Principle of Indeterminacy***, or the ***Principle of Tolerance***, leads us to the conclusion that ***to error is human***, and there is no need too ask forgiveness. ***All mistakes are innocent***.

Universe is not **certain**—it is not structured as we humans have believed for countless centuries. Religion and the objective scientists were wrong. The physics of **relativity** and **quantum mechanics** describe a Universe in which things are not and cannot be perfect. A Universe in which, we humans are constrained to make all our choices without **ALL** the information. Mistakes are simply holes or gaps in our knowing—lapses in our understanding.

I am often asked, "But, what if I knew better?" If I knew better and then make a mistake. Isn't that the result of stupidity. If I knew better, but still made an error, then surely that is my fault and not the result of ignorance.

What if I knew better?

I recall a young women I once treated. She had opened her hotel room door to a man claiming to be a maintenance worker, who then attacked and raped her. The attacker has stolen a hotel uniform from a laundry hamper and so seemed legitimate. However, something about his appearance disturbed her, but on second thought, she assumed she was just being silly and so unlocked her door. When I saw her several months later she was still struggling with guilt.

"Doctor, it was my own fault. I was so stupid. I shouldn't have opened the door. I knew something was wrong. I was so stupid. I knew better, but I opened the door anyway."

I responded, "You weren't stupid. You were only ignorant."

She replied, "No, Dr. Wilken, I knew better, I should never have opened the door, I was just so stupid."

"NO!", I told her, "You weren't stupid, you were only ignorant and I can prove it with one simple question. She looked deep into my eyes desperate to know what I meant.

I asked: "If you had known that the man behind the door intended to rape you, would you have opened it?"

"**No**, of course not."

No of course not. None of us would make a mistake if we knew we were about to make a mistake. Even when we humans repeat our mistakes, it is because we assume the mistake will not happen **this time**. We are ignorant of what will happen **this time**. As I have stated, the only cause of human error—the only cause of human mistakes is ignorance.

Scientists as well as non-scientists who seek to know must therefore embrace **humility** when we stand before the totality of Nature.

The ***Principle of Non-Allness*** is a fundamental law of Nature. And the first corollary to the ***Principle of Non-Allness*** is what I call the ***Principle of Error Innocence***.

Wilken's ***Principle of Error Innocence***

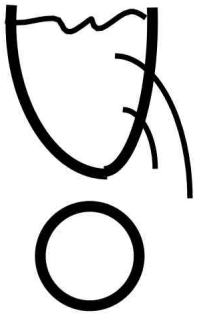
All actions occur in ignorance. **All human actions and all human choices are made without all the information**. **We are always acting and choosing without ALL the information**. What we don't know we must ignore and what we ignore may hurt us. Therefore all errors and and all mistakes are made in innocence.

Good news

I don't mean that mistakes are good things or that getting hurt is a good thing. I mean that since the cause of mistakes is ignorance and the proper response to ignorance is education, then **we can learn from our mistakes**.

We can acknowledge the mistakes of history and those that are occurring in our present world and work to correct them. This is good news. It will make it infinitely easier to build a better world.

When we understand the truth of "***to error is human***", we can then begin to process our mistakes in a synergic manner. The human who understands that mistakes are a natural part of life does not investigate the mistakes like a detective, he **analyzes** the mistake as a scientist. He does not blame when a mistake occurs, he seeks to learn from the mistake and to learn he must accept **responsibility** and seek responsibility in others for their mistakes. Once he knows who is responsible for the mistake he **educates**.



MISTAKES = Ignorance

ANALYZE

RESPONSIBILITY

EDUCATE —> self-educate

"Learn"

Education is the proper response to ignorance. Education and learning is the synergic alternative to adversary punishment and guilt.

Education is the proper response to ignorance. However there is something in guilt worth keeping. It is certainly not the badness, it is certainly not the blame, and of course it is not the punishment.

Guilt also contains regret and this is worth keeping. When a mistake happens there is always regret. In the adversary world where there is blame and punishment of course I might regret being blamed and punished. I also might regret being considered bad by those who are blaming and punishing me. But there is almost always another component of regret. When I make a mistake that hurts someone else, I regret that as well. This is the regret worth keeping.

And, this is often why we humans tend to hang onto our guilt feelings when we make a mistake. We regret injuring others. We can solve this dilemma by moving regret over into the synergic processing of mistakes, where it is called **restitution**. Restitution

means **to restore**, **to repair** the damage caused by the ignorance of our behavior.

The synergist does not feel guilty when he makes a mistake, but he is sorry if his ignorance injured other. As a synergist, he will freely try to repair things. He will freely offer restitution.

Adversary	Synergy
MISTAKES = Badness	MISTAKES = Ignorance
INVESTIGATE	ANALYZE
BLAME	RESPONSIBILITY
PUNISH —> self-punish	EDUCATE —> self-educate
"Guilt"	**"Learn"**
regret —	—> RESTITUTION

We humans have a choice as to how to deal with mistakes. If we process our mistakes adversarily we get pain and no learning. If we process our mistakes synergically, we get learning and no pain.

In fact, you cannot learn when you adversarily process mistakes. We humans cannot tolerate the pain of blame, punishment, and guilt. We will deny that we make a mistake. We will project the blame for the mistake onto others. "I didn't do it."—"It wasn't my fault."—"And, if it isn't my fault, why should I have to learn anything."

In fact, if I am to learn from a mistake, I must first admit it was my fault. This is the real force behind what I call the "***anti-learning barrier***". If I am to learn from my mistake I am trapped into accepting responsibility for my error. If I am adversarily processing the mistake, I cannot accept responsibility without feeling guilty. To avoid guilt I must deny responsibility. And if I wasn't responsible then I have nothing to learn.

The "anti-learning barrier"

This barrier became evident to me by another one of my patients. I once had the occasion to treat a young woman in the early stages of her fifth pregnancy. She informed me she had had four abortions previously and was pregnant and planning to abort this pregnancy as well. I thought to myself, why can't she learn to use birth control?

If we examine her situation in light of our new understanding, we see that for her to use birth control, she would have to admit that it is her responsibility to prevent unwanted pregnancies. That admission would lead her to the further conclusion that she was then also responsible for her previous unwanted pregnancies and their abortions.

This young woman was a Catholic and to admit responsibility for unwanted pregnancies and abortions were far too painful for her. She opted to deny any responsibility. "My boy friend got me drunk, and made me pregnant. It wasn't my fault, so I don't need to take birth control. Besides using birth control is a sin, I would never do that."

The human brain is the most powerfully precise computer in the Universe. If we program it to believe mistakes are bad, it will function to prove it does not make mistakes. The human brain rebels at the idea that mistakes are bad. It will defend itself in any way possible, it will defend itself by lying. When I am accused of **badness**, I must **lie to protect** myself—to protect myself from blame and punishment—to protect myself from guilt.

Confronted with an adversary reality that we live with today, it is rational to **lie**. Lying leads to **distrust**—"**I assume you are my enemy**". Thus, the processing of mistakes as bad always leads to **conflict** and adversary behavior.

If on the other hand, I process my mistakes in a more scientific manner—as simply **ignorant** – choices made without all the information, then I must tell the **truth to protect** myself – to protect myself from repeating the mistake—to protect myself and others from further injury—to protect myself from paying unnecessary restitution.

Telling the truth leads to trust—"**I assume you are my friend**". Processing mistakes as ignorance leads to **co-Operation** and synergic behavior.

Adversary	Synergy
MISTAKES = Badness	MISTAKES = Ignorance
INVESTIGATE	ANALYZE
BLAME	RESPONSIBILITY
PUNISH —> self-punish	EDUCATE —> self-educate
"**Guilt**"	"**Learn**"
regret —	—> RESTITUTION
I must ***lie*** to protect myself.	I must tell the ***truth*** to protect myself.
I assume you are my **enemy**.	I assume you are my **friend**.
Distrust	Trust
Conflict	Co-Operation

That **all actions occur in ignorance** is a fundamental 'knowing' derived from the ***Principle of Non-Allness***. And, its first corollary—the ***Principle of Error Innocence*** is a 'knowing' of great importance to understanding ourselves and the human condition.

Scientific Mistakes

All humans make mistakes. When humans make errors, it is not because they are stupid or incompetent. Humans always **act** without **ALL** the information. They make mistakes because they are **ignorant**—they **ignore** what they don't know.

The humans who created our classical science have made some mistakes. By examining those mistakes, we can learn from them and move on. In the preceding chapter, I discussed the error of **identity** as originally discovered by Alfred Korzybski. Here we will examine four additional sources of scientific error—**reductionism**, **exclusion**, **mixing levels of organization** and **either/or thinking**.

Reductionism

The strategy of physics called reductionism has been one of the most powerful tools in the history of science. What is reductionism? How does it work? **Lawrence Krauss**[1993] explains:

> "A physicist, an engineer, and a psychologist are called in as consultants to a dairy farm whose production has been below par. Each is given time to inspect the details of the operation before making a report.
>
> "The first to be called is the engineer, who states: "The size of the stalls for the cattle should be decreased. Efficiency could be improved if the cows were more closely packed, with a net allotment of 275 cubic feet per cow. Also, the diameter of the milking tubes should be increased by 4 percent to allow for a greater average flow rate during the milking periods".
>
> "The next to report is the psychologist, who proposes: "The inside of the barn should be painted green. This is a more mellow color than brown and should help induce greater milk flow. Also, more trees should be planted in the fields to add diversity to the scenery for the cattle during grazing, to reduce boredom".

"Finally, the physicist is called upon. He asks for a blackboard and then draws a circle. He begins: "Assume the cow is a sphere....".

"This old joke, if not very funny, does illustrate how—at least metaphorically—physicists picture the world. The set of tools physicists have to describe nature is limited. Most of the modern theories you read about began life as simple models by physicists who didn't know how else to start to solve a problem. These simple little models are usually based on even simpler little models, and so on, because the class of things that we do know how to solve exactly can be counted on the fingers of one, maybe two, hands.

"I like the cow joke because it provides an allegory for thinking simply about the world, and it allows me to jump right in to an idea that doesn't get written about too much, but that is essential for the everyday workings of science: Before doing anything else, abstract out all irrelevant details!"[32]

Reductionism means to reduce the problem being studied down to its component 'parts'. Then by understanding the behavior of the '**parts**', you can assemble an understanding of the behavior of the '**whole**'. Historically science has divided Nature into '**parts**' in order to study natural phenomena. Some of these '**parts**'—light, particles, atoms, molecules, plants, animals, and humans—form the focus for the classical **sciences**—optics, physics, chemistry, biology, psychology, and sociology.[33]

But, Universe is **process** rather than structure as will be explained more fully in the next chapter. What classical science has called 'parts' of the structure are in fact 'wholes' or **stages** of process. We humans will need to revise all our sciences to bring them up to date with Universe^{2001}—our most current model of Nature.

In Universe^{2001}, some of these **stages** of process are simpler—light, particles, atoms, small molecules, and some of these **stages** of process are more complex—large molecules, plants, animals, and humans. Those scientists who focused on the simpler stages of process have most benefited from the reductionist strategy. Those scientists studying the evermore complex stages of process have found reductionism less useful.

As the focus of science has shifted from the simpler to the more complex processes,

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[32] **Lawrence M. Krauss**, Fear of Physics, Basic Books, New York, 1993

[33] 'parts', 'wholes'—multiordinal terms

reductionist strategy begins to **exclude** relevant details. **M. Mitchell Waldrop**[1997] explains:

> "Complexity theory attempts to provide a general scientific understanding of "**complex**" systems, both in nature and in the human world. Examples of complex systems include ant colonies, immune systems, brains, economies, and human cultures. Even though these examples may seem very different on the surface, they do share a number of properties that make them alike at a deeper level.
>
> "First of all, complex systems typically contain very many interacting parts. Thus, a brain consists of billions of interacting neurons, and an economy consists of millions of people and thousands of firms. Many other complicated objects, such as computers, also have multiple parts, but in a complex system there is nothing like a computer's central processing unit. Moreover, the components often are not only leaderless but also "active," in the sense that they constantly adapt their behavior in response to what is going on around them. Thus, animals in an ecosystem will change their foraging behavior when their customary food grows scarce, and consumers in an economy will change their purchasing plans in the face of a recession.
>
> "Even with no one in charge, complex systems can often spontaneously shape themselves into highly organized patterns and structures. When weather conditions are right, for example, randomly moving molecules of air and water vapor above the Gulf of Mexico will organize themselves into a hurricane. When technological conditions were right for the personal computer industry to emerge, hundreds of new start-up firms organized themselves into a few locations.
>
> "Finally, such spontaneously formed patterns are constantly changing. Complex systems never seem to settle down to a state of equilibrium. Upheaval and change are the norm.
>
> "The above properties make complex systems very difficult to understand by the conventional methods of science. Physics and chemistry, in particular, have achieved enormous success over the centuries by a strategy known as "**reductionism**"—dividing up the world into comparatively simple pieces to

> study with mathematical precision. With complex systems this strategy rarely works. The interactions are as important as the individual pieces, and all of them have to be taken into account at once."[34]

Synergy is the associated behavior of 'wholes', not predicted by examination of the 'parts'.

