
LOGIC OF THE GREAT DARK

In the last essay, we hypothesized a structure for the autopoietic system based on the assumption that the pentahedron would have four different faces just like the minimal system. But that hypothesis remains merely a conjecture unless it becomes possible to build an autopoietic system. To build a functioning autopoietic system, we would need an “engine” which would allow us to manipulate the elements of the autopoietic system in a way which is consonant with the autopoietic structure. In fact, what we must be talking about is a system that can manipulate itself -- not just that, but also order itself reflectively. But the structure of the autopoietic system and the autopoietic engine must be two sides of the same coin. The “engine” cannot be different from the structure it is ordering, manipulating and reflecting on. But it is clear that the autopoietic structure of the pentahedron that appears as the autopoietic ring is not complex enough to serve as the autopoietic “engine.” We may be going astray in the way we talk about this “engine.” After all, an engine is a machine, and the autopoietic system is

precisely a machine that can organize itself. However, the structure of the autopoietic system that appears as a ring is different from the actual mechanism of organization. The organizing process is what is being termed here the “engine.” It is necessary to study this organizing process and see how it animates the autopoietic structure.

The organizing structure of the autopoietic system appears most clearly in the work of August Stern who has formulated Matrix Logic¹ and presented it in two very important books. The basic concept is that logic can appear as matrix operation of right or left truth vectors. This produces a very interesting super-set of conventional logic. The matrix logic has the same structure as the fundamental particles so that Stern claims that his special logic unites the mind and nature through the same basic structure. It is not possible to re-present the work of Stern within this context so it will be taken to be a prerequisite for what will be said in this chapter. This work is very significant and should be studied for its own intrinsic value. In fact, I would claim that Stern has made a break-through on the order of that of Einstein or Newton in his theories of logic, physics and computation. Here we can only venture to make some scattered interpretations of Stern’s work in the context of our own

1. August Stern, Matrix Logic (North-Holland Elsevier Science Pubs, 1988), Matrix Logic And Mind (North-Holland Elsevier Science Pubs, 1992)

study.

Matrix logic presents us with many new logical features, some of which are very powerful. For instance, the DeMorgan law applies to multiple operators in matrix logic. Matrix logic may be considered from the point of view of logical operations or from the point of view of matrix and vector operations, and thus logic is reduced in some sense to computation, and so the barrier between logic and numbers in computer science is broken down. Also, the logical operations may be considered from the point of view of physical structures of fundamental particles so that the logical operations take on new meaning directly related to the structures of matter and their manipulation in physical science. However, of fundamental interest is the fact that matrix logic has certain forbidden operations which distinguish it from what Stern calls the mod 2 set of operations which do not have forbidden interactions. Unlike normal logic, matrix logic operators can interact directly with each other. A table of the interactions of matrix logic lacks 49 interactions out of the 256 theoretically possible. These forbidden operations produce a structure which is very interesting. In effect, an anti-logic is produced which mirrors normal logic. Also, there is produced a set of 50 operations which are unique to matrix logic which represent the interaction between the positive and

negative logics. If the forbidden interactions did not exist, these 50 special cross-over operations would not exist. Now this structure of forbidden operations reminds us of the essence of manifestation. It says that at the heart of the matrix logic is a wall, a barrier that refuses manifestation. It is the existence of this forbidden territory that makes the logic and anti-logic pair appear. They are like matter and anti-matter, and will cancel when they come into contact. Thus, the cancellation phenomenon and the essence of manifestation (pure immanence) appear in the structure of matrix logic. Stern posits that the anti-logic may be equivalent to the unconscious. Remember that Matte Blanco posits that the unconscious is produced by symmetries. We do not see it because all of its operations bring things exactly back to where they were. Similarly, Stern says it is impossible for us to distinguish between the logic and anti-logic. But the formulation of Stern posits that there are 50 operators in matrix logic that track the transformation of the positive logic into the anti-logic. Those 50 operations appear directly as the result of the forbidden operations. Thus, something is added to what Matte Blanco has posited. In fact the 16 operators of the logic together with the 16 anti-operators, plus the 50 transitional operators produces a system with 81 operators plus identity. The mod 2 system merely collapses back into itself so that no more than 16

operations are produced from the interactions of mod 2 operators with each other. These 81 operators of matrix logic are very significant for us. In effect, they are produced by placing the truth values of -1, 0, 1 into the four places of a two by two matrix. Matrix logic has four truth values instead of two. In addition, it has -1 and 2 as truth values interpreted as weak indecision (neither true nor false) and strong indecision (both true and false). It is the production of a truth value of 2 which marks an interaction of logic operators as forbidden. Thus, in effect, matrix logic limits us to three truth values. The structure of four places and three values gives us mathematically $3^4 = 81$.

It is amazing that this is precisely the structure of a Chinese classic called the Classic of the Great Dark -- T'ai Hsuan Ching². This work was written about AD 53 by Yang Hsiung. He was a scholar who set out to redo the Chinese classics. The T'ai Hsuan Ching was his reworking of the I Ching. Instead of only Yin and Yang lines in six places, this new rendition has three kinds of lines (including twice broken) in four places to produce 81 Shou. Thus, two thousand years before Stern, the same structure was being used for different purposes. The T'ai Hsuan Ching was not a work of logic, but instead a heuristic description of how the world works

