

DOWNSIZING DARWIN



**AN INTELLIGENT FACE
FOR EVOLUTION**

ROBERT CAMPBELL

AN INTELLIGENT FACE FOR EVOLUTION

Ever since Darwin evolution theory as practiced in the West has taken the view that life is an accident devoid of plan or purpose. We humans ourselves are believed to be merely the random result of successful genes playing out evolution's blind game in the biosphere. The survival of successful DNA sequences is now believed to be the name of the game. Thanks to Richard Dawkins' popular book "*River out of Eden*" the arguments in defense of this Darwinian view have been presented in a way that allows them to be critically assessed. Part 1 of *Downsizing Darwin* shows that the arguments do not stand up to close examination, nor are they confirmed by the empirical evidence.

Although there is a place for natural selection, *Downsizing Darwin* goes on to demonstrate compelling evidence that there has always been intelligent direction in the evolutionary process. Moreover it demonstrates how intelligent processes are structured to function in the biosphere. This new method can be understood as a new paradigm and an expression of the cosmic order. It is a practical methodology applicable to the sciences, with profound implications for each of us. Intelligent processes are at work in human beings in a self-similar way to how they work in the natural order, ascending through the plants, the invertebrates, and the vertebrates to human. In the process they have invested us with three brains, three related but independent minds, in the long climb up evolution's ladder toward sentient awareness of our place in the cosmos. We have an ancient emotional mind that spans 400 million years of evolutionary history. We have a social mind that is transient, coping with the flux of ongoing circumstance moment by moment. And we have an intuitive mind that seeks the eternal. We are strange creatures indeed, part animal, part human, part divine.



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DOWNSIZING DARWIN

by Robert Campbell

A Critique of Darwinism
as presented in

RIVER OUT OF EDEN
A Darwinian View of Life

by Richard Dawkins

and

Introducing

AN INTELLIGENT FACE FOR EVOLUTION

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DOWNSIZING DARWIN

Robert Campbell

FOREWORD

When Charles Darwin published his famous book *The Origin of Species* in 1859, he began a debate that has, if anything, gained in intensity over the years. With modern techniques of probing genes the debate has taken on new proportions. A new breed of biologist, armed with a genetic arsenal, is striving to reduce the whole of life to the mindless perpetuation of DNA sequences. This, some feel, is consistent with the cosmological implications of the Big Bang—the origin and evolution of the universe according to blind, deterministic laws. In its passion for unity, science reduces life to a meaningless enterprise, an accident without pattern, plan or purpose. What a grand vision to lend humanity a sense of cohesion and lead us into the new millennium inspired with hope and direction.

On close examination, it becomes clearly apparent that there is no hard evidence to support random mutation and natural selection as the sole mechanism driving the evolution of species. This claim for a mindless evolutionary process, is itself a blind belief, completely lacking in substance. While many of us may sympathize with Darwin's disenchantment with the Biblical story of creation, this doesn't justify an alternate extreme. In the context of his time one can understand Darwin's need to reinterpret his evidence in a new, more coherent, and intelligent way. So he came up with the idea of accidental mutations which may, in rare cases, endow a greater survival advantage, leading to their natural selection, and consequently to the emergence and adaptation of new species according to environmental pressures.

There is abundant evidence to indicate that life has evolved up through the lower species, and adaptation according to natural selection is surely a part of it. But there is also abundant evidence to indicate that there is intelligent direction implicit in the evolutionary process, unfortunately all of it overlooked by science. Such questions are forbidden in the halls of science. It seems that mainstream science insists on placing itself in opposition to anything remotely smacking of spiritual overtones. And yet science openly strives to close the book on the whole

story of creation, to create a belief system with itself as the only authority, a book it believes must ultimately be accepted by all people for all time. It is an ambitious dream to be sure. But it would deny us any spiritual reality, deny there is any transcending basis to values, deny there are any moral issues implicit in experience, and consign us all to ultimate oblivion. This rather leaves us socially bankrupt as well. It's a truly strange phenomenon that well intentioned scientists of our intellectual elite could unwittingly embark on such a course. To any impartial observer something is off the rails. We are destroying ourselves through dogma, either the dogma of science or that of religion, and there doesn't appear to be any way to turn.

With these thoughts in mind the following book is written in two parts. Part 1 is a critical review of the most outspoken hard line Darwinist's thinking, as expressed in one of his several popular books (Not required reading). Richard Dawkins, an Oxford professor, is a very high profile figure in the UK academic community who has done a great deal to popularize the Darwinian view. His confrontational approach begs analysis and it seems appropriate to single out one of his books for discussion. His approach invites a critical review of the arguments he presents.

But it is not enough to ferret out the countless flaws in the thinking that pervades the whole of evolutionary biology. One must offer a more credible alternative consistent with the evidence. It is to this end that Part 2 is devoted to *An Intelligent Face for Evolution*.

DOWNSIZING DARWIN

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PART I

A Critique of

Richard Dawkins' book
RIVER OUT OF EDEN
A DARWINIAN VIEW OF LIFE

Introductory Commentary

In the academic world it is usual for scientific contributions to be assessed by a peer review process that for all of its weaknesses is better than nothing. A peer review process can cut both ways, however. Biases inevitably come to play, as they do in all human endeavors, and a peer review process can often serve as much to promote them as to expose them. It is only over time, sometimes over periods of many centuries, that biases gradually get weeded out from our garden of acceptable ideas.

In our current social environment, still on the threshold of the twentieth-first century, there is a tendency for certain academic ideas to get publicly extolled in popular editions, asserting views as established truth without confirming evidence to support them. This is a little disconcerting, since lay people have been educated to believe that science is a highly disciplined search for truth, based upon solid empirical evidence. We have seen the results. We drive cars. We have television sets and computers. It may therefore come as a surprise to some of us that strong biases and political pressures often prevail in scientific circles.

In Part One of the book we will be examining scientific biases that are currently favored in evolution theory. Richard Dawkins is to be commended for his popular writing in this regard, for he has attempted to publicly address many questions posed by skeptics of the evolutionary process as viewed by Darwinists. In doing so he has opened the way for public examination of the issues involved, for they concern us all. Darwinism is taught in our schools and it inevitably influences the thinking of future generations and the direction that our cultures will take.

Since literary works of a popular kind sometimes use the mantle of science to cloak biased views in the guise of truth, it is important that they be critically assessed. The scientists that write them have no conscious intention to deceive the public. They believe in the social value of what they are doing and they are conscientiously committed to their jobs. That's why they write. However subtle their biases may be they also wish to swing the tide of public opinion behind them. Science must sell itself as a worthy endeavor, as it should. We cannot get along without science.

The public, of course, is usually in no position to assess the merits of ideas preached from the pulpit of science. These are learned people who are experts in their field and highly respected. They must be right. Since there is normally no peer review in the public domain there is a good chance that many will believe the views that an expert expresses. In the interests of a little balance it should therefore be permissible for someone to take an academic writer to task over ideas that he publicly champions as truth.

I don't mean to single out Richard Dawkins for personal criticism. I'm sure he is a conscientious man who is very committed to doing his job well. He also shows signs of being inconsistent with some of the extreme views he expresses in his book "*River out of Eden*." And he may well have moderated his views since the book was first published in 1995. The book is nevertheless instructive because of the ideas it promotes that warrant the most critical examination. As one of the most vocal proponents of views that have become firmly entrenched in the academic community, the book betrays a powerful scientific bias, without the support of empirical evidence.

Richard Dawkins is the author of a number of popular books including *The Blind Watchmaker* and *The Selfish Gene*, books that by their title tell where he is coming from. He is promoting the Darwinian concept that the evolutionary process is the blind indifferent result of rare random mutations, a few of which accidentally endow a survival advantage that environmental selection pressures consequently favor. Some Darwinists have taken a more moderate line in recent decades, but not those of Dawkins' persuasion. As Dawkins himself claims, they have all but achieved a closed shop in scientific circles and they are promoting their beliefs as gospel to the general public, as we might expect.

The comments offered here are not intended to contest that chance events play a part in the evolution of life. We know from our own experience that accidents happen and some of us have a better capacity to cope with them than others, resulting in a certain survival advantage. There is every reason to believe that similar influences have helped to shape the development and adjustment of species in the natural environment.

What is contested here is the exclusive view that this is the *only* creative agent at work in the universe, or even that it is the most important. In the case of human experience most of us assume there is an intelligent process at work in the human mind that allows us to cope

creatively with random accidents. But Darwinists deny that there is any intelligence whatever at work in the evolutionary process. They believe that the universe is a vast sea of random atomic, molecular and radiation collisions, with no coherent universal order behind it other than these local chance collisions. This is a universal world view that they implicitly accept as the only foundation of the entire universe.

There is no evidence, much less proof, to support such an extreme position. It is a blind belief, a rock solid bias.

Accidents happen. They must be accommodated and adjustments made for life to continue. But we may not correctly assume from this that all events are determined by accident. There is also a system of order that pervades the universe, from atoms to galaxies and stars, and from the simplest bacterium to plants and animals and humans. All things in the universe are interrelated and interdependent, whether by gravity, light and electromagnetism, or by the chemical bath that we swim in. There is gravitational and electromagnetic communication between the stars just as there is physical and chemical communication between living species.

This is only part of the picture. We shall see that there is also tensional communication between the galaxies and stars. There is a synchronicity to their collective being and to the atomic synthesis that takes place in the centers of stars in the process of integrating space and time. There is also communication between the species through universal hierarchies that are an expression of an evolutionary order to the creative process on every level. There is a self-similarity that pervades the structure of all experience through which we are able to integrate and make sense of our everyday experience.

In touching on some of this as we go along, we shall see that the cosmic order that pervades the universe is implicitly intelligent. The nature of this *System* of order has been explored elsewhere¹, however we shall see here that there are persistent clues as to how intelligence works right under our noses, with the evidence spread far and wide. But there is no practical paradigm of how intelligence works currently available to science, leaving them with accidental causes in the classic mold of cause and effect as the only scientific alternative. This lies at the root of the professional bias espoused by the scientific community. It is that bias that will be under critical examination here.² It will also be shown that an alternate paradigm is possible that can find practical application in science. It is a paradigm that offers a far grander view of the universe with an intelligent role for humans to play.

With these thoughts in mind, one of Richard Dawkins' books, entitled *River Out of Eden*, will be critically reviewed point by point and chapter by chapter, beginning with the preface. This book will thus serve as a basis for a critical review of Darwinist ideas in general.

NOTES:

¹ The "System" inherent in the cosmic order was first introduced in a general way by the author in *Fisherman's Guide: A Systems Approach to Creativity and Organization*, New Science Library (Shambhala), Boston, 1985. It has been developed in more rigorous fashion for the scientific community in *Science and Cosmic Order: A New Prospectus*, available from the author.

² The bias began to take explicit form with the emergence of western science three to four centuries ago, but its origins reach back to Aristotle and Aristotelian logic (See *Science and Cosmic Order*). The essence of the bias is a refusal to acknowledge that universal influences are operative in the cosmic order of things. In the development of physics, for example, action-at-a-distance has been shunned like the plague. All events are believed to be the result of local influences operative in a space-time continuum. General Relativity theory has reduced space and time to a continuous field with curvatures to account for apparent gravitational actions-at-a-distance. It is a poor use of words because they are ambiguous. It is not claimed here that effects can be instantly transmitted through space and time faster than light speed. They occur via a timeless and boundless quantum field that mirrors the integrated fabric of space and time. Relationship-at-a-distance is better. Recently, there is experimental evidence of quantum events confirming quantum correlation-at-a-distance. The timeless, boundless and formless field of quantized energy is orthogonal to the integrated fabric of space and time. Universal influences in the natural order of things do keep cropping up, despite our most ingenious inventions to dispense with them.

CHAPTER 1
In the Beginning the Preface

Preface to River out of Eden:

Dawkins begins his book with a poem by Piet Hein:

*Nature, it seems, is the popular name
For milliards and milliards and milliards
Of particles playing their infinite game
Of billiards and billiards and billiards.*

There you have the bias of science wrapped up in a nut shell. Everything is the result of local interactions between elementary particles, going all the way back to the big bang. This is the view of the cosmic order held as immutable truth by mainstream science—an article of faith without a shred of supporting evidence.

Think for a moment. If all being, including the entire universe, is truly just a random game of atomic billiards, then there is no real or transcending basis to values of any kind, including truth. Therefore there can be no basis for saying that everything can be reduced to atomic billiards, for this mindless view offers no basis whatever for truth itself. It is a self contradictory position. It presumes a thing as true while implicitly denying there is such a thing as truth. Truth can hardly be the accidental result of atomic billiards.

One should be able to stop right there. The inherent contradiction should be seen by those who would maintain the position, discouraging them from holding to it. They should look for a more self consistent view, for an implicit order that allows of truth. Why don't they then? Because they do not have access to a practical alternate paradigm that will allow us to understand how intelligent processes work.

I would like to be kind and give Darwinists the benefit of a few doubts that may emerge here and there, and overlook weaknesses in their arguments in the hope that their intentions are directed toward an impartial determination of the truth. But they don't see how they can open the door to other possible options because the alternative is creationism. This is not just a matter of a difference of opinion over a few minor issues. Arguments on both sides are riddled with obvious flaws and flaunted in the face of solid evidence to the contrary. Such an entrenched approach on both sides carries with it a good measure of self-deception. They are reactionary positions in the evolutionary arena.

These opposing positions have little to do with the facts of the matter. They would dispense with most of philosophy, most of psychology, and proceed to contradict the laws of thermodynamics, not to mention the impact on our cultural traditions. On the scientific side this blind one-gearishness would ultimately reduce us all to mindless greed and obsessive action, all in the guise of logical argument.