So as Universe becomes more complex, reductionism fails to be as effective a strategy for understanding. In the past scientists have referred to the sciences of Physics and Chemistry as the **hard** sciences and those of Biology, Psychology and Sociology as the **soft** sciences. By this they implied that the scientists in the soft sciences were not as precise and rigorous as those in the hard sciences. The physicist with his hard science is not necessarily more precise and rigorous than the psychologist with his soft science, the physicist has been focusing on the so called simpler 'parts' of Universe, while the psychologist has been focusing on the more complex 'parts' of process.

But something **deeper** is going on here. Science is making an even more fundamental error. The labeling of stages of process as 'parts' of Universe represents an even larger error. The stages of process are not 'parts' they are '**wholes**'. And the study of 'wholes' requires an **inclusive** approach. This approach is diametrically opposed to reductionism.

Innovation and invention occurs when the scientist sees the 'whole' first. This fact is almost unknown. Our reductionist science teaches us that the discoverer simply assembles the 'parts' he finds in Universe into 'wholes'—whether these parts be postulates of a theory or pieces of a new invention. But this belief is wrong as **Arthur Young** the inventor the Bell helicopter explains:

> "There are no helicopter "parts", until after you first create the concept of the "whole" helicopter, then you make the "parts" to make the "whole". The "whole" is invented first. The "whole"comes before the "parts". The something extra in the "whole" contains the "purpose" and "function". This cannot be determined by examining the parts alone.
>
> "Since purpose is in the "whole" and not in the "parts", the "whole" must be greater than the "parts". How can we account for this? Because the "whole"

[34] **M. Mitchell Waldrop**, Complexity, Grolier Multimedia Encyclopedia, 1997

cannot function when divided. It follows that function is that aspect or "cause" which is not in the "parts" and which reductionist science cannot deal with, because science deals with mass, length, and time, which are all "parts". This leads to a basic cosmological postulate: **The "parts" are derived from the "whole", and not the "whole" from the "parts**." "[35]

Fuller comments on this as well,

"It is manifest that Universe is the maximum synergy-of-synergies, being utterly unpredicted by any of its parts. It is readily understandable why humans, born utterly helpless, utterly ignorant, have been prone to cope in an elementary way with successive experiences or "parts". They are so overwhelmed by the synergetic mystery of the whole as to have eschewed educational strategies commencing with Universe and the identification of the separate experiences within the cosmic totality. Universe apparently is omnisynergetic. No single part of experience will ever be able to explain the behavior of the whole."[36]

Remember, the main strategy of classical science has been to use **reductionism—**the breaking of phenomena into 'parts' for examination and experimentation. Reductionism is the method that produced most of the discoveries of the physical sciences including that of **energy**.

Reductionism focuses on the part to the exclusion of the whole. Because reductionism reduces the data being examined, it must by definition be incomplete. Reductionism is blind to the 'whole'. Reductionism cannot see synergy. This is not to say that all reductionistic science is wrong or that the tool of reductionism has no value. But we must use it cautiously.

The goal of reductionism as a strategy of science has been to simplify, simplify, simplify. Another powerful tool of simplification has been **exclusion**.

Exclusion

Historically, science has **excluded** that which cannot be observed from any

[35] **Arthur Young**, The Reflexive Universe, Delacorte Press/Seymour Lawrence, 1976

[36] **R. Buckminster Fuller**, SYNERGETICS, 1975-79, ibid

consideration in the creation of scientific theory. Exclusion like reductionism is a filter. But while the reductionism filter reduces 'wholes' to 'parts', exclusion filters out that which cannot be observed or measured.

Classical science defined **objective** as that which is **observable** and even more exclusively that which is **measurable**. That which can not be observed and measured is not objective. Science addressed only the objective. That which was not objective was not science.

Classical science **abandoned** the **non-observable** as **subjective**. But how can we develop a true and complete model of Nature, if we exclude **purpose**, **goals**, **values**, and **motivation**? How can we develop a science of humanity if we exclude **choice** and **decision**—if we exclude **mind** and **spirit**—if we exclude **awareness** and **consciousness**? Classical science's exclusion of the **subjective** as irrelevant ignores that part of reality that is most important to **humanity**. **Winifed Babcock**[1971] writes:

> "Scientists are aware that, in concert with observation, discovery depends upon and has come from the intuitive promptings and inexplicable flashes of insight, quantum jumps in understanding, that mark the history of mathematics and research in every field. The creative, innovative capacity in man rests upon his intuition, not logic. But intellect and reasoning power must be called upon to precise the ideas that intuition hands to consciousness. They must be stated in workable and transmissible terms, and they must be oriented within the body of human knowledge. The ability of a trained and disciplined mind to receive the ideas and to precise them leads to the expression of genius in Science that has sent it soaring at rocket speed. With precious few exceptions, men of genius in Science have been deeply, mystically, religious—some orthodox, some unorthodox. But Science as a body abhors mysticism. It should. Because mysticism as such, mysticism that repudiates intellectual probing and refuses to deal with reason, is not only as sterile as intellectualism that refuses to consider consciousness seriously, but is apt to be a shady business.
>
> "When men of intellect, men grounded in reasoning power and logic refuse to deal with consciousness, a "black market" that deals in intuition appears. Morsels of fact are elaborated into such farce insofar as truth is concerned

that Science is given still another reason to turn its back on the subject.

> "Mankind's fascination continues because intuition and individual experience insist that there is a power that may be projected outward and inward, a power that cannot be explained in physical, sensory terms. And there is a certainty in man that insists that death is not the end of the individual's life.
>
> "There are other scientifically trained people, however, who are openly devoting their lives to research consciousness because they realize that this is the great frontier to be explored, using the methodology of Science insofar as is possible. They realize that until Science comes to grips with the many states of human consciousness, scientists are not dealing with the most compelling question that faces them."[37]

Science must develop new methods for dealing with complexity. We must develop new approaches which can grasp and explain the enormous reality that is not objective—that is not observable. That does not mean we can abandon all we have learned about simpler Universe—light, particles, atoms, and small molecules. The methods and strategies of classical science were satisfactory for determining the laws of Nature that apply to simpler Universe. We must hold tightly to what we have discovered as **part** of the answer.

But we must seek the **rest** of the answer with new methods and new strategies of science that can explain the whole—that can explain the non-observable parts of the whole—that can explain complex Universe—large molecules, plants, animals, and humans. As we do, we will discover there exists a consistency with our earlier discoveries because Universe is a unity. **Arthur Young**[1990] explained:

> "Science could be described as a cooperative undertaking in which the discoveries by individuals are recognized and developed by the many, either through academia and the educational system or through industry and technology. This institutionalization of science has become not only a way of life in providing jobs and producing products, but has had a civilizing influence that crosses national boundaries and unites countries. It provides a mutual interest and a shared language between nations that governments and religious dogmas would keep separate and independent.

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[37] **Winifed Babcock**, The Single Reality, A Harold Institute Book—Dodd, Mead & Co.,New York, 1971

"However, this universality is accompanied by a different sort of division—the fragmentation of science itself into separate disciplines. While this fragmentation, unlike that of nations and religious sects, does not lead to war, the peaceful coexistence of separate disciplines has the unfortunate result that each discipline becomes a world unto itself, highly specialized and protected by the equivalent of language barriers. When I tried to tell a biologist of the contribution quantum physics could make to biology, he said he'd rather ride a black horse off a cliff at night than venture into quantum physics.

"Currently we find ourselves facing new and great problems: the exhaustion of natural resources; the pollution of the environment, the atmosphere, and the soil; overpopulation; and, even if atomic war can be avoided, the disposal of radioactive waste. These problems are especially difficult because they are long-term. Many result from major benefits. Thus public sanitation, by decreasing infectious disease, has made overpopulation a problem, and the automobile and other labor-saving but energy-dependent devices threaten exhaustion of natural resources, as well as pollution of the atmosphere.

"We might expect that the science and technology which have created these problems could now be directed toward solving them. But it soon becomes apparent that the central issue is life—not just its maintenance in the scheme of things, but its significance. Life is not recognized by theoretical science. The central doctrine of science is that life can be reduced to molecules, molecules to atoms, and atoms to particles yet more fundamental. As a consequence, the final authority in science is physics, and now nuclear physics. Nuclear physics seeks to find the answer to everything in multi-million dollar superconductive supercolliders that will take years to build. Even if a solution is found to the problem of ultimate particles (which, incidentally, only became a problem because of cyclotrons), the solution will have no bearing on life and the ability of the planet to support life.

"So, how are we to get science to put its heart to these problems that affect life? From its current perspective, motivated by fundamental questions like the Big Bang, the recession of galaxies, and the lifetime of the proton (already found to be millions of times longer than the age of the Universe), science considers life as a mere accident having no relation to first principles, Consciousness, if recognized at all, is viewed as an epiphenomenon emerging at a certain stage

of organization.

"Why does science ignore life? Largely because the formulations which have provided the basis of science—the deterministic formulas of Newton's theory of gravitation and the more recent probabilistic formulations of quantum physics—give no indication that there should be such a thing as life. In fact these formulations are so successful that there is reason to think they will ultimately show that what we call life needs no principles not already recognized by science. With such an assurance, science cannot be expected to treat life as any different from the other marvels that it has gone to such effort to discover and explain.

"I propose that when taken together with the findings that have led to quantum physics, the principles that make life possible are already implied in the deterministic formulations of classical physics. The failure to recognize these implications has made it possible for science to retain its obsolete dogma that the world is exclusively objective and that everything can be reduced to particles. It is as though we had been given a flying saucer but were unable to read the directions and so could not operate it.

"While the scientist may object to my reference to "errors" in science, and other readers might prefer to think that life has a spiritual origin and is therefore separate from science altogether, let me point out that it is to the credit of science that it can make errors. Without error no learning is possible; the recognition of error is the basis of progress. We should therefore not abandon science. It is the major contribution of modern civilization. We should rather take time to interpret that part of its message that tells us, first, where to find the basis for free will, and second, how free will through evolution develops the power to control matter."[38]

—Arthur Young

Another scientific mistake that continues to prevent our successful understanding of Universe is the confusion that results when we mix levels of organization.

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[38] **Arthur Young**, Mathematics, Physics & Reality, Robert Briggs Associates, Portland, Oregon, 1990

Mixing levels of organization

Alfred Korzbyski[1921] cautioned his fellow humans:

"For correct analysis and true definitions of the cardinal classes of life in our world it is necessary to have some just ideas about dimensions or dimensionality. I will explain briefly by an example. Measurable entities of different kinds can not be compared directly. Each one must be measured in terms of a unit of its own kind. A line can have only length and therefore is of one dimension; a surface has length and width and is therefore said to have two dimensions; a volume has length, width and thickness and is, therefore, said to have three dimensions. If we take, for example, a volume—say a cube—we see that the cube has surfaces and lines and points, but a volume is not a surface nor a line nor a point. Just as these dimensional differences have an enormous unrealized importance in practical life, as in the case of taking a line of five units of length and building upon it a square, the measure of this square (surface) will not be 5, it will be 25; and the 25 will not be 25 linear units but 25 square or surface units. If upon this square we build a cube, this cube will have neither 5 nor 25 for its measure; it will have 125, and this number will not be so many units of length nor of surface but so many solid or cubic units.

"It is as plain as a pike staff that, if we confused dimensions when computing lengths and areas and volumes, we would wreck all the architectural and engineering structures of the world.

"These definitions of the cardinal classes of life are, it will be noted, obtained from direct observation; they are so simple and so important that I cannot over-emphasize the necessity of grasping them and most especially the definition of Man. For these simple definitions and especially that of Humanity will profoundly transform the whole conception of human life in every field of interest and activity; and, what is more important than all, the definition of Man will give us a starting point for discovering the **natural** laws of human nature—of the human class of life. The definitions of the classes of life represent the different classes as distinct in respect to dimensionality; and this is extremely important for no measure of rule of one class can be applied to the other, **without making grave mistakes**. For example, to treat a human being as an animal—as a mere space-binder—because humans have

certain animal propensities, is an error of the same type and grossness as to treat a cube as a surface because it has surface properties. It is absolutely essential to grasp that fact if we are ever to have a science of human nature.

"A line has one dimension; a plane has two; a plane contains lines and so it has line properties—**one**-dimensional properties—but it has other properties—**two**-dimensional properties—and it is these that are peculiar to it, give it its own character, and make it what it is—a plane and not a line. So animals have some plant properties—they grow, for example—but animals have other properties—autonomous mobility, for example,—properties of higher dimensionality or type—and it is these that make animals **animals** and not plants. Just so, human beings have certain animal properties—autonomous mobility, for example, or physical appetites—but humans have other properties or propensities—ethical sense, for example, logical sense, inventiveness, progressiveness—properties or propensities of higher dimensionality, level, or type—and it is these propensities and powers that make human beings **human** and not animal. When and only when this fact is clearly seen and keenly realized, there will begin the **science of man**—the science and art of **human nature**—for then and only then we shall begin to escape from the agelong untold immeasurable evils that come from regarding and treating human beings as animals, as mere binders of space, and we may look forward to an ethics, a jurisprudence and economics, a governance—a science and art of human life and society—based upon the laws of human nature as the time-binding class of life.

