PRAGMATISM, MODELS AND REALITY

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The pragmatic person is sensible and knows that they cannot avoid facing reality, because in the end reality will always win. The question is: What is reality?

Models, Systems, Language, Space, Axioms

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SECTION I: -On Models

I.I: Basic Starting Point -Experience and Desire

1. Things Happen

2. Some Things are Pleasant,
   Some Things are Unpleasant

3. Sometimes it Seems one can Control Things,
   Sometimes it Seems one can Not Control Things

4. It would be Nice if one could Control Things
   So that only Pleasant Things Happened

I.II: Control -Goals and Knowledge

IF We do not Control Things then We must Accept Things as they Are.
It Seems that if we are to Control Things (to get what we want) Then:

1. We must know what we want

   -We may be mistaken

2. We must know how to achieve what we want

   -It may be impossible

3. We must know the consequences

   -Do we Know what is Good for us?
   -Pleasant Things may Cause Unpleasant Things
   -Pleasant Things may Dangerous
   -Why are some things Pleasant ?
   -Why are some things Unpleasant ?

4. We must Know why things happen

   -What has happened to make things as they are?
   -What is happening now to change things?
   -What is likely to happen to things in the future?

   -Knowledge may be difficult

   i. Things may be difficult to See how they Are ?
      -Invisible
   ii. Things may Appear different to how they Are ?
      -Illusion

5. We must have Freedom of Action

   i. Some Actions Prevent Other Actions
      -Blockages, Terminations (Checkmate in Chess)
   ii. Some Actions Encourage Other Actions
      -Invitations, Influences, Imitations
   iii. Some Actions Generate New Possibilities for Action
      -Discovery, Invention
   iv. We may interfere with other peoples actions
      -positively
      -negatively
   v. Other people may interfere with our actions
      -positively
      -negatively

      -are there things we must do?
         -are there alternatives?
      -are there things we must not do?
         -can they be avoided?
      -are there things which do not matter?
         -shall we do them?

I.III: Understanding and Models

-Understanding Implies Models (Theory, Simulation)

Actions with Models are

i. a. Construct Model (Theory over how Things Act)
   b. Select Model if Exists

ii. Test Model
   a. WHAT does Model Do (Which Actions and Results)
   b. DO Things Behave as in Model

iii. Modify Model
   a. TO See what Happens (Play with Model)
   b. TO Make Model more Like Things

iv. Act as if Things were Like Model
   a. No Surprises (Model True)
   b. Surprises (Model False -Modify Model)

Models allow man to alter his behavior in order to take fuller advantage of the natural order of things.

C. Langton

Artificial Life (p6)
Addison Wesley 1989

SECTION II: -Some Theoretical Tools

II.I: The Media

1. -Building a (Meta) Language

To create a model one requires a medium

i. physical medium (object, form, syntax)
ii. conceptual medium (metaphor, content, semantics)

In order to realize the conceptual medium in the physical medium

-one requires tools
-conceptual tools
-physical tools

In order to understand the process of using tools to transform the conceptual medium into the physical medium one requires a meta-language (a language to describe a language).

2. -Physical and Conceptual

The world around us is Physical and can be perceived by means of our sensory organs, sight, touch, smell etc..

However, our understanding of the Physical world around us is conceptual. We cannot see, touch, hear or smell our understanding. In fact our perceptual system transforms the Physical world into the Conceptual image in our minds.

We may use physical tools or media such as brush, paint and canvas, stone and chisel or even cameras and computers to make Physical objects, but we cannot use these things if we have no Conceptual understanding of how they work or what we wish to do with them. Ultimately, it our Conceptual models of the Physical world that enable us to function in the Physical world.

Similarly, without a representation in ink on paper, in paint on canvas, in stone or bronze, as modulated light or sound our Conceptual models remain invisible and cannot be shared with others.

We may in principle make a great distinction between the Physical world and the Conceptual world but in practice there is little difference. It is the Conceptual world that orders the changes in the Physical world and it is the Physical world that confirms the Conceptual order.

- Desired effect implies required action (effect known)
- Experimental action explores effect. (effect unknown)

3. Tools and Media

In principle there is no difference between a Tool and Medium, a camera or a piece of wood may be considered either as tool or medium. It is the way it is used that creates the difference. In practice, Tools and Media are direct opposites.

A Tool is used to perform a specific task as quickly and efficiently as possible and they must be easy to use. Designers use tools to visualize their ideas and engineers use Tools to build bridges. In this case both the idea and the bridge exist already in the mind and the Tools are simply instruments to realize in the Physical world things that exist in the mind.

A medium is more complex and has no specific task to perform. It is a toy to play with or a laboratory with which to experiment and so the outcome is unknown. A Tool transmits ideas, a Medium creates ideas.

a. Physical Tools and Media:

A camera is a Physical Object which works on Physical principles.

To use it as a tool one decides on the photograph one wishes to make, make the right adjustments to the camera and press the button. If one is not sure of the correct adjustment one makes several attempts using different adjustments and then throw away the resulting photographs which do not look like the one wanted to make. The more one knows how to make the right adjustments the quicker the correct photo is made and the quicker the money can be earned for making it. As a tool the more automatic the functions of the camera are (as long as it gives the photographer a bit of a chance to distinguish themselves from others in non-scientific applications) the better it is.

To use a camera as a Medium one must first decide what it is about a camera that makes it so interesting, then one must try and discover all the things that one could do with a camera that might be related to whatever it was that was so interesting. Then one has to try doing all the things one has thought of and look to see if the results suggest any thing else which might be interesting. If one finds something interesting one must try it, if one can find nothing interesting (or one understands the camera so well that it has become a tool) then one must throw the camera away and find another medium. In the meantime one has presumably discovered lots of information about what it was that interested you. Possibly even that it was not so interesting and that other things are much more interesting. As a medium, the more automatic the functions of the camera are the less chance the artist has to play with it under different circumstances.

The photographer throws away photos that are not good, the artist throws away the camera when the results are too good. That is why photographers are rich and artists are poor. Unfortunately, photographers need artists to explore new ways of working with photography (in fact to develop photography as a conceptual system). That is why photographers (and others) should pay for artists, just as technologists (and others) must pay for scientists.

b. Conceptual Media:

In order to make maximum use of the Physical Optical, Chemical and Mechanical Media which are combined to form a Physical Camera one needs to construct a conceptual medium. A vision of what a camera is and what one should do with it.

One could decide that the concept light is the most important. One may decide that the freezing of time into a single image was the essence, perhaps the ability to record peoples facial expressions in different contexts, or the ability for the camera to tell lies. One may even decide on different combinations, but in every case the Conceptual decision made would influence the photos which were actually Physically produced.

One could even say that the Physical Medium was simply an agent to enable you to explore the Conceptual Medium; the concept of light, the concept of time, the concept of humanity or the concept of truth.

The Conceptual Medium would determine the things you would do with the physical Medium and the Physical results would confirm or deny the Conceptual construction developing in the Conceptual Medium.

c. Conceptual Tools:

A Conceptual Medium is then a way of describing the world about one in such a way that ones ideas about the world can be developed and even changed if they prove incorrect or not useful. It is agent for developing understanding about the world but also about the way one thinks about the world. The result of the experiment, or the end of the journey is not known until it is reached.

Sometimes however, just like one needs Physical Tools to do a specific job, one also needs Conceptual Tools. Arithmetic is a useful Conceptual tool if one wishes to know how much money one has to spend to buy a camera after paying the rent. A graph may be a useful tool in determining exposure times after the camera is bought or maybe a diagram can show the relationship between the different ideas buzzing around in ones head -and it may even help to suggest what the next set of photographs, paintings or sculpture should be about.

Again, the distinction is subtle but vital. The diagram may be a Conceptual Tool used sometimes to clarify ideas, but it could also develop into a Conceptual Medium continually used to develop and even to express ones thoughts just like any other artistic Medium.

II.II: -Some Conceptual Media/Tools (Meta-Languages)

1. Languages:

Languages are in fact sets of building blocks which allow us to build models.

a. Alphabet, Grammar, Punctuation:

A language consists of a repertoire of Symbols (Alphabet) which can be combined to form Expressions, a Grammar which is a set of Rules determining how the Symbols may be combined plus (although it may not be obvious) a punctuation to show where one Expression ends and another begins. In formal languages (such as mathematics, logic or computer programming languages) the grammar and the punctuation are generally defined so that ambiguity (i.e. different grammatical structures having the same external form) is excluded. In artistic languages ambiguity is important. The use of ambiguity may be one of the most important differences between artistic and scientific languages.

Usually a Language also has a Dictionary which defines how the Symbols should be Interpreted. However, a painting, for example, might be considered to be an Expression within a Language that has no Dictionary. Note that this may be a fairly recent development in the history of art. Historically, many artists used symbolic images in their paintings which were generally recognizable by their public.

An Expression is any combination of Symbols which may be generated by the Grammar. If the Language has a Dictionary, then an Expression will usually be a meaningful statement when translated, if there is no Dictionary then an Expression may be referred to as a Well Formed Formula which simply means that it not contrary to the Grammatical rules.

In Music, the scale would be considered to be the Alphabet, and the laws of Harmony and Counterpoint considered to be a Grammar.

In a Natural Language, such as English, Dutch or French, there are in fact at least three linguistic levels: The (micro)level that Combines letters into words, the (macro)level that Combines words into sentences and the (meta)level which is the language of the grammatical textbooks which explain the language itself (in this case in the same language, unless one is learning a foreign language).

Languages do not need to be verbal, one can speak of Body Language, Sign Language, Social language, Pictorial Language and Artificial Language. If one accepts that all (mental and physical) things are limited in some way so that some forms (or combinations) are possible and others impossible then one may assume that the underlying constraints form a grammar and one may then consider all things to be an expression in one or another (possibly unknown) language.

b. Language as Model:

Although a Language is a construction kit for building models, it is itself also a model, a model of how one should build models.

If one speaks several Languages one will notice that some things are more difficult to say in one Language than in another, while other things may be easier. If one wishes to write a poem about snow it may be easier in an Eskimo language than one from tropical Polynesia.

c. Functions of Language:

Apart from natural Language, which has developed as a general purpose tool of communication or medium of expression, and specialized artistic languages like music, painting or dance one can also find other types of languages, such as:

i. Analytical Languages (descriptive)

A school text book on Geometry, for example, will contain a specialized language with which to analyze, or describe, geometrical figures. It will contain such words as: triangle, right angle, parallel, projection, plane, point and line.

Of course these words have also found a place in the English language and may be found outside text books.

Even so, when used outside the textbooks they will still refer to geometrical concepts. Also it would be very difficult to talk about geometrical constructions without using these concepts, even if the actual words used to refer to them are different (in French, for example).

Clearly, these concepts are part of the Language of Geometry, and both are inseparable from the other.

ii. Procedural Languages (algorithms)

A description is not a recipe. Computer Languages have been developed to enable people to formulate the instructions a computer needs to be able to perform a specified task.

