Chapter 4. Conjugal Bliss

At its core anything is simple. There is a fundamental principle of Observer Physics that when you explore anything thoroughly enough with attention, you begin to uncover what Palmer calls "Corecepts," or core concepts.

Core Concepts have great generalizing power and often tunnel across disciplines in their generality.

For example, at the end of our discussion of Cantor and the Decimals (sounds like a rock group) we discovered that to resolve the diagonal question, we need the core concept or belief (definition) that every decimal, whether degenerate or non-degenerate, has a conjugate "soul mate." Then we assume that our list of binary decimals contains all possible conjugate pairs, and that the unflipped diagonal is always on the list. If we make these conditions, we can "peek" into the list and see its completeness (and countability). The flipped diagonal will be the conjugate of the unflipped diagonal and therefore definitely on the list. Otherwise we can't tell one way or the other.

The conjugate principle is moving us toward Maharishi's SCI principle of wholeness.

Postulate: Every decimal in the set has a conjugate partner that also falls somewhere within the set.

Corollary: The two limit points of the decimal interval (0 and 1, 0.00000... and 0.11111) form a conjugate pair.

The conjugate of a degenerate is a 1 tailed decimal that automatically (from our localized viewpoint) converts back into a degenerate decimal somewhere on the list, possibly the same degenerate, in which case it is a self-referring conjugate pair: (e.g., 1000... --> 01111... --> 10000....) If it is not self-referring, it forms a pair of pairs, each with 1 tailed partners, that resonate with each other and collapse into a single pair when the 1 tailed partners convert back into ordinary degenerate decimals: (e.g., 11000... --> 00111... --> 01000... --> 101111... --> 11000....--> .....) The conjugate of a non-degenerate is a string of 0's and 1's with each digit reversed. It does not self refer, but in the case of periodic strings, the pair can be identical but phase shifted: (e.g. 10101010... <--> 01010101....) Algorithmic strings may do interesting things when flipped: (e.g., 1011011101111011111O... --> 01001000100001000001....) -- but they will have a conjugate algorithm. Non-periodic non-degenerates will just have a different, but conjugate, string with each digit reversed, by definition and common sense, since we can't actually write any one of them out in full.

This business of conjugate decimals expands its territory of influence when we realize that the decimals between 0 and 1 map to any interval or space or to anything and everything in the universe. We have already mentioned the importance of conjugate forms in quantum physics. We may also corroborate our corecept of conjugate decimals with the even more (or at least equally) general finding in Fourier analysis that everything has its conjugate mate. Most of these pairs remain as yet undiscovered. For example, the conjugate mate of a pure continuous sine wave is an impulse function, the equivalent of a dot. We recall that a dot in the context of an arbitrary interval is the equivalent in geometry of a single infinite decimal. So we have connected these two principles.

- 0.0000000**1**000000000000.... (Impulse Function)
- 0.1111111**0**111111111111.... (Sine Wave Propagating from a Source)
- 0.11111111000000000000.... (Collapsed Wave)

Interestingly, in this model, only a "dense" periodic wave has an impulse mate. The mate of a "spread out" wave

^ 0.010101010101010**0**010101010101....
^ 0.101010101010101**1**1010101010101...

forms a conjugate non-degenerate wave. The "spread out" wave represents a compound wave, not a pure sine wave.

Through Fourier analysis we discover that we can make any shape out of a sum of iterations of a single sine wave superimposed on itself after various transformations of phase, frequency, or amplitude. You can make anything in the universe. But it takes an infinite number of such sine wave iterations to make a pure impulse function. These two forms, sine and impulse, are like the opposite poles on a sphere or on a range of possibilities.

The principle of conjugate pairs is even more general than that. You can make anything out of anything. In other words, you can take as your base waveform any form (an umbrella, a flower, a piano) and by summing iterations of it at various phases, amplitudes, and frequencies, you can generate any other form. Each base form will have its own perfect conjugate somewhere in the universe that is made by so-to-speak turning itself inside out (or outside in). An impulse is a sine wave turned completely "outside in", and a sine is an impulse turned inside out.