"A change in our conception of human life and its phenomena is involved in the foregoing definitions of the classes of life; they will replace basic errors with scientific truths of fundamental importance; they will form the basis for scientific development of a permanent civilization in place of the so-called civilizations of the past and present. To know the cause of error is to find the cure."[39]

—Alfred Korzybski

James Grier Miller1978 , a life long student of **living systems**, wrote:

"The Universe contains a hierarchy of systems, each more advanced or "higher" **level** made of systems of lower levels. **Atoms** are composed of

[39] **Alfred Korzybski**, The Manhood of Humanity, E.P. Dutton & Co., New York, 1921

particles; **molecules**, of atoms; **crystals** and **organelles**, of molecules. About at the level of crystallizing **viruses**, like the tobacco mosaic virus, the subset of living systems begins. Viruses are necessarily parasitic on cells, so cells are the lowest level of living systems. **Cells** are composed of atoms, molecules, and multimolecular organelles; **organs** are composed of cells aggregated into **tissues**; **organisms**, or organs; **groups** (e.g., herds, flocks, families, teams, tribes), of organisms; **organizations**, of groups (and sometimes single individual organisms); **societies**, of organizations, groups, and individuals; and **supranational systems,** of societies and organizations. Higher levels of systems may be of mixed composition, living and nonliving. They include **ecological systems**, **planets**, **solar systems**, **galaxies**, and so forth. It is beyond my competence and the scope of this book to deal with the characteristics—whatever they may be—of systems below and above those levels which include the various forms of life, although others have done so. This book, in presenting general systems behavior theory, is limited to the subset of living systems—cells, organs, organisms, groups, organizations, societies, and supranational systems.

"It would be convenient for theorists if the hierarchical levels of living systems fitted neatly into each other like Chinese boxes. The facts are more complicated. I have distinguished seven levels of living systems for analysis here, but I do not argue that there are exactly these seven, no more and no less. For example, one might conceivably separate tissue and organ into two separate levels. Or one might, as Anderson and Carter have suggested, separate the organization and the community into two separate levels—local communities, urban and rural, are composed of multiple organizations, just as societies are composed of multiple local communities, states, or provinces. Or one might maintain that the organ is not a level, since there are no totipotential organs.

"What are the criteria for distinguishing any one level from the others? They are derived from a long scientific tradition of empirical observation of the entire gamut of living systems. This extensive experience of the community of scientific observers has led to a consensus that there are certain fundamental forms of organization of living matter-energy. Indeed the classical division of subject matter among the various disciplines of the life or behavior sciences is implicitly or explicitly based upon this consensus. Observers recognize that

there are in the world many similar complexly organized accumulations of matter-energy, each identified by these characteristics: (a) Physical proximity of its units. (b) Similar size in physical space of its units, significantly different from the size of the units of the next lower or higher levels. (c) Similarity of its constituent units. Such organized accumulations of matter-energy have multiple constituent units, ordinarily a preponderance of their components, which are systems of the next lower level, i.e, just as molecules are made up of two or more atoms and atoms are composed of two or more particles, so groups are made up of two or more organisms, and organs are composed of two or more cells. This is the chief way to determine to what level any system belongs.

"It is important to follow one procedural rule in systems theory, in order to avoid confusion. **Every discussion should begin with an identification of the level of reference, and the discourse should not change to another level without a specific statement that this is occurring**. Systems at the indicated level are called systems. Those at the level above are **suprasystems**, and those at the next higher level, **suprasuprasystems**. Below the level of reference are **subsystems**, and below them are **subsubsystems**. For example, if one is studying a cell, its organelles are the subsystems, and the tissue or organ is its suprasystem, unless it is a freeliving cell whose suprasystem includes other living systems with which it interacts."[40]

—James Grier Miller

William H. Calvin[1996] , a neuroscientist writes about human consciousness and the problems that can result from mixing **levels of organization**:

"Do the enigmas of quantum mechanics really have something to do with the conscious aspects of our mental lives? Or is the invocation of QM in the consciousness context just another mistaken instance of suggesting that one area in which mysterious effects are thought to lurk—chaos, self-organizing automata, fractals, economics, the weather—might be related to another, equally mysterious one? Most such associations certainly conflate the unrelated, and when the two areas are at opposite ends of the spectrum of enigmatic phenomena, the argument is particularly suspicious.

[40] **James G. Miller**, Living Systems, McGraw-Hill, Inc., 1978

"Reducing things to basics—the physicists' rallying cry—is an excellent scientific strategy, as long as the basics are at an appropriate **level of organization**. In their reductionist enthusiasm, the consciousness physicists act as if they haven't heard of one of the broad characteristics of science: **levels of explanation** (frequently related to **levels of mechanism**). The cognitive scientist Douglas Hofstadter gives a nice example of levels when he points out that the cause of a traffic jam is not to be found within a single car or its elements. Traffic jams are an example of self-organization, more easily recognized when stop-and-go achieves an extreme form of quasi-stability—the crystallization known as gridlock. An occasional traffic jam may be due to component failure, but faulty spark plugs aren't a very illuminating level of analysis—not when compared to merging traffic, comfortable car spacing, driver reaction times, traffic signal settings, and the failure of drivers to accelerate for hills.

"The more elementary levels of explanation are largely irrelevant to traffic jams—unless they provide useful analogies. Indeed, packing principles, surface-to-volume ratios, crystallization, chaos, and fractals are seen at multiple levels of organization. That the same principle is seen at several levels does not, however, mean that it constitutes a level-spanning mechanism: an analogy does not a mechanism make.

"Quasi-stable levels make self-organization easier to spot, especially when building blocks—such as crystals—emerge, Since we are searching for some useful analogies to help explain our mental lives, it is worth examining how levels of explanation have functioned elsewhere. The tumult of random combinations occasionally produces a new form of organization. Some forms, such as the hexagonal cells that appear in the cooking porridge if you forget to stir it, are ephemeral. Other forms may have a "ratchet" that prevents backsliding once some new order is achieved. While crystals are the best known of these quasi-stable forms, molecular conformations are another, and it is even possible that there are quasi-stable forms at intermediate levels—such as microtubule quantum states where the consciousness physicists would like the action to be.

"Stratified stability refers to stacking up such quasi-stable levels. Life-forms involve piling up quite a few of them; occasionally they collapse like a house of

cards and the higher forms of organization dissolve (which is one way of thinking about death).

"Between quantum mechanics and consciousness are perhaps a dozen of these persistent levels of organization: examples include chemical bonds, molecules and their self-organization, molecular biology, genetics, biochemistry, membranes and their ion channels, synapses and their neurotransmitters, the neuron itself, the neural circuit, columns and modules, larger-scale cortical dynamics, and so on. In neuroscience, one is always aware of these levels, because of the intense rivalry between neuroscientists working at adjacent levels.

"An occasional alteration in consciousness is due to widespread failures in certain types of synapses. But a more appropriate level of inquiry into consciousness is probably at a level of organization immediately subjacent to that of perception and planning: likely (in my view), cerebral-cortex circuitry and dynamic self-organization involving firing patterns within a constantly shifting quiltwork of postage-stamp-sized cortical regions. Consciousness, in any of its varied connotations, certainly isn't located down in the basement of chemistry or the subbasement of physics. This attempt to leap, in a single bound, from the subbasement of quantum mechanics to the penthouse of consciousness is what I call the Janitor's Dream.

"Quantum mechanics is probably essential to consciousness in about the same way as crystals were once essential to radios, or spark plugs are still essential to traffic jams. Necessary, but not sufficient. Interesting in its own right, but a subject related only distantly to our mental lives."[41]

—William H. Calvin

This brings us to our fourth scientific mistake.

Either/or thinking

All human action is to a large extent determined by our existing belief systems. These systems are determined by our existing **model of reality**. Until the discoveries of **relativity,** and **quantum mechanics** our model of reality was that originated by

[41] **William H. Calvin**, HOW BRAINS THINK—Evolving Intelligence, Then and Now, BasicBooks/HarperCollins Publishers, New York, 199

Aristotle.

Writing in 1941 in ***Science and Sanity*** the primary text for what is called **General Semantics**, **Alfred Korzybski** alerted humanity to important scientific mistakes that are embedded in the Aristotelian system:

> "In mankind's cultural evolution its current abstractions became codified here and there into systems, for instance the **aristotelian** system, our main concern here. Such systematizations are important, for, as the **Talmud** says, "Teaching without a system makes learning difficult."
>
> "It may be helpful to indicate some historical facts of the development of our orientations since Socrates (469-399 B.C.). Socrates was the son of a sculptor and himself did some work with the chisel and his hands. He became an important founder of a school of 'philosophy'. In brief, this school had very high standards for science, seeking the application of the science of the time to life, so that it became what may be called a ,school of 'wisdom'.
>
> "One of his students, Plato (427-347 B.C.), who came from an aristocratic family, became the founder of a different school, called the 'Academy', and the 'father' of what may be called 'mathematical philosophy'. Unlike his teacher, he began, in his 'Doctrine of Ideas', to verbally split humans into 'body' and 'mind', as if they could be so split in living beings. He built a system of 'immaterialism' or 'idealism'.
>
> "Aristotle (384—322 B.C.), the son of a physician, was the student of Plato, and particularly interested in biology, other natural sciences, etc. He founded the most influential of the three schools, which is called by his name. He was undoubtedly one of the most gifted men mankind has ever known. As usual in such cases, the study of one branch of knowledge leads to another, so Aristotle was led to the study of 'logic', linguistic structure, etc., about which he produced scholarly treatises or textbooks, ultimately formulating the most complete system of his time. Because of the completeness of the system, backed by powerful influences, it has moulded our orientations and evaluations up to the present. The man on the street, our education, medicine and even sciences, are still in the clutches of the system of Aristotle, a system inadequate for 1941 yet perhaps satisfactory 2,300 years ago, when conditions of life were relatively so simple, when orientations were on the macroscopic level only, and

knowledge of scientific facts was practically nil.

"In Aristotle's system as applied, the split becomes complete and institutionalized, with jails for the 'animal' and churches for the 'soul'. Now we begin to realize how pernicious and retarding for civilization that split is. For instance, only since Einstein and Minkowski do we begin to understand that 'space' and 'time' cannot be split empirically, otherwise we create for ourselves delusional worlds. Only since their work has modern sub-microscopic physics with all its accomplishments become possible.

"Similarly, and tragically, this applies to medicine. Until recently we have had a split medicine. One branch, general medicine, was interested in the 'body' (soma); the other was interested in the 'soul' (psyche). The net result was that general medicine was a glorified form of veterinary science, while psychiatry remained metaphysical. However, it has been found empirically that a great many 'physical' ailments are of a semantogenic origin. Only a few years ago general physicians began to understand that they cannot deal with humans without knowing something about psychiatry, and psychosomatic medicine began to be formulated. I cannot go into further detail here, except to mention that this is another constructive step away from the aristotelian system, which as applied trains us in artificial, verbal splits.

"One of the tremendous obstacles in the revision of the aristotelian system is exactly the excellence of the work of Aristotle based on the very few scientific facts known 2,300 years ago. The aim of his work circa 350 B.C. was to formulate the essential nature of science (350 B.C.) and the forms and laws of science. His immediate goal was entirely methodological (350 B.C.), and he aimed to formulate a general method for 'all' scientific work. He was even expounding the theory of symmetrical relations, the relation of the general to the particular, etc. In his days these orientations were by necessity two-valued and 'objective'; hence follows his whole system, then more or less satisfactory on macroscopic levels.

"In analysing the aristotelian codifications, I had to deal with the **two-valued**, '**either/or**' type of orientations. I admit it baffled me for many years, that practically all humans, the lowest primitives not excluded, who never heard of Greek philosophers, have some sort of 'either/or' type of evaluations. Then I

made the obvious 'discovery' that our relations to the world outside and inside our skins often happen to be, on the gross level, **two-valued**. For instance, we deal with day **or** night, land **or** water, etc. On the living level we have life **or** death, our heart beats **or** not, we breathe **or** suffocate, are hot **or** cold, etc. Similar relations occur on higher levels. Thus, we have induction **or** deduction, materialism **or** idealism, capitalism **or** communism, democrat **or** republican, etc. And so on endlessly on all levels.

"In living, many issues are not so sharp, and therefore a **system which posits the general sharpness** of '**either/or**', and so **objectifies** '**kind**', is unduly limited; it must be revised and made more flexible in terms of '**degree**'. This requires a physico-mathematical 'way of thinking', which a **non**-aristotelian system supplies.

"Modern scientific developments show that what we label 'objects' or 'objective' are mere nervous constructs inside of our skulls which our nervous systems have abstracted electro-colloidally from the actual world of electronic processes on the sub-microscopic level. And so we have to face a complete methodological departure from two-valued, 'objective' orientations to general, infinite-valued, process orientations, as necessitated by scientific discoveries for at least the past sixty years.