2. Derek Walters, *The T'ai Hsuan Ching, The Hidden Classic, A Lost Companion of the I Ching*. (Wellingborough, Northamptonshire: The Aquarian Press, 1983)

modeled on the I Ching. However, the T'ai Hsuan Ching indicates how the third thing interacts with things in creation, instead of how the opposites without the third thing interact with each other. The heuristic pattern was ignored because Yang Hsiung worked for a tyrant, and so his contributions were dismissed. This is apropos because Yang Hsiung has given us a dark picture of the world under the influence of the third thing that generates chaos. It shows his fundamental misunderstanding of the rolling over of opposites and the necessity of describing the world without the arising of the third thing. Yet Yang Hsiung gives us a sense of the quality behind the pristine logic of Stern. And it is important to note that 4^3 is the dual of 3^4 . So these two systems are opposites. One is the system of pure Yin and Yang and the interaction of opposites at a certain threshold of complexity. The other is the system that occurs when the third thing that is the precursor of chaos is introduced. Here the third thing is seen as the Yang or center. It is a center that is not empty but is occupied. The 80 shou that circulate around that center are seen as the interference pattern between the third thing, interpreted as the Yang and the opposites of creation. It is a picture of distortion of the natural order.

Shou 1

Tsan 1-9

CHUNG

The Centre

Four solid lines
Active flux
Latent sprouting
In the Yellow Palace
There is nothing that is not.
Is not this the Secret, thus?

The Mind makes war against the Secret
Which can explain both Yin and Yang.

The Dragon issues from the Center
The Head and Tail are signs revealing
How it will be used.

The Treasury is empty;
Therefore the great are denied life.

The Sun is Chief in Heaven;
By fortune are the seasons ordered.

The Moon's watch is extensive;
Unlike the West's enlightenment.

Yellow is not yellow;
Back and forth goes the Autumn routine.

The Yang is interpreted here as the Third Thing. Here we see some very interesting commentary on the Third Thing in its pure form. We can think of the Yellow Palace as the House of Being. In the House of Being there is “nothing that is not.” This is equivalent to the

sayings of Parmenides about the impossibility of non-Being. Here Yang Hsuing says that in this pure plenum of Being there is a secret. And sure enough we find that hidden within the palace of Being is the Essence of Manifestation or pure Immanence. He goes on to say that the Mind makes war against the Secret. The Mind attempts to render everything purely available as Pure Presence. But within Being, there lurks the secret of Immanence. He says that the war of the Mind against the unconscious gives rise to Yin and Yang. For Yang Hsuing, Yin and Yang are by-products and are not fundamental. This is the position of the Third Thing that sees itself as primal. He then says that the Dragon issues from the Center. This is in contradiction to the yang hexagram from the I Ching that shows the Dragon arising from the heavens and manifesting on Earth. In the I Ching version, the Center is always empty. The concept that manifestation arises out of the Center is an innovation. The head and tail of the Dragon are again derivative like Yang and Yin. They show how the power of the Dragon will be used. But here the power of the Dragon is reinterpreted to be the power of the Third Thing. Yang Hsuing then says the Treasury is empty, and therefore the great are denied life. This is a very revealing point. It intimates that control of the Third Thing is the means of access to power and wealth. When the center is empty, then power is not collected together,

and no one can control it. When one rides the Dragon of the Third Thing and learns to tame it, then one has produced a source of great power which can be used. Yang Hsuing says the Sun is Chief of Heaven, and the seasons are ordered by fortune; but on the other hand, the Moon's watch is extensive, but it is unlike the West's enlightenment. Here both the Sun and Moon are seen as inadequate. They are the great opposites like Yin and Yang and the Head and Tail of the Dragon. The Sun is undercut by the ordering of seasons by chance. The moon, though it has an extensive watch, does not have the enlightenment of the West. (This probably refers to the enlightenment of Buddhism from India.) He says, "Yellow is not Yellow." The defectiveness of the Sun and the Moon (Yang/Yin; Head/Tail) cause them to not be identical with themselves. This lack of self identity is a manifestation of differing and deferring within Being and the indication of the existence of the Essence of Manifestation. "Back and forth goes the Autumn routine." This later statement smacks of the boredom of nihilism. So we can see that Yang Hsuing has produced a picture in which Being rules over all, but in the end, that picture shows that Being undercuts itself. Here in a nutshell we see a picture of Being as self-grounding transcendence. The emptiness of the Treasury is the crack in Being itself, the window in Baal's house, the house of Being, through which Mot, or Death, enters to

seize him which appears in the myths of Ugarit. The eternal recurrence of the Same has a moment of difference which cannot be suppressed. Being must have a moment of non-Being, which despite Parmenide's assertion to the contrary, haunts Being internally. The first statement that "In the Yellow Palace there is nothing that is not" is undercut by the rest of the lines until in the end Yang Hsuing must say that "Yellow is not Yellow." And so nihilism arises from the impossibility of the self-grounding of Being.

Shou 41

Tsan 361-369

YING

Befitting

Four lines broken once

The first half of the calendar has been displayed;

The second half is regulated in harmony with it;

One line proceeds vertically, one line proceeds horizontally;

Heaven's laws are woven together, enmeshed, enmeshed

The Dragon flies up to Heaven

The Divination strides over the overlaps.

Blazing fire reaches down from Heaven;

Icicles sprout from the Earth.

The Chief Brightness reaches its limits;
The knight, by what is befitting, becomes great.