Experiment: The inside-out/outside-in transformation process is controlled by the Observer's viewpoint. To experience this, draw a sine wave (an interval of course) on a piece of cardboard. As you hold it in front of you and look at it, your line of sight is orthogonal to the wave form. You see a sine wave of a certain wavelength and amplitude. Now, holding the cardboard on an axis orthogonal to the wave, rotate the cardboard until it is turned 90 degrees relative to your line of sight. As you rotate the card, you will see the wavelength appear to shorten. When the card is lined up parallel to your line of vision, the wave will become an impulse function. So, at least in this case, the two conjugate forms are the same, but observed from orthogonal viewpoints.

A viewpoint transformation of **some** kind can be done to go back and forth between each conjugate pair. Unfortunately we just don't know what all the transformations are for all the possible forms, nor do we even know what the pairs are. But there is apparently a (one-to-one?) dictionary mapping of everything in pairs. This includes people, states of consciousness, and so on. Maybe the Noah's ark story isn't just a myth Noah means quietness in Hebrew. Maybe if the mind is real quiet you can see all the pairs within the compass[ionate] arc of the mind, and the transformations that link them across space-time and consciousness.

Principle: Every relative creation has a conjugate mate.
Corollary: The conjugate of the whole relative world is the Absolute.

From this corollary probably comes the old saw: As above, so below. As you can see, it probably should say: "As below, so above."

We recall that in our model an infinite mathematical sine wave is represented by a non-degenerate symmetrically periodic decimal (such as 0.101010101...). This corresponds to a point in geometry. Degenerate decimal waves are composites of overlaid periodic decimals in which the spaces after some point to the right are all filled with 1's, and then the 1's flip to 0's and stabilize. One wave is non-localized, and the other is localized.

Non-periodic non-degenerate decimals represent chaos in a system. For example, suppose we have a system with any two linked oscillators. We can describe it with a phase space that is toroid shaped. We can represent the operation of the system by a point spiraling around the donut like a crazy ant.

This way of looking at the pair of linked oscillators uses a simple mathematical concept called a Lagrangian, a very powerful and general descriptive tool that plays an important role in both classical physics and modern quantum mechanics. The Lagrangian method is a clever way of representing the time evolution of a complex ensemble given that we can identify its constituent components and their "initial conditions" at some arbitrary moment in the system's history. You can get the details on it from Donald Menzel, **Mathematical Physics**, (155-159, et al.) or other sources, but let's digress a moment and take a look at this mathematical method before we go back to our binary decimals.

In our example there are two oscillators. Each varies in such a way that it can be described as moving around in a circle. The Lagrangian idea is simply to represent the whole system with its two oscillators all at once as a single particle evolving in the context of a TWO dimensional phase space. Combining the two circles gives us a circle rotated in a circular way -- a torus, or donut. So we can represent the oscillators together as a single line meandering about on the donut-shaped phase space plane. Thus we represent the evolution of the ensemble of two unidimensionally varying objects as a single particle wandering in a two-dimensional space. If we can describe that motion with a function, then we have a history of the motions of the two-object ensemble for all time. The only other information we need is the positions of the two particles at some arbitrary point in time when we decide to start the clock so we can anchor the system to our temporal reference frame. These are the "initial conditions". Theoretically a classical set of trajectories or a quantum wave function can take the form of a Lagrangian and describe the entire history of a collection of interacting particles. In practice it is not that simple. Partly this is because of the difficulty of pinning down initial conditions, and partly it is due to built-in uncertainty, and perhaps lack of some component information, not to speak of the problems of dealing with 10*23 or more components in a system of atoms or molecules. That moves us into territory where we take recourse to other approaches.

Once we understand the general principle of the Lagrangian, we can adapt the mathematics to describe the motions of any ensemble or any other kinds of variation you can imagine in a multidimensional phase space. For example, a system of (n) particles moving about in a three-dimensional space can be described as a single particle moving about in a (3 n) dimensional manifold. This procedure has significance for observer physics, because it demonstrates how an observer can shift viewpoints with regard to a system. Viewing from one perspective he sees a multiplicity of objects interacting in space/time in a complex way. By a simple shift of perspective the observer can "unitize" the multiplicity of objects into an ensemble, and then treat the ensemble as a single particle without sacrificing any of the diversity inherent in the multiplicity. No information is lost, and at any point in time the observer can give you a status report on every component of the system by simply reading off its value in each dimension at that point in the phase space.