Darwinian evolutionists *must* choose to ignore a large body of contradictory evidence in order to foster their beliefs. Their faith in the blind process of “natural selection” prejudices their efforts. On the basis of Dawkins’ book, it will be shown that extreme Darwinism is a blind belief without foundation, as fervent as any religion and with all the earmarks of self-deception.

To suggest, as Dawkins does at the outset, that the Darwinian view has poetic beauty and inspirational value is to seriously compound the deception, for now we are treading in a fanciful world of double speak. It is inconsistent with Dawkins’ argument to throw in a healthy dose of values, including beauty and inspiration. Beauty and inspiration are larger than the bare facts of life. They are universally recognized qualities that are implicitly associated in some way with ultimate truth, transcending physical existence. We all sense their transcendent quality and we credit their ephemeral essence as real. Values determine everything that we do. But here we are urged to use them in order to justify a blind materialist view with no self-consistent place for values at all. At the same stroke we are to believe that this is in accord with sound reason.

That’s double speak. After all, no intelligent reader is likely to deny a place in their lives for beauty and inspiration. Are atomic accidents beautiful? We can’t even see them, much less assert with such confidence that they determine our being. Who really wants to live in a world reduced to atomic billiards? Who really believes it?

If no one really believes it, yet say that it is so, why do they make such efforts to sustain the deception? Why did Darwin go to all the trouble in the first place? No one can deny the “extreme perfection and complication” of nature’s mechanisms, but to suggest that Darwin’s hypothesis explains them is an unsubstantiated leap of blind faith. Why did Darwin take this leap?

Is it as Richard Dawkins suggests, that nature’s complex mechanisms fulfill an apparent purpose? Purpose again implies values in anticipation of achieving a future objective. We take medicine for the

purpose of curing a disease. We say it is valuable for achieving that anticipated result. Can we invest genes with the capacity to anticipate the future? Purpose implies intelligence at work to achieve a meaningful result. Then how can all creation be the accidental result of blind atomic billiards? We shall see that double speak pervades the arguments for Darwinism.

Thermodynamics is a fundamental science that deals with such things as energy, heat, work and order. The first law of thermodynamics says in effect that you can't get more out of a process than is put in. The energy involved in the process is equivalent to the work done and the heat expended. The second law says that you can't get as much out of a process as is put in. The energies are more randomly ordered as a result of the process. There is a lowering of the system's potential to do useful work. Thermodynamics denies that order can arise spontaneously from random chaos without some outside agent.

For example, the famous nineteenth century physicist James Clark Maxwell imagined a demon that could separate fast moving molecules from slow moving molecules, and thus create order from randomness. Since living processes are a highly ordered affair, the world would require some intelligent agent in order for life to spontaneously arise. The world would have to be populated with Maxwell's demons to arrange things just so. The accepted laws of chemical processes are contradicted if inorganic chemistry is to spontaneously give rise to the infinitely more ordered realm of organic chemistry associated with living processes¹.

So even on the basis of the chemical laws on which it is erected current evolution theory contradicts itself. We are back to a fanciful world of double speak that flows like an ambrosial river out of Eden in an effort to float the words and works of those most ardently committed to the Darwinian perspective.

Why do they employ this double speak? Why did Darwin make his blind leap of faith? Perhaps Richard Dawkins suggests the reason when he points out the luxuriant diversity of earthly life that impresses us so. We need an integrating principle, some way to mend the incredible teeming fragments of life that swarm through the biosphere and so assimilate them into some intelligible whole. We need some means to integrate the diversity of our experience and a five thousand year old creation myth won't do any more.

Charles Darwin was searching for unity in the diversity of experience. Richard Dawkins is inspired by the beauty he perceives in the unity underlying the diversity. He has used the Darwinian paradigm as an avenue to that end, investing it with “sinewy elegance” and “poetic beauty,” qualities that derive from an integrated perspective. Unity is the unspoken quest underlying our most fundamental scientific and religious endeavors. We seek to either mend or transcend the fragmented circumstances of our physical existence.

From this perspective Dawkins’ purpose is honorable enough, for we surely need some means to integrate our experience in order to cope. But the paradigm is defective, of certain limited merit in its place, but it is overblown out of all proportion. We shall see that contradictory evidence is ignored, distorted, or misrepresented by the scientific community in a vain effort to support a single lame idea upon which the whole of evolutionary biology is based.

The most damaging aspects of the Darwinian paradigm are the entrenched biases that have become associated with it, both pro and con, over the last century and a half since Darwin published his ideas. This has preempted any serious efforts to truly unmask the creative order that underlies the evolutionary process. We may justly call it the cosmic order, for it pervades the entire universe.

NOTES:

¹ Sir Fred Hoyle and Chandra Wickramasingh make a similar point in *Our Place in the Cosmos*, J.M Dent Ltd., 1993. (Phoenix Books, 1996)

CHAPTER II
The Digital Adam and Eve

River Out of Eden - Ch. 1-The Digital River:

The double speak proceeds in Dawkins' first chapter by suggesting that religions are grounded in ancestor worship and that it is real ancestors not supernatural gods that hold the key to understanding life. Is religion really grounded in ancestor worship? According to the founders they are based upon direct experiential insights into a transcendent and intelligent creative order.

The point here is not to justify traditional religions, nor the cultural biases that have become associated with them. The point is that Darwinism is an unsubstantiated belief that cannot claim to be based upon direct experiential insight into the creative process. It is pure conjecture, yet Dawkins insists that life is just digitized information in a river of genes out of Eden.

Dawkins points out that ancestors were survivors and are rare compared to descendants, but this is not a very "astonishing" fact as he claims. It is hardly a profound or meaningful basis for a new belief system to explain the whole creative order.

If a successful life is measured solely by prolific numbers of offspring, thus determining successful genes, and if this is the sole reason why birds fly well, fish swim well, and why we love life, sex and children, then the selfish gene is ultimately the only reality and greed is the only moral. By this standard we may be able to understand why we "love" our own children or close kin, but why should we love or even respect the children of others, except as potential mates to propagate our own greedy genes? Social relationships all become reduced to strategic alliances of mutual greed. Better to kill off others outside our alliances to make more room for own greedy genes to succeed, at least to the extent that we can do it successfully.

Mother Theresa was obviously severely deranged, to say nothing of Jesus Christ or the Buddha, or the countless selfless contributors to enhancing the human condition. And childless souls like Isaac Newton, Copernicus, Michelangelo, and Leonardo were likewise all losers, unless we are to think of them as worker ants foregoing offspring so that others, who might happen to share some of their genes, may better survive. The most intelligent and compassionate among us must be blind slaves of

genes, along with the most mindless of the propagating majority. This view of Darwinism denigrates us all. It would leave us bereft of any sense of meaning to our being except the blind gratification of animal drives. Insight into the creative order begins and ends with our own greedy flesh.

Darwin himself did not endorse such an extreme view. He took issue with the dogmatic Genesis view held by the church, however he was not an atheist in the same extreme sense that a modern Darwinist is. Nothing was known of molecular biology during his time.

Genes, it is claimed, are not upgraded or otherwise altered in the using. They are passed on unchanged except for very rare random errors, a few of which may bestow certain advantages. Now how does any biologist know with such supreme certainty that this is so? How does one know that a so-called “error” is really an error, not just sometimes, or most of the time, but *always*. Since there is no decisive “proof” available, this must be accepted as an article of faith, along with the rest of the package. Any evidence to the contrary is thus precluded from investigation, even if some worthy soul points it out. (And some biologists have done so. One who has produced compelling evidence is Professor Michael J. Behe in his book *Darwin’s Black Box*, Touchstone books, NY, 1998.)

Genes, in this strange language of double speak, are then invested with values such as companionship. Genes must be good at working cooperatively with other genes of the species, it is maintained, while at the same time maintaining that they compete with other genes. “Good genes” know when and how to be altruistic to good collective advantage. These clusters of inanimate molecules that we call genes are invested with complex intentions and value judgments. This is quite apart from any sense of social propriety that we may entertain as individuals, and yet Dawkins implies that our genetic inheritance predetermines our judgments as well. If our judgments are in fact predetermined why does Richard Dawkins feel a need to sway the world to his view? Why should anyone care?

Now genes of different species are said to be in different rivers that don’t have to cooperate, at least not in the same way, according to Dawkins. It is an inverted river that keeps branching downstream, all the rivers diverging from common ancestors, all the way back to invertebrates, plants and bacteria and presumably to the first living cell, however it came to get started.

It is maintained that major divergences of rivers, such as the mammals from the reptiles, did not in fact represent major events at the time, that they were no different in kind to any other divergence in species brought about by geographical separation. This is a little like saying that because a work of art begins with a single meaningless pencil stroke, the end result is only a meaningless scribble. Accidental geographical separation is also considered necessary in order for diverging species to evolve in parallel.

Both the fossil record and the living record provide powerful evidence to the contrary. The first mammals diverged in Triassic times, over 200 million years ago, when the reptiles were just beginning to bloom into a great divergence of species. Yet during the reptilian period the mammals experienced very little evolution apart from refinements associated with warm blooded activity, all being confined to small rodent-like creatures until nearly the end of the reptilian reign. The reptiles completely dominated the scene, then abruptly became almost totally extinct about 65 million years ago.

Despite all the reptilian “success,” it wasn’t mammalian divergence from the end of the reptilian period that survived and blossomed in its turn. It was those tiny shrew-like rodents that had emerged near the beginning of the reptilian period, and that had undergone little change for 160 million years, that suddenly and rapidly exploded into a great divergence of mammalian species ancestral to those that we know today.

The mammalian expansion had even started just before the dinosaurs met their demise, along with a global explosion of the flowering plants, and a diversification among the insects, which happened to provide a more efficient pollinating vector. There were a few flowering plants prior, but not in abundance. After many millions of relatively stagnant years why should they choose that precise period to diversify? At the same time India had begun slamming into Asia, pushing up the Tibetan plateau. Continents around the globe were under compression, rising and eventually creating vast areas of newly seeded savanna where successive waves of mammalian herbivores could thrive and explore new mammalian forms.

So it wasn’t just an accidental series of mutations among a few primitive mammalian rodents that heralded the beginning of the mammalian age. Concordant developments among the plants and invertebrates provided an enriched food supply to support the higher metabolic rate of the mammals and birds. And global tectonics

cooperated by providing appropriate terrain. A genetically unrelated diversity of factors converged in a relatively short space of time to make the event possible. The reptiles had had their day in the sun and it was time for them to make room for new developments not associated with the survival of their genes.

Should we now believe that the genetic sorting out of 160 million years of highly successful reptilian evolution, after the early rodent-like mammals had branched off, turned out to be a waste of time and a nearly complete failure? If they were so successful for so long, why didn't they evolve again from the remaining reptilian stock? And are we to believe that all of the information genetically assimilated for successful survival strategies was suddenly forever lost to surviving reptiles, as well as to future generations of mammals?

Why then had mammalian evolution been so lethargic for so long, only to burst forth so quickly in such great diversity with the reptilian extinction? Was it really just that they couldn't compete with dinosaurs? It took the reptiles over 200 million years to explore the limits to size, while the mammals did it eighty to ninety percent faster in more refined body plans, once they got started. Is this just another advantageous series of accidents that didn't happen to come along until late and then came in a flurry? Was there no integrating intelligence in the works that could reinvest the lessons learned by the dinosaurs to the advantage of the mammals?

Dawkins goes on to chastise his zoologist colleagues, some of whom are tempted to assign deep structural significance to the great divisions in the animal kingdom, since they represent the emergence of new blueprints or *bauplans* as they are sometimes called. He apparently believes that humans and cockroaches are equal players in the evolutionary theater, with any competitive edge going to the roaches, since they have been here relatively unchanged for a couple hundred million years and so have a highly successful survival record. Is that beautiful and inspirational?

The fact remains that however modestly and gradually the vertebrates diverged from the invertebrates, there was a vastly different body plan associated with their emergence, linked to a completely new way in which to integrate their experience.

With the primitive fish came the emergence of an autonomic nervous system coupled to cerebral hemispheres. Worms, crabs, insects and the like, don't have this complex apparatus. With the vertebrate

animals emotive experience, associated with the autonomic nervous system, could be mirrored in cerebral awareness to some extent.

The cerebral hemispheres are like a screen on which emotional experience is projected as if onto a TV screen where it can be observed. This is the basis of self consciousness and it evolved into the remarkable ability to intentionally modulate emotive or emotional behavior in the higher vertebrates. Higher vertebrates can select from a variety of emotional responses and tailor them to suit their circumstance.

No one but Dawkins is insisting that this unique new ability must have come into being perfectly formed. This is a smoke screen that he injects to refute the evidence. For some three hundred million years prior to the first vertebrates, the invertebrates were busy developing many different body plans with different sensory modalities and diverse means of locomotion, exploring them all to the full, from sponge and jelly fish to millipede and mollusc.

Then suddenly a whole new plan emerges that becomes anchored to a relatively fixed internal skeletal arrangement and limb structure, even similar sense and visceral organs from the reptiles to man. And integrating the sensitive mobility of the vertebrates is an autonomic nervous system coupled to cerebral hemispheres. However it got started this is a profoundly different new body plan capable of higher levels of sentient awareness. This evolutionary development reflects an intelligence inherent in the creative process capable of anticipating future developments in broad outline, hundreds of millions of years in advance.

There has been no significant vertebrate divergence from this common plan for three hundred million years, no millipede lizards or eight legged spidermen, no compound eyed aardvarks or hummingbird cocoons. The fact is that with the vertebrates the whole focus of evolution changed to a higher level of integrating experience, a more conscious and sentient level harnessed to a common skeletal and nervous system format.