"The aim of the work of Aristotle and the work of the non-aristotelians is similar, except for the date of our human development and the advance of science. The problem is whether we shall deal with science and scientific methods of 350 B.C. or of 1941 A.D. In general semantics, in building up a non-aristotelian system, the aims of Aristotle are preserved yet scientific methods are brought up to date. "[42]

—Alfred Korzybski

Learning from our mistakes

What can we learn from the mistakes of Classical Science?

The future of humanity depends on a new approach to understanding ourselves—an inclusive approach in examining our human problems and our human difficulties. Today[2001] we know that such an approach must be wholistic, integrative, and

[42] **Alfred Korzybski**, Science and Sanity, 1933-48, ibid

inclusive.

We may assume that the human is a sphere, but our assumption is likely to exclude relevant details that may make our conclusions useless. We may even assume that the human is an animal, but Knowledge^{2001} reveals that this is also likely to exclude relevant details, and make our conclusions erroneous.

Todays research scientists when studying the effects of new medications and biologicals on rats and monkeys, run a high risk of excluding relevant details that make the application of their findings to human patients erroneous.

We can solve our human problems, if we use all that we know in 2001.

Today we know that **reductionism** and **exclusion** are not valid methods for studying humanity. Furthermore, understanding Universe, Life, and ourselves will require that we heed the warnings of Korzybski, Miller and Calvin to avoid "**mixing levels of organization**". And lastly, we must learn to recognize when we are falling into the trap of **either/or thinking** and look for the **both-and** alternatives.

Today, we know that there is a limit to knowing. We know that the cause of all mistakes is ignorance. We know that the most intelligence behavior any human can exhibit is to learn from their mistakes.

With this preamble we are ready to examine: What do we know in 2001?

What Do We Know[2001]?

If our goal is to deepen our understanding of the human condition and of ourselves, then we must begin by examining what we know. Any understanding of ourselves cannot occur in isolation. We humans cannot understand ourselves apart or separate from Universe. We are embedded in the Universe and the Universe is embedded in us. The better we understand Universe, the better we can understand ourselves.

Universe is a unity that can take many forms. Universe is a unity that wears many faces. Humanity is but one of the forms of Universe—but one of the faces of Universe.

To deepen our understanding, we will need to examine some of the other forms of Universe—some of Universe's other faces. In this chapter we will examine Universe as Process, Action, Choice, Restraint, Hierarchy, Purpose, and Inclusion.

Universe as **Process**

Knowledge[2001] reveals that the world of substance has been replaced by that of process. The only thing in Nature that never changes is the requirement for change. Change means movement—motion. With constant change we see constant motion. **Timothy Ferris**[1997] explains:

> "Galileo's most significant contribution to the physics of cosmology came with his insight into the concept of inertia. Aristotle had assumed, and the Western world had come to believe, that the natural tendency of objects is to remain at rest. This certainly seems to accord with experience—a book or a boulder stays in one place unless one expends energy in moving it—and even today the word **inertia** is commonly taken to mean sluggishness or stasis. Galileo saw that this common sense assumption was wrong. He pushed wood blocks across a tabletop, then polished the table and the blocks and pushed the blocks again, and pondered the significance of the fact that when there was less friction they traveled farther. He reasoned that if they could be polished perfectly, so that there was **no** friction, they would keep moving forever. Inertia, he concluded, is not just a tendency of bodies at rest to remain at rest, but also of bodies in motion to remain in motion.

> "Galileo's counterintuitive insight resolved the basic objections to the Copernican assertion that the earth moves. (If the earth is spinning, why does a man who jumps straight up land in his footprints, rather than hundreds of yards to the west? And if the earth rotates, why aren't howling easterly winds constantly raking the surface of the planet?) Jumpers don't fly westward nor do easterly gales constantly blow, because the jumpers and the atmosphere are already moving with the turning earth, and so tend to remain in motion. Today we have seen enough of the Universe to know that motion, not rest, is the ordinary state of matter, and that to be immobile is at most a local trait, measured in terms of a local "inertial rest frame". The farther out one looks, the more one finds that everything, relative to most other things, is moving. The Universe was born restless and has never since been still."[43]

Light has a velocity of 186,000 miles per second (in a vacuum). It has but one speed (in any given medium) and cannot be at rest. Particles are indeterminate. We can know either their position or their speed, but not both. The electron is known to spin and have variable speed as it circles about the proton in the nucleus of an atom. Atoms of course are composed of particles so they are internally in constant motion. We further discover that atoms or molecules that make up a liquid or gas are in constant thermal motion, and their distribution of velocity is determined by the temperature of the system. Plants have movement as they seek the light and grow towards the sun. Animals move about their habitat in search of food, shelter, and a mate. And humans have full mobility as well. To walking and running, we add driving our cars, and riding in boats and planes. So, Nature is always in motion. Universe then results from process and the fundamental basis of process is **no** thing. As **Stanislav Grof**[1983] and **Brian Swimme**[1985] explain:

> "The developments in twentieth-century physics have transcended the Newtonian-Cartesian model. Astonishing explorations of the micro-world have created an image of reality which is far different from the seventeenth-century model of Newton; and Descartes. The model of solid and indestructible matter has disintegrated under the impact of experimental and theoretical evidence. The fundamental building blocks of the Universe—the atoms—were found to be essentially empty."[44]

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[43] **Timothy Ferris**, The Whole Shebang, Simon & Schuster, New York, 1997

[44] **Stanislav Grof**, EAST & WEST: Ancient Wisdom and Modern Science, Journal of Transpersonal

> "If you take a single atom and make it as large as Yankee stadium, it would consist almost entirely of empty space. The center of the atom, the nucleus would be smaller than a baseball sitting out in center field. The outer parts of the atom would be tiny gnats buzzing about at an altitude higher than any pop fly Babe Ruth ever hit. And between the baseball and the gnats? Nothingness. All empty. You are more emptiness than anything else. Indeed, if all the space were taken out of you, you would be a million times smaller than the smallest grain of sand."[45]

If we examine our bodies, we find they are appear quite solid. But, in fact our bodies are made up of organs; which are made up of tissues; which are made up of cells; which are made up of molecules; which are made up of atoms and atoms are mostly empty space. Then what is it that gives substance to our bodies?

Alfred Korzybsi[1933] explains:

> "To bring what is said here to a level of visualization and feeling, we may use the analogue of a rotary fan made up of separate radial blades. When such a fan rotates with a certain velocity, we see a solid disk, simply because our nervous system does not discriminate between the rotating blades. The separate rotating blades are visually seen by us as a single solid disk, although there is no disk present. If the blades rotate fast enough, we could not throw sand through them, as the sand would be too slow to get through before being struck by one of the blades.
>
> "Something similar may be assumed as going on in what we usually call 'materials'. Atoms represent very minute energetic configurations or dynamic structures where extremely rapid processes are going on, not unlike the 'rotating blades' of our example; and what we register is the 'disk', be it a table or a chair or ourselves.
>
> "For a similar reason, we may assume that we cannot put our finger through a table, as our finger is too thick and too slow, and that, for some materials, it takes X-rays to be agile enough to penetrate."[46]

Psychology, 1983

[45] **Brian Swimme**, The Universe is a Green Dragon, Bear & Company, Inc., Sante Fe, 1985

Universe is **no** thing. Universe is **process**—constant change—constant motion.

When we look at all we know of the Universe—all the observationally known to exist phenomena—from the expanding space, spiraling galaxies, stars, orbiting planets, and moons—down to the earth with its climatic cycle, geological phenomena, the migration of great plates of the earth's crust producing the motion of continents, the moving waters along shores and banks, down to the flowing red blood in our bodies—it is clear that Universe is dynamic—is motion—is **no** thing.

R. Buckminster Fuller[1975] explains:

> "Because physics has found no continuums, no experimental solids, no things, no real matter, I decided half a century ago to identify mathematical behaviors of energy phenomena only as **events**. If there are no-things, there are no nouns of material substance that the old semantics permitted wherein a noun **verbs** a noun or a subject **verbs** a predicate. I found it necessary to change this form to a complex of events identified as **me**, **which must be identified as a verb**. The complex **verb—me** observed another complex of events identified again ignorantly as a 'table'. I disciplined myself to communicate exclusively with verbs. There are no **wheres** and **whats**; only angle and frequency events described as **whens**.
>
> "Universe is also a verb. When people say of Universe, "I wonder what is outside its outside?" they are trying to conjure a unitary conception and are asking for a single picture of an infinitely transforming, nonsimultaneous scenario. Therefore, their question is not only unanswerable but unrealistic, and indicates that they have not listened seriously to Einstein and are only disclosing their ignorance of its significance when they boastfully tell you that the speed of light is 186,000 miles per second. You cannot get out of Universe. Universe is not a system. Universe is not a shape. Universe is a scenario. You are always in Universe. You can only get out of systems.

***Think of a motion picture.** Frame by frame a scenario unfolds. The whole unfolds only when we follow the progression of movement from one frame into the next frame.

Fuller continues:

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[46] **Alfred Korzybski**, Science and Sanity, 1933-48, ibid

"Universe can only be thought of competently in terms of a great, unending, but finite scenario whose as yet unfilled film strip is constantly self-regenerative. All experiences are terminated, ergo finite. An aggregate of finites is finite. Our Universe is finite but nonsimultaneously conceptual; a moving-picture scenario of nonsimultaneous and only partially overlapping events. One picture—one frame—does not tell the story. the single frame picture of a caterpillar does not foretell or imply the transformation of that creature, first, into the chrysalis stage and, much later,into the butterfly phase of its life. Nor does one picture of a butterfly tell the viewer that the butterfly can fly."[47]

Universe as ***Action***

Recall my discussion from ***UCS•1—We Can All Win!***.

All living systems **act** to meet their needs. But, with the discovery that Universe is process **action** is even more fundamental than life.

Science[2001] accepts **Arthur Young**'s belief:

"What is most basic in universe is not material particles but **activity**. The older concept of a universe made up of physical particles interacting according to fixed laws is no longer tenable. It is implicit in present findings that **action** rather than matter is basic."[48]

Science[2001] has discovered **action** to be fundamental in **non-living Universe**—light, particles, atoms, and simple molecules as well as within living Universe which is life itself—the living molecules, the plants, the animals, and we humans.

- Action implies motion, movement, animation—**process**.
- Actions require energy to occur. **No energy—no action.**
- Actions have duration. Actions always have a beginning and an ending.

[47] **R. Buckminster Fuller**, SYNERGETICS,1975, 1979, ibid

[48] **Arthur Young**, The Foundations of Science: The Missing Parameter, Robert Briggs Associates, San Francisco, 1984

While some actions may occur in a very short time, they all require some time. There are no instantaneous actions in Universe. **No time—no action.**

- Actions have location in space. Actions always begin somewhere and end somewhere else. **No location, No space—no action.**

Because actions require energy, location or space, and time, synergic science sometimes uses the term **energy event** to describe what we commonly call action.

R. Buckminster Fuller writing in 1975 explained:

"Two different energy events cannot pass through the same point at the same time. When one energy event is passing through a given point and another impinges upon it, there is an **interference**.

"We find experimentally that two lines cannot go through the same point at the same time. One can cross over or be superimposed upon another. Both Euclidian and non-Euclidian geometries misassume that a plurality of lines can go through the same point at the same time. But we find experimentally that two or more lines cannot physically go through the same point at the same time.

"When a physicist bombards a group of atoms in a cloud chamber with a neutron, he gets an interference. When the neutron runs into a nuclear component: (1) it separates the latter into smaller components; (2) they bounce acutely apart (reflection); (3) they bounce obliquely (refraction); (4) they combine, mass attractively. The unique angles in which they separate or bounce off identify both known or unknown atomic-nucleus components."[49]

Therefore **actions can not** and **do not occur in isolation**. If they impinge on the environment or on others, they will effect or impact on the **environment**—they will effect or impact on **others**.

Actions can effect or impact on environment and/or on others in a **negative** and **harmful** way. It can effect or impact on environment and/or on others in a **neutral** or **negligible** way. Or it can effect or impact environment and/or on others in a **positive**

[49] **R. Buckminster Fuller**, SYNERGETICS,1975, 1979, ibid

and **beneficial** way. Therefore actions that effect or impact on others can produce the following results, using the language of games:

- Other can **lose**. They are **hurt** by the action. They are **less** after the action than before.
- Other can **draw**. They are **ignored** by the action. They will be the **same** after the action as before.
- Other can **win**. They are **helped** by the action. They are **more** after the action than before.