Here is the point of balance between the third thing and the chaos it produces. Here the fabric of fate is woven between the poles of chaos and the ordering of the third thing -- the law givers like Solon or Plato's Stranger who give laws from themselves. The setting up of a calendar system is an example of this kind of law giving. It is ultimately a production of fate. Fate is an artificial concept. It is produced when someone violates a law and is punished. The fated are the ones who are bound within the laws instead of being freed by them. All human laws bind some and free others. The fated are the ones bound within the laws -- they are the children of Varuna. Those freed by the laws, the ones who make and keep their contracts, are the children of Mithra. The fated run afoul of the laws of the lawgiver, and thus are doomed. When this kind of enactment of social laws is projected outward on the whole Uni-verse, then fate becomes cosmic. The fate is always represented as a weaving by the Norns, but also by Penelope and Helen. Weaving is one of the two archetypal tasks of women. Weaving and carrying water from the Well. Each of these jobs are symbolic of fate. One is the fate of beginnings -- the wondrous fate that we are born human beings. The other is the fate of ends --

the fate of being bound within the laws having run afoul of them. Yang Hsuing says that Heaven's laws are woven together. This will have special importance for us. He says, and repeats, that they are enmeshed. This double enmeshing is the production of chaos, an interference pattern due to the giving of the laws by the one who acts in the place of the third thing, the lawgiver.

The character for manifestation is Hsien (Ken 5137). It contains three elements. The radical is the character for a shell, and it stands on the right. On the left there is the sun above and fire below, and between the celestial and terrestrial fires are threads. Now the character for manifestation tells us that the process of manifestation involves the connection between heaven and earth. Heavenly fire is connected to earthly fire by silk threads. But as the threads descend from Heaven, the layers of the heavens are articulated like the ribs of a shell. The character for shell has a single stroke at the top and then the articulation of the four ribs ending with two strokes at the bottom, representing the opening of the shell. The movement from one (the axis) toward duality (the opening of the shell) is implicit in the structure of the shell which is also parallel to the movement between heaven and earth by the threads. Suddenly we realize³ that the threads, as woof, cross the warp of the ribs of the

3. I am indebted to Robert Luongo for the discussion that led to these insights.

shell, and so we get an implicit weaving within the character for manifestation. It is this weaving that is referred to here -- the web of fate manifesting.

The Dragon flies up to heaven, and the Divination strides over the overlaps. Here we can see the overlaps as the weft where warp and woof meet and interfere with each other. The dragon embodies the unseen cause. Divination attempts to understand the unseen causes by looking at the interferences between the warp and the woof. The blazing fire from heaven is counterpoised to the icicles from earth. This may be an allusion to the nihilistic opposites, saying that as the Chief Brightness reaches its limits, i.e. the Dragon reaches Heaven, there is a production of nihilistic opposites. But it is clear from the text that some breach between heaven and earth is being described. The knight can take advantage of the situation in which the breach between heaven and earth occurs to become great. What we see hear is the eclipse of the primary cause by secondary causes that show up in the weaving of fate. As the Dragon of causation withdraws, the Diviners move in to assess the weave, and this causes a split between heaven and earth which manifests as nihilism. This situation of imbalance can easily be taken advantage of by some to become great.

Shou 81

Tsan 721-729

YANG

Nourishing

Four thrice broken lines

Yin -- a fully stretched bow in the wilderness

Yang -- the mysterious myriad things

Glowing crimson beneath

Hoarded in the heart of the abyss;

Wonderful is the intellect's foundation.

Hoarded in the heart of the abyss,

The mind outside it.

Feasting, eating:

Regulations, regulations;

Their purposes dependent, dependent.

Advantageous to levy taxes on purchases.

The yellow heart sits in the belly.

The white breast gives life to flesh.

Trust in virtue, not in making amends.

The yellow heart sits in the belly.

Rising, it attains Heaven.

Scrupulously, scrupulously,

One day, three sacrifices;

The ox is the omen:

A plump one is not advantageous.

Scrupulously, scrupulously,

The sacrifice is plump,
But without a body.

The little child hauls an elephant;
The married lady and the man:
Honor and courage;
The Knight nourishes the sick.

Fishbones do not rid the poison.
The sickness begins with ghosts
on the top of the mound.

The stars, like the years,
Repeatedly return to their beginning.

The stars, like the years,
Repeatedly return to their end.

Now all is frozen;
Hands reverently lift the crimson disk up to
Heaven.
There, in the clear sky,
Is the Mystery's secret fountain.

This final shou is amazing. It represents total fragmentation equivalent to what has been called the Ephemeron. It begins with an amazing image which is the inversion of Yin and Yang. Yang should be thought of as a stretched bow, and Yin as the myriad things. The

bow is the unseen causation acting on the things. The reversal of Yin and Yang (yin is yang and yang is yin) is the ultimate extent of nihilism. It is not just the passive nihilism produced when heaven and earth are split. Active nihilism comes from the destruction of meaning which is done by reversing everything and making every nihilistic opposite stand for its own opposite. It is the house of mirrors where everything is distorted. The fact that the color crimson is mentioned is a warning. Yang Hsuing goes on to say, "Hoarded in the heart of the abyss; wonderful is the intellect's foundation." This is an amazing statement. The intellect's foundation is the abyss. This is the truth of the self-grounding of Being (ontological monism). We discover it in the end. The hoarding in the heart of the abyss is the clinging to existence which is the work of Being, that subtle clinging. The intellect's foundation is hoarded in the heart of the abyss. That foundation is logic, specifically as it manifests as matrix logic. Nagarjuna said this: All four positions (A, not A, neither A nor not A and both A and not A) are empty. But reason sees this as a threat. It construes the emptiness of all things as a threat to itself. Matrix logic has all these four truth values. Matrix logic is equivalent to classical Indian logic without excluded middle. Logic is the foundation of the intellect. But logic exists within an abyss which is the inability for Being to ground itself which is based on the fact that

everything is intrinsically empty. “Hoarded in the heart of the abyss; the mind outside it.” The mind is always in bad faith. It is always outside itself. It cannot even experience the abyss directly. Even grief cannot last forever. One eventually smiles in spite of one’s self. So the mind is always outside its own engulfed foundation within the abyss. This, I think, is a definition of what Sartre called Nothingness -- the continual separation of the mind from itself. The mind is always being lost in the affairs of life. So the next few stanzas depict the loss of the mind in the states of affairs of life. “Feasting, eating” are contrast with the control of the law with “regulations, regulations.” He says, “their purposes are dependent” which means to me that each are different kinds of desiring machines. One kind attempts to devour the world, and the other attempts to order the world, and these are basically the same thing. All the workings of the mind relate to the secondary causes. They cannot comprehend the primary cause. Everything is dependent on everything else. Power relations are set up, and some find it “advantageous to levy taxes on purchases.”