This did not occur within the infinitely more diverse format of invertebrate evolution. Neither did invertebrate evolution have to explore the same limits to size that the vertebrates have. The invertebrates were focusing on methods of sensing and responding to a huge variety of circumstance, not on the limits to behavior associated with four limbs. There's never been a forty ton spider, ant, or crab. Even the giant mollusks and cephalopods are no match for dinosaurs and whales. These obvious facts have been conveniently ignored.

The climb up the ladder of sentient awareness has integrated the whole of vertebrate evolution into a common scheme that has obviously drawn on the several hundred millions of years of prior invertebrate experience. All the diverse modes of sensitive motility did not have to be re-explored again in order to settle on a single quadruped format with a common mode of nervous system integration. This is a powerful indication that the whole creative process is in communication with itself, just as the various parts of the human body are. Why is no scientist trying to determine how? Given the current constraints of the Darwinian paradigm they would not know where to begin.

It isn't an easy thing to formulate an alternate paradigm. It is commonly believed that it all has to do with chemical messages. Of course there are chemical messages, but that isn't all. It's like saying because we send letters that we can't sense another's mood or meaning, or the feeling of spring. How is the sense in the message to be read and understood if there is no more to the creative order than inanimate messages going from place to place like billiard balls.

There is nevertheless a rather obvious hierarchical order to the evolutionary process in which each higher level is dependent upon the capabilities achieved by the lower levels in the long hard climb toward higher levels of sentient awareness. We are indebted to plants for oxygen and food, to invertebrates for the basics of sensory response, and our autonomic nervous system is anchored firmly to the primitive parts of our cerebral hemispheres associated with the reptile and lower mammal. These are well established biological facts.

Although we are emotionally anchored to our early vertebrate ancestors, the neocortex (or new brain) has exploded in size with the higher mammals and man. This enhanced intellectual capacity is not directly colored by emotional input and thus has brought with it an increasing ability to modulate and tailor more primitive emotional urges to better consciously suit the needs of circumstance. We will return to this later.

Dawkins keeps shifting back and forth in double speak. His rivers of genes are now digital rivers, physical bits of genetic know-how that offer no place for values and purpose. But somehow there is only one genetic code for the whole of earthly life, from bacteria to humans (and perhaps only one in the universe if life originated from space). The chances of this happening twice by accident, he says, are about a million million million million million million to one, so life on Earth *must* have evolved from a

single cell, he insists. There are other scientific options possible, which we will come to later, but he doesn't acknowledge them since it would disrupt his argument. In fact the odds against life emerging on Earth, or anywhere else, by accident are infinitely greater than those that he quotes but this fact is also ignored.

Genes are digital information and this, Dawkins claims, has dealt the final killing blow to vitalism. By implication he means to also sweep aside any other possible belief about the nature of life. By some unexplained leap of logic he makes the remarkable statement that it is *no longer possible* to believe that there is anything fundamentally mysterious in living protoplasm.

I am not contending here that genes do not encode discrete bits of information but how does one conclude from that bit of knowledge that there is nothing else whatever involved in the creative process? And if less than one percent of the diverging branches of the evolutionary tree have survived, are we then not forced to conclude that over ninety-nine percent of the information accumulated through the evolutionary process is forever lost to future generations and a waste of time? According to the same logic we may expect the percentage of retained information to get smaller and smaller as the process proceeds. The genetic river must be drying up, despite all its branching and diversification. The DNA struggle for survival is destined to lose. The contradictions to the exclusive Darwinian argument keep multiplying with the diverging branches of the evolutionary tree.

Jumping from genes being encoded information to genes being capable of exclusively directing living processes is like saying that because a set of engineering drawings and specifications contain all the information necessary to erect a building that they can do it themselves. There is no team of architects or engineers producing the most incredibly complex of plans. They happen by accident, even though countless useless mistakes can apparently perpetuate themselves in reptiles for 160 million years before their demise. There is no construction company reading the plans, organizing and assimilating the skills, the equipment and the materials and then erecting the structures. All this happens by itself without supervision or management. And there is no budgeting, or financing, or sales involved. The chemical resources are assumed to be gratis and if there's a surplus of cement more buildings can go up, whether there's plumbing or electricity available for them or not, and without regard for whether the buildings are of the slightest use to

anyone. Buildings are infinitely simpler things than cells, not to mention multi-cellular creatures.

There is no intelligent direction integrating and balancing the diverse requirements of biological structures, nor are there intelligent occupants in the biological buildings of Dawkins' world. "Life is just bytes and bytes and bytes of digital information," he says. Let's all go out and propagate as much as we can, for it is only the survival of our genes that matters, and for that who needs to study genetics, or anything else.

Not quite. There's a bit more to it than that, says Dawkins. Bodies are important too. Genes inhabit bodies he observes. A polar bear has about 900,000,000 cells grouped into a couple of hundred types for different body parts, he says, all with the same genes. How do the body parts differentiate? Only certain genes are programmed to turn on in certain cells. How are they programmed? By the computer method known as bootstrapping, says Dawkins, who confesses that there is an element of the chicken and egg paradox here, then hurries on to say it is not insuperable. How does bootstrapping work? By chemical differences caused by "polarities" within the fertilized egg as it divides again and again. How does the polarity come into being and function? He doesn't pursue this process of regress further, for there surely seems to be some kind of incredible communication system at work, which intelligently organizes the orderly development of polar bears, and that discovery would refute his whole argument.

Then there is the physical shaping of the embryo as it develops. How does a glob of replicating cells assume a complex functional form. He marvels at the process but he doesn't touch on how this works. Nor does he comment on how all the cells in the mature body somehow communicate with one another to maintain a balanced commitment of available resources to meet an immensely complex priority of mutual needs. The truth is that no scientist knows how it all works together. Science doesn't know how experience is organized and integrated. When it gets down to this fundamental level of abstraction the inquiry stops. Dead in its tracks! It stops even though science implicitly acknowledges that genes are hierarchically ordered, that some genes control other genes that in turn control others. But if there is hierarchical order at work this contradicts random order as the driving mechanism. We can hardly believe that one of those billiard balls could suddenly become a cue ball

and cue with the ability to shoot other billiard balls around with unerring accuracy.

Then come the blind assertions, the leaps of faith. Dawkins invents a “...throbbing, heaving, pullulating, protoplasmic, mystic jelly,” new descriptions of life’s animating reality coined to ridicule all opposition to atomic billiards. “Nineteen fifty-three, the year of the double helix, will come to be seen ... as the end of mystical and obscurantist views of life...” he says. Really! What can it be but another obscurantist view of life.

CHAPTER III
Out of Africa

River Out Of Eden – Ch. 2- All Africa and Her Progenies:

Double speak gets underway again early in this chapter, even though Dawkins generally deals more with hard evidence. An extreme version of so-called “cultural relativism” is brought on the carpet for a dressing down, and one wonders why Dawkins should do this, if not to discredit by inference more than the target. Dawkins has a tendency to use facts out of context to tar everyone who disagrees with the same brush, although he does make allowances in a footnote for more “sensible” cultural relativists. His criticism is directed against those who suggest that modern science has become a creation myth, hardly different in kind to the creation myths of earlier cultures.

“Show me a cultural relativist at thirty thousand feet and I’ll show you a hypocrite,” he exclaims. Of course airplanes really fly, and it really is a credit to our understanding of certain physical principles that they do. We have learned a few things in the course of our social evolution. But we are talking about creation myths as they may or may not relate accurately to the creative process, not about the physics of flight.

Are we to believe that because we can machine parts and assemble them into a workable aircraft that we can use the same principles to make a canary? Can we use the same principles to model the whole of creation? Can we reasonably extrapolate many orders of magnitude beyond energies ever achievable in particle accelerators, to determine events in a supposed big bang origin of the entire universe? Can we reasonably employ notions of an assumed space-time continuum to calculate when a physical origin to the universe occurred, despite an inability to unambiguously identify either space or time as real *a priori* entities?

Space and time and force and so on are ideas invented by man from physical observations to help us cope with everyday experience. The origin of the universe is itself a contradiction in terms for it nullifies these physical concepts and the principles upon which they are based. This is well known and yet this fundamental fact is ignored. We are supposed to believe that this whole incredibly vast universe was once compressed into a volume infinitely smaller than a single proton. If everything was once compressed into a singularity the size of nothing without distinguishable order within it, and nothing outside it, then all of

the laws of nature on which all theories are based are refuted. This contradiction in terms divorces us from our own experience. The big bang theory does not allow of confirmation in experience, not ever. It is a blind belief in a mathematical concoction. Is this not the stuff of myth?

Quantum mechanics and general relativity are fundamentally incompatible yet both are used in the big bang theory. Principles of quantum mechanics are irrevocably based upon the quantization of experience, in other words upon a fundamental discontinuity in space and time as we determine them scientifically. Yet quantum mechanics is used to speculate upon how matter condensed and formed into stars and galaxies as the aforementioned space-time continuum expanded.¹

How can space and time be both continuous and discontinuous? If it is discontinuous how can it be said that it is expanding at all? How can it be said that a physical continuum exists at all? On a cosmic scale, how can the Doppler shift of distant galaxies be attributed exclusively to recessional velocity? The Doppler shift is a shift toward the red end of the electromagnetic spectrum of the spectral lines observed in the light from distant galaxies, and the farther away they are the greater is the shift. From this it is assumed that the further a galaxy is from us the faster it is receding, so the universe must be expanding, and it must have expanded from a singularity—from absolutely nothing—at the starting point in the history of creation.

There are other things in the works, however. A discontinuous universe must also be synchronous to a good degree, but with every reason to expect unsynchronous effects, such as the Doppler Shift, due to great distance alone. This possibility has never been investigated by science, since it is precluded by the bias.

Just as genetics packages experience into discrete bits so does the cosmic order that governs the quantized behavior of atoms. Our concocted physical laws can then hardly be said to accurately reflect the actual universal order of the cosmos. They capture fragments of cosmic behavior imprisoned in a space-time mold, and these laws have limited use in a limited context. In a cosmic context our thus far contrived laws break down completely. They have nothing to say about the principles that determine the primary nature of space and time and energy and force and mass and so on. These are all concepts that are derived *a posteriori* from the creative process. They are observed after the fact, not before. They can hardly be assumed to have an *a priori* reality in a mock

scenario that determines their own creation. This is bootstrapping run amuck.

Science excels at turning a blind eye to intractable theoretical problems. General relativity theory and quantum theory are not cosmologically compatible. They each have limited pragmatic value within their separate arenas of application, and even here they can claim no absolute validity. The theory of cosmological origins is based upon a swamp of assumptions and riddled with flaws, yet it is preached as gospel for popular consumption.

Darwinian theorists likewise seem fervently intent upon following in the footsteps of physicists anxious to inflate their earthbound achievements out of all proportion to reality. There is not the slightest confirming evidence that chance and natural selection is the *only* agent at work in biological evolution, and there is a great deal of evidence to the contrary.

There is likewise no self consistent evidence that the universe ever had an origin. This is a space-time concept in the first place. In a discontinuous universe alternate explanations emerge for both the red shift of distant galaxies and the background radiation. There is also hard evidence accumulating that there is such a thing as instantaneous relationship-at-a-distance and that it does not diminish with increasing separation.²

This latter bit of evidence means that there must be universal influences at work in the creative process, just as gravity was conceived to be a universal attraction in pre-relativity physics. What then is the non-physical communicating link between separate entities? Can it be ignored or buried under layers of obscure mathematical language in constructing either cosmological or evolutionary theories? Can life be reduced to arithmetic?

There are powerful biases at work in the scientific community. We all want that feeling of unity, of the transcending universality of our guiding principles, even if they are meaningless. Dawkins even confirms that science may be described as a religion, while at the same time discrediting religions as unfounded belief systems. Double speak flourishes in the world of myth.

“Scientific beliefs are supported by evidence, and they get results. Myths and faiths are not and do not,” he says. Bold talk! Of course some scientific beliefs are supported to a good degree by evidence within the restricted context in which they are conceived, and of course they get

certain predictable results in the same context. But that degree of success achieved does not entitle science to claim universal validity and omniscience as its own unique accomplishment. Even the most widely useful scientific theories face glaring contradictory evidence in addition to their internal contradictions.

Contrary to Dawkins' bold claim, the extension of our currently available scientific theories to *unequivocally* explain the cosmos is a leap of blind faith unsupported by evidence, and with negative results. It erodes the traditional value systems that diverse religions and cultures have evolved over millennia. Despite divergences there is a remarkable universality to the essential core of these value systems, albeit partly clothed in their various creation myths. Dawkins tries to use double speak to sublimate and transplant this epic achievement of our ancestors. He hijacks for his own purposes our transcendent sense of beauty, inspiration, harmony and truth that has so arduously evolved. But in his linear rivers of digital logic the only thing that can self consistently survive is a blind quest for physical dominance. In this context anything goes. Deception, conflict, meaningless turmoil and collective failure will prevail if this mindless view of reality becomes generally accepted.

Among the negative results achieved by biased views of science is the preclusion of viable alternatives that may have much more to offer. Science becomes a club of believers forging mutual alliances that select against alien paradigms. Dawkins himself might call it a meme, his social equivalent of a set of genes struggling to survive. This entails winning a struggle against opponents who are deemed inferior and whose voices must not be heard in their ranks. The preconceived paradigm must prevail, despite its flaws, for therein lies the glorious experience of unity that integrates the diversity of experience for those who are true believers.