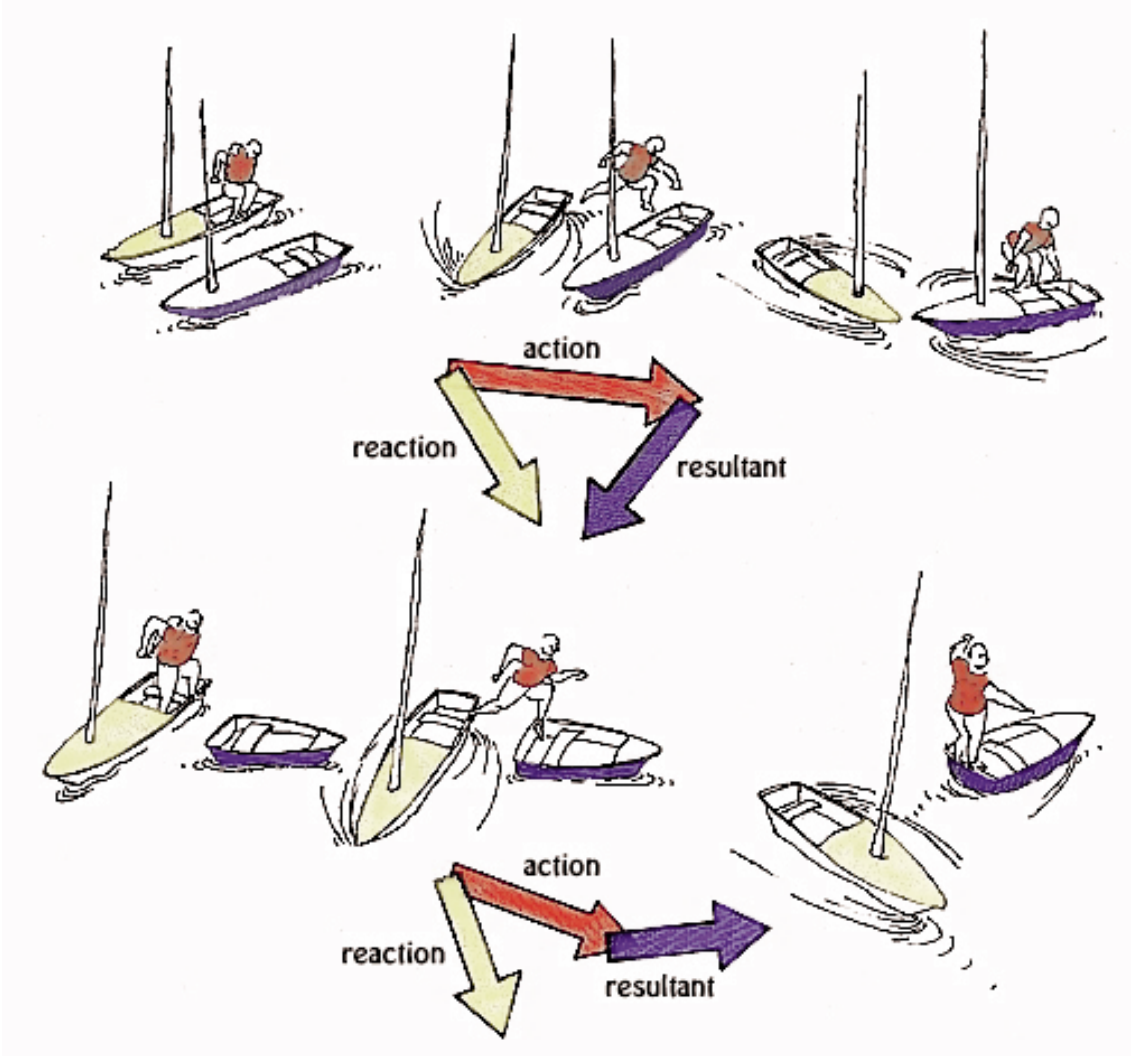
From the point of view of an individual effected or impacted by action, I can be: **hurt**, I can be **ignored**, or I can be **helped** by the action.

- Actions that **hurt** are **adversary**.
- Actions that **ignore** are **neutral**.
- Actions that **help** are **synergic**.

Because of the effect or impact that this action always has on the environment or upon other, we discover that **action** is **always accompanied** by two other phenomena—the **reaction**, and the **resultant**.

In the illustration[50] on the following page, we see the man **act** by jumping from one boat to another.

[50] **R. Buckminster Fuller**, SYNERGETICS,1975, 1979, ibid



As he jumps, he pushes off causing a **reaction** in the boat he left. As he lands his impact effects a **resultant** on the boat he lands on. The reaction occurs at the beginning of the action while the resultant occurs at the end. The environment or other **reacts** at the beginning of the action. And the effect or impact on the environment or other occurs at the end of the action producing a **resultant**.

•**Action**, **reaction**, and **resultant** are always found **together**.

By understanding that these three phenomena always and only coexist, we should not be surprised that as actions can be either adversary, neutral or synergic. So too, reactions and resultants can have the same three effects.

Reactions can be adversary, neutral or synergic. Resultants can also be adversary, neutral or synergic. And while this is not always the case, we would expect and discover that:

- **adversary** action usually provokes **adversary** reaction ending in an **adversary** resultant or **loss**, while
- **neutral** action usually provokes **neutral** reaction ending in a **neutral** resultant or **draw**, and
- **synergic** action usually provokes **synergic** reaction ending in a **synergic** resultant or **gain**.

*Korzybski on **Action***

Writing in 1933, Alfred Korzybski explained:

> "As in the older days we introduced units or elementary quanta of mass, and later, an elementary quantum of electric charge, so in our newer knowledge we have need for an elementary quantum of action. Action is defined as energy multiplied by 'time', or **A=Et**.
>
> "Naturally such a product as energy multiplied by 'time' must play an extremely important structural and semantic role in this world of space-time, where nothing happens 'instantaneously', but all action requires 'time'. If we could discover some unit of action, we could change from the language of 'energy' and 'time' to the language of 'action' and 'times'. This language, by the way, is much more satisfactory and structurally closer to experience than the old languages. 'Action' as structurally defined (product of 'energy' by 'time') is one of the two fundamental entities of pre-relativity physics which have survived the Einstein revolution.
>
> "It is really a universal term which we can apply without danger of speaking nonsense. Energy in space-time must by necessity be reformulated as 'action'.

the quantum theory posits structurally that the action of physical processes is built up of a number of elementary quanta of action."[51]

*Korzybski on **Action by Contact***

Again writing in 1933, Alfred Korzybski explained action further:

"Let us recall some structural and semantic conclusions which the differential calculus suggests. When we are dealing with the notion of a variable, we see that the variable might be **any** element selected out of an ordered aggregate of elements. We can select elements relatively widely separated from each other, as, for instance, the numbers 1 and 2, or points, let us say, an inch apart. It is obvious that if we choose, we can make the gaps smaller, and postulate an infinity of intermediate steps. When we make our gaps smaller, the elements are ordered more densely and closer together. In the limit, if we choose indefinitely many elements between any two elements, our series become compact, if we still have a possibility of gaps; or they eventually become what we call continuous, when there are no more gaps.

"Without legislating as to whether the entities we use in physics are 'continuous', 'compact', or 'discontinuous', we may grant that the maximum elucidation of the above terms in mathematics is very useful. We can easily see that in terms of **action** a continuous series gives us **action by contact**, since consecutive elements are indefinitely near each other. As the differential and integral calculus brings us in touch not only without **x** but also with its indefinitely close neighbour **x+dx**. We see that the calculus introduces a most important structural and semantic innovation; namely, that it is a language for describing **acton by contact**, in sharp contradistinction to the structural assumption of action at a distance.

"Let us illustrate the above by a structural example. Consider a series of equal small material spheres connected with each other by small spiral springs. as shown on following page as Fig. 1.

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[51] **Alfred Korzybski**, Science and Sanity, 1933-1948, ibid

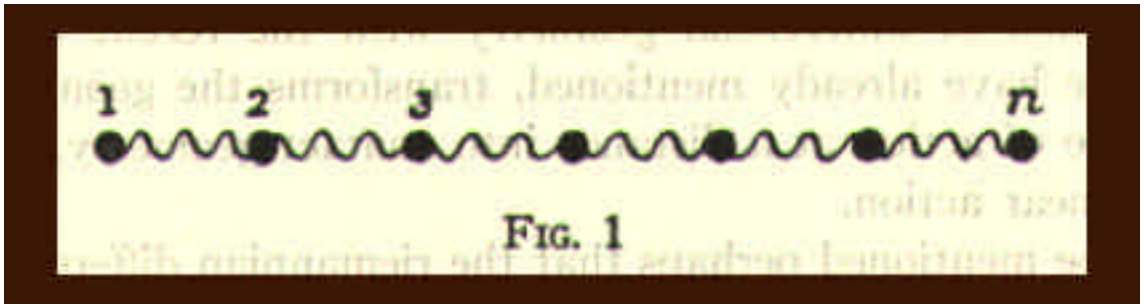

FIG. 1

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"These little spheres all have inertia, because of which, and because of the little springs, they resist displacement. If we displace the first of our spheres either in the transverse or longitudinal direction, it acts upon the second sphere, which in turn acts upon the third, etc.. We see that the disturbance of equilibrium of the first little sphere is transmitted like a wave to the next spere and so along the whole series. The most significant point in the analysis of such a wave of excitation is that it is not transmitted with some 'infinite velocity', or 'infinitely quickly' or in 'no time'. The action of each sphere is slightly delayed owing to its inertia, that is, it does not respond 'instantaneously' to an impulse. It must be noticed that the displacement is not due to a velocity, but to an acceleration, which is a change of velocity and requires a short interval of 'time'. The change in velocity again requires an interval of 'time' to overcome inertia and produce displacement. Similar reasoning applies to a long train just being started by the engine. The cars being coupled together by more or less elastic means, the engine may be moving uniformly and some of the last cars still be stationary. The pull of the engine is **not** transmitted instantaneously but with a **finite velocity**, due again to the inertia of the cars.

"We see then that the only structurally adequate means of describing changes in continuous, deformable materials is to be found in differential equations which express a method of dealing with **action by contact**.

"We have already seen that this action by contact involves also the **finite velocity** of propagation, a fact of crucial structural and semantic importance. In the history of science we can distinguish three periods. The first was naturally the period of action at a distance, the best exemplified by the work of

52 **Alfred Korzybski**, Science and Sanity,1933-1948, ibid

two great men, Euclid and Newton. In it we find of course, a superabundance of 'infinities'. With the advent of the differential calculus, and the introduction of differential equations in the study of nature, the notion of action at a distance became more and more untenable. We had a period of pseudo-contiguous action, which indeed involved differential equations; but the **velocity of propagation** was not introduced explicitly, and so there remained an implicit structural assumption of 'infinite velocity' of propagation. As an example of such pseudo-contiguous action we can cite the older theories of potential, which give differential equations for the change in the intensity of the field from place to place, but which do not contain members that express a change in 'time', and hence do not take into account the transmission of electricity with finite velocity.

*Here, **Korzybski**1933 references **Max Born**[53] and then continues. "The modern theories, as for instance, the Maxwell theory of electromagnetism, and the Einstein theory, are based on **action by contact**. these theories not only use the differential method, but they also introduce explicitly the **finite velocity** of propagation."[54]

Young on ***Action***

Writing in 1984, Arthur Young explained:

"The discovery by Max Planck in 1900 of the **quantum of action** revolutionized physics and revised the very basis of scientific thought. This discovery provides the possibility of an entirely new view of the Universe. The older concept of a Universe made up of physical particles interacting according to fixed laws is no longer tenable. It is implicit in present findings that **action** rather than matter is basic, **action** being understood as something essentially undefinable and nonobjective, analogous, I would add, to human **decision**. This is good news, for it is no longer appropriate to think of the Universe as a gradually subsiding agitation of billiard balls. The Universe, far from being a desert of inert particles, is a theatre of increasingly complex organization, a stage for development in which man has a definite place, and without any upper limit to his evolution."[55]

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[53] **Max Born**, Einstein's Theory of Relativity, London, New York, 1962

[54] **Alfred Korzybski**, Science and Sanity, 1933-1948, ibid

Writing six years later, **Arthur Young**[1990] explained:

> "Because it led to quantum physics, the discovery that light is radiated in whole units, or **quanta** of **action**, is probably the the most important discovery made by science since its inception about for hundred years ago. Another reason for its importance, in my opinion, is that it provided scientific sanction for the idea that what is most basic is not material particles but **activity**. It is not hard to think of a particle having energy due to its motion. It is hard to think of activity with no particle. Of course you can think of the quantum of action as a particle, but shorn of its energy there is nothing there. This is why if one person sees a photon, or "particle" of light, it is annihilated and no one else can see it. We never do see objects; we see the light reflected from them.
>
> "What does this do to the objectivity of the photon? Is something objective which can only be seen once? It's no wonder that Planck had to wait nineteen years for physicists to accept his thinking. This is the period given, but I don't think there was any general acceptance until 1926, when Werner Heisenberg showed that our uncertainty about the position and momentum of a particle is equal to Planck's constant.Even Planck found it hard to believe his own theory, and Einstein, despite his getting the Nobel Prize from using Planck's theory to explain the photoelectric effect, would not accept quantum theory: "God does not play dice with the Universe."
>
> "As I have heard it, Newton thought the regularity of the planets' motion was evidence for God. Others say that Newton thought that it would sometimes be necessary for God to readjust their motion. In any case LaPlace said he had accounted for their motion and made God an unnecessary hypothesis.
>
> "How could Einstein use God's regularity to exclude uncertainty if LaPlace could use regularity to make God unnecessary? The point is that there could be no novelty, no creativity, in a Universe with no uncertainty.This merit of uncertainty, novelty, contrasts sharply with the interpretation of the quantum of action as an inevitable defect of observation, but it does not conflict with the interpretation of the quantum as spontaneous creativity or freedom.