These languages define procedures for doing things, in cooking a set of instructions to do something is called a recipe, in computer terminology it is called an algorithm.

Once again, different languages are different models of different worlds. A certain algorithm may be easy to express in one computer Language and impossible in another. It would, for example, be impossible to draw pictures in a language that was designed exclusively to handle the administration in a factory office. Such a language may be able to generate the sickness and promotion histories of each worker, but would not include such simple graphical concepts as line, point or circle.

iii. Predictive Languages (calculi)

A recipe, or Algorithm is fine if you know how to get to where you want to be. Sometimes, however, one knows where one wants to be but not where it is.

In the war, for example, a radio signal from a spy may be detected. Obviously, one wishes to catch the spy, the problem is: Where are they? The solution is to take two sensitive radio receivers, set them a distance apart from each other and then turn the antennas until you get the strongest signal. Then you know the directions from which the signal comes, and by letting the two directions intersect one finds the location of the spy. In fact, exactly similar to way one uses both eyes to determine the position of something.

Such a recipe, or algorithm, for finding something is called a calculus. It has an alphabet, in this case consisting of radios, positions and directions and a set of rules for combining them. A calculus is thus a Language for finding things.

iv. Artificial Languages (un-interpreted)

Both Mathematicians and Artists, seem to like playing with Languages that don't actually mean anything, although strangely enough they may mean something to somebody else.

Mathematics is full of languages that were developed not to say something but to explore the characteristics of the Language itself. The mathematician Turing, invented during the war the Turing machine, which was in principle a set of symbols and a set of rules governing the exchange of one symbol for another dependant on the symbols previously written.

This simple model was originally developed and explored as part of the research into how enemy codes could be deciphered, but in fact it became the theoretical basis for the general purpose computer and much more.

Also many artists have experimented with visual Languages, with pen and ink, in paint, with film or in video and computers, later other artists or designers have used the results of the experiments to express their own artistic or commercial ideas and have thus given these languages meaning.

It seems that developing a language and using it to express something may be two completely different things.

Science = creating / testing Language
Technology = using Language.

c. Syntax and Semantics:

Generally, the rules of a Language (its alphabet and Grammar) are referred to as Syntax and the things referred to in the language (its meaning) is referred to as Semantics.

This distinction may sometimes be useful, but one should remember that because a Language is a Modeling System the Syntax is usually based on the world which is to be modelled. Similarly, the world which is to be modelled could also be considered to be a language composed of an Alphabet and a Grammar.

The concepts Syntax and Semantics are therefore only valid as distinction between the Modelling System and the World that is being Modelled, they express the relationship between the two and not real qualities inherent in each one separately. However, the twin concepts Syntax (form) and Syntax (content) may be useful in art. If every artistic statement has a Form which is linked to its Meaning and every Meaning has a Form through which the meaning is manifest then it becomes possible to play with the relationship between the two. Forms can be modified to study the effect on Meaning and Meanings can be changed to study how this affects the Form.

d. Primitives, Compounds and Gestalts:

The Symbols which form the Alphabet of a Language are often called Primitive Expressions, because they are the primitive raw material which the Languages in fact processes to generate more complex Expressions.

The more complex Expressions, composed of Primitive Expressions, are called Compound Expressions.

Some Grammatical Rules may only accept Primitive Expressions in order to generate Compound Expressions. Other Rules may accept Compound Expressions and generate more complex Compound Expressions. Or an Analytical Language may accept Compound Expressions and break them down into Primitive Expressions.

Languages may also be linked, the Compounds of one Language may be the Primitives of another. For example, a Language that generates Lines or Circles from Points may be used to create the Alphabet of another Language that combines Lines and Circles into more Compound Figures.

This may even play a role in perception. A pattern of rotated squares may be interpreted by our brain as rotated squares, but it may also be interpreted as squares and diamonds, or even as triangles and octagons depending on the circumstances. We may even watch somebody drawing four lines on a piece of paper, but as soon as the lines are connected we will almost certainly see a square and it will probably be very difficult to see four lines. Even if the lines are not connected we may still see a square drawn with dashed lines, and not the individual lines which actually make the drawing.

Such a tendency to see a Compound figure instead of a collection of Primitives may be called a Gestalt.

2. Systems:

The world is full of objects. In a System it is not the objects which are important but the relationships between objects. If there is no relationship between any two objects then they are considered to be part of different systems. A machine is a system (i.e. a collection of related objects or parts) but social groups, animals or a factory can also be seen as systems.

a. Transformation:

System Theory is concerned with the dynamic behavior of systems. The basic concept is Transformation. Any action performed on any object will Transform that object. Heat will transform Ice into Water, assembling a clock will transform a collection of parts into a single unit and eating is a transformation of food into energy.

In assembling a clock, for example, some parts may need to be attached to others before being assembled into larger units. Ice cannot transform into Steam without first transforming into Water. It is possible to make diagrams of the possible transitions in a system (Transition Diagram) so that the relationships between transitions are easier to understand and the system may be controlled.

Note that a Transition diagram is concerned with which transitions are possible and when they may take place, not particularly why they take place. In a Transition Diagram it is sufficient to state that Ice transforms to Water, the actual process does not need to be understood or explained. For this reason System Theory is also known as Black Box Theory. It describes how a (possibly unknown) system functions, not the actual mechanism inside the black box.

b. States:

A state is simply the condition in which a system is at a given moment. Ice is a State of Water and so is Steam. As a clock is assembled it passes through different States of assembly. A person in an argument may pass through different States of anger. In fact it is the State of a System which Transforms and not the system.

c. Trajectory:

A Transformation Diagram shows all the possible transformations of a system. Water, for example, may Freeze but it may also Evaporate. A Trajectory is the set of Transformations that have actually taken place (or assumed to have taken place) within a System.

d. Finite and Infinite Trajectories.

A System may reach a Final State (a completed Clock) or it may continue transforming indefinitely (a working Clock). An Infinite System (unless it is an Evolutionary System) will usually keep looping back to previous States, so it will generally be cyclic.

An Evolutionary System will be difficult to describe (or predict) because it will (by definition) generate not only new States but will in fact be capable of transforming itself into a new System (i.e the set of States which represents the system will actually be different at different stages of its development). It is probably also impossible to determine if it will continue to evolve, terminate or become cyclic.

e. Open and Closed Systems:

An Open System has an Input. A control knob, a Free Variable, a way of influencing the system. A television is an open system, the channels can be changed, the colour balance altered and the sound can be made louder or softer. Changing channel may mean that the sound level needs to be changed but changing the sound level does not usually change the channel.

A Closed System cannot be changed from outside, it has no Input, just a trajectory of changing States. Plants growing in a sealed bottle are an example of a closed system. The Ecological System on Earth may also be considered a closed system if one disregards the constant energy from the sun and the occasional collision with meteorites.

f. Feed-Back:

Some times the Systems own State may (partly) determine the next Transition. A Thermostat is an example of such a System, the heating system will be turned on if the System is cold and turned off if the System is warm.

Such a System is called a System with Feed-back. When reaching for a cup of coffee the movement of ones arm will be controlled not only by the position of the cup but also by the position of the arm.

g. Stable and Instable Systems:

Some Systems (or some States within a System) change easily, while others are more difficult to change. A pencil balanced vertically will easily fall over but once fallen will remain stable.

h. Positive and Negative Feed-back:

Feed-back in a System is generally of two types:

Positive Feed-back is where an increased output leads to an increased input. Population Growth is a form of Positive Feed-back. As the population grows the increase in the population also becomes greater. Positive Feed-back has a tendency to create unstable systems because the action of the System reinforces itself until the System collapses or blows up.

Negative Feed-back is where an increased output leads to a decrease in input, like the thermostat or the movement of the arm in reaching for the coffee. Negative Feed-back tends to produce stable Systems.

Clearly, the System can work both ways. When the energy levels in a human get low then they may feel hungry and so they will eat, a full stomach will then generally cause them to stop eating and to transform to another activity State. Such a System of Internally regulated Equilibrium is called Homeostasis.

i. Cause and Effect:

The concept of Feed-back completely destroys the idea of Cause and Effect. Normally in a System the Input (what one does to the System) would be considered to be the Cause and the Output (the resulting State change) would be the Effect. However, Feed-back effectively links the Output to the Input so that Effect becomes Cause.

The loss of the idea that every Effect has its Cause does not imply that things just happen without any causal link. Obviously, even in a Feed-back situation the present State influences the following State in a causal manner.

To solve this dilemma the concept of Influence is probably preferable to the concept Cause because it does not destroy the concept of Cause but merely weakens it. Influence can be Positive or Negative so it is probably advisable to speak of in terms of Support and Resistance instead of Cause and Effect. This also has the advantage that when studying Systems it would encourage one to look for a dynamic interaction between several influences which Support or Resist any given Effect instead of a single Cause.

j. Information:

Obviously, the State exhibited by a System can be regarded as Information about the System. System Theory is also closely related to Information Theory.

However, one should clearly realize that the Information referred to is not Information as we may normally expect to find in a newspaper or the TV news. In this context Information refers to the limited set of possible States of the reference System and what the chances are of any one state being exhibited at any one given moment.

This may sound trivial but is of vital importance in technical systems concerned with the efficient error-free transmission of coded information such as by telephone, computers or even television. A simple binary machine, which has only two States (such as a flashing light) can only transmit two messages, although of course it could be any two messages that one cares to define. This is the difference with what is normally considered to be information because in the case of the binary system we would need to know which two messages might have been sent, and in the newspaper we do not generally know in advance what all the possible events are or the chance that they would actually happen.

This is a bit like buying a newspaper to know if your local football team has won the match, there are only four possibilities: Won, Lost, Equal, Canceled. This information could be transmitted by two binary machines, lets say a red lamp and a green lamp: both on = Won, Both off = Lost, Green on = Equal, Red on = Cancelled. Two dots in the newspaper could also have given the same Information and the rest of the paper is in fact Redundant and can be thrown away. Great stuff for spies, but usually humans like to know more. However it is useful for storing all ones love letters in the computer with a minimum of space, or for sending cheap telegrams.

Redundancy, means "not necessary". Redundancy in a coded message means that the same message could be sent, or stored, using less symbols, this is a pity if transmission, or storage, is expensive. However, Redundancy can also be used to check accuracy of transmission. For example, the message could be sent twice so that the receiver would know that if both copies were not identical then there was a faulty transmission and could ask for a repeated transmission. Another method, parity check, is to count the number of zeros or ones in a binary symbol and to send this information as part of the message, the receiver then makes its own count and checks to see if it is the same as given (or agreed to earlier). If the count does not a agree, then the receiver knows that a single bit has been changed during transmission. This method would only work if the line is good, because if two bits were changed the error may be undetectable. Early computers (even in 1970) had the rather annoying habit of suddenly printing "Parity Error" when reading data from a magnetic or punched paper tape.