This inevitably invites opposing reactions that are likewise founded on the unsubstantiated claims of various religions or crudely contrived new sciences without the slightest practical value other than to grasp at some basis for universal values. The opposing sides then justify themselves by pointing their accusing fingers at the opposition and escalating the mindless strife. Faith in the veracity of science falters, while it continues to erode the foundations of traditional values. We find ourselves left without meaningful direction or guidance.

This chapter in Dawkins book, however, concentrates on techniques used to trace our ancestry via mutations in DNA. The controversial

notion of a “molecular clock” suggests that mutations in any one region of our genetic machinery occur at a constant rate per million years. That there should be controversy on some points is at least a relief and the logic here is difficult to follow given some of the evidence. For instance many species of beetles have been around for a quarter of a billion years. They have seen wave upon wave of reptilian and mammalian species come and go, vast lineages of them, yet they persist in much the same way as they always have. There are now an estimated three hundred and fifty thousand different species of beetles, but they are all distinctively beetles. Why haven’t they long since evolved into something else?

Many facts of this general kind indicate that meaningful mutations are highly selective and carefully timed for reasons other than so-called natural selection. The most significant advances concern ascending a sentient hierarchy and this implies that different orders of mutation are possible. Although some comparatively minor variations may be accidental, the evidence indicates that others are intelligently directed. Hierarchies pervade the evolutionary order and Darwinian theory cannot self consistently account for them, since higher levels implicitly direct subsumed levels and this refutes random order as the driving mechanism of the creative process.

In any case, attempts are made in this chapter of Dawkins’ book to trace us back to an African Eve, a common maternal ancestor, via mutations in mitochondrial DNA down the female-only line. Mitochondria are semi-independent organelles that maintain the energy supply within eukaryotic cells. There are many of them in every cell and they have their own DNA. This approach has been taken since it was believed by many biologists that mitochondrial DNA is passed down exclusively through the female line. One not familiar with all of the evidence might be inclined to go along with much of this, if it wasn’t also peppered with repeated unsubstantiated statements and biased opinions.

For instance there is no conclusive evidence that eukaryotic cells just happened to evolve by ingesting prokaryotic cells, or that two billion years ago the ancestors of mitochondria were free living bacteria. There are serious conceptual problems with how a bacterium could just accidentally and autonomously integrate itself as a vitally essential organelle within a vastly more complex organism. Order does not arise spontaneously from disorder unless the second law of thermodynamics is wrong.

For example the DNA in mitochondria is not sufficient to supply all the proteins that it needs. These organelles must depend on the nuclear DNA of the host cell also. There is partial autonomy delegated to mitochondria but it is not complete nor is it simple.

Mitochondria are subservient to the needs of the host cell, which in turn is subservient to needs of the multi-cellular host. There is a complex hierarchy involved that intelligently integrates needs according to available resources. How did such a complex arrangement happen by accident? Hierarchical order is a property of intelligence not random chaos. Yet Dawkins says this theory has now gained near-universal acceptance. “Not only is Dr. Margulis’s theory of origins—the cell as an enclosed garden of bacteria—incomparably more inspiring, exciting and uplifting than the story of the Garden of Eden. It has the additional advantage of being almost certainly true.” I can not see many people outside his close-knit community working up a head of steam over this.

Many unsubstantiated assumptions pervade the sciences and Dawkins seems to like flaunting them to build his case. The manufacture of sex cells, he claims, involves a purely random exchange of great chunks of chromosomes from both parents, “...ripping out half of one document, in the form of randomly chosen fragments, and mixing it with the complementarily butchered half of another document. Unbelievable—vandalistic, even...” he says.

But there is surely nothing random about the meticulously accurate pairing off paternal and maternal chromosomes before the exchange of genetic information in a fertilized cell takes place, nor is there any evidence to suggest that the exchange itself is random. Randomness is assumed. That we don’t understand the process is not justification for saying that it’s random.

The process in fact shows evidence of being directed by highly ordered energies that are not dependent upon normal molecular chemistry, not valence, not catalysis, not thermodynamics, not any physical agent that we can identify. The process of meiosis, like mitosis, does not happen capriciously by chance. Meiotic spindles that orchestrate cell division do not form at random. No one knows what makes the tiny organelles called centrosomes migrate to opposite ends of a cell, replicate themselves, polarize the cell, align the chromosomes and grow the spindle of tiny fibers that pull them apart at just the appropriate time. But these questions are set aside by Darwinists, since they have no answers. Yet they assume the process is random without offering a mechanism by

which randomness could work the result, and despite the display of ordered energies at work.

Organized energy can more easily be described to have an intelligent basis, not that this description alone sheds any immediate light on the specifics of how the energies are organized and work. The point is that this alternate line of inquiry into the nature of organization structure is thwarted before it begins by Darwinian dogma. Darwinism is assumed to be the *only* organizing principle.

Sex is nevertheless a snag in tracing our genetic ancestry, and mitochondrial DNA offers better clues, since mitochondria are passed on to offspring independent of sex via the mother only, it is claimed. In view of other objections, however, the assessments at this point are certainly subject to major qualifications and may easily be in such serious error as to be completely misleading. This is especially so in the absence of serious research into the organization of the creative process itself, and the continued insistence that order emerges exclusively and linearly from random chaos. Incredible as it sounds, this is the dogmatic stance of mainstream science. Dawkins expresses it by insisting that our ancestral line, going all the way back to the first cell, holds the key to understanding life itself. But then he focuses on the mindlessly selfish gene, relegating the bodies they inhabit to a secondary importance.

A couple of decades ago, when biologists began using the rate of mutation in mitochondrial DNA as biological clocks in order to trace the evolutionary lineage of various species back to some historical origin, there were some early warning signs that the clock may not be completely reliable, but the Darwinian paradigm was sufficiently powerful to override them. Just as the paradigm turns a blind eye to a host of evidence that would undermine it, it homes in on other evidence that may potentially offer some support with reckless abandon.

There have been reports that the mutation rates of mitochondrial DNA are neither constant nor reliable as evolutionary clocks. They may vary drastically from gene to gene and in the same gene within different lineages. Estimates of when the first major divergence of the main varieties of multi-cellular invertebrate animals occurred, such as worms, arthropods, mollusks, chordates and echinoderms, vary from 670 to 1,200 million years ago, whereas the fossil record indicates the divergence occurred during the Cambrian period, about 530 million years ago. The fossil date may be modestly older than the fossil record indicates, but not older by several hundreds of millions of years.

Now there is evidence that mitochondria do not migrate passively only from the mother cell to the daughter cell. They do not migrate passively at all, since mitochondrial behavior is likely to be highly regulated by complex machinery in the cell.* Furthermore, electron microscopy and DNA detection studies have shown that the sperm's mitochondria can enter the egg. Added to this is some controversial evidence that sperm contributed mitochondrial DNA can recombine with that from the mother. If so, this means that a single recombination event could instantly insert or erase multiple mutations in a piece of DNA, rendering the clock very misleading or useless. This might also explain how some people have two different versions of mitochondrial DNA in their cells.†

NOTES:

¹ Quantum mechanics was born at the turn of the century with Max Planck's discovery of the quantum of action, known as Planck's constant, designated as h . It means essentially that the light from a rainbow comes to us in a series of discretely quantized packages of energy across the whole of the electromagnetic spectrum, like a series of discontinuous pulses, even though the spectrum itself is a continuous range of frequencies across its breadth. The bias of science precludes any explanation as to why this is so. According to science space and time are not quantized, while energy is. This interpretation is not consistent with the evidence. A credible explanation is offered, however, if the whole universe is projected as a discontinuous series of still frames in an ongoing cosmic movie. Relative motions then take place as a series of quantum jumps in position between one still frame and the next, in this way defining the nature of events in space and time. This alternate view of the cosmic order is fully consistent with the evidence, yet it has never been investigated.

*M. P. Yaffe, *The Machinery of Mitochondrial Inheritance and Behavior*, Science, vol. 283, 1999, 1493.

†E. Strauss, *Can Mitochondrial Clocks Keep Time?* Science, vol. 283, 1999, 1435.

² Fiber optics experiments in Geneva have established that photon pairs remain in an intimate relationship up to 10.9 kilometers apart, with no indication that this kind of communication between them diminishes with distance of separation. A. Watson, Quantum Spookiness Wins, Einstein Loses in Photon Test, Reporting in *Science*, **277**, 481, 1997.

CHAPTER IV
On Winning by Cheating

River Out Of Eden – Ch. 3 - Do Good By Stealth:

Double speak even creeps into the title of this chapter of Dawkins' book. Values, good and bad, are touted as both the motive and the modus operandi of a mindless creative process.

The title refers to a discussion of how the orchid has evolved to imitate both the appearance and smell of the sex organ of the female wasp, thus attracting male wasps to copulate, philandering creatures that they are, and promoting its own pollination. Dawkins gets into his discussion by quoting at length from a personal letter from an American minister who read of the phenomena in National Geographic. The man was so impressed that he came to believe "...that some kind of God in some kind of fashion must exist, and have an ongoing relationship with the processes by which things come into being." The man consequently abandoned atheism and embraced the church.

This letter has apparently disturbed Dawkins, for he responds publicly to the minister's private letter at length: "...How, I want to ask the minister, can you be so *sure* that the wasp mimicking orchid (or eye, or whatever) wouldn't work unless every part of it was perfect and in place? Have you in fact given the matter a split second's thought? Do you actually know the first thing about orchids, or wasps, or the eyes with which wasps look at females and orchids? What emboldens you to assert that wasps are so hard to fool that the orchid's resemblance would have to be perfect in all dimensions in order to work." What follows from the pen of an eminent biologist obviously seeking converts to his mindless position is good cause to be disturbed, for he himself has no basis on which to be so *sure* of blind accident as the sole creative agent. His own logic is riddled with holes.

Dawkins states that "The purpose of this chapter is to destroy the argument that complicated contrivances have to be perfect if they are to work at all." Now despite what Dawkins says, this really isn't the purpose of the chapter. Dawkins' purpose is clearly to destroy any impression of intelligence at work in the creative order. Since the minister linked an intelligent agent of some kind to perfection, Dawkins wants to exploit this statement and erode any suggestion that complicated contrivances must be perfect from the outset, then maybe he can float

this to triumph over any suggestion of intelligence at work at all in the evolutionary process. In other words, he hopes to succeed by stealth, which he feels would be good. He has contrived the approach to exploit the minister's sentiments.

Although this is clearly his hope, the two things are not synonymous. Intelligence does not imply perfection in all things from the outset. We know from experience that if we exercise a little intelligence that we can learn by degrees and adjust our course of action accordingly toward a satisfactory result. But the Darwinian position does not allow of intelligent feedback or assessment of alternatives prior to selecting a course of action. Evolutionary mutations are seen as rare random accidents that just happen to have a survival advantage that becomes established after the fact. There is no intelligent anticipation allowed in the process, no intelligent feedback, no prior value judgments to direct the evolutionary process toward a needed result.

Having created a straw man, Dawkins sets out to destroy him by first running through many examples of creatures being fooled, from insect to human. Male stickleback fish are excited to mating behavior by any pear shaped object. An oystercatcher bird will try to incubate an egg as big as an ostrich egg. Some ground-nesting birds will roll anything remotely resembling an egg back into their nest. Baby herring gulls peck at the red spot on the parent's bill for food, and will peck at any red spot. Black headed gulls will react typically to a dummy gull head mounted on a stick, minus a body. A deaf mother turkey will kill its own young as a predator response to motion alone because it cannot hear their distinctive chirps. Bees will clear a live bee from the nest if it is daubed with oleic acid, because this acid is given off by decaying bees and triggers an undertaker response. A female digger wasp always inspects its nest before dragging its prey in, and if its prey is moved a few inches, will keep going back to inspect its nest each time. Another digger wasp identifies its nest by landmarks of twigs etc. around its burrow, and if the twigs are moved a few feet, will dive into the ground where it thinks its burrow should be. One digger wasp provisions its larvae in several burrows, according to their daily growth assessed at a morning inspection, and subsequent switching of the larvae doesn't bring corresponding adjustment in the provisions provided to each one. Evolution certainly hasn't had an easy time exploring the integration of experience.

All of this is intended to show that a very crude resemblance between an orchid and a female wasp might well be sufficient. “The general lesson we should learn is never to use human judgment in assessing such matters.” Yes, Richard Dawkins really says this in print. If we are not to use human judgment, what kind of judgment are we supposed to use?

Then he emphasizes again his stated purpose of the chapter, to defeat the fallacy of what he dubs “the Argument from Personal Incredulity.” We are apparently not entitled to disbelieve the exclusive Darwinian viewpoint. Of these arguments he says, “Time and again, it has proved the prelude to an intellectual banana-skin experience.” Therefore it must always prove futile to disbelieve the Darwinian paradigm, is the implication in his statement. Now it must be conceded that not many people will take the time and effort to carefully sift through the verbiage masking and distorting the evidence, to sort out word by word the gross transgressions of common sense that pervade the literature. But that does not justify the Darwinian position by default.

Dawkins further pursues his stealthy purpose by adopting the word “brittle” to describe a device that must be perfect if it is to work at all. Our besieged minister surely made a poor choice of words and Dawkins is going to milk them for all they are worth, despite the fact that they are really beside the point. Man made articles are generally not brittle, says Dawkins, for even a 747 can fly on two engines. After ten minutes of thought Dawkins says that he can only come up with one near brittle man-made device, namely the arch, since its integrity obviously depends on the interdependence of its parts. Now think for just one minute. Will half a wheel work? Or a gear without teeth? Or a roof without supports? Or a table without legs? Or a pulley without an axle? Or a lever without a fulcrum? Or a window without a frame? Or a door without a hinge and a latch? Or a bucket without a bottom? Its hardly worth pursuing this tiresome logic. A man can live without one arm or one ear, but not without a heart, or a head. Some things are more essential than others to the integrity of the whole and this is no accident. Experience is a highly structured affair.