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55 **Arthur Young**, The Foundations of Science: The Missing Parameter, 1984, ibid

"Science is the quest for certainty, but science can only find it in what is less than ourselves. Uncertainty is what characterizes what is greater than ourselves. Uncertainty and its interpretation are important for science. Uncertainty is not only inevitable, it is the most basic ingredient—the photon, or quantum of action. Science is slowly beginning to see this uncertainty in a better light—as spontaneous creativity, as the source of life and the drive that sustains evolution in its ten-billion-year quest to surpass itself."[56]

Writing in 1976, **Arthur Young** explained:

"Light is unique in that, unlike everything else that exists in actuality, it has no mass (no rest mass). It has no charge and, as evidenced by the finding of relativity that clocks stop at the speed of light, it has no time. While light in a vacuum has a "velocity" of 186,000 miles per second, this velocity is not motion in the ordinary sense since it can have no other value. Objects can be at rest or move at a variety of speeds. Light, on the other hand , has but one speed (in any given medium) and cannot be at rest. Even space is a meaningless concept for light, since the passage of light through space is accomplished without any loss of energy whatever.

"Light involves us in a special kind of difficulty, the difficulty of knowing about that which provides our knowledge of other things. We might imagine a painter who wanted to paint the paintbrush, a problem I encounter when I want to repair my glasses: I cannot see without them; and light, by which we see, cannot be seen.

"This sort of Zen paradox is not appreciated by the scientist, who likes to think of light as "just another kind of particle." This interpretation does not stand up because that which is outside of space and time, and which has no rest mass, by definition cannot be a particle.

"Light is not an objective thing that can be investigated as can an ordinary object. Even a tiny snow crystal, before it melts, can be photographed or seen by more than one person. But a photon, the ultimate unit of light, can be seen only once; its detection is its annihilation. Light is not seen; it is seeing; Even when a photon is partially annihilated, as in scattering of photons by

56 **Arthur Young**, Mathematics, Physics & Reality, Robert Briggs Associates, Portland, Oregon, 1990

electrons, what remains is not part of the old photon, but a new photon of lower frequency, going in a different direction.

"An ordinary object can be thought of as a carrier of momentum, or energy, which it can impart to another object. A hammer striking a nail exerts a force which drives the nail; a bowling ball conveys energy which knocks over the pins. In both cases, the hammer and the bowling ball remain after the work is done. With light, however , its transport of energy from one point to another leaves no residue. **Light is pure action**, unattached to any object, like the smile without the cat."[57]

*Young on the **Principle of Least Action***

Writing in 1976, Arthur Young explained:

"The difficult question is: what is **action**? This will become increasingly important as we proceed. Curiously, the notion of light as action was one to emerge quite early. It was observed in the 17th century that sunset occurred a little later than it would if light followed a straight line: light as it enters the atmosphere follows a curved path. This phenomenon is explained as due to the fact that the speed of light is reduced by the atmosphere.

"What is remarkable is that the path followed by the light through the layers of atmosphere is precisely that which gets it to its destination in the shortest possible time. In driving from a point in the city to a point in the country, we can reduce the total **time** if we shorten the time spent in the heavy traffic of the city, even at the expense of going a longer distance in the country. Fermat, the famous 17th-century mathematician, was the first to solve this problem of the path for the minimum time. Yet light, going from a denser to a rarer medium, follows just this path.

"As Planck himself said of phenomenon: "Thus, the photons which constitute a ray of light behave like intelligent human beings: Out of all possible curves they always select the one which will take them most quickly to their goal."[58]
"This law, that light always follows the path taking the shortest time, is known

[57] **Arthur Young**, The Reflexive Universe, Delacorte Press/Seymour Lawrence, 1976

[58] **Max Planck**, Scientific Autobiography and Other Papers, Philosophical Library, New York, 1949

as the **principle of least action**.

"According to Planck again: "It made its discover Leibniz and soon after him also his follower Maupertuis, so boundlessly enthusiastic, for these scientist believed themselves to have found in it a tangible evidence for an ubiquitous higher reason ruling all nature."[59]"[60]

Haskell on ***Co-Actions***

Edward Haskell is the discoverer of co-Actions. The concept of **co-actions** was introduced in ***UCS•1—We Can All Win!*** and will be reviewed here.

It is great importance in understanding synergy. When participants—parts—components—are in relationship with each other, they are considered scientifically as a **unity**. The individual actions of the participants—parts—components of this unity are considered together as a ***co-Action***. And, this is regardless or whether the participants—parts—components intend to act as a unity or not. In my earlier discussion in volume one, I applied Haskell's concept of ***Co-Actions*** to human relationships. This was only a small application taken from the much larger body of work created by Haskell and his associates called the **Unified Science**[61].

In the ***Unified Science***, Universe is considered to be a **system-hierarchy** made up of **seven** "kingdoms". These "kingdoms" are designated as **particles**, **atoms**, **molecules**, **geoid systems** (galaxies, stars, planets, moons, etc.), **plants**, **animals**, and **humans**. Haskell applied the concept of ***Co-Actions*** to all **seven kingdoms—particles**, **atoms**, **molecules**, **geoid systems**, **plants**, **animals**, and **humans**.

The concept of co-Action can be applied not only to 'individuals' within these "kingdoms", but also to groups, and communities of individuals as well. Taking humans as the example it can be applied to the microcosm of the individual—the **body** is made up of **organs**, organs are made up of **tissues**, tissues are made up of **cells**, cells are made up of **organelles**, organelles are made up of **molecules**, molecules are made

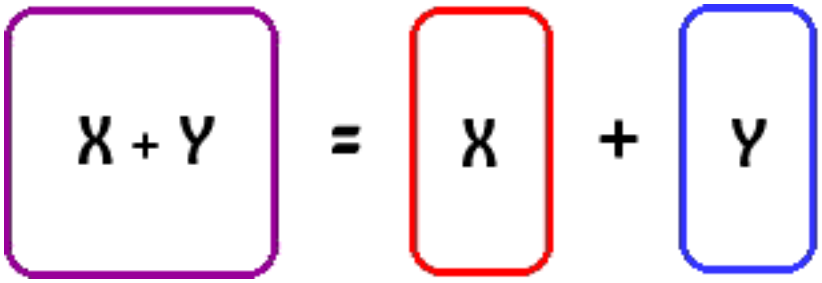
[59] **Max Planck**, Scientific Autobiography and Other Papers, 1949, ibid

[60] **Arthur Young**, The Reflexive Universe, 1976, ibid

[61] **Edward Haskell**, FULL CIRCLE: The Moral Force of Unified Science, Gordon and Breach, New York, 1972

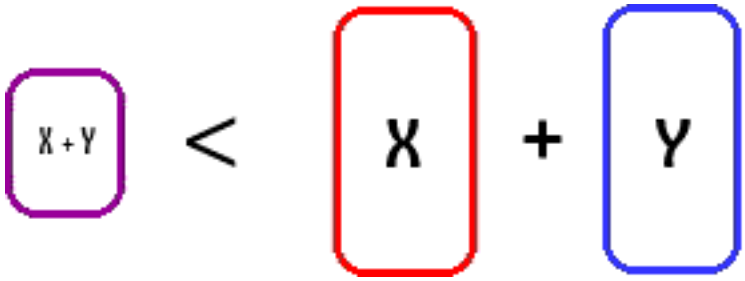
up of **atoms**, are made up of **particles** and particles are made up of gravitationally trapped **light**. It can further be applied to the macrocosm—the individual is a member of a **family**, the family is 'part' of a **community**, the community is 'part' of a **city**, the city is 'part' of a **county**, the county is 'part' of a **state**, the state is 'part' of a **nation,** and the nation is 'part' of the entire **human culture** which inhabits planet earth. And then it can also be applied to the **earth** which is a 'part' of the **solar system**, which is 'part' of a **galaxy**, which is a 'part' of a **star cluster**, which is a 'part' of a **supercluster**, which is a 'part' of **Universe**. The following redundancy is repeated from ***UCS•1.***

Haskell's *Co-Actions* apply to all 'wholes' or **unities** within Universe. If we imagine a two 'part' **unity** made up of 'part' "**X**" and 'part' "**Y**". We can then represent the resultant of their interactions within the **unity** as follows: If the two 'parts' have a neutral relationship, then "**X**" and "**Y**" are unchanged by their interaction.



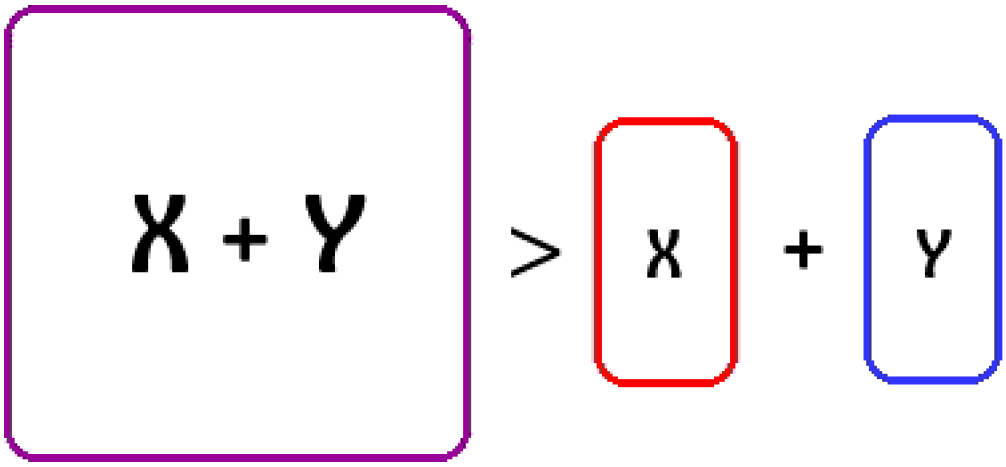
The sum of the 'whole' (**X** + **Y**) is **equal** to the sum of the 'parts' (**X**) + (**Y**).

If the two 'parts' have an adversary relationship, then "**X**" and "**Y**" are made less by their interaction.



The sum of the whole (**X + Y**) is **less** than the sum of the 'parts' (**X**) + (**Y**).

Or, if the two 'parts' have a synergic relationship, then "**X**" and "**Y**" are made greater by their interaction.



The sum of the whole (**X + Y**) is **greater** than the sum of the 'parts' (**X**) + (**Y**).

These are the three general classes of ***co-Actions***. Co-Actions can be assigned to these three classes based on net effect. There is a class of neutral Co-Actions, a class of adversary co-Actions, and a class of synergic co-Actions .

Edward Haskell explained that within these three classes there are nine possible specific co-Actions.

We can find nine specific types of co-Actions to describe the relationships between the 'parts' of any 'whole' or **unity**.

The relationship within the unity might be good for "**X**", good for "**Y**"; it might be good for "**X**", neutral for "**Y**"; it might be good for "**Y**", bad for "**X**"; it might be neutral for "**X**", good for "**Y**"; etc.; etc..

Edward Haskell's described these nine possibilities in his ***Co-Action Table***, shown below.

X

Y \ X	−	0	+
+	−,+	0,+	+,+
0	−,0	0,0	+,0
−	−,−	0,−	+,−

Y

Within a unity, each 'part' may benefit, may remain unchanged, or may be injured. We see the same table below using the language of games.

X

Y \ X	Lose	Draw	Win
Win	Lose,Win	Draw,Win	Win,Win
Draw	Lose,Draw	Draw,Draw	Win,Draw
Lose	Lose,Lose	Draw,Lose	Win,Lose

Y

Universe as ***Choice***

Edward Haskell's ***System-Hierarchy***[62], was first formulated in 1964, it contained **seven** "kingdoms"—**particles**, **atoms**, **molecules**, **geoid systems**, **plants**, **animals**, and **humans**. In 1976, Arthur Young working independently without knowledge of Haskell's work, formulated the ***Theory of Process***[63]. In it he distinguished seven **stages** of process in Universe—**light**, **particles**, **atoms**, **molecules**, **plants**, **animals**, and **humans**. Both Haskell's ***System-Hierarchy*** with **seven** "kingdoms", and Young's ***Theory of Process*** with **seven** stages of process are '**models**' of Universe and offer value in understanding Nature. Their similarities offer us corroboration, and their differences offer us opportunity to improve our understanding.

Arthur Young explains that all ***stages of process*** make ***choices***. Universe is structured from these choices. Understanding choice is fundamental to understanding Universe, process, and ourselves. Action implies a need for choice. The living system must choose which action or actions to take. The living system must decide **when** to act and **where** to act. Actions bring choices.

Choice is defined in the dictionary as deciding, picking, selecting. This would seem a type of **pre-action**, or for living organisms mental or intellectual action.

Arthur Young believed that the phenomena of choice begins even before the beginning of life. He tells of the work or an earlier Young (no relation to him). An Englishman named Thomas Young who in 1803, shed light on the phenomenon of choice when he designed a unique double slit light experiment.