3. Space

a. Coordinates and vectors:

Space is in fact an address system. By dividing a two-dimensional map of the city up into small squares it is possible, via an index, to locate any street (or house) in the city. The divisions are called coordinates. Usually, in a map, the coordinates are labeled differently with both letters and numbers being used. For example, the position of the concert hall may be given by the location L7, but, as is usual in mathematical systems, it could just as easily be located by the number pair 12,7. A set of coordinates, so as just given to locate the concert hall is known as a vector.

b. Dimensions:

The concert hall can be located by just two coordinates (often referred to as X and Y). An airplane flying above the concert hall could not be located until we knew how high it was. A third dimension is required to specify its height. We may hope that the concert hall remains in the same position for eternity but we cannot expect the airplane to remain permanently still, so we really need a fourth dimension, time, to specify its true position.

c. Points, Lines, Planes and Volumes:

A single position in a space (of any dimension) is called a Point.

A number of connected (or neighboring) points is called a Line, or a String if isolated from a spacial context as is a string of symbols.

A two dimensional (section through) space is called a Plane.
A more than two dimensional section of space is called a Volume.

d. Time and space:

Since Einstein it is, at least by physicists, considered normal to refer to time and space as a single entity. This is not so strange as it at first may seem. Traveling to America results not only in a change in position in space but also to a change in time.

e. Tables

If we needed to refuel the airplane to America in mid flight we would need to know its position in space at different positions in time in order to find it. If the flight was a regular occurrence we could write down all the positions of the airplane at different times on a two-dimensional piece of paper. The behavior of the airplane in time would then be represented purely in space. We have in fact invented the timetable, but it is important to realize that the plane changes (position) in time but the timetable does not. Variable time can be represented in unchanging space.

The result is a look-up table which enables us to retrieve information by looking at the data stored at the intersection of the coordinates. A distance table, showing distances (or the time taken to travel the distance) between cities is another example.

f. Memory and Space

A look up table is obviously a form of memory. The information is stored on the paper and not in the head. A computer memory can also be organized so that it functions as a look-up table.

If we wished to store the position of the airplane at different time points we could not do this with a single variable. We would require a variable tx that stored the x position at time t and also variables ty and tz to store the y position and the height. These would all need to be repeated for every point in time. We would need a lot of variables and also some way of linking them so that we got the correct x,y and z positions for each point in time. If we wanted 10 time points we would need 30 variables.

The solution is to bundle the variables under a single name and to organize them as if they were the coordinates on a map. In other words we define a variable tp with 10 locations by 3 locations: i.e. tp(10,3) in computer representation. tp(1,1) could then contain the x position at the first time-point, tp(1,2) the x position at that time-point and tp(1,3) the height at the that time-point etc..

In computer terminology such a use of memory is called an Array or a Matrix. In this case we have defined a two-dimensional matrix, but in a similar way we can define matrices with more dimensions.

g. Folding the Space:

Let us suppose that the time it takes for our airplane to fly the atlantic depends on three sets of conditions:

a. is the plane empty or full? (a=0,1)
b. is it flying to or from America? (b=0,1)
c. is the plane flying for or against the wind? (c=0,1)

We could then construct a three-dimensional matrix c(2,2,2) where each dimension was equivalent to one of the above sets of conditions so that m(1,0,1) for example meant that the plane was full, flying to America and against the wind. This location, or address would then contain the relevant flying time so that a look-up table could be built which would give the correct flying time for any combination of conditions.

i.e.

		a = 0		a = 1	
		b = 0	b = 1	b = 0	b = 1
c = 0		8.0	8.3	8.2	8.5
c = 1		8.1	8.4	8.6	8.7

But what happens if we knew how long the flight took but want to discover what the conditions were? In this case we just turn the table inside out! In other words, we define a matrix t(8,3) equivalent to the following table:

		flying time							
		8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7
conditions	a :	0	0	1	0	0	1	1	1
	b :	0	0	0	1	1	1	0	1
	c :	0	1	0	0	1	0	1	1

To be honest, as a computer application this would not quite work. The conditions would need to be indexed as (1,2,3) and not as (a,b,c) and the flying times would also need to be converted to an indexed list so that one would refer (in effect) to flying time number "2" and not to "8.3". However the principle remains the same and t(2,1) would store the first condition (a) of flying time no. 2 which in this case would have the value "0" indicating that the plane was empty. In the computer the index of the matrix (the address) may begin with "zero" and not "one".

The point is that the dimensions of the matrix, and the information which is stored in it can be reorganized according to the data which it is to contain and the way it is to be retrieved.

h. Dimensional Stability:

The dimensions of space are not absolute and can be converted so as we have just seen.

A bread slicer can also be considered to be a simple dimension converter which converts a three dimensional loaf into two-dimensional slices. If the cuts are thin enough, the whole loaf could be spread out on a table so that each particle of loaf could be referred to in terms of its position on the two-dimensional table. A television set is another everyday dimension converter.

A television receiver translates the (presumably) four dimensional (three dimensional physical space plus time) transmitted electro-magnetic wave into a one dimensional video signal. In this case information is lost. Each individual receiver is not interested in how the transmission wave propagates through space. In fact the receiver merely records how the wave is modulated at the location of the receiver. In this sense the receiver is taking a one dimensional (time) slice of the original four dimensional wave.

However, both inside a television or a video monitor a second level of translation takes place. The one-dimensional video signal (consisting of changes of energy levels in time -which are used to control the intensity of the electron beam directed against the phosphor screen) is converted into a two-dimensional image on the screen, by moving the electron beam. Rather like the action of the bread slicer, the one dimensional signal string is cut into regular pieces and the pieces are systematically arranged under the previous piece until the screen is full and the process begins again. No information is lost. In fact it appears that information is added because a video image is more recognizable than a video signal. Principally, this is a debatable point: The signal information is unchanged, but the conversion to an image makes relationships between the (light) intensities more obvious. These intensity patterns are then further processed by our eyes and brain where new patterns of information, relative to the observer, may ~~are~~ actually created by the observer.

i. Ordered Sets:

Obviously in our matrix (or space) we have connected a set of positions in time to a set of positions in space. In fact a space can be defined as being an Ordered Set. A section through space, i.e. the collection of heights at different times is merely an Ordered Sub-set of the original Ordered Set represented by the space. In this case the heights would be ordered in terms of positions in time.

j. Parameters:

For some reason we may need to store a lot of information about our airplane. We may wish to record not only its position in time and space but also its speed, direction, mass, surface temperature and fuel consumption.

In order to do this we would need a matrix with several dimensions. Because we are conditioned to accept that space is three-dimensional the term Parameter is used in abstract models instead of the word Dimension. One would refer to the parameter speed and not to the dimension speed, however the terms are roughly equivalent.

Nevertheless, the term Parameter does raise a question regarding our perception of space. For example, a musical sound has many parameters: its location in time and three dimensions of physical space, its intensity, frequency and timbre. As an abstract model this is acceptable but sound is also a physical vibration of the air. If space is only three-dimensional what happens to all the different parameters in physical space? An object has not only length, width and height, it also has colour, temperature, mass and maybe a smell, these are also physical qualities -should they not be included in our concept of physical space? If Space is simply an address system, then we may need several parameters, or dimensions, in order to address (or distinguish) one musical sound unambiguously without confusing it with another.

k. Coordinate Systems:

Until now we have considered the usual x,y coordinates (called Cartesian Coordinates) as found in city maps or two-dimensional graph paper in school. However other systems are possible.

Polar Coordinates are based on the circle and (in two-dimensional form) represent the angle of rotation and the length of the radius. In three dimensions (a sphere): the vertical angle, the horizontal angle and the distance from the center.

Naturally polar coordinates can be converted into cartesian coordinates and vice versa.

It is also possible to represent three parameters (or dimensions) on a flat piece of paper. Our table of flying times was an example, however other systems are possible. If one draws an equilateral triangle, and then draws within the triangle parallel to each side an equal number of lines (for example ten lines parallel to each side of the triangle) then every intersection of three lines represents a combination of three elements (such as a colour table showing all the combinations of three colours). The three points would represent the three primary (pure) colours, and the middle point would represent a mixture of ten parts of all three colours. The other points would represent the other mixtures.

l. Geometry and Topology:

In three-dimensional physical space the dimensions are usually considered independent of each other. This need not always be so. An object made of rubber will usually contract in one dimension when stretched in another. Also plants generally get thicker as they grow taller.

In a flat country there is only one shortest distance between two points, in a mountain area there could be three (round both sides of the mountain and over the top). On a sphere (such as the Earth) there could be one, two or an infinite number of shortest routes between two points depending on where they are.

If one forgets the school geometry of Euclid, which is based on the idea that the world is flat, then it becomes easy to discover that there are many different forms of space each with its own characteristics (or Geometry).

Geometries can also be classified in terms of Topology. Topology is concerned with the number of edges and surfaces that a volume (or the space filled by a hypothetical volume) may have. A flat disk (two surfaces and one edge) is not topologically identical to a flat disk with a hole in it (two surfaces and two edges). A hemisphere is topologically equivalent to a flat disk, although the geometry is different.

Strangely as it may seem, a flat disk with a hole in the middle can be constructed in Euclidean space. Most of the surface also obeys the laws of traditional geometry. However, two points can not be connected by a straight line if the hole lies between them. The shortest distance must then be a curve, if the points lie diametrically opposite each other across a circular hole, then there must be two shortest distances between them (one in each direction around the hole). It would seem that Euclidean space can easily be disrupted to produce new forms of geometry.

m. Domain

Objects are usually considered to be located in space. However, objects may also be considered to be spaces within spaces. Our airplane flies through space, but we may walk about inside the airplane and hope that we remain isolated from the space outside until the plane lands. A correl of grain may be located within a piece of bread which is located within a cupboard. The space we perceive when watching television is not the same space as the video signal which generated it. The space created by our childhood dreams is also not the same as the space in the video image even though the image may transport us back to our dreams.

When talking about spaces it is advisable to specify the location (Domain) of the space referred to. Are we talking about the domain of video signals, the domain of images, the domain of dreams, the domain of philosophical speculation, the domain of financial profits, the domain of educational needs or the domain of political manipulation?

The Domain may also be referred to as the Universe of Discourse, or when a system has a single domain simply the systems "Universe".

A television signal, a painting or a piece of sculpture may have certain characteristics in one domain but it may have completely different characteristics in another domain.

n. Mapping:

Projecting (or translating) a point, a set of points, or an object from one location in space to another, or between two or more different spaces, is called Mapping. Essential to mapping is the relationship between the object before and after mapping.