The Lagrangian approach simplifies a system, and at the same time maintains a vision of its complexity in terms of the dimensional size of the phase space. Instead of measuring entropy in terms of multiplicities of microstates of many particles, the observer then measures it in terms of a single particle in multiplicities of dimensions.

An interesting sidelight is that the Lagrangian approach, when applied to number theory, can result in the representation of ALL real number decimals -- which form the continuous points in a single line segment -- as "whole numbers" in an infinite dimensional phase space. That is to say, we can think of each point on the real line as a projection of a single point somewhere in a denumerably infinite dimensional space of whole numbers in the same way that we can project each value of the function y = 2x to a point on the x axis.

<u>Key Principle of Observer Physics</u>: The observer's attention defines the level of multiplicity apparent in a system. By zooming in far enough, macrostates disappear, and microstates reveal unity and simplicity. By zooming out far enough, microstates disappear and the macrostates can unitize into a single particle with no state changes. (Refer to **ReSurfacing**, Exercise # 26, "The Expansion Exercise", # 18, "Viewpoints".)

Let us return from our digression to consider an interpretation of the linked oscillator phase space in terms of binary decimals. The activity of the meandering point represents every possible binary decimal from 0 to 1. We can also see demonstrated the binary decimal conjugate pairs, which depend on the Observer, of course. The Observer' s criterion is whether the point passes through an arbitrary particular point that he designates as the "initial condition" or "starting point". He can call "re-passing" through the starting point a 1, and "not re-passing" a 0. Each cycle around the donut thus generates a 0 or a 1, producing an infinite string of 0's and 1's in our idealized system. If the moving point passes through the starting point every so often, the string is periodic. If it passes through for a while and then stops or passes through periodically but then settles down to passing each time, the string is degenerate. If it never passes through, that's 0.000.... If it always passes through, that's 0.111... = 1. If it passes now and then randomly, it is a non-degenerate string. Such a set of strings is called "quasi-periodic": it looks periodic on the surface because it goes around and around, but is really chaotic because it never follows exactly the same path. (See Briggs and Peat, **Turbulent Mirror**, pp. 40-41.)

Our Observer can shift his viewpoint and reinterpret the system: Passing through can become a 0, and not passing through can become a 1. The phase space system is the same, so the list of possibilities is the same, but each string on this second list is the conjugate of a number produced by the same string of cycles of the system viewed from his first viewpoint. Both lists contain only 0's and 1's and are a complete catalog of all possibilities of the system's phase space operation. Thus they both contain the same list of numbers. We see here a demonstration of how each decimal has its conjugate. The Observer looks at the same system doing the same things, but, from a different viewpoint, he gets the same list in a different sequence. The two sequences are paired one-to-one by conjugation.

In chaos theory Mandelbrot and others have found that in any chaotic sequence, such as white noise, there are always embedded binary cascades of the strange attractors of orderly fractals buried inside them (and vice versa). Order and chaos are conjugate fractals. For a quick intuitive idea of it think of Escher's drawings. Mandelbrot's classic work on the subject of fractals is really worth delving into. Briggs and Peat's **Turbulent Mirror** also is a good introduction to fractals. A binary cascade is like our list spliced with alternating degenerate and non-degenerate decimals. The "chaotic" non-periodic decimals form gaps between "orderly" periodic and/or degenerate (i.e."terminating" periodic) decimals.

With our "gap" theory of non-degenerate numbers we can suppose that each degenerate decimal represents a point in an interval, and each non-degenerate decimal represents a gap of indeterminate size between points.

Principle: Each point in a line interval has a gap partner, except the limit of the interval, so there's one extra dot. (Or, if we don't include the two limits, we have one extra gap.)

Let's look at a binary cascade. Suppose we have a mathematically modeled system such as an iterated growth equation

* $X(n+1) = B\ Xn$

The (n)s are subscripts indicating generations, and (B) is some birthrate factor that shows how fast the growth goes. We normalize the equation so all the (X)s occur only between

0 and 1. That means we are dealing with either degenerate or non-degenerate decimals from our list as outputs for the system. Now we multiply the right side by the Verhulst factor (1 - Xn):

* X(n+1) = (B Xn) (1 - Xn).