Some interpret his experiment as demonstrating that **photons** make decisions.[64] It appears that a photon of light makes a **random** choice as to where it will go in universe. When a photon is released at a particular point in universe, one second later it can be anywhere within a sphere of 186,000 miles. Recall from ***UCS•1,*** our earlier discussion of the phenomena of choice.

Choice begins at the energy level of the photon. A photon of light makes random choices

[62] **Edward Haskell**, FULL CIRCLE, 1972, ibid

[63] **Arthur Young**, The Reflexive Universe, 1976, ibid

[64] **Gary Zukav**, Dancing Wu Li Masters, William Morrow & Co., 1979

as where and when it will go in Universe. When a photon is released at a particular point in Universe, one second later it can be anywhere within a sphere of 186,000 miles.

Scientifically, **choice** is defined as that condition where a system moves from a point of multifaceted potentiality to a point of single actuality.

The photon, once released at some point in Universe has the multifaceted potential to be anywhere within a sphere of 186,000 miles within one second. We cannot predict where it will be at the end of that second, for its choice is random. But we see that it moves to only one place in that sphere. It selects a single actuality.

Choice –def**—>**

Multifaceted potentiality –becoming a**—> single actuality**

Again, if photons choose, then they must have a form of **consciousness**. This is not the complex form of consciousness we see in humans. Light is the simplest form of process and consciousness at the stage of light must be the simplest of consciousnesses.

Light is the simplest of Universe's phenomena and humans appear to be the most complex. In Universe all is change. And change means change in energy. Change in energy is change in information. Universe is full of change and Universe is made up of energy and information. We humans know that when we are confronted by change, we respond by making choices. Every event—be it birth of a child or loss of a loved one, feast or famine, poverty or prosperity, peace or war—represents change. Every idea—be it a discovery that cures cancer or a decision to commit a crime—represents change. Every situation—be it getting a new job or losing a job, marriage or divorce, childhood or old age—represents change. We humans adapt to these changes by making choices. This is what all living systems do from the time of conception until they perish. They make choices. They make decisions.

The human brain is estimated to be capable of 10 raised to the exponential power of 800 thoughts (10^{800})—multifaceted potential. The human brain will have only one thought at the time of decision—single actuality. At any moment I am capable of an enormous number of behaviors but I will choose only one—**multifaceted potential becoming single actuality**. With the power of action comes opportunity for choice.

And while choice is available to all forms of process, there are restraints to those choices.

Universe as **Restraint** to Choice

Science is that human behavior that seeks to determine the boundaries of restraint—the boundaries that limit choices. These restraints to choices once discovered are expressed in scientific theories—in scientific generalizations. These are the rules of Universe—the '**Laws' of Nature**.

Universe is hierarchical and different restraints exist at different levels of hierarchy. Because Universe is knowable, it can be studied and understood. Because Nature plays fair and follows the rules, we know that whatever happens in Universe **should** happen. When we understand all of the laws of Nature that apply to a particular form of process, and when we understand the choices made within that process then we can accurately predict what will happen.

Science promises us again and again that if we but discover the laws of Nature that apply to ourselves—that apply to humanity, then we humans can choose the reality we want.

Universe as **Hierarchy**

Universe is hierarchical. It is arranged in levels. This hierarchical '**structure**' of Universe is created by the interaction of choice and restraint. It is as if choice and restraint were partners in a dance. The Universe is in constant motion and Universe is not a hierarchy of things, it is a hierarchy of **processes.** In ***Unified Science***[65], **Edward Haskell** explained that Universe was a **system-hierarchy**:

> "The universe is a Systems-Hierarchy. It has evolved in a cumulative manner, each higher step in this hierarchy, after the first, consisting of lower step components plus a new entity which has emerged out of the hierarchy, mutually modified. The world is therefore at the same time "richly strange and deeply simple."

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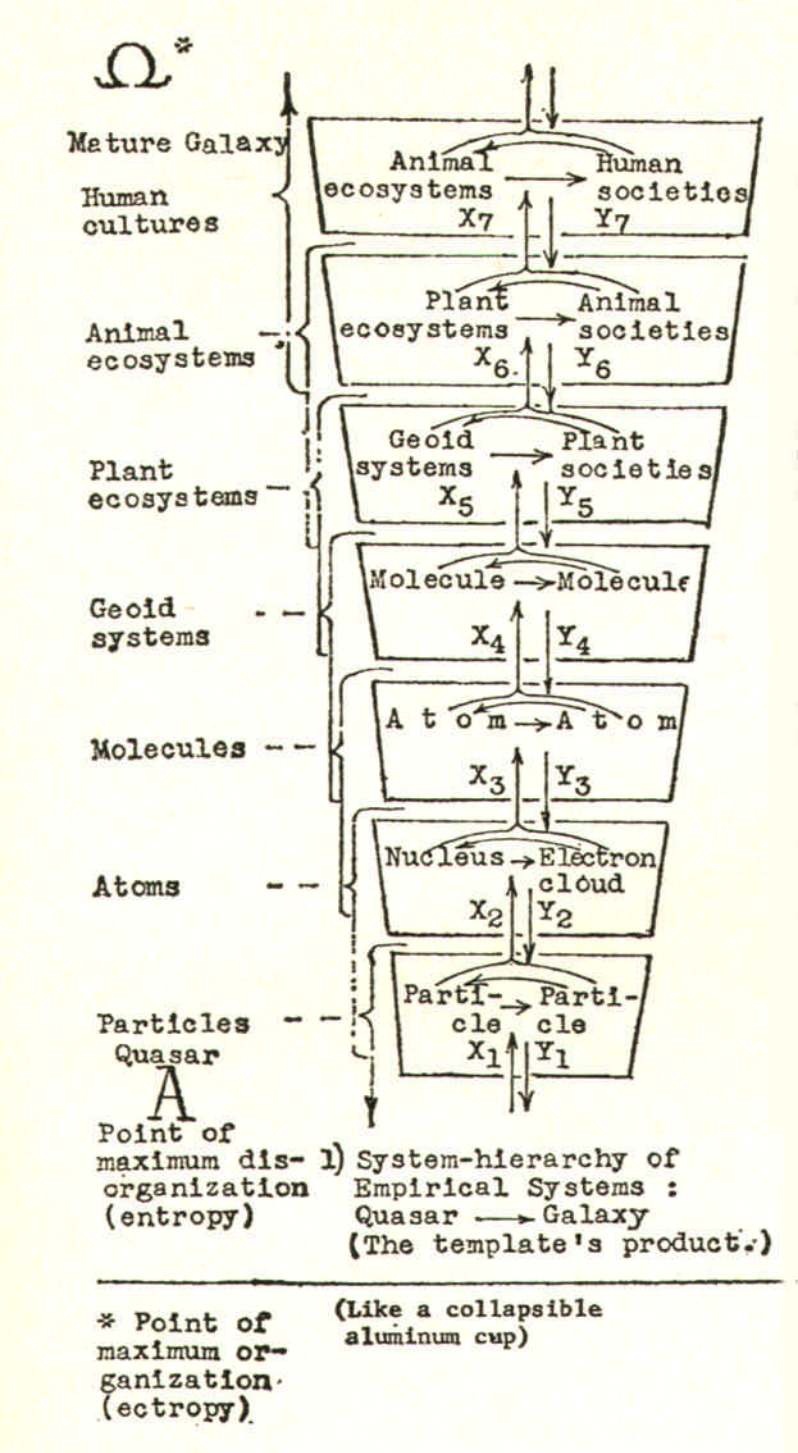
65 **Edward Haskell**, FULL CIRCLE, 1972, ibid



"Consider the deep simplicity of Unified Science: the "steps" of its great natural hierarchy fit together like the broad rings of collapsible aluminium drinking cup, shown dis-assembled in the above figure.

"Each broad ring represents a natural kingdom or Major Stratum.Large portions of the bottom ring, stable particles, nest into the second ring, atoms, as shown by means of the nested braces in the drawing. (Stable particles — plus neutrons which are composed of stable particles — combine to form atoms.) Large portions of these two rings nest into the third ring, molecules. (Atoms combine to form molecules.) Large portion of these three nest into the fourth ring called geoid systems. (Particles, atoms, and molecules combine to form the lowest geoid systems, gas -dust clouds, and these form all the higher ones — stars, planets, moons and so forth.) And so on up to the highest known natural kingdom, human cultures.

"The hierarchy of ecosystems extends, shown in the drawing, from Alpha Â to Omega Ω, the beginning and the end — of organization."[66]

—Edward Haskell

Take yourself, you are a living system. If we **look inward** towards the microcosm we see that your **body** is made up of **organs**, your organs are made up of **tissues**, your tissues are made up of **cells**, your cells are made up of **organelles**, your organelles are made up of **molecules**, your molecules are made up of **atoms**, your atoms are made up of **particles** and your particles are made up of gravitationally trapped **light**.

If you **look out** towards the macrocosm, you are a member of a **family**, your family is part of a **community**, your community is part of a **city**, your city is part of a **county**, your county is part of a **state**, your state is part of a **nation,** and your nation is part of the entire **human culture** which inhabits planet earth.

And, if we look farther out from our earth, we see that the earth is a part of the **solar system**, which is part of a **galaxy**, which is part of a **star cluster**, which is part of a **supercluster**, which is part of **Universe**. The structure of Universe is hierarchical and the levels of this hierarchy are cumulative. They include one another. If we humans are to understand ourselves, we must consider ourselves in terms of the rest of Universe in which we are embedded.

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66 **Edward Haskell**, FULL CIRCLE, 1972, ibid

Universe as **Purpose**

Arthur Young[1976] and **John Saloma**[1991] explain:

> "Process is defined as a series of actions or operations taken to reach an end, therefore process projects a goal.[67]
>
> "Process, accordingly, must have direction, build on itself, and use means to attain its goal, these means being determinate or predictable if they are to be effective. The free, initiating, creative play of purpose needs fixed laws, constraints, and a deterministic framework through which to realize its goal. Young's process paradigm deals expressly with this interplay of freedom and constraint."[68]
>
> "As the reader is probably aware, the notion of purpose or teleology is forbidden in science, among biologists especially, who, while they must be strongly tempted to invoke it at every turn, avoid it as reformed alcoholic avoids a drink. Physicists avoid it because their problems don't require it. And yet we find one of the greatest physicists **Max Planck**[1949] saying that: "...the historical development of theoretic research in physics had led in a remarkable way to a formulation of the principle of physical causality which possesses an explicitly teleological character."[69] Let us note then that the purposiveness is associated with that aspect of light known as the principle of least action."[70]

When Arthur Young examined process he discovered that process has goals. He saw that process has direction, that it builds on itself, that it must use means, that means must be determinate. The dynamic we call process has purposiveness—there is goal seeking.

> "Thus, Young recognizes both "first cause" (in the guise of **purpose**) and a teleological (directed toward an end—**goal**) design in nature, two admissions

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67 **Arthur Young**, The Reflexive Universe, 1976, ibid

68 **John S. Saloma**, Commentary to the Theory of Process, The Theory of Process 2, Robert Briggs Associates, Portland, 1991

69 **Max Planck**, Scientific Autobiography and Other Papers, Philosophical Library, New York, 1949

70 **Arthur Young**, The Reflexive Universe, 1976, ibid

to theory that modern science has scrupulously avoided. since at least Sir Francis Bacon, science has limited itself to the consideration of objective reality, rendering itself a partial theory of the nature of reality. Young's aim in the **Theory of Process** is to achieve a comprehensive theory or metaparadigm that includes and is thoroughly consistent with the best science but which is capable of dealing with nonobjective, nondefinable aspects of reality beyond the accepted limits of current science.

"Young's investigation of how process works led him to some profound insights into the nature of reality. At the most general level, process or time-structure exhibits several features. It incorporates "the arrow of time", the basic asymmetry of time, always moving ahead from the past through the present into the future.

"The concept of "process" is the single most overarching and inclusive term in Young's theory and a good starting point for a systematic consideration of his ideas. Process is a description and an interpretation of how the Universe works. Young uses the term interchangeably with "time-structure", suggesting an underlying and definable dynamic. Process is initiated by a purposive, goal-seeking thrust, an initial venturesomeness that pushes it ahead. At its most fundamental level, the Universe is a process put into motion by purpose, analogous to a learning experience. Ancient cosmologies speak of God wanting to know himself, seeking to actualize that which was only potential. This same undeniable thrust toward actualization is the essence of what Young means by process."[71]

Arthur Young discovers both purpose and goal embedded in process. And, we must understand both purpose and goal, if we are to understand dynamic Universe. Purpose begins with the simplest stage of process in Universe—Light. **Young** explained:

"The essential contribution of quantum physics is that **light** comes in **whole** units (quanta) which **cannot be** further **divided**. Light, moreover, is **immaterial**; it is without charge, rest mass or other properties. It is outside of space-time. Clocks stop at the speed of light and the photon can traverse an unlimited distance without loss.