The yellow heart is again our identification with Being within our own bodies. These are the same bodies that are nourished by the white breasts of women. Our bodies grow, and this conflicts with our positing of a clinging to life through Being. The ideal world of virtue is contrast

with the world of women and contingency. The yellow heart, within the belly the center of craving -- when it rises to the true position of the heart above the diaphragm it attains heaven. This is to say that when the heart is cleared of its clinging and craving, it becomes purified and can respond to the promptings of the angels. Thus, we see the scrupulous man doing sacrifices. But ultimately all the sacrifices cannot stop him from realizing that the sacrifice is without a body. This means that the sacrifice is empty. The realization of emptiness of all things, including the sacrifice, allows miracles to occur like the child carrying an elephant, because as empty, in reality it has no weight. Or the married man and woman can bear honor and courage. Or the Knight can nourish the sick.

“Fishbones do not rid the poison.” There is a deep sickness in the yellow heart. Taking fishbones does not stop the poison from acting. Fishbones represent the ineffectual cure. “The sickness begins with ghosts on top of the mound.” This is to say that the sickness begins when the mind is projected as something separate and outside the body. Once that occurs, then the mind is outside “it.” That is outside its own real foundation in the body. It is the body that is the foundation of the mind, not logic. Logic is an illusory foundation. Logic is like the fishbones. It cannot cure the poison of the dynamic

clinging to Being.

We end with an image of eternal return to the beginning which is the end. And here is the most amazing line: “Now all is frozen.” The whole purpose of Being is to freeze the world so it can be held onto longer. It attempts to freeze everything, like the Gorgon’s gaze.

“Hands reverently lift the crimson disk up to Heaven.” The crimson disk is a world turned upside down by Yin becoming Yang and vice versa. The attempt to return to heaven is a recurrent theme. It is like the theme of the splitting of heaven and earth which, in the West, is the split between mind and body. Going back to heaven is impossible, but we continually end up trying to do it, mostly through sacrifices.

“There, in the clear sky, is the mystery’s secret fountain.” This is the flaw, the trinity, the mystery from which flows a cornucopia of things released through sacrifice of the perfect example. It is this flaw, or mystery, that we continually attempt to understand.

Yang Hsuing had an amazing intuition about the nature of the inverse of the system of the I Ching. He embodied that understanding in his Classic of the Great Dark. And we see that these qualitative states are isomorphic to the Matrix Logic operators. In those operators, the third

thing is manifest in a very powerful way which is both a formal system and a structural system at the same time. Matrix logic is the only system of thought in which the artificial barrier between the structural aspect of the system and its formal aspect is broken down. Matrix logic is an example of a fused formal-structural system which goes far beyond the formulation of Klir. Stern has produced a fused formal-structural system in which the interaction of the third thing clearly appears in a very powerful set of operations that can be used to manipulate the autopoietic structure represented by the different views on the pentahedron. We need to explore the relations between Matrix Logic and the autopoietic structure. We will see that Matrix Logic is the perfect candidate for the “engine” that allows the autopoietic system to manipulate itself.

Let us begin by remembering that the pentahedron has four views: Klienian bottle, Pentahedral lattice of minimal systems, five groups of order 20, and the 32 pentagrams. Now Stern discovers that at the center of his matrix logic is a quaternion group of eigenvalues, or truth values. It is of interest to note that there are a series of algebras which are special cases of linear algebras which allow multiplication and partial division. This series is produced through doubling and contains the real numbers, complex numbers, quaternions, and

the Cayley numbers in a series 1, 2, 4, 8. There are no further algebras of this type of $n > 8$. The complex numbers are an anti-numbering system and associated algebra at the level of two where the real numbers are paired with i . The quaternions have i , j and k as numbering systems added to the real numbers. These “imaginary” numbers are merely symbols that distinguish the different kinds of numbers from each other. The eight-fold hyper-complex numbers have the symbols i, j, k, e, I, J, K . Each higher algebra is weaker than its predecessor and is produced by doubling. The quaternion algebra is at the threshold of complexity of four. It is a minimal system with a very special relation between its elements. That special relation can be thought of to be similar to the Kleinian bottle. For instance, the complex numbers are like the Möbius strip. The point i is like a singularity in which the number system twists around just like a Möbius strip twists around. The square root of -1 is i . Taking the square root and making it defined as an alternative numbering system allows certain quadratic equations to be solved that could not be solved otherwise. But that alternative numbering system is merely the obverse of the real numbers. The imaginary numbers are related to the real numbers by a group operation that allows the equations to be rotated as they are solved. This rotation is like a twist. There is a single twist around the singularity defined as i . The