Instead of a continuous population growth, we get a nonlinear system that self-interacts. It will tend to oscillate around an attractor. If we increase the "birthrate" factor (B), we begin to put some stress on the system and the attractor oscillates, but then settles back down. It is stable at .66. If we push (B) up more, the oscillations last longer but still settle down. At a certain (B) value (3.0), the attractor bifurcates and we have two attractors governing the system' s oscillations. Add more stress on (B) (above 3.4495), and the attractors bifurcate again. Continuing in this manner, when B = 3.56999, we get a cascade of bifurcations that goes to infinity as its limit. By the time we reach B = 3.7, the population varies wildly, but when (B) is a little over 3.8, there' s a sudden window of orderliness. Around 3.86 the chaos returns. By 4.0 it completely fills the phase space from 0 to 1.

Remember that this is a cascade of bifurcating values, all of which lie between 0 and 1. So we are filling the phase space interval with "dots" or decimals. At a certain limit for (B), the number of attractors reaches its limit of infinity. This process of increasing (B) and bifurcating attractors is sometimes called the "period-doubling route to chaos." When Robert May of Princeton did computer plots of the Verhulst equation, some surprising things showed up. He found that after the attractors went from four to infinity (which they do in a rapid cascade), the "infinities" regions reversed and went to four, and then to two, and then to one. The "infinities" regions of chaos in the same progression however also expanded their territories in orderly parabolic curves "eating" each other up. Furthermore, odd blank bars occurred where the system suddenly went from chaos back to normal for no apparent reason. These windows of orderliness recur fractally (at different scales) throughout the range of (B) values. Then, within each window of order, the bifurcation cascade process repeats in the same way but fractally at different scales and speeds. This apparently chaotic intrusion of orderly bars of varying width is called "intermittence". Apparently a stable, orderly system fractally remembers chaos from time to time (like a radio broadcast with occasional static), and a chaotic system fractally remembers its original orderliness from time to time.

This discovery destroys the thermodynamic hypothesis of ever-increasing inevitable entropy and chaos. Total chaos is just a theoretical limit to a range, and total order is also its opposite theoretical limit. Real world systems have no "absolute" zero ground state of orderliness or "absolute" chaos of total never-ending disorderliness. These extremes are conjugate poles of a system, just as 0 and 1 are for decimals. When the stress goes beyond a certain limit, the system becomes totally chaotic within the entire phase space. The attractors then overwrite themselves (increasing their density) and the occurrence of order bars appears to decrease. The window bars of order become unmanifest. But order is still buried deep inside the chaos as the other side of its nature that makes it possible for chaos to be chaos. This mathematical model gives very useful descriptions that apply to lots of real world situations.

On the other hand, if you de-stress the above system, it becomes more and more orderly. This is what Maharishi calls lowering the level of excitation. If you decrease (B) until (1 > B > 0), then the Verhulst system inevitably becomes as "extinct" as dinosaurs and dodos. There are no attractors, because there is no population. Extinction is a very orderly condition. Death is a great "attractor." But just as there is no permanent life, there is no such thing as permanent death. Even after the thermodynamic "death" of the universe, there remain minute fluctuations, quantum fluctuations -- little Jurassic Parks -- that can roil the whole thing up again. A key finding of chaos theory is called the "butterfly" principle. Even a tiny fluctuation can cause an upheaval in a nonlinear system.

This brings up another key principle -- the Poincare Peak. All quantum physicists must never forget the Poincare Peak, especially because they believe so strongly in the magic of statistics, the greatest shell game going. A Poincare Peak is an occurrence of the **LEAST PROBABLE** condition of a statistical system.

Principle: In any system involving "random" statistical fluctuations that recur at a certain average frequency, you will always have a Poincare Recursion, the inevitable recurrence of the LEAST probable condition of the system, a window of "pure" orderliness.

Corollary: Poincare Peaks (PP's) are flashing by fractally at infinitesimal intervals all the time.

Corollary: If we put our attention on the PP's, we can "zoom in" and live on top of a Peak or anywhere on its slopes. We simply change lenses and change the movie -- any way we like.

Even though blind democracy seems to rule most of the time with its vastly superior population at the equilibrium macrostate, the "Minority Report" comes to light occasionally. Every dog has his day, even the least probable one. The **Avatar Materials** are a Minority Report of a highly improbable kind from one viewpoint. From another viewpoint they are inevitable.