But not according to Dawkins. He launches into attack against the straw man by listing various examples of mimicry in nature in addition to that displayed by the orchid. Among those that he contends creationist propaganda has served up as “brittle” are the camouflage of the tiger and leopard; the fishing rod of the angler fish; femmes fatales fireflies that

mimic the flash patterns of other species in order to cannibalize them; saber-toothed blennies that mimic fish that clean a host, then feed on the host; many animals that resemble bark, twigs, leaves, flowers, stones, and seaweed; ground nesting birds that fake injury to protect their young; cuckoo eggs that resemble those of their host species; female mouthbreeder fish with dummy eggs painted on their flanks to attract males to brood real eggs.

Throughout his argument Dawkins focuses on that word perfect, maintaining that is the key contention that makes the creationists wrong and Darwinists right. I'm not defending the creationists, only pointing out weaknesses in his arguments. He stresses that not only does visual acuity change from one species to another, so do the conditions. He maintains there will be a continuum of conditions from very bad to very good and then goes into a discussion to explain the obvious. Of course visual acuity varies with distance and lighting and angle. We can't see in the dark or through the back of our head.

But then Dawkins makes a giant leap of logic. With his smoke screen about perfection in place, holding the reader's attention on the one hand, on the other hand he tries to float the whole Darwinian position past like a magician doing a magic pass. He says, "As evolution proceeds, resemblances of gradually improving perfection can therefore be favored by natural selection, in that the critical distance for being fooled gradually moves nearer."

Can a wasp copulate with an orchid from a distance? And the wasp is not a night time philanderer that can mistake a lover in the dark. And the wasp is attracted not only by shape and color but also by smell, and the size must be just right for pollination to occur. These are highly complex variables that must be selected together in concert through parallel sets of mutations. Smell alone is as characteristic as fingerprints and so vast in its possibilities as to be virtually unlimited. Shape and size can be almost anything, and large combinations of color are possible. Yet the orchid's survival depends upon selection from this unlimited range of options, with a very specific need for an insect pollinating vector. Somehow this maze of possibilities converges upon a specific wasp sufficiently for the strategy to work, and we are asked to believe that the selection was achieved by repeated parallel sets of blind fortuitous accidents, completely at random. Remember that the Darwinian position is that mutations are rare accidents and only a rare few offer a survival advantage.

Earlier on Dawkins cites odds of a million million million million million to one for the genetic code evolving twice by accident, so that we *must* all have evolved from a single cell. The odds of all of the factors coming together by parallel series of rare random mutations in order for the orchid to imitate the wasp in the required time for selection pressure to be effective are so complex as to be not computable, but they are at least of the same order of enormity as the odds that Dawkins cites above. Try to compute the odds of a fish sprouting a fishing pole complete with a bait on the end of its nose. Before this succeeded there must be gillions upon gillions of extinct mistrials among many species of fish, with part poles growing out of their tails and bellies and sides.

But Dawkins directs the discussion to his liking where he can make a point or two and pretend this wraps up the whole case. By citing a little knowledge acquired by biological research, one is supposed to believe he has the weight of the entire scientific community behind him. He focuses on the eye, the creationist's favorite conundrum, as he calls it. There is no intention here to defend the creationists' traditional positions, especially the literal Genesis account. The intention is only to explore the weaknesses in Dawkins' arguments for Darwinism and show that the evidence is better explained by intelligent direction in the evolutionary process. Eyesight, he observes, fades with age, being adaptable to a continuum of tasks, so there is no difficulty in understanding the gradual evolution of the eye.

Think about this for a moment. Does the gradual wearing out of our biological machinery justify the Darwinian stance that all life forms, including those complete with eyes, evolved not only gradually but also by blind luck in a game of chance atomic billiards? This is clearly the implication that he wishes to convey in argument after argument that is completely beside the point. I have pointed out before that intelligence allows for learning through intelligent feedback and consequent adjustments to intentionally converge toward an anticipated result. Pure chance allows for no communicative feedback and no direction.

He now enlists the enormity of geological time to make his case credible, citing the work of two researchers, Nilsson and Pelger, to show that the eye can evolve in a relatively short period of time. Apparently, according to biologists' reckoning, invertebrate eyes, employing at least nine different design principles, have independently evolved between forty and sixty times from scratch among many species. One might well wonder how nine different design principles were conceived. One might

well wonder why all this diversity of accumulated information should be lost to the higher sentient evolution of the vertebrates, if evolution really is a linear branching affair that is not otherwise in communication with itself. One might also wonder why the vertebrates should not have to explore the same ground again in order to arrive at a suitable “camera” eye design. Later we shall see that the vertebrates are thought to have branched off from the chordates, which diverged in the Cambrian Period, thus ignoring a couple hundred million years of other invertebrate evolution, including eyes.

In any case Nilsson and Pelger had to start somewhere, he says, and make some assumptions in devising a computer model to simulate the number of generations required to evolve an eye. To start with, they had to assume that a light sensitive cell had already somehow evolved, although it could be of no selective advantage. Selection pressure would require some kind of vision process in which the eye could be an integral part to offer a survival advantage. This question is set aside as “a nice subject for future study,” as the critical questions invariably are, since nobody knows how to study them within the Darwinian paradigm. The paradigm fails completely with fundamental questions.

Nilsson and Pelger worked at the level of tissues which can change according to random mutations. They began already well on the road to an eye, with a flat retina atop a flat pigmented layer and protected by a flat transparent layer. The critical elements in an eye are thus assumed as already given, arranged in the required order, in correct relative size, and in the correct position, without bestowing any survival advantage whatever to the animal. That surely makes things infinitely easier. How could such a meticulous arrangement of complex cells have happened by accident if it was useless as a functioning eye? We have not yet even mentioned the maze of neural connections from retinal cells to a brain that somehow becomes wired to portray the signals as a meaningful image to a resident observer of some kind, or how this is integrated with other sensory modalities together with visceral and somatic motor responses.

In any case Nilsson and Pelger then let the refractive index of the transparent layer mutate while the shape of the model could deform at random, but under two all important constraints. Any mutant change must be small, and it must represent an improvement. How is any improvement to be demonstrated by the creature if the proto eye is not already properly wired to a functioning brain and integrated to some

functional extent with its whole nervous system? Nilsson and Pelger are cheating more than a little bit. But the whole field is so biased that this kind of procedure is allowed. And what basis is there for assuming that ordered hierarchies are not structured into the genetic expression of a host creature such that a comparatively small mutation on one level does not result in comparatively major changes on subsumed levels? Hierarchically ordered homeodomain proteins and homeotic genes that activate batteries of genes are recognized in biological text books. But that implies intelligence at work. Hierarchical order is not consistent with random order.

Despite such gaping holes in the logic it was concluded from this hopelessly simplistic computer study that a good camera eye can evolve in fewer than four hundred thousand generations, and for small animals this amounts to less than half a million years. What they are talking about is only the evolution of the refractive index and the shape of the eye, and this with cheating. All the really hard stuff is ignored completely. Yet Dawkins concludes from this camera eye simulation: "There has been enough time for it (the camera eye) to evolve from scratch fifteen hundred times in succession within any one lineage." Is this good impartial science?

Dawkins makes an admission here, as to his reasons for insisting that evolution must be gradual. "Without gradualness in these cases we are back to miracle, which is simply a synonym for the total absence of explanation." Is intelligence a miracle? Can we explain how intelligence works, how it's ordered? We live with it every day, and from very modest self-observation we find that it seeks out spatially, temporally, and intuitively ordered patterns in order to cope with experience. The socio-economic organizations that we function in are also structured communications systems that we have patterned according to the way that experience is implicitly presented to us. We are not totally blind victims of chance in everything that we do. We can plan and be agents of responsible action. Since we are also products of the evolutionary process, is it such a travesty of common sense to think that intelligence may also be at work in the evolutionary process?

The point is that this avenue of research into the nature of intelligent order has been declared off limits by science while a host of clues abound right under our noses. This is an outrageously unscientific bias that is shared by most of the scientific community. Of course eyes evolved. But they didn't evolve, gradually or otherwise, by blind

meaningless luck. Dawkins' whole argument is again completely beside the point. He is blowing smoke to screen the real issues. It is very hard to understand why intelligent academic leaders should devote such strenuous efforts to consign themselves and the whole of humanity to a mindless oblivion. Only double speak saves true believers from this personal realization.

Dawkins goes on to the "dance language" of honey bees in an effort to explain how it could have evolved gradually with intermediate steps. A foraging bee returns laden with pollen and nectar and then proceeds to communicate where the food supply is by doing a figure eight dance in the darkness inside the hive on a vertical comb. There is a straight section in the middle of the figure eight which is oriented like the needle of a compass to tell the direction in relation to the sun, and the position of the sun is adjusted for by an internal clock that bees have. The distance is communicated by the rate of a peeping sound the dancer bee makes, perhaps combined with its rate of turning and waggle. The other worker bees then leave the hive and fly in a straight line to the food supply.

Before going on let's examine Dawkins position closely again. Ask yourself, is it sufficient to establish that evolution is a gradual process in order to prove the Darwinian position that all advances are the result of rare random mutations that accidentally endow an incremental survival advantage? We all know that intelligence can gradually accomplish things. But as Dawkins seems to see it there are only two contestants in the field, the Darwinists and the Biblical creationists with a Genesis bent. He doesn't seem to acknowledge the possibility that the whole creative process could itself be an intelligent process, with all of the properties that we normally ascribe to intelligence. This means that there is an intelligent order that is both transcendent and immanent through which all things are in some way interrelated. This approach at least has the advantage of explaining the natural emergence of our own intelligence and it is not necessarily opposed to a certain niche for both the Darwinian adaptation of species, and also the essential values that have evolved through our various religious traditions. But Dawkins' extreme and exclusive stance keeps running into insurmountable difficulties even on the grounds that he chooses to prove its efficacy.

Dawkins goes on to point out that many insects navigate by the sun and bees can see the polarized direction of light, and thus can navigate on cloudy days. Now this capacity to see the polarization of light, however

gradually it may begin, must be the result of a fortuitous series of random sets of mutations, according to Darwinism, even though fortuitous mutations are extremely rare. Each mutation must be a set, because it must fully integrate specially designed emerging receptors in the bees' eyes into the whole nervous system of the bee, together with its motor responses to survival needs, as the bee is genetically programmed to perceive and respond to them. It is very hard to imagine that one genetic mutation can accidentally alter the eyes together with a host of adjustments to the nervous system and behavioral responses. And if it is a set, similar complementary sets of mutations must occur many times in succession to effect the result gradually through selection pressure. And only rare mutations endow a survival advantage. How then can a random collection of mutations occur simultaneously to alter the eye and nervous system to act in concert in any meaningful way. A bee might well begin to grow antlers first.

It is Dawkins' position that this capacity evolved as an adjunct to the evolving bee's eye. It must also have evolved in parallel with the bee's internal clock in such a way that both are linked to motor responses to need. The directional process is reversed for bees in the Southern Hemisphere, and reverses annually in the tropics, so a rare mutation must do more than just fortuitously hit on perceiving polarized light, and being able to use it. It must interpret the information, linking this to a specific spatial direction of motion with respect to the sun when it is out in various parts of the world and also to an internal clock. If all of these things do not come together at once, at least to some extent, then no survival advantage can be demonstrated that will drive evolution in a positive direction according to the Darwinist theory. If Dawkins or anyone else can conceive of how the complexity of this task can be accomplished without benefit of intelligent input from a broad base of experience, why don't they explain it instead of producing peripheral smoke screen arguments that mask and ignore the main issues.

Dawkins deals only with what he portrays as the main problem, to establish a credible series of gradual intermediate steps. Some tropical bees build exposed combs attached to a tree. One species is cited that dances on top of the comb such that the straight run of the dance points to the food, and the straight run may have begun with a few steps on take off that became ritualized. An obvious way to prolong the take off run is to repeat it, thus leading to a figure eight, Dawkins says. It might be obvious to an intelligent human being. But is he now talking about a

random genetic mutation that directs behavior, or is he investing the bee with an independent intelligence governing behavior to some extent, such that it also directs its genetic programming? Dawkins own words imply the latter, which he earlier insists is utterly impossible. There is no intelligent feedback in the Darwinian position.

To this point, none of this discussion addresses the question of how the bees evolve the capacity to identify the message that is being transmitted through hearing and feel, and then translate it into the appropriate action. To perform the dance is one thing. To perceive and interpret it is another. Why should the other bees pay any attention to one bee that has slowly begun to act just a little bit strange? Why should they gradually intuit some meaning in this bee's slight deviations from the norm. Do bees have an empathy for one another? Are they consciously aware to some extent? Are they psychically bonded? Are they in intimate communication? Do they experience mutual needs? Do they have some form of inter-bee value judgment? Is there some level of intelligent comprehension of the dance that can be learned, as more advanced creatures do, by following adults when they are young and gradually making the necessary associations? Could there be some collective patterned energy at work, in conjunction with their genetic make up, that they independently relate to and that guides them accordingly? Or is their response to the dance only blindly genetically programmed by atomic billiards? In any of the former cases there is intelligence at work in the evolutionary process. In the latter case, the already prohibitive odds of a random collection of simultaneous parallel mutations working toward a concerted result are multiplied many orders of magnitude.