A slide projector will map the image on a slide onto a screen. The mapped image will vary in size depending on the distance between projector and screen and the magnification factor of the projector lens. The process of mapping will have modified the image (in size) but the image on the screen should still have a direct relationship with the image on the slide. Each point on the slide will have a corresponding point on the screen although the distances between two points on the slide will not be the same as between the corresponding points on the screen. Even so, the ratio between the lengths of any two lines on the screen will be the same as the ratio between the two corresponding lines on the slide. The images are different (in size) and yet they are identical (if one ignores size). Despite the similarity, the projected image is usually preferred because details are easier to see. One the other hand one may prefer to see a large complex image greatly reduced in size because this would help one to see the overall structure easier.

The two-dimensional space of the screen is, in theory, topologically identical to the two-dimensional space of the screen. If this is not so, one of the two has been bent, then the topological differences between the two spaces will distort the image on the screen so that size will not be the only difference between the images. Maybe one eye will become larger than the other, if it is a portrait, or the smoke from a chimney may now appear bent although it was straight in the original slide.

In all cases, the actual image seen by each individual observer will be different, although if the screen is bent the images may be less consistent with each other than when the slide was bent or both were flat. The image which is seen is of course an individual mapping specific to each observer.

If we were to compare mappings, to map the maps, we would be able to deduce a lot of information. The distortions would give us clues about where people were standing, about the condition of their eyesight and the flatness of the screen and the slide. Maybe if we asked people to describe what they saw in the image we could also gain insight into their perceptual and cognitive processes by studying the differences in their descriptions.

Unconscious mapping may be the way we intuitively learn about the world around us. Maybe if we try consciously we may learn a lot more.

o. Mapping in Art

A basic aspect of the creative process is the removal of an object or concept from its original context (meaning) and its re-placement in another context where it may be manipulated further.

In a surrealistic art work this process is obvious. However the same process is also present in more traditional art. For example, a cow may be moved from the category "meat for the butcher" and via the category "modulated light" placed in the category "lumps of paint". Once reduced to "lumps of paint" any operation possible with paint may be applied to the cow and to any other object which has been similarly reduced. The process can also be reversed. If a human face has been reduced to "lumps of paint" it may (or may not -depending on the treatment of the image) retain its association with "butchers meat" when the "lumps of paint" are translated back to the categories "cow" and "human being".

p. Memory and Time:

In a computer program to generate four mirrored circle segments, the positions of two segments needed to be swapped. In real-time this is impossible, one segment is drawn and cannot be exchanged with the segment that is not drawn -if both are drawn then both positions are fixed and they cannot be un-drawn, if neither are drawn, then there is nothing to swap.

If the information is stored, the data can be exchanged and re-ordered as required. If there is a memory recording the changes in memory positions, the changes would become a clock generating a time sequence of <time-before-the-change> and <time-after-the-change>. These changes would be recorded in locations in the memory. The events would be no longer present but would have been replaced by a record of the event. Time has then been destroyed and replaced by (positions in) space. Memory would seem to destroy (real-)time.

Strangely enough, human memory, by remembering that there was a situation before now, enables us to be conscious of (real-)time. However it has done this by converting the existential present moment into a string of events in time-space (i.e. locations in cerebral storage are mapped into hypothetical time).

The clock creates (i.e. measures) time-space, the memory maps (real-)time into time-space. In (real-)time there is no time-space, only now! The memory destroys time but needs the clock to create the illusion (i.e. remembrance) of that which it has destroyed.

Maybe it is the paradox, the tragedy and the sacral honor of humans to preserve the memory of that which they have destroyed as an inevitable part of the generative living process; so that things may live on as remembrance of their own demise -for without their disappearance there would be no memory but existential fact (and therefore only undetectable aspects of (real-)time).

4. Logic:

a. True and False:

Logic is a system of rules for determining the truth of a statement. However it does not test for truth pragmatically by scientific experiment but by means of rules which can be essentially reduced to "If X (is true) then Y (is true)".

Traditional Western logic (since Aristotle) has generally claimed that something is either True or Not-True (False) and that things are not allowed to be "a little bit true" and certainly never both "True" and "Not-True" at the same time.

Obviously such beliefs are unacceptable for artists who do not think in terms of unambiguous black and white but prefer not only shades of grey but other colours too. It is also difficult to say whether an art work is completely True or completely False so the more Science has developed rational logic as its basis the more the artist has become alienated from Science and logic. As a consequence many people would claim that Art has no logic and it is the enemy of Scientific thinking. Such a view tends to forget that in the Renaissance the mathematics of perspective and the science of anatomy were the basis for a great renewal of European Art.

Luckily some modern Logicians have noticed that the traditional Binary (or two valued) Logic is not only alienated from Art but maybe also from the reality of daily life. Modern "Fuzzy Logic" now deals with things that are "a little bit true" or "almost certain" and is used in such pragmatic things as washing machines to control the washing program or to control the movements of elevators in busy high-rise buildings.

In Artificial Intelligence other types of Logic have been developed including systems based on "Beliefs" and not "Facts" or systems to determine whether certain actions (like deleting information) may be permitted or not.

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b. Formalism:

A Formal System is a system based on rules. Logic is based on rules so systems of Logic must be Formal Systems. Obviously there are degrees of formalism, depending on how explicit the rules are stated.

The lowest level is probably that of "Common Sense". Many people equate "Common Sense" with "Logic" and would claim that anything which did not fit in with their everyday experience was "Not Logical". Perhaps this is not unreasonable, apparently a set of rules have been violated, but what are the rules? Most people, unless they are philosophers, would never dream of trying to formulate the rules of "Common Sense" so it is a very weak system of rules.

Artists also appear to have systems of rules. The work of an Artist is generally recognizable as being made by that person and not by someone else. So there must be rules somewhere that determine that some objects are likely to be made and not others, or that if similar objects are made by different Artists they will still look different. Many Artists have managed to make statements about their work although probably no Artist could instruct someone else to apply the rules in the same way so as to produce (not reproduce!) their work. Also Artists tend to change their rules, so artistic production appears to be based on a fairly weak system of rules.

The rules of traditional Logic, have been formulated and widely accepted over the years. The work of one Logician can be followed and even corrected by another. The rules of Logic may be stated but it is still difficult to ask a machine to "Prove" something. Traditional Logic is a fairly strong system of rules.

Artificial Intelligence is concerned with instructing a machine to draw conclusions about the information which it receives or has available. Machine instructions need to be completely and carefully specified. Computer Programs (including Artificial Intelligence) are very strong systems of rules.

But can a machine generate its own instructions? Would it need strongly defined rules or weakly defined rules? If Artists (and people generally) use weakly defined rules and machines use strongly defined rules is it possible to use strongly defined rules to build weakly defined rules? Are weakly defined rules really useful -do artists (and other people) make too many mistakes because of their weak rules?

c. Tautologies, Axioms and Theorems:

If everything is to proved then a circular (closed) system is inevitable. If A "Proves" B, then what "Proves" A? If new concepts are introduced to "Prove" A then they too must be "Proved" and if no new concepts are introduced then B must eventually be used to "Prove" A.

Circular Proofs, when A Proves B and B Proves A, are said to be "Tautological". Tautological systems are rather dangerous. When two thieves "Prove" themselves innocent by stating that each was with the other when the two crimes were committed, then the stories may be difficult to disprove but they may not easily be believed either.

If one cannot accept circular proofs (or definitions) then one must base ones logic on basic assumptions such as "Policemen never tell lies". In Formal Systems such an assumption is called an "Axiom". It can never be proved, it is just accepted.

If "Policemen never tell lies" is an axiom and "Thieves sometimes tell lies" is an axiom then obviously "If a Policeman and a Thief disagree then the Thief is telling lies" is an unescapable conclusion. Such a Statement which is proved always to be true is called a "Theorem".

Note that the Theorem is a direct result of the Axioms. If we change one axiom to "Policemen sometimes tell lies" then the Theorem becomes "If a Policeman and a Thief disagree then nothing can be proved without further evidence".

In Traditional Binary Logic not only can the Theorems be proved from the Axioms by applying the rules of Logic, the same rules can be used to prove the Axioms from the Theorems. This means that a set of equivalent Logic can be built from different combinations of Axioms, whereby an Axiom in one system would be a Theorem in another. This is rather useful when building an electronic circuit based on Binary Logic because if the required logical components are not available they can be built from other components rather like using bricks to define a house or using a house to define bricks.

d. Automatic Theorem Proving:

The idea that Logic is based on formal rules combined with the fact that computers also can also only work according to rules leads naturally to the idea that computers can be used to prove Logical Theorems.

The principle is simple: one begins with a set of Axioms and allows the computer to re-write them step by step according to the transformation rules normally allowed in Logic. If the computer eventually produces the required Theorem by means of the permitted transformations then the Theorem is said to have been "Proved".

This procedure has lead to a modified definition of the terms "Axiom" and "Theorem". Within Formal Language Theory, a Language is an alphabet of initial symbol strings (the Axioms) plus a set of Transformation Rules. Any string of symbols generated by that Language is considered to be a "Theorem" of that Language. Obviously, the only "Truth" value of such a Theorem is that it can be produced by the specified set of rules. This means that just as Artists are free to make concrete images or even Poems which mean nothing outside themselves, so can Scientists experiment with Languages in a similar way.

e. Consistency and Completeness:

Traditional Logical systems are expected to be Consistent and Complete. That is to say that if a system proves a Statement to be True then the same system should not also be able to prove the same Statement to be Not-True. Also we expect that if a system can determine the Truth value of Statements within a specific Domain (for example, Mathematics) then it can determine the Truth value of all statements within that Domain. For example, a Formal System (such as that attempted by Chomsky) to generate the sentences of the English Language must be able to generate ALL possible English sentences and ONLY generate sentences acceptable within the English Language.

Gödel (see Hofstadters book "Gödel, Escher, Bach") took a Formal System used to prove the Theorems of Number Theory and coded the formulas which it generated so that they could be interpreted as sentences in natural language. In this way he was able to get the system to generate the Statement "This Statement cannot be Generated".

This was the basis of his famous Proof that complex Formal Systems can never be both Consistent and Complete. A rather serious blow for Formal Logic.

Note that Gödel used a coded translation of his System to get the System to make statements about itself. We may conclude that a Formal System cannot Prove itself and there may arise difficulties when a Formal System is interpreted.

f. Some Problems of Interpretation:

Gödels Proof may have some important implications for daily life:

We may suspect paradoxical behavior from ANY system when it refers to itself. Any machine, person or organization (natural or social system) capable of modifying its own Rules of behavior should be viewed with suspicion. The paradox of "Who controls the controller?". The Law makers can easily become Lawless if they uncontrolled may make their own Laws.

We may also suspect that any Theoretical or Ideological System when interpreted will lead to paradoxical situations. Maybe this is why Laws and Social Theories always seem to go wrong when put into practice.

Even Logic and Science have problems with the interpretation paradox. If Logical or Scientific Systems are Interpreted they may be destroyed by paradox but if they remain uninterpreted then they are simply empty formalisms.

Strangely enough, Art may profit from the distortions generated by the interpretation process. Maybe in fact, it is exactly these distortions which are the motor of the creative process.