quaternion numbers is merely the next higher group with similar properties in a more complex configuration. Here there are three such singularities, and it is produced by doubling the complex numbers. Thus, it is exactly like the Klienian bottle which is produced by doubling and joining the mobius strip. Thus, we see that the pentahedron has at its core a Klienian bottle, and the matrix logic has at its core a quaternion group, so there is a similarity between the two structures which is very important. The matrix logic is poised at the next higher threshold of complexity from the pentahedron. Stern pointed out that the 16 logic operators may function as the points of a hyper-cube. Thus, there is a connection between the hypercubic matrix logic and the pentahedral core Klienian bottle. This connection is very significant. It allows us to see that what is a topological structure in the pentahedron becomes articulated as a mathematical structure in the hypercubic matrix logic. We can see the matrix logic as embedded in the pentahedron. It is as if when we look closely at the windegg, the four dimensional Klienian bottle, we see that it actually has a structure which is a quaternion group. That group is both the truth values and the eigenvalues of the matrix logic. The quaternion group embodies the symmetries that are active in four-dimensional space. Those symmetries that allow the Klienian bottle to twist through itself without intersecting

itself are essentially quarternion rotations. Once we have established that the hypercubic rotations of the matrix logic are embedded in the pentahedron, we can begin to see how matrix logic can fulfill the role of the operators that allow the autopoietic system to operate on itself. Also, we can understand how the autopoietic structure can be so special. In four-dimensional space, the rotations allow the possibility of perpetual motion. Movements that are blocked in three-dimensional space, become possible in four-dimensional space. The autopoietic system takes advantage of these rotations through the embedding of the quarternion group within the pentahedral structure of the autopoietic system. It also makes clear that there are two possible levels of this embedding. The quarternion group appears here, but also it can be doubled by the hypercomplex Cayley algebra with eight imaginary singularities instead of four. Thus, we get an inkling that the autopoietic system can itself be doubled. We have called this the social or reflective autopoietic system. The autopoietic system that reflects on itself does so through the possibility of the Cayley hypercomplex algebra. Thus, a contention that we have made over and over that there is a social or reflective autopoietic system is substantiated by the availability of the mathematical substructure for just such a hyper-autopoietic system.

Having realized that the Klienian bottle (windegg) is part of a hyper-Klienian bottle that allows it to rotate through itself both externally and internally, gives us, for the first time, a vivid picture of the inner workings of the autopoietic system. The hyper autopoietic system is doubly closed. It is a pair of intertwined Klienian bottles. They twist through each other as each twists through itself. This double-double action is what allows the autopoietic system to be reflective; whereas the double action of the single quaternion group is what allows it to act on itself and organize itself. Just like the mobius strip which has only one side, so too, the quaternion group allows the thing acted upon to be identical with the part acting. The operator is identical with the operand -- exactly as Stern says about his Matrix Logic. We get a picture that the reflected action of the operand/operator is again the same structure acting on itself through reflection rather than action. Also, it is clear that this series ends abruptly at eight so that it only has four levels like the levels of Being. What is beyond that level is impossible instead of unthinkable. There are only four levels mathematically, and no others. Thus, the minimal system of eigenvalues at the heart of the pentahedron corresponding to the deep structure of the hypercube has its reflection, and through that, becomes cybernetic, or self steering. But beyond the reflexivity of the minimal system on itself, there are no other higher structures

beyond reflexivity which yields cybernetic relations of the system with itself. Beyond reflexivity there is only the void.

Having understood the embedding of the hypercube within the pentahedron, we can go on to attempt to understand the other views of the pentahedron. The pentahedron has the lattice structure: 1-5-10-10-5-1. Through that structure we see that it may be looked on as five transformations, or five minimal systems. The five transformations were called by the Chinese the five Hsing. In the five minimal systems, we see each of the four elements: earth, air, fire and water united with each of the Hsing. This gives 20 essential relations between the Yang transformations and the Yin earthly elements. These correspond to the 20 Mayan day names. They also correspond to the 20 sources beyond substitution and reversibility within the I Ching. They also correspond to the 20 letter forms in Arabic without dots. They are source forms of relations between heaven and earth. Each of the four elements are kinds of receptivity in the earth of celestial causations. Every celestial cause makes four impacts in relation to each kind of receptivity. If we look back to the Chinese character Hsing for manifestation, we see the celestial fire (sun) and the terrestrial fire connected by threads. These two fires (the hsing of fire and the earthly element fire) interact and

form a bond like a marriage. Shaykh al-Akbar says that every celestial cause has four wives. These are the four elements. This makes 20 fundamental possible relations between celestial causes and terrestrial receptivities. Thus, we see that the five minimal systems have an important role as representations of the fundamental possible relations between the celestial and the terrestrial. We can look at either the five Hsing themselves alone, or the minimal systems of their relations with the receptivities of earth.

Now, in the character Hsien shows us golden threads connecting the celestial cause with the terrestrial element. We can see that the 32 pentagrams are exactly the nature of these threads. We can think of the 20 relations as places and the 32 pentagrams as the qualities of these places. The threads are the woof which pass over the ribs of the shell which acts as the warp. As with all such threads, these go over and under as they pass through the warp. When they appear, we see them as whole, but where they pass on the other side of the warp, we see them as broken. Thus, we see the natural alternation of the woof between whole and broken. Notice that the shell in the Chinese character Hsien has four ribs. This means that the threads pass over and under four times. This generates the 16 four-line grams of Ilm al-Raml. We know that if we are weaving a tapestry, we can vary