“The steamhammer of geological time” is not long enough to crack this “peanut” as Dawkins calls it, because concerted parallel mutations in a whole generation of individuals are necessary before they can even *begin* to demonstrate a selection pressure to their collective advantage. Bees must slowly learn to dance according to where they found flowers. Genetics must relate to direction and distance—to space and time. As if the odds against a concerted set of such mutations happening by accident once was not enough, another complementary *set* of complex mutations must again happen by chance, to interpret the dance—and again, and again, and again in generation after generation after generation, if the final result is to be achieved gradually by selection pressure. Dawkins’ own argument of gradualness in the evolutionary order only compounds

the already impossible odds against it happening by chance to more impossible levels.

CHAPTER V
The Survival Advantage of Death

River Out Of Eden – Ch. 4 - God’s Utility Function:

Dawkins flaunts double speak in grand fashion in this chapter. God’s Utility Function indeed! “We cannot admit that things might be neither good nor evil, neither cruel nor kind, but simply callous—indifferent to all suffering, lacking all purpose,” he says. For an example he cites the case of wasps laying their eggs in caterpillars, grasshoppers and bees so their larvae will eat the host alive while it matures. What happened to his inspirational and beautiful vision of Darwinian evolution “...incomparably more inspiring, exciting and uplifting than the story of the Garden of Eden”?

And what is the survival advantage of suffering? The capacity for suffering clearly increases up the ladder of sentient awareness, from plants to invertebrates to vertebrates, then onward with increasing conscious sensitivity up through the vertebrate series from reptile, to lower mammal, to higher mammals and humans.

No creature has ever been created to suffer more than us humans. We are born the most helpless of all, and we are obliged through our suffering to consciously learn, while primitive single-celled creatures that multiply by division triumphed painlessly in the contest of perpetuating genes a few billion years ago. They are still alive and replicating today, while all but a small fragment of subsequent species have gone extinct, vast lineages of them.

If there is utterly no purpose in all of this then what possible survival advantage can suffering have? What blind agency could there be to declare that consciousness should emerge at all, much less consciousness of pain and death? This is a complete refutation of survival. Is this accidental process of creation so malicious that it generates meaningless suffering, and progressively exaggerates it, to elevate into positions of dominance particularly perverse strains of mindless genes that possess a capacity to consciously observe their own meaningless denial in death? Is that what we human beings are?

In the same self contradictory fashion, Darwinist extremists feel justified in insisting that there is *no* purpose in the creative process, *no meaning whatever*, while at the same stroke insisting that gene survival is the *only* purpose, that *all meaning* reduces to this sole arbiter of our

existence. Where is the hard evidence for making such an extreme and exclusive and self-contradictory claim that is contradicted by the evolutionary record itself?

Even a cursory examination of the evolutionary record tells us that plants took a couple of billion years to develop into highly organized multi-cellular collections working in concert for a collective result. This had to happen before the multi-celled invertebrates began to explore many different modes of sensory response to their environment. You can't walk before you can stand. It was only after the invertebrates had been at this work for some three hundred million years more that the vertebrates emerged with a relatively fixed skeletal, visceral, and sensory arrangement. The evolution of diverse modes of sensitive mobility stalled in the vertebrates. The vertebrates converged upon on a single overall body plan.

But with the vertebrates came cerebral hemispheres harnessed to an autonomic nervous system. The cerebral hemispheres act like a screen on which to project dynamic elements of experience in awareness, including autonomic patterns of animation—namely behavior. Another whole new focus to the evolutionary process emerged. Vertebrates are specifically designed to reflect with a degree of awareness on emotive experience, on their own behavior and the emotions that drive them. As they further evolved they learned to consciously modulate their emotionally driven responses to their environment, according to how they intuitively perceived their needs or wishes. The more advanced vertebrates can select from a range of possible behavioral responses to circumstance and creatively tailor them to suit.

We can thus identify distinct levels in the evolutionary process from plants to invertebrates to vertebrates as discrete steps up a ladder of sentient awareness. Plants are concerned with converting energy into static *forms*. Each species combines nutrients and the energy of the sun to integrate cells into characteristic *spatial forms*. Many body plans become possible.

The invertebrates are concerned with developing dynamic motor-sensory responses to their environment, using the sun's energy stored in plants. Each species demonstrates a specific *temporal routine* of behavior that quickly modifies their spatial form and position in specific patterns suitable to their needs. There is a specific pattern of behavior associated with each species.

The vertebrates are able to monitor patterns of motor-sensory behavior in conscious awareness. They acquire an intuitive *idea* about their behavior in *space* and *time* and they can intentionally alter it to suit their needs. They can integrate their behavior over a span of space and time, rather than respond blindly to immediate stimuli as lower invertebrates do.

The evolutionary process may thus be said to have moved up a hierarchy from *Form* through *Routine* to *Idea*. If we look at this hierarchy in reverse order we find that it is a universal pattern to creative activity in a way that transcends space and time. The hierarchy may be written *Idea*→*Routine*→*Form* and there is feedback in the opposite direction.

All of us give explicit *forms* to our *ideas* through our *routines* of behavior, and we can see or otherwise sense the idea take form. Routines of activity are the pivot through which idea is balanced by form. We sculpt a statue from a block of stone through the *routine* of chipping away until we see that the *form* matches our creative *idea*. Likewise the *routine* of walking gives *form* to the *idea* of going shopping. The routine of typing gives specific form to the ideas expressed in this book. So it is with everything we intentionally do.

So it is also with the biological sustenance of life itself. The *idea* of life acquires its living *form* through the chemical *routines* of storing the sun's energy in sugars through photosynthesis by plants. The *idea* of all higher life *forms* is dependent upon *routines* of utilizing the energy stored by plants. Animals *routinely* eat plants or other animals that eat plants, sustaining the very *idea* of life in *form*.

The vertebrate capacity to modulate emotive (emotional) responses took place in distinct stages of biological evolution over the last four hundred million years or so. As the limb structure became fixed with the vertebrate transition to the land, the vertebrate brain began to blossom in three major steps that were associated with the species on each higher step.

The reptilian brain (crocodile, lizard, etc.) first developed through a reign of supremacy on the planet that lasted for more than two hundred million years. The lower mammalian brain (ancestors of all mammals from bats, to primates, to whales with modern descendants represented by the horse, cow, antelope etc.) next bloomed with the extinction of the dinosaurs, beginning about sixty-five million years ago.

The neocortex, or new brain, blossomed in the higher mammals (dog, cat, monkey, porpoise, human, etc.). In the higher mammal, the reptilian and lower mammalian brains remain represented but they became functionally consolidated with the autonomic nervous system. The further explosive development of the new brain did not establish direct neural controls over the more ancient consolidation of the emotional apparatus. The emotive apparatus thus has a built-in degree of autonomy that is indebted to the reptiles and the lower mammals.

In other words a large intellectual capacity progressively emerged that is fueled by emotional energies of autonomous origin deeply rooted in our evolutionary ancestry, going back some four hundred million years. These evolutionary developments have reached their zenith in one species, *Homo sapiens*. Although the porpoises and whales may have larger brains they are lacking in frontal development associated with creative activity. In addition, the functional organization of the human neocortex has become bilaterally polarized to a very high degree. The right and left hemispheres have different specializations of function through the development of language and the consequent capacity to deal creatively with experience in abstraction. Words assume the role of elements of experience, so that we can simulate experience through language, analyse past events and plan ahead.

The capacity to simulate experience through language has not been a biological development, even though our biological apparatus has made it possible. Genes don't program the meanings in words. They don't program meaning at all. We have to learn meaning through experience with intelligent input, and we can learn many languages if we make the effort. We also learn to intuit many things that we can never adequately put into words.

In the few decades since Sperry's classic split brain experiments it has become clearly established that our right brain is generally concerned with mute intuitive perceptions into the dynamics of spatio-temporal organization, including music, art, and aesthetic values, while our left brain is concerned with explicit techniques of expression including languages and sciences of all kinds. Despite a few anomalies in this arrangement, we can sum up simply. We can say that the mute right brain deals with intuition, the language left brain deals with technique.

Since we are born the most helpless of creatures, we must consciously learn to do most everything. Shortly after we learn to walk the learning process becomes very dependent upon language, so that the

bilateral polarization of function into right and left hemispheres becomes ever more committed from age one. This conscious integration of experience may have to cope with genetic limitations but it is not genetic in nature. All humans have a huge capacity to learn compared to other animals that learn their routines more quickly, but have a lesser degree of conscious control.

It should now begin to dawn on the most recalcitrant observer that a huge body of evidence is accumulating to indicate that the whole evolutionary process is intelligently directed and planned from the outset. The overall plan is implicit in the nature of the intelligent order, while the specifics have flexibility to accommodate conditions. Since that order is cosmic in its design, the plan is universal wherever intelligent life may evolve in the universe. This does not mean that all forms of intelligent life must be humanoid, but they must have a capacity to reflect upon emotive experience in abstraction and translate some degree of intuitive insight into the cosmic structure of experience into a reasonably self-consistent form of behavior. This three-fold nature is especially mandatory in all socially intelligent creatures.

Natural selection is accommodated as a subsidiary adaptive mechanism. Even in our intelligently run social and economic organizations developments are subject to trial and adjustment, while chance events happen continually. In the biosphere, however, an overall development plan has been instituted from the very beginning, working on a time schedule of nearly four billion years.

The development plan involves climbing back up the hierarchy of sentient awareness in discrete stages toward knowing the nature of the intelligent order that initiated the planetary endeavor in the first place. Through knowing that order, and coming to intelligent terms with it, we may hope to transcend our physical limitations, including our eventual decline and death. Coming to intelligent terms requires that right brain intuition and left brain technique (our spiritual and social commitments) find accord with our evolutionary history structured into our emotional apparatus. These three focal points of mental activity must arrive at a mutually sustainable balance. They are themselves an expression of the cosmic order.

The balance depends upon the degree to which we can see into the workings of the order that has determined our evolution, and translate this insight socially. If it is all a random accident, then there is no order, no value in seeking one out, and nothing of meaning to translate socially.

We are then left socially, spiritually and morally bankrupt. The evidence for intelligent order is overwhelming, however.

As humans we have become endowed with a biological apparatus through which we can transcend our own origins, even while we must strive to reconcile our activities with our biological roots. Our right and left brains are harnessed to a common emotional apparatus and the three are constrained to live in the same house together. These are the three independent yet mutually related focal points to conscious mental activity.

Emotional energies are *routinely* being refluxed into conscious cerebral awareness where right brain intuitive insight into the dynamics of the circumstance conceives of relevant mute *ideas* that then find left brain translation into explicit *forms* of behavior. The somatic enactment of explicit techniques is in turn fueled by emotive energies that *routinely* become tailored in the process, such that the *form* of the activity mirrors the mute *idea*. It is similar to chipping away at marble to make a statue.

And so we learn and intelligently evolve, both intellectually and emotionally, by lending appropriate forms to experience. The forms themselves may be transient, requiring perpetual reassessment of what is appropriate, but the process itself is eternal. Universal values emerge as the transcending essence of the process, since it implicitly involves the integration of experience and the pursuit of unity. This means the integration of history. The integration of space and time!

But Dawkins wouldn't agree with this even though it is based on solid evidence. His denial of the "why" question indicates he doesn't believe in meaning. This rather leaves evidence of anything out in the cold.

"We humans have purpose on the brain," he says, implying that this is a meaningless phenomenon. In typical doublespeak he at the same time points out the utility function of the purposeful creative activities by which we survive, from making cars to can openers. "Show us almost any object or process, and it is hard for us to resist the "Why" question—the "What is it for?" question," he says. Genes are supposed to be the universal answer. But then he tries to distinguish between when the question has meaning and when it does not. We may not ask the temperature or the color "...of, say, jealousy or prayer." Isn't it strange that no one is ever inclined to do so? He tosses in this ridiculous example to show that we have no right to expect answers to "Why" questions about the universe. "Behind the question there is always an unspoken but

never justified implication that since science is unable to answer ‘Why’ questions, there must be some other discipline that *is* qualified to answer them. This implication is, of course, quite illogical,” he writes.

Dawkins is very confident of support among his colleagues. Only the scientifically illiterate ask “Why” questions about living creatures, he says, proud that Darwinists now have “an absolute majority” in the scientific community. It has become so closed that no one else can get published by academic publishers. They have genes on the brain.

“Actually, Darwinists do frame a kind of ‘Why’ question about living things, but they do so in a special, metaphorical sense,” he says. Special privileges for Darwinists! A metaphor is a figurative way of saying the same thing as in plain language, but in special double speak language it is supposed to mean something else altogether. “The illusion of purpose is so powerful that biologists themselves use the assumption of good design as a working tool.” “Why” questions are accepted as a kind of shorthand by modern Darwinists, he says. It certainly saves them the arduous and usually impossible task of explaining many evolutionary developments by natural selection.

An example he quotes is that bees see well into the ultraviolet range of the color spectrum and flowers are decorated with ultraviolet patterns that we can’t see “...which often serve as runway markers to guide bees to their nectaries.” The ultraviolet markings could be completely irrelevant or they could have been purposefully developed, but Darwinist shorthand permits them to claim they are the sole result of gradual selection pressure, on the assumption that bees need a runway to take them where the nectar is. Bees must somehow have coincidentally mutated a parallel ability to read and interpret abstract signs. It’s obviously very convenient for Darwinists to expropriate purpose to a mindless cause.