Of course these statements are also based on an Interpretation of Gödel so maybe they are just paradoxical distortions derived from the Interpretation process itself.

Maybe life itself, if it obeys its own rules, is just one big paradox.

5. Logic, Grammar, Systems and Space:

Traditional Logic is a calculus to determine the Truth value of Statements. It has an Alphabet of Axioms, an implied Grammar of permitted Substitutions and Transformations which may be applied to the Axioms. Traditional Logic is a Formal Language.

Systems have a set of States, which can be considered to be the Alphabet of the System, they also have a permitted set of Transformations which may sometimes only be applied in a specific order similar to the Grammar of a Language. The Trajectory of a System may be compared to the Strings generated by a Language.

If we systematically generated all the possible Strings of a Language or systematically performed all the possible Transformations of a system then we would have generated an ordered set of Strings or States. If a Space is an Ordered Set of Identities, then we can state that both Languages and Systems generate (or fill) Space. The number of choices we have to make (i.e. transform a then b or b then a) would be related to the number of dimensions in the space and the number of possible steps within that choice would be related to the size of the dimensions. Obviously the Grammar would determine how closely related each subsequent String or Transformation was to its neighbor and so would determine the Geometry (and Topology) of the Space.

Conversely, movement through space could be seen as a set of Transformations, if not all Transformations were permitted then we could imagine the restrictions as being a hidden Grammar determining our actions.

If Media are considered to be Languages for constructing Models and Models are considered to be Languages to evaluate pragmatic Actions, then Media and Models can also be considered to be Spaces.

Clearly, comparison between phenomena is much simpler when we can map them into a single Language. The metaphor of Space may be a powerful Language for comparison.

Unfortunately, in practice, the complexity of the Space required may be beyond our powers of representation. Strangely enough, our intuition may function as of it was dealing with a complex Space when dealing with complicated problems. We even speak of Ideas taking Form in our Mind, taking a new Viewpoint, Balancing contradictions and Ordering our Thoughts. These are all operations in Space.

Maybe the Spacial organization of our Brain Cells lead us to use Space as a Metaphor or maybe the physical movements of our bodies in physical Space are responsible. Maybe both or maybe neither.

SECTION III. -Power and Control

-Knowledge and Understanding give Power to Control
-When individuals compete for Control or have Different Goals
Then Conflict may be expected.

1. AESTHETICS, SOCIETY, SCIENCE AND PARADOX

a. Balance

Aesthetics can be considered to be concerned with creating an integrated balance between opposites, for example, between soft and hard, horizontal and vertical, chaos and order, similarity and difference.

Presumably, the "point of balance" is homeostatic and individually valid.

In other words, the aesthetic balance is not constant but is a dynamic interaction between the balance of opposites in the object and the balance of opposites in the observer. An individual in a personal state of chaos and turmoil will presumably have a tendency to prefer objects or environments which exhibit a certain peace and order.

However an individual who is in a state of transition from a stifling order to a more flexible state, perhaps somebody growing out of a period of depression for example, would probably choose a dynamic environment until their own dynamic state became so chaotic that a reaction occurs and they turn their preference to states of order.

One may also expect that artists who produce work contradictory to their own natural character produce the most interesting work. When a chaotic artist produces chaotic work there is a lack of aesthetic balance and a lack of tension in the work. On the other hand, an artist with a highly developed sense of order may systematically disrupt the order and develop new dynamic equilibria. It is the struggle with the personal temperament that keeps the game exiting. Of course, after a period of time the personality should become more balanced as a result of the game and the freedom of movement becomes greater so that the aesthetic balance can become more complex and less restricted to a single direction.

b.Cultural Definitions

The presence or absence of a certain amount of communal agreement regarding the point of balance can be used to define cultural boundaries -in combination with linguistic differences based on the basic analysis of the conceptual components of a (or the) universe and the names which they are given. In this sense the two seemingly obvious criteria for cultural identity, language and religion, could be seen as providing the causal (heavenly) and factual (earthly) analyses defining the basic elements (or protagonists) of the aesthetic synthesis.

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c. Some Practical Implications of Aesthetics

i. Politics

Not only is it the individual whose ideals and desires are (sometimes) in conflict. A society is also full of social (psychological, philosophical or economic) conflict. The resolution or exploitation of these conflicts is the profession of politics. Aesthetics not only have political implications, one could even argue that politics is essentially and primarily concerned with aesthetics -the balance of social factors within society, the balance of honesty and expediency in communication, the balance between long and short term (economic) planning, the ethical balance implicit in political strategy and personal survival and of course ultimately the balance between all these individual factors. A political party is thus a community with a (largely) common aesthetic.

ii. Commerce

There are also commercial implications of aesthetics. Given a set of technical (or marketing) criteria (such as intended function, construction techniques and materials, price, durability, environmental factors and the availability of competitive alternatives) who is to decide what is the optimal balance between these sometimes contradictory factors? Obviously this is a double edged sword: commercial competition provides the consumer with a choice out of a range of competing optimized (aesthetic) balances concerning the different design factors and the "market" for the product is represented once again as a community with a shared aesthetic, on the other hand, the existence of a single (objective) balance between the different design factors is obviously against commercial interests because all competing products would need to be identical to each other and any (except the most trivial) deviation from the optimal balance would imply an inferior product.

iii. Conflict

Apart from the ethical aspects (and the relationship between ethics and aesthetics discussed later) there is another aesthetic aspect implicit in a conflict situation.

The commercial exploitation of differences in the balancing point between the various design factors creates a fundamental conflict between a scientific (i.e. theoretical) solution to a specific design problem (for example, a piece of computer hardware or software) and a commercial solution. The IBM PC (and its copies) is perhaps a good example of a technically (theoretically) poor machine (at least in the areas of time-sharing and graphic operating system) but was (at least for the copiers and the software producers) a commercially successful machine.

On the one hand, the commercial manufacturers require theoretical knowledge which can be readily translated into practical solutions as part of the design strategy (i.e new materials, new construction techniques, new basic principles, new operating techniques, new applications etc.) but not theoretical knowledge which could provide optimal solutions for design questions (i.e. what is the optimal computer, programming language, data-base or automobile). It is also not in the interests of theoretici (scientists, philosophers or artists) to provide such an answer because this would remove the basis of their research.

On the other hand, commercial competition encourages evolution towards a single ultimate product (certainly in technical fields). Successful strategies applied by one manufacture are often adopted by others. In the field of computer languages is this particularly noticeable but also in the field of car design and other consumer products.

Nevertheless, the question arises if there is indeed such a thing as an optimal design strategy of that this can only exist within a limited domain. A theoretical solution may be theoretically perfect, i.e. will do everything that one could ever wish to do with it -but is it easy to use, is the price reasonable and does one need all the facilities? The computing language ADA was developed by the Pentagon as a single multi-purpose language that could do anything -but was it successful? It seems it was much to unwieldy to use efficiently. Divergent developments (by evolution or design) converge towards a single product which explodes into a diversity of solutions under the pressure of its own complexities. A good tool is either efficient and specialized or generalized and inefficient. The aesthetic circle is round.

iv. Games

In a real or simulated conflict situation who are the protagonists and what are their goals (aims, interests etc), which moves and counter moves are available, which strategies and counter strategies are available and perhaps most important -are the chances for success equal?

Obviously in a game the aesthetic balance of equal chance for all players is important, not only from an ethical point of view (fair play), but also as essential part of the motivating excitement of the players regarding the unknown outcome of the game.

v. Ecology

When the aesthetic balance between the players chances of winning gives equal chances the game is probably played more often. When the complexity of the game is sufficient, in combination with its repeated playing, new strategies can develop.

An ecology can also be considered as a complex game. The chances of survival for the protagonists determine the chances of their continued participation. The continuation of the ecological game (with temporary winners) allows continuation of the evolutionary process. Destruction of one of the protagonists means an end to their potential contribution to the web of evolution.

vi. Boundaries, Integration and Opposition

An important aspect in integrating opposites is the transition or interaction between the boundaries, for example, is the vertical in violent conflict with the horizontal or is there a gentle transition. Do opposites destroy each other or do they enhance each other? Aesthetics have ethical implications.

Concepts as balance, synthesis and harmony which can be derived from the integration of (opposing) elements have ontological and/or religious implications.

The unification resulting van aesthetically integrated elements also has implication for the efficiency of the perception and of the use memory. Elegance as synonym for efficiency and the grotesque as eye catcher.

The mental effort involved in discovering and developing relationships between elements in order to weave the integrating web has implications for the intellectual development.

There is also a paradoxical implication. In western society opposites are mutually exclusive and cannot therefore be in balance so that aesthetics gains a paradoxical implication.

vii. Paradoxes

The paradox, or rather its elimination, lies at the basis of the western philosophical tradition of dialectical thinking. Within this tradition the existence of a paradox is a signal that there is an error in the thought process. Paradoxically, this was always interpreted at the micro-level and not on a higher level. Nobody seems to have realized that the very existence of paradoxes implied that the idea of a Euclidean, homogenous and universal (paradox free) system of thought might be incorrect.

vii. Aesthetic Paradox

What must the artist do in a predominantly rationalistically orientated society?

To be irrational means not to be taken seriously, but to be rational means that there is no difference between art and the rest of society, so the artist has no justification. In such a paradoxical position the position of paradox would seem the only possible position.

The paradox of visual illusion, the surrealistic paradox, the paradoxes of meaning in abstraction, of high culture in pop art, of content in minimalism and of originality in post-modernism.

The strategy of the Zen koan, of satire, the joke and the riddle. Inside logic and outside at the same time. The participator observes and the observer is forced via conundrums to participate.

viii. Science and Art

Perhaps the most fundamental difference between art and science is that science is the destroyer of paradox and art the creator of paradox. Two symbiotic social functions in a grotesque relationship. Art as synthesis, as generator of languages and models, against science as analysis and tester of languages and models.

Possibly, if science pursues the post-Einstein and post-Gödel path even this distinction will be modified and the two cultural modes may fuse in a new aesthetic unity.

2. The paradox of Power

Science promises Power ..... But as so often happens when people are seduced by the promise of power, the toll that has to be paid is slavery and impotence. Power means nothing unless it is the power to choose.

Joseph Wiezenbaum
"Computer Power and Human Reason"
Freeman, San Francisco, 1976

Power implies the ability to control. In order to remain in control, that which threatens the system of control must also be made harmless. This means that the borders of the control system must be continually increased in order to remove potential threats to the system from outside. Eventually, everything must come under control of the system. Control implies a reduction of freedom, a prevention of unwanted events, so it is inevitable that all systems of control expand out of self preservation and at the same time reduce the freedom of choice to that which is permitted by the system.

A lack of control implies that unwanted events may easily occur, even potential disasters are not excluded. The question is: how undesirable are the potential disasters and can they be survived?

a. The Polemical Shift

The most intense conflict is probably between different (ontological) systems i.e. ideological systems built on different beliefs. Clearly there must be a common Space in which the systems are in competition otherwise they would merely coexist, possibly without even being aware of each others existence.