color of the threads, but we can also vary how many threads a particular colored thread can skip in its journey through the warp. Thus, the various patterns of the tetragrams appear when a particular thread goes over several layers of the warp or under several layers of the warp. All the possible patterns give us the 16 permutations. The tetragrams of Ilm al-Raml appear as directly related to the operators of matrix logic. In the mod 2 system, these operators form a closed system where any two operators interact to produce another operator from the same set. It is only by introducing the forbidden operations in which the truth value 2 (both ... and ...) that the 81 operators which produce a logic and an anti-logic along with the 50 intermediate operators appear. The mod 2 logic is the one associated with Ilm al-Raml. The matrix logic introduces us to the great dark in which the essence of manifestation appears at its heart as forbidden operations. It is matrix logic that is the engine of the autopoietic system by which it operates on itself. This move, that opens up matrix logic by introducing the third thing to the mod 2 logic system, is similar to the move that introduces a fifth point to the tetragram. The pentagram moves us from the minimal system to the meta-system of the pentahedron which contains multiple minimal systems. The Fibonacci series and the golden mean appears in this meta-system which embraces the icosahedron/dodecahedron as well as the

pentahedron of four dimensional space. The meta-system has a special kind of inner coherence not possessed by the minimal system. Thus, the addition of a single point to the tetrahedron moves us into a whole new dimension of possible relations with deeper inner coherence. All this is determined by how many ribs are in the warp which divides heaven and earth. We see in the character Hsien that there are four threads in the warp. However, the shell spins out from its axis toward its opening like a cornucopia. That spinning gyre might have any number of layers. Thus, we can see that each of the heuristic levels of complexity for the interaction of opposites may be represented by additional threads in the warp. If there is one thread, we are at the axis itself, and heaven and earth are united. If there are two threads, then we have the possibility of major and minor yin and yang which are the four major states corresponding to the Sun, Moon, Planets and Stars. If there are three threads, we have the trigrams which are fundamental to the I Ching. This gives us eight qualitative states for the system to be in. If there are four threads, as we have said, we get Ilm al-Raml, and there are sixteen possible systemic states out of which the pattern of fate might be constructed. If there are five threads, then we have 32 possible states of patterning. Each layer of the woof is a state that the system assumes. As the dynamic system bounces between its possible states at this level of progressive

bisection, we get the patterning of the fabric. If there are six threads, then we are at the threshold of complexity of the I Ching and there are 64 possible qualitative states for the relations between heaven and earth. Of course, we could go on from there. Each level added to the woof increases the complexity of the qualitative states. All these levels of waves are additive. Thus, the basic level where there is only one thread, we get a ground swell from yin to yang. To this are added a harmonic of the four yin/yang combinations that give us a more complex wave structure. To this is added the wavelets of the trigrams, then the tetragrams, then the pentagrams, and the hexagrams. Each level adds nuances to the interaction of heaven and earth and makes the patterns of interaction more complex. All these levels are there, and we can select a threshold of complexity at which to study any particular phenomenon. The autopoietic system resides at the level of five threads to the warp. It doubles the tetragrams by adding another distinction beyond inward/outward, sensory/meaning, terrestrial/celestial, basic/metaphorical. It adds a thread of inner coherence at the center of the meta-system analogous to the golden section. The shell in the character Hsein unfolds according to the Fibonacci series. The golden mean gives us the perfect relation between the parts and the whole. The larger part is to the whole what the smaller part is to the larger part. This is harmonic unfolding that appears

in the growth of many organisms. The pentahedron as the meta-system represents the growth of the minimal system, its unfolding into existence. When we consider the minimal system as a temporal gestalt, we get the pentahedral meta-system. But within growth, there is a hidden possibility of sustained growth as identical with stasis. Plato wanted to found his city on this form. It is the form of the reflective autopoietic system. It is a hidden possibility of growth and no-growth at the same time. Plato's sophist wanted change and changelessness at the same time. The pentahedral structure of growth has hidden within it this possibility which is like the soliton. The soliton is an anti-entropic wave. It will go on forever within its channel. We see that the Kleinian bottle within the pentahedron is a perfect channel whose inside is its outside, and so within that channel we might have solitons in perpetual motion. Solitons in a Kleinian bottle is the image of growth arrested, yet perpetuated forever at the same time. There are not just solitons, but also instantatons. They exist when the trough is through potentials as well as actuals. Thus, we see instantatons popping from place to place. The 20 relations between heaven and earth are the places. The 32 pentagrams are the waves which pop from place to place. They do so as operations on a boolean ring are performed. Through these operations, the pentagrams, or what ever bifurcation level of complexity is chosen, transform into

each other. The thing about the level 32 is that it is the first level of complexity that has enough different patterns to give each of the relations between heaven and earth its own quality. The level of the I Ching is preferred because this binary structure has within it 20 sources that correspond to the essential relations between heaven and earth. In fact, the level 32 is conspicuous by its absence in the Chinese theoretical system. They avoided expressing the Hsing as pentagrams. However, we can pick any heuristic level to express the interference between heaven and earth and the complexity of the patterning of the dynamic system. The important point is that the n-grams express the quality of the relation between heaven and earth and can be seen as the woof that moves through the warp of the heuristic bifurcation levels and which produces a woven pattern of fate -- the pattern of the jumps of the dynamic system between states at a given level of its descent toward chaos.

We have accounted for each of the aspects of the character Hsein. The sun and fire radicals represent the heavenly causes and the earthly receptivities. We know from the Chinese there are five heavenly causes and four earthly elements, and these combine to give 20 possible relationships. The threads are the n-grams that, depending on the number of layers in the warp, appear as the woof and show us the pattern of the evolution of a

dynamical system through time. They are, in a specific sense, the writing of the fate of that dynamical system. Fate here means the actualized states to which the system jumps in the order that it jumps to them. These are laid down as a pattern of the woof in relation to the warp. The solid or broken lines in the n -gram represent the passing over or under the threads of the warp. The shell in the character can be seen as the mobius strip or the complex number system. The shell has an axis, the mobius strip has a twist, and the complex number system has the singularity i around which the number system twists back on itself. The Kleinian bottle (the windegg), or the quaternions number system has more such twists or singularities. With a single axis of unfolding a flat fabric is woven. With two or more axes of unfolding, a more complex multidimensional fabric is produced such as the fabric of spacetime.