In comments on the previous chapter it was pointed out that the bee dance is one thing. To perceive and interpret it is another. One group of researchers, Wenner and colleagues, while accepting that the dance happens, denied that other bees could read it. In an experiment to determine one way or the other, a researcher named Gould painted the eyes of the dancing bee so it couldn’t see, whence gravity substitutes for the position of the sun. Then he used a light bulb as a sun substitute for the remaining bees and tricked them into flying in the wrong direction, which was nevertheless in accord with the dance. This proved that the bees are able to interpret the dance and that they are not guided by other

clues. But so what? This doesn't argue in favor of Darwinism but against it. It argues strongly in favor of purposeful design. It compounds the odds against the bee dance evolving through selection pressure alone far beyond credible limits, as was pointed out before. The ability of other bees to read the dance must evolve in parallel.

Darwinists must think the rest of us dull to be so easily duped. But then the rest of us don't see the political in fighting through which they have established and maintain their dominant position. The rest of us just see the results that emanate from the academic institutions we support, and most of us have no intelligently informed basis on which to contest them. Even if we do have, we cannot get heard where it matters, while they can say whatever they like. By their own paradigm, their words don't have to have meaning, so long as they have survival value. The mindless religion thus proliferates like the pox.

"Utility function" is a technical term that means "that which is maximized," according to Dawkins. The utility function of all living bodies reduces to one thing, DNA survival, he insists.

Now double speak kicks into high gear. To establish his case Dawkins asks us to imagine that living creatures were made by a Divine Engineer, then we are to try to work out, by "reverse engineering," what was being maximized. This according to Dawkins is God's utility function, although the connection escapes me. He says it reduces to one thing, namely DNA survival. *Only* DNA survival. DNA by itself is an inert chemical. What utility is there in that?

The ludicrous manipulation of language is supposed to make us believe anything. We are to believe that the four hundred million year evolution of conscious sensitivity, with a capacity in humans for intentionally directed thought and behavior, is a meaningless by-product of DNA survival. Our acute awareness of all suffering, sacrifice, injustice, death, is completely irrelevant to God's utility function. There are no universal values, no truth, no beauty, no love. Nature isn't cruel, just completely indifferent, he insists. Our sense of wonder and our quandary over our painfully terminal situation is nothing more than a grim sadistic joke, completely without significance. This is the interpretation that Dawkins insists is full of inspiration and beauty.

For the next dozen pages, Dawkins discusses why the proportion of males to females in wild populations—the sex ratio—is usually 50:50. This seems to make no economic sense in many species where the harem system prevails, but by "reverse engineering" Dawkins tries to show us

“...how everything makes sense once you assume that DNA survival is what is being maximized.”

Without a shred of supporting evidence he assumes that the blind purpose is always to maximize something, yet it is the rest of us that have purpose on the brain. We previously examined hard evidence to show that the human nervous system is structured such that we must evolve toward a conscious sustainable balance between three focal points of mental activity. Our ultimate survival as a species depends upon it. Maximization has nothing to do with it, except as a pathological emotional drive that we must learn to check. The purpose is intelligent balance appropriate to the needs of circumstance.

In any case, he makes extensive reference to the armchair logic of Sir Ronald Fisher to show that it is the parental expenditure on sons and daughters that is held at 50:50, since selection pressures will tend to maintain the balance. “For brevity” he invests animals with the power of decision over the sex of their offspring to maximize their numbers, or alternatively over their own sex, or in the case of bees the proportion of brothers and sisters reared, all according to utility function that somehow becomes genetically programmed. The assumed steps in the process of natural selection are conveniently omitted under the contrary guise of “utility function,” another way of concealing double speak within a cloud of smoke. Dawkins even points out that a bee hive behaves like a single individual, which directly implies a level of collective intelligence at work.

But even if one assumes that Dawkins’ quantum leaps in logic are justified, so what? In the absence of evidence does it mean that his contrary logic reflects how sex is actually selected? There can easily be alternate explanations. Does any of this argue in favor of the maximization of DNA survival as the sole arbiter of evolution? Does it argue against intelligence at work in the evolutionary process? Once again Dawkins’ arguments are completely beside the point.

Dawkins goes on to suggest that all design “trade-offs” in nature are attributable to God’s Utility Function for DNA survival, from the beautiful plumage of the male peacock that attracts the female, to the climactic odyssey of the Pacific salmon returning thousands of miles to its birth place to spawn and die.

How does a biologist know that a female peacock is attracted to the male by the beauty of its plumage? Are peacocks capable of making certain value judgments that are not genetically programmed and

neurologically wired accordingly? If so then intelligence is at work. If not, then how did the perception of beauty begin to be appreciated in order to exert selection pressure in parallel with its random appearance? Why didn't it happen with the wart hog? Even in a peacock there is an autonomic nervous system distinct from cerebral hemispheres that allows emotional experience to be reflected in awareness. This neural wiring has diverse aspects and is extremely complex, again requiring recurrent concerted *sets* of random mutations, each of which must be just right, if it is to evolve by selection pressure alone. The odds of so many factors converging synchronously at random, each from an unlimited range of possibilities, are prohibitive. And how could this lead the female to appreciate beauty in any case?

It is all well and good to say that the effort of swimming upstream is so great that the Pacific salmon cannot pay to do it twice, therefore selecting in favor of one "big bang" reproductive effort. But what selection pressure impels the salmon to make the consummate effort to return unerringly to the place of its birth to breed and die in the first place? "Genes do not improve in the using," Darwinists claim, so the effort itself has no selection pressure in that respect. And even if salmon from the same spawning season could smell the difference between rivers and tributaries flowing out of the same terrain, why should this memory be encoded to impel their collective return? How do they find the river where it flows into the sea to even begin their upstream ordeal for hundreds more miles? Smoke screen arguments are all that Darwinists seem able to come up with.

Like his fellow hard line Darwinists, Dawkins has the myopic habit of taking isolated elements of local situations, such as the loudness of talk at a cocktail party that escalates to everyone shouting in order to be heard, and then he extends them into eternal universal principles. "God's Utility Function betrays its origins in an uncoordinated scramble for selfish gain," he insists, extending noisy talk at a party into a universal law. The evolutionary process is a four billion year endeavor, not an evening sipping martinis with noisy friends. The same noisy friends will castigate you for being openly rude or selfish.

The truth is that the creative process turns on two mutually exclusive variants, one evolutionary and one involutory. The evolutionary variant is an intelligent process directed toward the balanced integration of experience, transcending and subsuming the

creative process itself. We can learn to integrate history in a coherent and comprehensive way, according to how we make commitments.

The involutory variant is a blind identification with self to the exclusion of other, leading to the ultimate fragmentation of experience, to decay and death. Both variants manifest in a great diversity of ways in the evolutionary process, even within the same organism and the same species. But if the involutory variant succeeds to the complete exclusion of the evolutionary variant, it destroys the host it feeds upon and ensures its own demise. At the same time the evolutionary variant acknowledges a place for the involutory variant while it learns to redeem its energies.¹

Both variants share the same sensory referents in our natural heritage, and in doing so they present us with a bipolar moral disparity at the roots of perception. There is a little tug of war going on all the time as we continually assess which course of action is the most appropriate. We have to make these value judgments, however minor they may often be. We cannot avoid them. Sometimes they are based on socially oriented preferences, such as acceptable manners, or choice of friends, or choice of employment. Sometimes they relate to intuitively oriented issues such as the intention with which one helps another, or the intention with which one does a job. Sometimes they relate to our natural environment, such as how best to dispose of our garbage, or our nuclear waste. In other words value judgments assess the relative merits of our performance in bringing the three focal points of mental activity to an appropriate balance.

It has taken four billion years on the planet to biologically evolve a species capable of intellectually, intuitively and emotionally learning to appreciate this aspect of the cosmic order. In so doing we may evolve to transcend in good measure the organic process of our own evolution. The three focal points to the integration of experience may be keyed to our organic form, but an appropriate balance between them is not confined to it, since it is independent of genetics. We may evolve to transcend our genetic origins through the meaningful integration of history. That's the point.

It is to this end, implicitly ordained throughout the history of the biosphere, that the creative process is constrained to endure the suffering that it does. Suffering is essential to learning, to the appropriate sorting out of the involutory variants, and consequently to the process of our conscious evolution. In biological time we have only recently ventured

out of the jungle. We have yet to appreciate the cosmic import of our being. We shall explore more evidence of this later.

But Dawkins maintains that "...there is, at bottom, no design, no purpose, no evil, no good, nothing but blind pitiless indifference. ...DNA neither knows nor cares. DNA just is. And we dance to its music." The last sentence is not consistent with the rest of his logic. He has been insisting all along that DNA is the only reality. The word "we" is a myth. "There is no spirit driven life force, ..." There are no musicians, and there are no dancers. There is only sheet music compiled by accident.

The danger that hard line Darwinism poses is very real. This involutory variant of the creative process might win a selfish contest for survival by completely negating the evolutionary variant. Darwinism erodes at the foundations of all redeeming values. It erodes at the foundations of civilization itself. Greed is openly stated as the only moral. Darwinism perpetuates and extends itself through our educational institutions and through the media, claiming dominance over every academic device at its disposal to silence intelligent opposition or alternatives, all without evidence to establish its case.

NOTES:

¹ A description of how the involutory and evolutionary variants mutually relate to the same perceptual referents was outlined in *Fisherman's Guide, Appendix 2.*, *ibid.*

CHAPTER VI
Our Celestial Prison

5- The Replication Bomb:

Dawkins begins this chapter of his book with reference to the three supernovas that have been observed in our galaxy since Chinese astronomers first documented a star exploding in 1054, to leave the Crab Nebula in its wake. He applies the analogy to the information explosion that he says has occurred on our planet, and that he calls the replication bomb, linking it to DNA. “The reason self-replication is a potentially explosive phenomenon is the same as for any explosion: exponential growth—the more you have the more you get.”

Double speak creeps in again here for he jumps from DNA replication to our technological culture. We have seen that the latter is dependent upon language and is not genetically programmed by accident. It is through us, he says, “—through our brains, our symbolic culture and our technology—that the explosion may proceed to the next stage and reverberate through deep space.”

But why, in the first place, are we to assume that there has been an exponential explosion of digitized information via DNA survival? If less than one percent of species have survived to the present, this indicates a growing proportionate *loss* of information that has been accumulating through the evolutionary process. The only way it could be preserved is if some intelligent process could reemploy the information gained from extinct lineages to enhance the evolving characteristics of surviving lineages.

We might expect an intelligent process to work in much the same way that we humans are able to reemploy the lessons we learn in one circumstance to help us cope in certain other circumstances that arise in the future, since different experiences are frequently presented to us with inherently similar characteristics. Intelligent creatures are endowed with memories and a capacity for recall that permits the spanning of space and time. To the extent that we can understand the ever changing stream of circumstance we can tailor old memories to reapply similar techniques to new situations. Memories are not hard wired to the thought process, since the abstract concepts of thought are not hard wired.

However, the recall process is tensionally coupled to sensory input such that it is always relevant to the ongoing stream of circumstance. As

a simple example, when we see that we are out of groceries, we remember that we must go shopping to stock up for future needs based upon our past experience. We span space and time through our perception of appropriate needs and we respond accordingly. It is in this way that we effect the integration of history, and the evolutionary process is busy at the same endeavor. So is the whole cosmic order that turns the heavens. But all of this is contrary to the Darwinian position. So accordingly information digitized by DNA must be being lost.

Dawkins then turns to the origins of life. He concedes that there is no direct evidence of the replication event that started life on the planet, but insists that it *must* have begun as a chemical event. There is no evidence whatever for that either, but most Darwinists seem *certain* that it was through a series of chemical accidents that biological life got started. That is blind unsubstantiated belief. It is difficult to understand why anyone should volunteer to be so totally committed to a mindless idea that requires their own complete psychic demise at death.

After an excursion through right and left handed stereoscopic chemicals that rotate polarized light in opposite directions, and that can act as a template for their mirror image forms, Dawkins comes to the work of Rebek and colleagues. These researchers demonstrated that true self replication is possible among simple molecules, something that molecules don't normally exhibit. Two small molecules are shown to join in solution to make a third, which then acts as a template to promote the formation of more of itself from the two starting molecules still in solution. The population of the product molecule thus grows exponentially. One of the starting molecules comes in a variety of forms so that there can be competing varieties of the product molecule replicating itself. Ultraviolet light can also mutate one of the products into a slightly different form which is more adept at replicating itself and soon dominates the test tube population.

Dawkins is so sure that Rebek and colleagues are on the road to replicating the origins of life that he refers to these simple chemicals as "protocreatures." One can hardly construe this as impartial science. These "protocreatures" consist of a chain with only two links and the two starting molecules chemically combine to produce them initially, without benefit of their template. One might as well say that they can jump to Jupiter because they have learned to jump a meter. All it takes is a little more practice.

DNA can have billions of links in its chain and its monomers do not join up spontaneously without benefit of a template and a great deal more. They need enzymes to specifically catalyze thousands of essential chemical reactions in the life of a cell. Enzymes are large protein molecules that fold up in specific ways to fit the reactants together in just the right way for them to combine in each reaction. They can speed up the reaction rate a million times, so that each chemical reaction in a cell needs one. They are produced by the machinery in the cell, with the aid of still other enzymes, according to DNA blueprints that encode their amino acid sequences, typically hundreds to thousands of units long for each enzyme.