Compromise implies integration within a common system of beliefs and especially the realization of common aims.
Integration transforms conflict into competition.
Competition within a system then presumably becomes limited to a hierarchical struggle. Hierarchical conflicts are concerned with personal power (and riches) and not with different strategies. Historically it is the strategy which is important (and its consequences) and not the person.

Conflict between ideologies are of course a basis for struggles for power and are more likely (even necessary) within an conceptual structure which only admits a single solution.

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b. The Polemical Paradox

Integration of (ontological) systems reduces destructive polemical struggle but also reduces generative diversity.

c. Justification of Power

-physical power and reward for supporters
-pragmatic neutralism
-claims based on supporting tradition or ideology
-stability
-claims based on criticism of tradition or ideology
-change
-claim to end anarchy and fill power vacuums
-stabilization

-a change of aesthetics implies a change of power (and vice versa)
-the media are theoretically neutral, but by limiting or encouraging flow of information and ideas play an important part in supporting or undermining ideologies.
-media may also have inherent qualities which encourage or inhibit the expression of certain ideas. For example, writing may permit more complex grammatical structures than verbal messages. Visual media may have less specific meaning than written or verbal media (see Marshal McLuhan -The Medium is the Message).

d. Conceptual Polemics

-The DIALOGUE (Plato)

(modeling in clay)
(painting)
(apartheid)
-consensus
-constructive
-exploratory
-associative
-mono-conceptual
-model generative
-stable
(medieval)
(aristocratic)

-The DISCUSSION (Marx)

(sculpting in stone)
(science and law)
(class and cultural conflict)
-disagreement
-destructive
-conflictive
-rational
-dialectical
-model testing
-dynamic
(modern)
(bourgeois)

The Dialogue has no means of testing (the limits of) its validity.

The Discussion is only valid between equally coherent systems bound by a common polarity within at least one dimension.

Internal coherency of the system is not a proof of validity. Concepts outside the dialectic are not accessible (except via apparent irrationality).

The Dialogue is necessary to develop coherency before Discussion begins.

Possibly Women tend towards Dialogue and Men towards Discussion.

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e. Democracy and Consensus:

Democracy is a system to weaken the exclusive Power of the Elite. Knowledge and Understanding are the weapons of Democracy and Communal Self-Interest is the motor. The largest Community of Self-Interest wins the vote and minority Interests can be disregarded. By manipulating Knowledge and Understanding and balancing the Communities of Interest the Elite can maintain their positions of Power. Democracy is a Discussion centered on the largest Community of Self-Interest.

Consensus is a System which destroys the Power of the Elite. Decisions are not based on the Majority of Votes but on total agreement within the Community (or Group). Decision making is slow but thorough. Because ALL viewpoints and Interests within the Community are considered and evaluated in relation to each other the Dialogue between the different Conceptual Models can be far richer than the Democratic Discussion which is ultimately limited to a single "Winning" viewpoint.

Within a Democratic Discussion all Information not considered relevant to the final outcome is rejected. Within the Consensus Dialogue ALL information is relevant. In detective stories it is often the small, seemingly irrelevant detail, which betrays the real murderer. In real life the situation is often the same, the small detail that is easily ignored may be the most important clue that the accepted Conceptual Model needs modification.

f. The Group Paradox:

If an Individual within a group is to have a fair chance of survival then every Individual within the group must be equally equipped for the fight against potential dangers. The deer that cannot run will be eaten by the lion. Paradoxically, this implies that all Individuals within the group need to be almost identical to all the other Individuals within the group. Presumably evolution will also tend towards similarity among Individuals, a successful survival strategy will multiply and unsuccessful strategies will die out. If the environment changes the Individual will presumably have problems in adapting because there are no alternative models of behavior easily available. Individuals often gather together for statistical protection in Herds. When disaster strikes the greater the Herd is the less chance there is of a specific Individual becoming a victim. The Herd offers statistical protection but not behavioral protection. The Individual is always alone in the group and can easily be isolated, manipulated and destroyed.

If a group is not organized as a collection of Individuals but as a cooperative Team then, as long as the Team as a whole is able to function efficiently, the members of the team may be permitted to specialize. A lame wolf may lie in wait while the faster Team mates drive the prey towards the ambush. Specialization and differentiation within the Team may actually aid efficiency of the Team because the range of tasks which it may successfully undertake is enlarged. If circumstances radically change then the Team will have a better chance to adapt by changing leadership to a member with more appropriate skills. The Team (or Pack) offers not only statistical protection but also behavioral protection. The Team member is never alone in the Group, as reward for the loss of Individual freedom it receives Group protection. The greatest danger is over-specialization. If a member is isolated from the Team then their survival chance is greatly reduced, as is the chance for the Team if it looses a key specialist.

2. Forms of Power

-The power of Knowledge (elite knowledge dangerous for public)
-The power of understanding
-The power of Intellect
-The power of ideology
-The power of law
-The power of love
-The power of seduction
-The power of greed
-The power of force

Power is the ability to force upon people a choice which they would not choose to have.

The power of the victim is the choice to Submit or to Resist.

Absolute power is the ability to give people no Choice.
Freedom is the discovery of Choice.

New elites require new Ideologies
New Ideologies get believed by other people to do things which the center of power did not intend them to do.

Maybe all important changes occur on the periphery of power
Caused by people believing the ideologies of contending elites

a. Balance of Power

Systems and Games: who is the flower and who the bee?

-What are the interests?: follow the money and find the reason

-the economy of scarcity
    -the cake that needs sharing

-the economy of plenty
    -the grain of corn which multiplies

-the flower and the bee:

Artists often think that they need the gallery or the cultural civil servants to provide them exhibitions or grants. In fact the gallery and the civil servant need the artist just as much in order to justify their own existence.

-a buyers or a sellers market?

SECTION IV. -Some Basic Models (the world around us):

1. Natural Ecological Systems:

A. LIVING ORGANISMS (As Physical Systems):

chaos, entropy and order

M=> Mineral
V=> Vegetable
A=> Animal

	M	V	A	
Orientate/Move			X	(find food, partner, defence)
Eat		X	X	(transform energy)
Grow/mutate		X	X	(cell growth, fission and fusion)
Reproduce		X	X	(self preservation/increase)
Degenerate		X	X	(get old and die {system fails})
Disintegrate	X	X	X	(rot away)

Plants and Animals Grow and Multiply (create order)
-How did they get there?
-How did they get organized?

Material Disintegrates (Entropy -2nd. Law of Thermodynamics)
-How did it get there?

-Big Bang and the Cosmic Dance of Shiva ?
-Jim Lovelock and the Theory of Gia ?
(The Earth as Living Organism)

B. LIVING ORGANISMS (As Social Energy Systems):

-Animal and Human

- -Feeding
  - -finding (hunting, grazing, gathering, farming)
  - -surviving shortages (storage, hibernation, migration, death)
  - -preparation (rituals and taboos)
- -Reproduction, birth and death
  - -finding a mate
  - -binding with mate
  - -care of children
  - -mating cycles
  - -male, female and neutral roles
  - -rituals and taboos (birth, death, mating)
- -Shelter and Competition
  - -social identities
    - -individuals (self supporting)
    - -pairs (family)
    - -groups (tribes, clans)
      - -definition and preservation of identities
  - -territorial rights
    - -static or mobile
      - -inner sanctuary (nest)
      - -operational area (territory)
      - -foreign territory (disorientation)
  - -the rules of conflict (winners and losers, fight or flee)
    - -prey and predators
    - -the fight for dominance (resources and reproduction)
    - -punishing broken taboos
    - -group decisions
  - -changing group
    - -marriage
    - -hierarchy and class
    - -outcasts

Mobility and intelligence
Sociability and intelligence

Altruism and Survival

Social organization and Energy preservation

C. THE HUMAN BODY-SPACE:

-The Human Body as a semi-autonomous Ecology System

i. Basic Concept:

The human body is an organized symbiotic colony of specialized sub-colonies of micro organisms (cells and proto-cells). The (human) reproductive system validates this concept by demonstrating that this complex colony of cells can be generated by cell fission from a single cell after fusion by two non-identical cell halves. Can a study of the micro-sociology lead to insights useful to the macro-social ecology?

ii. The Basic Analysis:

Hierarchical Analysis:
sub-cellular, cell, organ, system, person

Medial Analysis:
chemical, electrical, cellular, mechanical

Functional Analysis:
- -Regulation, Control and Decision Systems
  - autonomous and non-autonomous regulatory systems
- -Processing (Supply, Elimination, Interfacing)
  - -material
  - -information
- -Communication and Transport
  - -intern
    - energy
    - waste (disposal)
    - information
  - -extern
    - speech
    - sight/sound/orientation/touch/smell
    - muscular/skeletal system (mechanical)
  - -internal/external interface
    - control signals (voluntary and involuntary)
      - -electrical
      - -chemical
- -Reproduction, Defence and Regeneration
  - defence system
    - -micro level (immunology)
    - -macro level
      - active (flight and fight strategies)
      - passive (protective bones and muscles)
  - cellular reproduction, differentiation and migration

Symbiotic Analysis:
- -How do the systems (Gestalts) relate to each other?
  - -Paradoxes/conflicts
    - skeletal system: rigid support vs. flexible movement
    - reproductive system vs. immunological system
  - -Relationships
    - Reproduction and Repairing Wear and Tear
    - Cellular Differentiation: Boundaries and Interfaces
    - Sub-cellular symbiosis: viruses and cellular evolution

Discriptional Analysis:
- -Which parameters permit the most elegant and complete description of human body?
  - -A worm with legs?
- -Which systems (by inclusion, exclusion or variation) define the boundaries between human and non-human?
  - -A talking worm with hands?

Analogical Analysis:
- -Are there any valid analogies useful to techno-cultural systems
  - -artistic/cultural/educational
  - -social/political/economic/ecological
- -Are there techno-cultural concepts useful to understanding of the body?

2. Polemical Systems:

A. THE MILITARY:

Basic Task: Defence of that which must be defended

-Western Philosophy: Attack is best form of defence (weapons -the gun)
-Eastern Philosophy: Defence is best form of defence (judo -the mind)

Generals always fight the previous war

> A Japanese commander once destroyed a Korean city by firing arrows carrying grass seeds over the wall in the spring. In the autumn, when the grass was dry, he fired flaming arrows over the walls and burnt down the city.

-The American Civil War:

- -the south were better fighters
- -the north were better soldiers
  - -the soldiers won!