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[71] **John S. Saloma**, Commentary to the Theory of Process, 1991, ibid

"Such lack of materiality vexes the scientist. It is impossible for him to establish the photon on an objective basis; he cannot give it a position or predict it. If he does detect the photon, as, say, on a photographic plate, it is annihilated and has no future to predict. The layman, on the other hand, is bathed in a world of light (as well as other radiation, including heat and radio waves); it is of no concern to him that the light he sees by no longer exists after he sees it. Not having taken the monk's vow of science—that the Universe is objective—he participates in the Universe, and this participation, as well as all chemical and other interactions in the Universe, is due to photon exchange.

"Heisenberg, in 1925, first called attention to the fact that to observe an electron, we must disturb it. Since, in theory, it is impossible to know the exact position and velocity of a particle, we can only predict probabilities. What Heisenberg failed to note is that when this principle is applied to photons, we cannot predict at all. Physicists cope with this problem by considering all photons to be "virtual", which means that they are unobservable. Science thus comes back to where it started, before it decided to exclude what was unobservable.

"But why is the layman better off: Because, as the Zen expression goes, "Ordinary life is very Tao." Spiritual teaching has always emphasized the ineffability of the highest principle: "What is the sound of one hand clapping?" Such enigmatic expressions warn that the ultimate essence is not a thing, it is no thing."[72]

"In showing that the 'parts' arise from the 'whole' we provide confirmation for light as first cause:

"Light=Quanta of Action=Wholes=First Cause

"Actions are unqualified. While mass is measured in grams, length in meters and time in seconds, quanta of action are counted with no necessity of specifying the kind of unit. This implies their fundamental nature: Actions precede measure, they are prior to the analysis which yields grams, meters, and seconds."[73]

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[72] **Arthur Young**, The Foundations of Science: The Missing Parameter, 1984, ibid

[73] **Arthur Young**, The Reflexive Universe, ibid

Arthur Young[1984] discussing the photon and consciousness begins by quoting **Francis Bacon**[1609]:

> "Upon the whole I conclude with this; the wisdom of the primitive ages was either great or lucky: great, if they knew what they were doing and invented the figure to shadow the meaning; lucky, if without meaning or intending it they fell upon matter which gives occasion for such worthy contemplations.
>
> "The accounts given by the poets of Cupid, or Love say then that Love was the most ancient therefore of all things whatever, except Chaos, which is said to have been coeval with him; and Chaos is never distinguished by the ancients with divine honor or by the name of a god. This Love is introduced without any parent at all; only, that some say he was an egg of Night. And himself out Chaos begot all things, the gods included. The attributes which are assigned to him are in number four: he is always an infant; he is blind; he is naked; he is an archer.
>
> "The fable relates to the cradle and infancy of nature, and pierces deep. This Love I understand to be the appetite or instinct of primal matter, or to speak more plainly, the natural motion of the atom, which is indeed the original and unique force that constitutes and fashions all things out of matter. Now this is entirely without parent, that is, without cause. For the cause is as it were parent of the effect; and of this virtue there can be no cause in nature, therefore neither kind nor form. Whatever it be therefore, it is a thing positive and inexplicable. And even if it were possible to know the method and process of it, yet to know it by way of cause is not possible; it being next to God, the cause of causes, itself without cause. That the method even of its operation should ever be brought within range and comprehension of human inquiry is hardly perhaps to be hoped; with good reason therefore it is represented as an egg hatched by night.... For the summary law of nature, that impulse of desire impressed by God upon the primary particles of matter which makes them come together, and which by repetition and multiplication produces all the variety of nature, is a thing which mortal thought may glance at, but can hardly take in....
>
> "Let us now consider his attributes. He is described with great elegance as a little child, and a child forever; for things compounded are larger and are

affected by age, whereas the primary seeds of things, or atoms, are minute and remain in perpetual infancy.

"Most truly also is he represented as naked; for all compounds (to one that considers them rightly) are masked and clothed, and there is nothing properly naked except the primary particles of things.

"The blindness likewise of Cupid has an allegorical meaning full of wisdom. For it seems that this Cupid, whatever he be, has very little providence, but directs his course, like a blind man groping, by whatever he finds nearest; which makes the supreme divine providence all the more to be admired, as that which contrives out of subjects peculiarly empty and destitute of providence, and as it were blind, to educe by a fatal and necessary law all the order and beauty of the Universe.

"His last attribute is archery, meaning that this virtue is such as acts at a distance; for all operation at a distance is like shooting an arrow. Now whoever maintains the theory of the atom and the vacuum....necessarily implies the action of the virtue of the atom at a distance: for without this no motion could be originated, by reason of the vacuum interposed, but all things would remain fixed and immovable."[74]

—Francis Bacon

Arthur Young[1984] continues:

"While I cannot find it is this essay, I have seen it stated elsewhere that Bacon called attention to the fact that Cupid is depicted as a person because first cause must have the potential to become everything which evolution can produce. I emphasize this point in criticism of current theories which treat consciousness as an "epiphenomenon"—that is something which emerges late in evolution.

"I realize that it is much easier to accept the idea that consciousness is an epiphenomenon than to acknowledge that consciousness was there in the first place. But such acceptability is deceptive; it gives us an IOU for the explanation and then defaults on the payment. We must show the potential for

[74] **Francis Bacon**, Wisdom of the Ancients, 1609, Quoted by: Arthur Young, The Foundations of Science: The Missing Parameter, Robert Briggs Associates, San Francisco, 1984

consciousness in the origin of things; it cannot arise from the increasingly specialized parts which develop as evolution proceeds.

"The photon, in fact, is the primordial and only entity to which the term "consciousness" properly applies; the later developments—particles, atoms, molecules, cells, etc—are means or vehicles in which the photon invests. The theory we are exploring requires that we view the photon as possessing or controlling the molecule rather than the other way about. We recognize that the photon is the seed principle or life spark. It is the whole from which other more highly organized entities evolve.

"This whole, or quantum of action, as we have seen, is in continual vibration, or cycling, and therefore conscious in that it acts and reacts. Such consciousness is not of course consciousness as we know it; but as it applies to its own activity it is sufficiently similar to have the potential for consciousness. Admittedly, this is a great mystery, and we are not explaining it; but we are giving it the importance it deserves. We have identified the quantum as just that ingredient needed to explain the thrust of life, to account for life's freedom and its urge to surpass itself. It is remarkable that we find further confirmation in the ancient Greek myth of Cupid, first and most potent of the gods. In Bacon's interpretation, written three hundred years before Planck discovered the quantum of action, we have a description of just those features which the quantum was subsequently found to possess.

"Classical physics, including relativity, describes a Universe with no drive, no motive power; a Universe, as Bacon said, where no motion can be originated, all things....fixed and immovable. The drive or dynamic which is required for evolution is thus needed apart form evolution. This drive, implicit in the quantum of action, has been recognized by science in that it is now known that all commerce between particles, atoms, and molecules is due to quanta of action (photons). What has not been realized is that life and consciousness are implicit in this same drive."[75]

—Arthur Young

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[75] **Arthur Young**, The Foundations of Science: The Missing Parameter, 1984, ibid

Universe as ***Inclusion***

Now we are ready to widen our understanding of the human condition and of ourselves. This expansion of our understanding cannot occur in isolation. We cannot understand ourselves separate from Universe. Science[2001] has discovered that reality is inclusive. **R. Buckminster Fuller**[1975] explains:

> "My definition of Universe includes not only the physical but also the metaphysical experiences of Universe, which the physicists thought they had to exclude from their more limited definition of the finite physical portion of Universe. The metaphysical embraces life which is weightless as well as all the weightless experiences of thought, including all the mathematics and the organization of data regarding all the physical experiments, science itself being metaphysical. Metaphysical generalizations are timeless, i.e., eternal. Because the metaphysical is abstract, weightless, sizeless, and eternal, metaphysical experiences have no endurance limits and are eternally compatible with all other metaphysical experiences. What is metaphysical experience? It is comprehending the relationships of eternal principles. The means of communication is physical. That which is communicated, i.e., understood, is metaphysical. The symbols with which mathematics is communicatingly described are physical. A mathematical principle is metaphysical and independent of whether X, Y or A, B are symbolically employed.
>
> "Universe is all the Known: If we let **U** stand for Universe, **M** stand for metaphysical and **P** stand for the physical, then the most comprehensive generalization would be that which has **U=MP**. An eternally regenerative Universe results from the metaphysical times the physical. We could then have a subgeneralization where the physical $\mathbf{P=E^r \bullet E^m}$, where $\mathbf{E^r}$ stands for energy as radiation and $\mathbf{E^m}$ stands for energy as matter.
>
> "But where is **life** in this formula? It is not physical. Whatever else **life** may be, we know it is weightless. At the moment of death, no weight is lost. All the chemicals, including the chemist's life ingredients, are present, but life has vanished. The physical is inherently entropic, giving off energy in ever more disorderly ways. The metaphysical is antientropic, methodically marshalling energy. Life is antientropic. It is spontaneously inquisitive. It sorts out and endeavors to understand. Live is metaphysical.

"Universe is then the aggregate of all humanity's consciously apprehended and communicated nonsimultaneous and only partially overlapping experiences.

"**Aggregate** means sum-totally but nonunitarily conceptual as of any one moment. **Consciousness** means an awareness of otherness. **Apprehension** means information furnished by those wave frequencies tunable within man's limited sensorial spectrum. **Communicated** means informing self or others. **Nonsimultaneous** means not occurring at the same time. **Overlapping** is used because every event has duration, and their initiatings and terminatings are most often of different duration. A man is born, grows up, has children and grandchildren. His life overlaps that of his grandfather and farther and that of his children and grandchildren. But his grandfather's life did not overlap his children's nor his grandchildren's lives. Hence, partially overlapping.

"We find no record of man having defined the Universe—scientifically and comprehensively—to include both the metaphysical and the physical. The scientist was able to define physical Universe by virtue of the experimentally verified discovery that energy can neither be created nor lost; therefore that energy is conserved; therefore it is finite. Thus, man has been able to define successfully physical Universe—but not, as yet, the metaphysical Universe

"Our definition of Universe includes both the objective and the subjective, i.e., all voluntary experiences (experiments) as well as all involuntary experiences (happenings)."[76]

—R. Buckminster Fuller

Universe^{2001} is all the physical plus all the metaphysical.

Universe^{2001} is **inclusive**. It includes not only the **planets**, **stars**, and the **galaxies** It includes not only the **atoms**, **molecules**, and the bodies of dead **plants**, **animals** and **humans**. But it also includes **light**, **particles** ,and the behavior of living **plants**, **animals** and **humans—**which includes **awareness**, **instinct**, **emotion**, **purpose**, **goals**, **values**, **motivation**, **choice**, **decision**, **mind**, **spirit** and **consciousness**.

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[76] **R. Buckminster Fuller**, SYNERGETICS, 1975-79, ibid

Universe^{2001} is all the thus-far observationally known to exist phenomena and all the thus-far non-observationally known to exist noumena. This includes the objective—what we can see as well as the non-objective—what we cannot see. This includes the physical—what we can feel as well as the nonphysical—what we cannot feel.

Universe^{2001} is inclusive. It is then as **complete** a model of Nature—as complete a model of **reality**—as total humanity^{2001} can create.

CAUTION!!

This does not mean Universe is imaginary. It does not mean Universe is fabulous. It does not mean that Universe is non-existent. Universe is a model of **reality**. Reality may be non-physical. Reality may be non-objective. But reality exists and Universe is real.

Arthur Young[77], R. Buckminster Fuller[78], and Edward Haskell[79] made major contributions to our understanding of Universe^{2001}. Universe^{2001} is our total understanding thus far of all that humanity **knows** of and about NATURE.

Universe^{2001} is **unity** and it is also a **unity** of **unities**, that follows one **universal set of principles** or truths.

Max Plank's discovery that ***light*** is a ***quantum of action*** and the discovery of ***synergy*** turn the scientific world upside down. Our time-binding power is master of cause and effect and yet that power which we call reason has to start with something; it cannot admit first cause. Try it on yourself; you will always find yourself asking what was the cause of the first cause. "Which came first the chicken or the egg?" Reason begins at the other end, with objects, and proceeds to divide the objects into parts.

We can trust neither our power of reason nor our our power of intuition separately; we need both. We do not live in 'space'. We do not live in 'time'. We live in 'space-time'. Our Universe is not composed of 'wholes'; our Universe is not composed of 'parts'.

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[77] **Arthur Young**, The Reflexive Universe, 1976, ibid

[78] **R. Buckminster Fuller**, SYNERGETICS, 1975-79, ibid

[79] **Edward Haskell**, FULL CIRCLE, 1972, ibid

Universe is composed of 'wholes-parts'. 'Wholes' and 'parts' are compliments. They complete each other. Together they form a ***unity***.

Universe wears the faces of Process, Action, Choice, Restraint, Hierarchy, Purpose, and Inclusion.

All 'wholes-parts' in 'space-time' have ***substance*** and ***form***. The substance is '***matter-energy***', and form is ***order***. Order is the structure, organization, and pattern of that matter-energy.

'**Order**' is as fundamental as '**space-time**'—as fundamental as '**matter-energy**'. And, we will discovery in the next chapter, that '**orde**r' is the third fundamental of Nature.