As long as conservation holds, and physicists really don't want to let go of that one, the system never forgets, even though it sure looks like all the data is erased by the scrambling of entropy. Physicists discount recurrence of a Big Bang after a Heat Death, because its improbability is so vastly, hugely, greater than any imaginable projected time frame for the universe. Not so. They are stuck in their habituated Observer viewpoints trying to look at something that requires a very different viewpoint. They forget that tiny quantum fluctuations can precipitate highly improbable statistical fluctuations in very large systems.

Look at all the macroscopic quantum phenomena we are getting used to these days!! Also, do not forget the role of Observer consciousness. Time is an inseparable artifact of consciousness. Dead men tell no time. No one of our biological ilk lives in a Heat Death. It' s like the Big Sleep. Pure Awareness stays awake, but has no opinion about time. Consciousness of time is caused by resistance in the Observer and has no relation to phenomena except that the Observer who is unwilling to take responsibility for his resistance places the blame on "phenomena." Eventually slight perturbations wake the system up again. Any orderliness is always remembered by the system, because it is there inherently conserved by the very existence of the system in awareness. Of course, if there is no system, there is no orderliness. But then there is no chaos either. There **always** is undefined awareness.

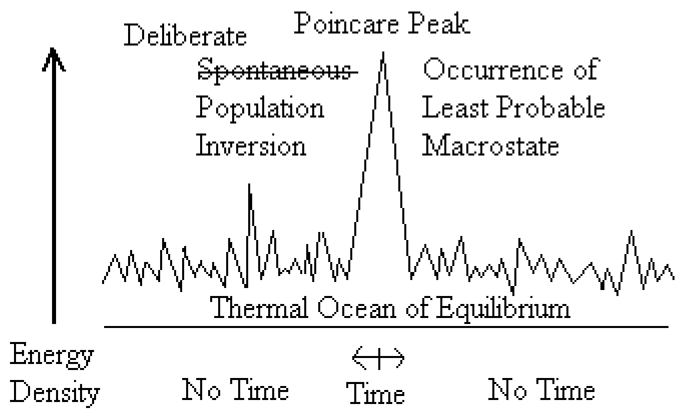
Principle: Poincare Peaks can recur sooner than you imagine if you can imagine that they recur sooner than you imagine they do.

A great example of how the system never forgets even when erased with total chaos is the story of data going into a Black Hole. Physicists talk of the three hairs: mass, spin, charge -- that are all that remain of information attached to anything falling into a black hole. First of all, this notion suggests that really all information is just made of combinations of these three hairs, just like all colors are made from the three primary colors.

Let' s just suppose that there' s some information attached to this book and it falls into a black hole. Information is a form of energy. You can' t have energy just disappear or that violates some of the basic ideas of physics about conservation. The situation is complicated by Hawking evaporation. An object goes in with information and material can come out -- but apparently without any information other than the three hairs -- when it emerges. Observer physics comes to the rescue. The problem is caused by the physicists shifting viewpoint without telling you. When the book falls into the black hole, we are on the outside watching it go in. When the electrons and other fully erased particles come radiating out, we also are on the outside watching. However, the book remains intact, stuck on the event horizon from our outside Observer viewpoint. There it remains for all time. Only from the viewpoint of the cockroaches riding on the book does the data actually fall in.

The black hole distorts space/time so that different observers get widely different interpretations of events that seem situated fairly close together. So as far as we observers can tell from the outside, the information remains intact and is stuck like a postage stamp on the event horizon. It remains there unless the black hole completely evaporates or joins with other black holes and swallows up the universe. In the latter case the observer falls into the black hole and his viewpoint has shifted dramatically. In that case he may not see the information in the same way that you don' t see the information of the wavelength of your sine wave when you turn the cardboard 90 degrees. He moves to a viewpoint where he may not be able to see it, though it may still be there. If the black hole completely evaporates, the terminal phase is greatly accelerated and ends with an explosion. This rearranges the book' s information pretty thoroughly as it scatters through our viewpoint in bits and pieces, but does not "destroy" anything. It is probably expanded and broken into little pieces and thoroughly rearranged. This is like incinerating your piece of cardboard with a firecracker or match.

Principle: Conservation holds unless the Observer doesn' t hold onto conservation. (The Observer decides.)



(DE) (Dt) >= H

NOTE: See Laurent Nottale' s **Fractal Space-Time and Microphysics**, especially chapters 2 and 3, for discussions of fractal spaces, hyper-real numbers, and other fascinating new approaches to models of physical systems.