- -problems in the civil war:
  - -new weapons (rifles made cavalry useless)
  - -communications (army too big, not used to fighting in woods)
  - -care of wounded (one in seven wounded died through lack of care)
  - -care of prisoners (chance of dying higher than wounded)

-Viet Nam:

- -the Guerrillas won against the soldiers

-Contingency Planning, The Secret Weapon:

- -Strategy (long term aims and methods)
- -Logistics (provisions and communication)
- -Tactics (short term actions and reactions)

-available equipment (tools of war)
-information and intelligence
- -passive: spy
  - -knowing what's going to happen and planning reaction
- -active: dirty tricks
  - -ensuring that what happens is what one expects or desires

-Pyrrhus: Won the battle and lost the war
-He who lives and runs away, lives to fight another day

-Mistakes:
- -one learns through ones mistakes
- -without mistakes there is no learning
- -can one afford to make mistakes? (simulation)

B. GAMES THEORY

-The prisoners dilemma:

two prisoners commit a crime. There is no evidence. If one confesses then he gets a light punishment and the other one gets a heavy punishment. If both confess then both get a heavy punishment. If nobody confesses then both will go free. The prisoners have no contact with each other and do not know what the other will do.

The Payoff Matrix:

		A: Confess	A: Silence
B	Confess	A(-10), B(-10)	A(0), B(0)
B	Silence	A(-3), B(-10)	A(-10), B(-3)

Obviously, both should remain silent

-Maximalize the Reward or Minimalize the Risks?
-Winners, Losers or Cooperation

3. Artificial Systems:

A. THE COMPUTER:

-Code Interpreting Machine (Turing Machine)

i. Move to Position
ii. Read Code
iii. Interpret Code
  a. as Instruction (Read more Code?)
  b. as Data
iv. Move to Position
v. Write Result of Action

-Computer as Universal Model
  -Operation
  -Operandi
-Activity Finite or Infinite?
  -Problem of Computability

Codes and States:
-number of states (equals number of interpretations)
-combination of states (permits more interpretations)
-combination is enumeration (counting)

Relationships:
-binding in space (information patterns)
-binding in time (clocks, flags and the opening of doors)

Identities:
(qualities, characteristics and geometries)

-the fact that the bifurbication diagram behaves differently for different values of the reproduction factor shows that numbers do in fact have different characteristics. Just as the I Ching is based on the different characteristics of the numbers 2 and 3.

-even+even	=even		-fem+fem=fem
-odd+odd	=even	(same -> even)	-man+man=fem
-even+odd	=odd	(different -> odd)	-fem+man=man
-odd+even	=odd		-man+fem=man

B. ARTIFICIAL LIFE and ARTIFICIAL INTELLIGENCE

Artificial Life		Artificial Intelligence	
-Bottom-up	Modelling	-Top-down	Modelling
-Local	Control	-Global	Control
-Simple	Specifications	-Complex	Specifications
-Emergent	Behavior	-Prespecified	Behavior
-Population	Simulation	-Individual	Specification
-Parallel	Processing	-Central	Processing
-That which	could be	-That which is	already

4. SUB-ATOMIC SYSTEMS:

NEWTON vs. THE QUANTUM MECHANICS:

(Gary Zukov, The Dancing Woe-Li Masters)

Heizenbergs Uncertainty Principle shows that one can determine the position of an electron but not its velocity, or one can determine its velocity but not its position. He illustrated this principle by suggesting that high energy gamma rays have a golf length which is short enough to detect the electrons position but their high energy levels would change the path of the electron. Low energy radiation can be used to determine the electrons velocity but the wave length would be too long to determine the position of the electron.

It would seem that, certainly when using high energy gamma rays, the observer cannot observe without disturbing the system which is observed.

In 1803 Thomas Young projected a beam of light through first a single and then a double narrow vertical split and compared the shadows. The single split showed, as expected, a single vertical stripe of light. However the shadow of the double split showed a number of alternating light and dark bands. Obviously the waves of light, after passing through the splits, were interfering with each other and producing interference patterns on the wall. Young had proved that light was a wave phenomenon.

In 1905 Einstein studied the photo-electric effect. When light falls on the surface of metal, electrons vibrate loose from the metal and fly off. Einstein proved that the colour of light was not determined by the number of emitted particles but by their energy levels. These experiments proved that light was a particle phenomenon.

In 1925 Compton let x-rays collide with electrons, which everyone assumed were waves. The result was that the x-rays were reflected as if they were billiard balls. The frequencies of the x-rays were modified by the collision in exactly the same way as particles would be, only particles don't have a frequency. Comptons results can be described in terms of waves (dispersal of waves with reduced frequencies) or in terms of particles (dispersal of particles with reduced energy).

It would seem that light can be proved to be composed either of waves or of particles, but not both at the same time. The choice is dependant on which experiment one chooses. The way an observer looks at the physical world affects the way the physical world seems to behave. There is no "objective" physical world which can be discovered by a neutral observer. The observer is part of, and partly creates, the world which is observed.

> An Independent Reality in the usual physical sense cannot be credited to the phenomena or to the tools of observation.
>
> -Niels Bohr

It seems that not only do we partly create the world we observe, but the world we observe partly creates us!

NEWTON	Q-MECHANICS
-Conceivable	-Inconceivable
-Based on Visible elements	-Based on Invisible elements
-Describes Things	-Describes Systems
-Predicts Events	-Predicts Possibilities
-Assumes objective Reality	-Assumes No objective Reality
-Observer Separate from Observed	-Observer Part of Observed
-Pretends to Describe Reality	-Satisfied by Correlating Experience

Reality and the Mind:

According to Einsteins final opinion things like gravity and mass do not really exist. These are simply creations of our mind. Gravity is the same as acceleration and that is movement. Matter does not exist -matter is a bending of the space-time continuum. There is not even such a thing as energy -energy is the same as mass and mass is only a bending of the space-time continuum.

What we consider to be a planet with it own gravity field, moving round the sun in a path that is formed by the gravity field of the sun, is in fact a severe bending of the space-time continuum that follows the simplest way through the space-time continuum close to a very large bending of the space-time continuum.

There is nothing other than space-time and movement and in fact even these are the same.

Physics is the study of the physical reality. If a theory has no relation to the physical world it is perhaps pure mathematics, poetry or an essay in prose but it is not physics. We can now ask if Einsteins fantastic theory really applies. The answer is a careful, but generally accepted, Yes! Most physicists agree that the General Theory of Relativity is a valid way to look at large scale phenomenon and at the same time they wish to find more proof to confirm or to test the theory.

The first proof was that the General Theory of Relativity correctly described the erratic path of Mercury round the sun. Until then the path could not be explained without the presence of a hypothetical planet which has until now has still not been found.

The second proof was discovered on 29 May 1919 during an eclipse of the sun when it was discovered that the path of light from distant stars was bent as it passed near the sun, so that the stars appeared in a position different to where they really were.

A third proof was that the wave length of the light emitted by (heated) natrium was shorter in the sun than on earth. This is in agreement with the prediction that a clock (i.e. the constant emission rate of natrium) would be slowed down by the bend in the space-time continuum which we know as the sun.

In 1958 David Finkelstein published an article where he suggested, on the basis of Einsteins theory, that a one-way membrane could exist through which light and physical objects could pass but from which they would be unable to escape due to the density of the area. In 1970 the first "Black Hole" was discovered.

We call something nonsense if it is not in agreement with the rational construction we have carefully developed. But this construction has no intrinsic value and must be continually replaced by more useful versions. Nonsense is also a product of our mind. There is no such thing in the real world. In the one reference system Black Holes and Event-limits are reasonable. For another reference system the absolute absence of movement is reasonable. Neither are nonsense, except when seen from the standpoint of the other.

The Inertia of the Mind:

Whenever new blocks of phenomena force changes in the patterns of thought..... even the most eminent of scientists face an enormous problem. Because the required change in thinking can give the feeling that the ground disappears from under ones feet.... I believe this difficulty cannot be overestimated. If one has once seen the despair with which sensible and quiet scientists react to the demand to change the existing patterns of thought, then one can only be surprised that such revolutions in science are generally possible.

-Heizenberg

Space-Time:

In Space-Time is everything which for us becomes past, present and future given in one form.... Every observer discovers, as it were, by the passing of time new bits of space-time that create by them the impression of successive aspects of the material world, while in reality the totality of events which fill space-time exist before the observer has experienced them.

-De Broglie

-So what happens to Shrödingers possibility wave-functions in space-time. How can they collapse if everything already exists? Are there jumps to other worlds, or do they exist both intact and collapsed in space-time? The answer maybe both, neither view is incompatible with the other. There could be alternative space-time universes, or the alternative universes could also be considered as being located in different dimensions of a single space-time universe.

-Batten

Relative and Non-Relative:

Not everything is relative. Einsteins special theory of relativity is in fact more concerned with that which is not relative. A ruler of a specified length may appear shorter, or a clock may appear to be slower, to an observer who is travelling faster than us -but the moving observer can use Einsteins Special Theory to calculate how the ruler, or the clock, would appear to us (assuming the relative movement was known). So the theory describes how the relative appearances of physical reality seem to change in relation to different observers, but at the same time it is determining also the unchangeable, absolute, aspect of the physical reality.

The appearance is not reality, neither is reality arbitrary, but it is the relationships between the appearances which give us insight into how reality functions -but not what it is.

One should also not forget that the theories of scientists, even if proven to be consistent with what appears to be reality, are also only mental constructs which prove useful but do not have to be true.

Symbols and Tools:

Symbols are tools which help us to explore and understand our experiences.

Symbols and Experience do not follow the same rules. The moon is not the finger which points to the moon. Do not confuse the two!

> Because everything is just appearance
> Perfect in what it is
> Without binding in good or bad
> Acceptance or Rejection
> You can just as good burst out laughing
>
> -Longchenpa (14th cent.)

A Bit of Both and Not Either:

Polaroid sun glasses are so called because they Polarize light. Normally light consists of waves (or particles) that move in all directions. Polarizing filters are made of plastic that has been stretched in one direction so that the plastic molecules become elongated and can only let light through with the same orientation as the extended molecule.

Obviously, the combination of a Vertically polarized filter placed before (or after) a Horizontally polarized filter will block all light from passing through. However, what happens when one adds a third, Diagonally placed filter?

Strangely enough, a Diagonally polarized filter when placed before or after the above combination causes no light to pass through, but when placed between the two other filters suddenly light passes through all three filters.

How is this possible? According to the quantum-theory, Diagonally Polarized light exists in its own right and is not just a mixture of Vertical and Horizontal Polarized light. How can such a thing pass through all three filters but not through two?

This reminds us of the anecdote of the American tourist in Lebanon during the civil war. Stopped in the street by a group of masked men, one wrong word could cost him his life:

> "Are you Christian or Muslim", they ask.
> "I'm a Tourist", he screams.

Apart from the physical mystery, the demonstration with Diagonal Polarized light also contradicts the Distribution Law of Logic which states that A and B or C = A and B or B and C. In other words, to say "I toss a coin heads or tails" is the same as to say "I toss a coin heads or I toss a coin tails". According to this basic law of logic the order of the three filters should make no difference. Unfortunately, the world around us does not always seem to obey our logical laws, not only in the sub-atomic world but also in the macro world of Polarized light.