What has not been discussed yet is the face of the pentahedron as five groups of 20. There are actually several orders of groups that have five groups of that order: 8, 12, 18, 20, 50, 52, 68, ... and perhaps more. We choose 20 because that is the number of elements there are in all the minimal systems of the meta-system. The other sets of five groups could be significant as well in other contexts. For instance, we note that there are five groups of order 50, and there are 50 operators that relate

the logic to the anti-logic under the matrix logic system. This may be very significant. There are 15 groups of order 81 of which five are Abelian. This may be significant as well. It is hard to tell without detailed research into the structures of these groups and their relation to each other. But the five groups of order 20 are definitely important. Here we see the principle of the relation between group theory and higher logical types advocated by W. in his book Change. The only difference is that W. did not realize that the higher logical types at which different group structures appeared themselves formed a closed loop. W. explained the relation between continuous change and discontinuous change based on this structure. A continuous change occurred, as operations stayed within a certain group. When a discontinuous change occurred the same elements acted according to the operations of a different group. What we add is that the groups themselves form a cycle which is related to the pentahedron. This allows us to form a closed set of regimes that is like a meta-level closure similar to the closure of the torus. This gives us an outward closure that is the dual of the inward closure of the Kleinian bottle. Similarly, the pentagrams of the interference pattern is the dual of the actual structure of the meta-system lattice which is our normal structural view of the pentahedron. We know this is true because the same 20 sources appear positively as relations

between Hsing and elements, and negatively as the sources beyond mirroring and substitution in the I Ching. The pentagrams form a ring, and the 20 source forms are dominated by groups which are related to each other as meta-levels which, in turn, form a ring. The autopoietic system is a very complex structure. But all the parts are accounted for as we add to it the structures of matrix logic. What is amazing is that all these structures except for the last one mentioned appear in the character for manifestation in Chinese. It is clear that the Chinese have a deep insight into these structures.

The realization concerning the warp and the woof leads to another insight that should be mentioned. Stern mentions auto-products as his concept of how matrix logic would describe autonomous systems. What we realize is that it is possible to construct a cellular automata which weaves auto-products in two directions where the matrix logic operators form a checkerboard pattern, and the logical truth values (bra and ket) form the other checkerboard pattern. Such a pattern could fold back on itself at the edges in four different configurations, depending on whether the ends were swapped when the edges of the flat cellular pattern were glued together. Two twists on both horizontal and vertical edges would be equal to a Kleinian bottle. The auto-product matrix, with autoproductions in both directions

forming a Kleinian bottle, is probably the cellular automata version of the reflexive autopoietic system. It would be interesting to build such a structure and see whether it possessed artificial intelligence and life as well as social reflexivity.

Ultimately, this structure which is woven, reminds us of fate and the weaving of women. Gelven talks of four ways that fate is used by humans: the gambler uses fate as chance and discovers in it play or risk; the historian uses fate as destiny and discovers in it what belongs to his people; the birthday celebrant uses fate as fortune and discovers in it his own inheritance; the tragedian uses fate as the inevitable and discovers in it meanings. We shall see later that the tragedian in the Oedipus tragedy, for example, uses chance as his sub-text against his continually hurling the fatedness of his character. But within that context, he also acts as an historian as the fated king expresses the destiny of the city, and in learning his fate, Oedipus realizes his inheritance from his father. Thus, Oedipus embodies all the different kinds of the uses of fate.

We distinguish the koan that sees freedom and determinism as simultaneously and independently true from fate. Fate appears because there is an arbitrary lawmaker, Liai, the father who lays down a law, or

curse, or comes under a curse. The arbitrary lawgiver, like the Athenian stranger or Solon, produces a system of laws that ensnare some and free others. The ones who can make and keep contracts within the system of laws are freed to do things that they could not do otherwise. The ones who break the arbitrarily imposed laws become ensnared and entangled in those laws and their punishments. Thus, in the Indo-European system, there is a distinction between those who are freed and those who are ensnared. When this ensnarement in unjust laws is projected upon the world, we get the concept of fate or the Wyrd. The wyrd is the action of Varuna in the world. It is the magical word of Varuna. Thus, the Indo-Europeans had a sense of fatalism which meant that they could be ensnared in their doom at any time. Beowulf, for instance, says: "Fate often saves an undoomed man when courage is good."⁴ This is interpreted by one critic to mean that "If fate has not entirely doomed a man in advance, courage is the quality that can perhaps influence fate against its natural tendency to doom him at present."⁵ Thus, Fate is a predetermined ensnarement. But it may not be a total ensnarement in which case courage can allow the human, by heroic action, to unensnare himself. Fate and Wyrd has a mysterious depth which the Koan of determinism and freewill does not have. This is similar to the difference between the

4. Norton Anthology of English Literature pg. 34

5. Norton Anthology of English Literature pg. 24

mod 2 logic and matrix logic with its forbidden operations. Matrix logic introduces the forbidden which can be seen as the essence of manifestation or unconscious that produces a much more complex system of 81 instead of 16 operators. The 81 Shou of the Classic of the Great Dark is the structure of ensnarement. It is a mysterious structure.

Shou 42

Tsan 370-378

YING

Greeting

Three single broken strokes on a double broken stroke

Recessive flux.

The completed form of the first half of the elements is united, flows against the current, and meets with this element in greeting.