Until the General Theory of Relativity, the Geometry of Euclid was accepted without doubt as the underlying structure of the universe. Birkhoff and von Neumann refuted the universal character of classical logic. Until today Classical Logic is, almost without a trace of doubt, still accepted as a natural mirroring of the nature of reality.

Quantum-mechanics and Buddhism:

Experiments to discover the fundamental particles of which atoms are composed of has lead to the discovery (or creation) of many particles with different characteristics.

Most of these particles are not stable and have a tendency to decompose after a (very) short period of time, depending on the particle.

After decomposing, a particle may recombine to form the original particle, the component particles may recombine with other particles which happen to be present or the component particles may further decompose and form complex interactions between the decomposed particles of decomposed particles.

For example, a proton never remains just a proton. It alternates between being a proton plus neutral pion and being a neutron and positive pion. A neutron never remains just a neutron. It alternates between being a a neutron plus antiproton etc. etc... All particles exist potentially (with a certain possibility ratio) as different combinations of other particles.

The idea that all particles exist as different combinations of other particles is in agreement with Buddhist belief. According to the "Flower Wreath Sutra" every part of the physical reality is built up out of every other part. This theme is illustrated in the metaphor of "Indras Net". Indras Net is a large net of pearls draped over the palace of the God Indra. "In the heaven of Indra is a net full of pearls. They are so organized that in each pearl all the others are mirrored. In the same way is every object in the world not completely itself, but exists in relation to all other objects and is in fact all the rest".

It seems it is even possible that what appears to be empty space may suddenly decompose into particles which may further decompose, recombine in different combinations and finally disappear again. In the sub-atomic realm is a vacuum apparently not empty. "Empty" and "Full" are false oppositions which we have created, just as we have created the idea of "Something" and "Nothing". Perhaps we have lived with our abstractions so long that we have come to believe them.

One of the Prajnaparamita Sutras, the Heart Sutra, states one of the most important ideas of Mahayana Buddhism:

..... form is emptiness, emptiness is form.

The sub-atomic realm appears in a constant state of transformation with the transformations only being limited by the Uncertainty Principle, the Conservation Laws and the Possibility Ratios.

The Topology of Conservation:

There are twelve Conservation Laws (such as Conservation of Energy, Impulse, Charge, Time Inversion, Electron Family Number etc...). Some of the Conservation Laws determine all sub-atomic interactions, others determine some of the interactions. There is a simple rule of thumb: The stronger the force is the more Conservation Laws are valid. Strong interactions are limited by all twelve laws. Electro-magnetic interactions are limited by eleven laws and weak interactions by only eight. Gravitational interactions have not been studied but should be limited by even fewer laws.

Different Theories:

Theoretical Physics falls roughly into two schools of thought. The old school continues to search for the fundamental building blocks of the universe. At present the most likely candidate is the Quark, an hypothetical particle that was speculated over by Murray Gell-Mann in 1964. The name comes from a word in Finnigan's Wake from James Joyce. However, even if this is found, it still leaves the question: From what are Quarks made of?

The new school of thought follows so many different paths that it is impossible to summarize them all. Some Physicists believe that time and energy are the basis for everything. According to this theory, everything is a manifestation of an underlying four dimensional geometry. Others (such as David Finkelstein, search for processes "underneath time" from which space and time are derived from. These theories are at the moment pure speculation. They cannot be proved (mathematically demonstrated).

Scientists and Artists:

Why do some idiots get loads of money to let non-existent particles bash against each other and invent silly stories while other idiots are hardly allowed to get social welfare and almost forbidden to continue making silly pictures?

Maybe the strange galactic world of Einstinian Space-Time or the sub-microscopic world of the quantum-mechanics within and around us are not so exceptional as we may imagine. Maybe if we looked we may discover that the apparently normal world in which we live is just as strange. Maybe it is the task of the artist to discover this and to make it visible.

The Rules of The Game:

The first step in the procedure of quantum-mechanics is the preparation of a physical system (the apparatus for the experiment). This is called the Region of Preparation.

The second step is the preparation of another physical system to measure the result of the experiment. This is called the Region of Measurement.

The third step is to translate what is known about the Region of Preparation and the Region of Measurement into a Mathematical representation.

The variables of the Mathematical representation are then applied to a formula that expresses the natural causal development (Schrödingers Possibility Wave Function). Note that this does not actually explain how things happen, because nobody knows. The Kopenhagen Interpretation states (in contradiction to Einstein) that the quantum-theory is a complete theory because it correctly correlates experience in all possible experiments and not that it explains in detail what actually happens.

Naturally the last step is the performance of the experiment and the discovery of the result.

In order to apply the quantum-theory the world needs to be divided into two parts, the observed system and the observing system. These are not the Regions of Preparation and Measurement. These are parts of the the observed system. The observed system can only be observed in terms of an interaction with the observing system. Even then it is only the interaction with the instrument of measurement that can be observed.

The observed system (the particle) is represented as something that moves between the Region of Preparation and the Region of Measurement. Each group of experimental specifications that have been described in the mathematical language of the Quantum-mechanics is called by the physicists an "Observable".

In the world of the Mathematics the specifications of each of the possible situations in the Region of Preparation and the Region of Measurement coincide with Observables. In the world of experience an Observable is the possible appearance (in our experience) of one of these groups of specifications. In other words, what happens between the Regions of Preparation and Measurement is mathematically expressed as a correlation between two Observables (Production and Detection). The Observed system (the particle) is therefore a Relation between two Observables.

According to Stapp:

> -The physical world is not a structure that is built out of un-analyzable and independently existing entities, but more a web of relations between elements where their function is completely derived from their relation with the whole.

Professor G.F. Chew, head of the Physics department of Berkeley University has stated:

> -Our present struggle [with certain aspects of advanced Physics] is maybe only a preview of a totally new form of human intellectual activity, that not only lies outside physics, but maybe also cannot be described as "scientific".

SECTION V. -THE REALITY OF LANGUAGE

Models and Reality:

If one accepts that reality can only be perceived via, or in terms of a model, then the following questions are raised: What then is reality, is there no reality, what is the relationship between the model and reality?

The best answer would appear to be: Reality is that which is outside all models.

This would imply that "Real Experience" (i.e. the experienced results of actions performed in terms of the model) would in fact be an interference pattern generated between the model and that which is outside the model, experienced within the terms of the model.

Reality would then appear to behave differently in terms of different models (even two observers with different models observing the same phenomenon would probably experience it differently) and it would seem reasonable to assume that people with different models do in fact inhabit different worlds.

Interference implies a two-way mapping (i.e. $X=f(Y)$ and $Y=f(X)$). So the model would affect reality. This is obvious: if one does not believe in killing butterflies because they are from God the butterfly population will probably be greater than if one believed that they were from the devil and must be exterminated.

A multitude of models affecting reality which in turn manifests itself differently within each model. The Mirror mirrors reality and reality mirrors the mirror.

The New Science:

Under the influence of modern Physics and the computer related studies of Complexity and Chaos, derived from the problems of trying to simulate natural systems such as the Weather, animal population growth or the fluctuation of commodity prices in the market by means of computers, a body of Modern Scientific thought is developing which is radically different from the old Science.

OLD	NEW
Complexity can be simplified into parts and the parts can be independently studied.	Complexity is the result of Organization. It cannot be analyzed, only synthesized.
When Complexity has been simplified it can be understood.	When Complexity is analyzed it disappears.
When something is understood (describable) then it is predictable.	Complex Systems must be simulated, the results cannot be predicted, even when the System is fully described.
Science is asking questions that can be answered true or false.	Science is making models that show apparent relationships not absolute answers.
The discovered laws are universally valid.	There are many worlds, and they all have their own rules, there may be similarities between the worlds.
The Universe is made of objects that obey the fundamental laws without feeling.	Things behave differently in different contexts -maybe the universe cares.

Topological Constancy:

Topology is the comparative study of Geometries. Effectively, it defines the differences between systems. It is said that topology is the study of rubber. A drawing made on a piece of rubber can be stretched in all directions but the connections between points on the surface remains the same. This is true, and yet the distortion has created differences, perhaps a drawing in distorted shape would look pretty strange when the rubber returns to its original form. Maybe by focussing on the connections everything seems the same but that is surely purely a question of what one looks for. Obviously, the flat world of a piece of paper is different to the solid world of a globe. In a paper world, for example, one can draw as many lines as one wishes through a fixed point, in a three-dimensional world (as any constructor knows) only one piece of wire can be in one place at one time and all the other bits have to go somewhere else.

This is probably the reason for the sometimes heavy fights between Theorists and Practitioners. A draftsman, working on paper, may be foolish enough to draw a series of wires passing through a single point but the engineer knows better. The draftsman would be wise, even when working on paper, to base his drawings not on the rules of paper but on the rules of physical space.

Even then, one must consider "Which Physical Space?". A silly question you may say. However, light is part of the Physical three-dimensional world and yet a number of laser beams may pass through the same point in space (although there may be some interference). A laser light show (in this respect) obeys the laws of paper but the same structure made in wire would not. The world of light and the world of wire are not identical.

The Universe is full of similarities, but it is also full of differences.

Perhaps it the (Topological) constancy of certain relationships under changed circumstances that generates the concept of Identity. The material from which something is made, the context in which it is placed and they way it changes when we look at it from different (mental or physical) viewpoints generate differences and similarities. The appearance of an object in a room will change according to our position and, for example, the lighting conditions and yet under the changing circumstances some characteristics of that object will remain constant. These constants define for us its identity. Possibly in another context its identity will be modified -we sit on the table and the table becomes a chair -unchanged physically but changed in function because of its physical similarity to a chair.

Maybe intelligence is the ability to discover, and to exploit, the similarities and differences of the world around us as it manifests itself within our different sensory and conceptual spaces. "Understanding" can then be seen as a comprehension of the specific similarities and differences within the domain of our understanding. Maybe Understanding is local Topology and Intelligence is global Topology and both support each other.

The Pragmatic person needs to Understand in order to function, but Intelligence is also useful to test the Understanding and to develop it.

It is the task of the Artist and Scientist to search for these changing patterns of similarity and difference, but they can be very subtle. We must look very carefully.

Understanding the differences and Similarities maybe the same as Understanding the World.

Language and Culture

Culture is a communal reference space (language) which gives definition to a society by providing it with communal models. The Cultural Language may develop and be modified but it should never be destroyed because without it we are autistic children.

An individualistic society has (per definition) no culture and will surely suffer for the breaking of Indras Net with its cultural form of AIDS.

The Final Answer

The pragmatic questions are:

what should be (or not be) avoided?
what is unavoidable?
how can the unavoidable be reconciled with the unacceptable?

Without our Models we cannot hope to answer these (or other) questions. Unfortunately we have no way of knowing if our Models tell the Truth.

With Thanks
to
FATIMA LASAY!