The Scaly Dragon lies beneath the water

In the abyss

Crossing the water, at the third hour

The transformation of man is completed.

Through Yin's words

One hundred clans are in harmony.

The scaly dragon, lying hidden under water

Transform the Center

The essential quality is sincerity.

The quintessential quality comes and goes;
The weird preferences of the intelligence and
consciousness.

The Secret and the Yellow greet each other;
Their ideas affecting each other mutually.

To see blood enter the door;
Cherishing the greeting in the Central
Chambers.

When the once broken meets the twice broken, there is a greeting. The scaly dragon lies under the water in the abyss. This dragon can be seen as the mystery of the ensnarment of fate or the wyrd. When we apprehend fate, there is a greeting of the dragon, an unseen cause of our own doom that suddenly appears. Perhaps that dragon, as a monster, can be fought off as Beowulf repeatedly does. Or perhaps the monster will claim us. Beowulf, in his swimming contest, crosses the water, and by crossing that water and fighting off the sea monster, he is first transformed into a hero. That mystery, as we see it in the inner structure of the autopoietic system, has special magical words that bring harmony. The harmony is the arising of the possibility of the autopoietic structure in society. The magic words forbid the 50 operations within the matrix, and thus posit the essence of manifestation, split logic from anti-logic, and produce the 50 intermediate operations which are the structural

transformation between logic and anti-logic as well as the path of their cancellation. The scaly dragon under the water transforms the center. The center is the third thing. This third thing can be seen as an unseen cause, as a dragon, or as the yellow palace of Being. The dragon brings the mystery, the trinity, the paradoxicality on which the Indo-Europeans seem to thrive. This transforms the center into not just the harbinger of chaos, but also the prerequisite of the appearance of the autopoietic system as the utopia which is opposite the kakatopia.

The essential quality is sincerity, but the quintesssential quality comes and goes. The quintessential quality is not stable. It shows us the weird preferences of the intelligence and consciousness. We can interpret this as Sartre's nothingness, or bad faith, which is at the center of consciousness. It is a distortion of consciousness which is caught between process Being and Nothingness which cancel to produce Hyper Being. In Hyper Being, the Essence of Manifestation appears along with the differing/deferring within manifestation that indicates the unseen presence of the causes that will ensnare. That is the dragon under the water. The Secret, essence of manifestation or unconsciousness, and the Yellow, the manifest house of power and Being, greet each other. Their ideas mutually affect each other. This occurs

through the logic and the anti-logic cancelling via the intermediate logic operators. To see blood enter the door, again the image of red or violence. The fact that logic and anti-logic inhabit the same space means that there will be war. It is like the two chess armies. They each contain 64 bits of information -- exactly what they need to map the whole board. Each army is the transformation from two to three dimensions of the same information differentiated by the board. This first occurs at the threshold of complexity of 64 which is 2^6 and 4^3 . The next number that this occurs at is 729. The 81 Shou of the classic of the great dark are meant to have nine Tsan, each to approximate this next level of complexity where the perfect transformation between dimensions occurs. The transformation between dimensions also sets up the possibility of conflict between identical nihilistic opposites, as in chess. Cancellation is seen as a war between the forces of light and the forces of darkness. This is the Zoroastrian approach to the opposition between the nihilistic opposites. Ahura Mazda stands eternally against Ahariman. Logic is eternally cancelling with the anti-logic. The cancellation process can be seen exactly in the 50 operators. The 50 forbidden operations become the 50 intermediate operations between the logic and the anti-logic. We see blood enter the door because we smell conflict arising, such as the conflict between the armies at Troy or the armies in the Mahabharata. The

Western worldview generates conflict, total universal war, as a by-product. Even if we cherish the greeting in the central chambers, we cannot escape the fate of utter war, the projected reality of the all against the all including the self against the self as posited by Plato. In the central chambers, the possibility of too much harmony, i.e. the autopoietic system, is balanced by the war at the door which eventually slips in to destroy the utopia.

Gelven says fate is abandonment⁶. He seems to follow Heidegger in this which sees fate as falling, a gnostic image. Instead, we can realize that the essential Indo-European image for fate is ensnarement, and that the idea of ensnarement is artificially produced. It is based on the strange depth that existence has due to projection of the essence of manifestation or the unconscious which, in effect, produces the logic/anti-logic duality that leads to cosmic war. Those who fall in the cosmic war are fated to do so, as those who survive within it are slated to be heroes even if they do not survive the whole battle. The hero is the one who fights his fate and avoids ensnarement as long as possible and goes down fighting. And that fatedness is seen as being embodied in the weave of the golden threads that connect heaven and earth through the ribs of the shell of the unfolding

6. See Gelven, M. Why Me.

cornucopia. Women do this weaving. The Norns are the ultimate weavers, but other women weave fatedness as well, such as Helen and Penelope. And we have discovered that through the appearance of the quaternion group and the Cayley hyper-complex numbers systems, this weaving can occur on a loom with multiple axes. The Cayley hyper-complex numbers give us four axes the same number as there is in spacetime. So the weaving of the fate of dynamical systems in spacetime can occur through the loom of the reflexive autopoietic system. This says that fate is social. It is a projection of the Indo-European social system. It is a strange world with a mysterious depth. It has within it a wondrous possibility of ultra-harmony within the reflexive autopoietic lower utopia which balances the horror of the kakatopia it projects as a reality on the earth and its surrounds. This is ultimately another image of the nihilistic opposites of ultra harmony verses ultra disharmony. Too much harmony and too little harmony. The Western system can never find the middle way. It is lost in a storm-tossed ocean of a myriad of extremes.

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