Selection must take place from twenty amino acids that must each be identified and brought into place for assembly in a very precise order. The assembly machinery consists of many ribosomes which are chains of RNA, also produced with the aid of still other enzymes from DNA, and these are precisely connected and folded into complex nodules. The assembly machines themselves are useless without both transfer and messenger RNA, both of which are transcribed with the aid of still more enzymes from DNA which must partly unravel in exactly the right place for this to happen. Messenger RNA brings to the ribosomes the section of blueprint from DNA that encodes the amino acid sequences for making a specific enzyme, while transfer RNA collects the necessary amino acids and brings them to the ribosomes for assembly. It is obvious that migrations throughout the cell must be specifically directed, timed, and integrated, according to an incredibly complex host of needs, yet the direction process is a complete mystery. The cell membrane must also remain in contact with the external environment and for this purpose it has complex proteins embedded in it that contact numerous external chemical messengers and trigger complex internal sets of chemical messengers, hundreds of them in cascades of reactions that transmit chemical instructions to DNA. The cell must also acquire essential raw materials and cut them up like vegetables for a stew but in precise ways with the aid of still more enzymes. And the cell must identify and dispose of waste materials as well as repair itself and maintain a cell wall outside the membrane together with its internal architecture. Then every once in a while it must spontaneously divide itself in two, each half containing precisely one complete set of encoded plans, together with all of the other equipment and enzymes necessary to continue the work.

Miss out a few critical enzymes and the whole thing won't work. These tasks, and more, are essential to simple prokaryotic cells, the bacteria. Bacteria typically have a few thousand enzymes to catalyze the necessary chemical reactions. The eukaryotic cells that are the building blocks of all plant and animal life are much more complex, somewhat like comparing a 747 to a motorcycle. They have many more enzymes that are required to function in a much more complex environment. But even the simplest bacterium has as much traffic within it as a large city crammed with motorcycles, cars, and trucks, each headed for specific destinations to perform a great diversity of tasks and guided by processes that we can hardly guess at.

The simple truth is that it remains a complete mystery how these diverse and incredibly complex and interdependent processes ever came together into a functional whole by any means imaginable, much less by accident. The simple truth is that the collective ingenuity of all of the biologists on earth still cannot begin to fathom how the many pieces of the puzzle work together, even after having identified much of the chemistry involved. They have no means at their disposal by which to research how experience itself is organized and integrated. The Darwinian paradigm prevents it, since Darwinists think they already know.

Undaunted, Dawkins plods onward. He points out that it is only in the last few decades of our four billion year evolutionary saga that our nervous systems have developed radio technology and now an expanding shell of information-rich radio waves is advancing outward from the planet at the speed of light and might one day be detected by remote civilizations far out in space. He calls it "...the radio threshold—the moment when a proportion of the information overflows from the parent world and starts to bathe neighboring star systems with pulses of meaning."

Note the double speak use of the word "meaning." Here Richard Dawkins unwittingly confirms that he himself believes that there is such a thing as a basis to meaning that is not genetically programmed and that altogether completely transcends DNA survival. How else could alien creatures hope to intelligently identify it? He has just finished saying, "The Centaurian radio astronomers would report, amid fanfares of excitement, that the star Sol had exploded in the informational equivalent of a supernova (they'd guess but might not be sure, that it was actually a planet orbiting Sol.)"

From this he says we can guess that information explosions “...pass a graded series of thresholds.” He has now begun to talk about the nature of a tiered order that transcends and subsumes random mutation and natural selection, in open contradiction to his own earlier position, which somehow seems to conceal the meaning in his own words from himself. He certainly isn’t a bad fellow at heart.

He first identifies five major thresholds in reverse historical order: the radio threshold, the language threshold, the nerve-cells threshold, the many-cells threshold, and the replicator threshold. The last one is now called “...a triggering event that made the whole explosion possible.”

From here he jumps back to his old position and uses the example of chain letters to emphasize the enormity of the numbers that result from geometric progressions, and different strategies that people may invent to get the letters duplicated. Then he says, with reference to the letters, “It is important to understand that none of these replicating entities is consciously interested in getting itself duplicated.”

Of course chain letters are not interested in getting themselves duplicated. That’s exactly the point! Neither are inert chemicals like DNA. Chain letters have intelligent agents behind them, namely people that are manipulating their content in order to achieve their replication. So does DNA have intelligent energies working behind it, manipulating its content so that it relates meaningfully to the working machinery of the whole cell, even to the organs and host in complex multi-celled creatures.

Like chain letters, living creatures are complex communications systems in intimate contact with themselves and their environment. “But it will just happen that the world will become filled with replicators that are more efficient,” he says, ignoring the fact that people are writing the letters, just as all Darwinists ignore so much obvious evidence that intelligence is implicitly at work in the creative process. Just because a letter may be left unsigned is no reason to assume that it wrote itself.

Dawkins adds the example of the “St. Jude Letter” to show how easily people may be duped into believing, implying that anyone who believes there is anything more than random chemistry at work in the creative process is also easily duped. On the face of the evidence the opposite is true.

“A successful replicator molecule will be one that, for reasons of detailed chemical technicality, has what it takes to get duplicated,” says Dawkins, implying that although the technical details are beyond most readers, we may take his word for it. “All the organs and limbs of

animals; the roots, leaves and flowers of plants; all eyes and brains and minds, and even fears and hopes, are the tools by which successful DNA sequences lever themselves into the future,” he says. But you can extract pure DNA or RNA from a cell and place it floating freely in a jar with all the necessary monomers to replicate itself and it will not do so. You can wait forever if you like. Naked DNA and RNA are both inert so far as self-replication is concerned.

By stressing this theme over and over Dawkins expects us to believe that life got started by simple self-replicating chemicals that by some completely unknown series of accidental steps became DNA, a complex chemical that is not remotely similar. But even if we take raw DNA or RNA as a starting point, we are still no closer to life. We can sprinkle DNA in the earth, and streams and lakes and rivers and oceans and organic soups forever and it will not initiate new life. This in fact happens daily on a huge scale, complete with the cellular machinery that surrounds it, every time a leaf falls or a creature bleeds or kills or dies, but new life does not reassemble itself and come creeping out of our graveyards. The host creature is not something physical, and when it dies, the life disappears from the chemistry. The host is a manifestation of the intelligent processes that guide and direct the chemistry of life. The host is a microcosm in the universal chore of integrating history.

Dawkins next turns back to thresholds for a guess at the steps in the chronology of a life explosion on any planet, anywhere in the universe, the series of thresholds through which life must pass. He is entitled to his guess, even though he is unaware that he is back to sniffing out the nature of hierarchies in the cosmic order. He is talking about deciphering an order to life that transcends and subsumes its primary chemistry. He is also talking to a certain extent about climbing a ladder of sentient awareness to conscious thought. But then, typical of his science training, he reverts to a linear progression of technical achievements rather than stick with our continued evolution as intelligent beings.

He then adds to his initial five thresholds and identifies ten thresholds in all, and some of them are legitimate levels in a universal hierarchy of a higher order than the three levels *Idea*→*Routine*→*Form* identified earlier. He even says that some of these steps are likely to be genuinely universal, while others may be peculiar to our own planet. “It may not always be easy to decide which are likely to be universal and which local, and this question is interesting in its own right.”

So Dawkins does have some inspiring glimpses into reality. He really does believe in transcending universal influences that are operative in the creative process. He is even attempting to integrate history through the chronology of the thresholds. And him a Darwinist no less!

Before reviewing Dawkins' ten thresholds it is worth diverging for a moment to explain a little about hierarchies. Since we all encounter them in business organizations it will be convenient to explain how they become established there.

In a one man business there are no hierarchies apparent because they all exist in the intelligence of one man and he does all the physical work. To an outside observer the physical work is all that is seen and we may call this the *form* level. Behavior takes a certain form and gives a specific form to a product.

Let's say our businessman is making stainless steel screw nails for the marine industry. Lets call him Hank. Hank has one machine that he operates himself, he purchases and stocks the raw materials he needs, he keeps his own books, he services and repairs the machine, and he makes his own sales and deliveries. He is a factory laborer, purchasing agent, warehouseman, accountant, repairman, salesman and delivery boy all wrapped up in one. All the variety of jobs that Hank does are *form* level work, that we might better call *functional work* in the case of a business.

Hank's business is good and in no time he has twenty machines making stainless bolts and a variety of fittings as well as screw nails, and all the jobs that he used to do have been delegated to fifty or sixty employees. They are divided into departments that each do different kinds of *functional work*. Even the foremen or heads of these small departments are concerned with the form of their final product and thus do functional work through focusing on task cycles.

Does that mean that Hank now has nothing to do? Not on your life. Now he has headaches with matching up work schedules with sales commitments, and cash flow financing with customer credit, and inventory levels with turnover, and costing with pricing, and quality control verses customer satisfaction, and equipment maintenance versus replacement, and rental space versus purchase, and more, that all used to fall into place simply in his head. Now he has to commit plans to paper and keep records that never used to be needed. He has to budget all his resources against all his commitments according to product cycles.

This is a new kind of work that does not directly involve the *form* of the end product that employees in each department produce, whether it

be a balance sheet or screw nails. Hank's work now involves the *routines* of his business that are predominantly associated with product cycles as opposed to task cycles. We may call this kind of work *supervisory work*, keeping in mind the special meaning associated here with the word *supervisory* to distinguish it from *functional work*. A supervisor in this sense works on a higher level of abstraction than a functional foreman. And now Hank has to do hiring, and evaluate pay levels, and train and discipline as well, but this is usually of a functional nature.

Hank's business continues to prosper and grow. He has started to cast, forge and machine larger stainless fittings, valves, and small pumps, all for the marine industry. He has put a down payment on factory space and offices that now house five hundred employees. He has had to further delegate the personnel function at the *functional* level, and he has also had to appoint a Plant Superintendent responsible for *supervisory* level work in the Operations Department, with plant foremen, maintenance foremen, scheduling, quality control inspection, and cost accounting, all at the functional level reporting to this superintendent. He has also had to develop an Engineering and Design Department with delegation of *supervisory* work to a Chief Engineer, with design engineers, draftsmen, mold makers, costing and budgeting, scheduling, materials testing, and technical inspection all at the functional level reporting to him. He has also had to delegate work at the supervisory level to a Sales Manager over a Sales Department, and to a Chief Accountant over a Treasury Department, each with a variety of tasks at the functional level reporting to them.

Hank himself is now obliged to concentrate primarily on what we will call *administrative level work*, concerned with the assimilation, maintenance and development of *knowledge* implicitly essential to the facilities, to the technical and human resources, and to the infrastructure of the organization generally. He is concerned with these kinds of infrastructure cycles, as opposed to product or task cycles.

A three level universal hierarchy was previously identified but it subsumes and transcends a four level universal hierarchy in which explicit *knowledge* becomes distinct from the integrating *idea*. The elaboration of a four level hierarchy may therefore be described as: *Idea*→*Knowledge*→*Routine*→*Form*. Four levels are common in large organizations whether economic or biological. Hank's work has now graduated to administrative *knowledge* level work.

It soon becomes apparent to Hank, however, that conditions are just right for him to go international and if he doesn't do so, it could adversely affect his business at home since boats and ships travel the world and they need service. In order to do so he must fill out his line of products, have a network of international distributors and a couple of manufacturing plants abroad. He has to delegate *administrative* level work to develop the necessary facilities, resources and infrastructure. He also needs a Marketing Department, probably at the *supervisory* level, completely distinct from Sales, to assess international markets and keep the stream of available products current with market needs. The other five departments, Operations, Engineering, Sales, Treasury, and Personnel, will probably all be promoted to *administrative* level work with Vice President chiefs.

Hank has had to move up another level of abstraction in his everyday thinking. As President and Managing Director, he is now concerned primarily with *idea level managerial work*. This kind of work integrates, maintains, develops and diversifies, or consolidates his far flung organization. This work gives overall coherence and direction to the organization. It was there when he was a one man operation too, but he was too busy to give it much notice. Nor did he need to. Now it requires nearly all of his time.

The point in all of this is that every business organization during its growth goes through these same four major stages of delegation up a hierarchy of different levels of work. (In still larger organizations the process starts again with a broader focus, involving considerable diversification.) As delegation proceeds the same six departments always break out, tailored only to the nature of the business they are in. Within the larger departments, especially operations, the same six sub-departments break out again within it as it grows. In practice intermediate levels of work creep in and the six departments are not always separately delegated, but invariably when this happens bureaucracy and political infighting begin to erode the organization from within. The organization loses its transparency and ceases to operate intelligently and responsibly.¹

Note, however, that direction in the hierarchy always comes in reverse order to that in which delegation occurs. *Idea* gives direction to *Knowledge* which gives direction to *Routine* which gives direction to *Form*. Thus it is also in the evolutionary order. We have evolved up through the plants (cellular form), the invertebrates (motor sensory

routine), the vertebrates (cerebral awareness in knowledge), to Homo sapiens (idea integrating history). The history of our evolution has been incorporated into our anatomy such that our creative *ideas* give direction to our accumulated *knowledge* which gives direction to our motor sensory *routines* which animates our physical *form*. But this pattern is surely a reflection of a self-similar pattern to universal intelligence that has directed the evolutionary process in the first place, as the evidence clearly and powerfully indicates, culminating in the delegation of conscious intelligence to humans.

When we come to assess the evolutionary process in this light, the futility of the Darwinian position becomes apparent. It fatally cripples itself by focusing exclusively on the physical *form* of chemical processes, which are valid enough in their own right, but they don't give direction to the evolutionary process. By concentrating exclusively on the lowest level in the hierarchy Darwinism has no hope of ever advancing up through the hierarchy to understand the integration of living processes. The more Darwinists win, the more we all lose.

With these thoughts in mind let's return to Richard Dawkins' ten thresholds.

The first threshold, he says is the arising of some kind of self copying system with some rudimentary form of hereditary variation, with occasional random mistakes in copying, which he says will result in a mixed population competing for resources which will become scarce.

Now the earliest fossil evidence of life has recently been pushed back to nearly four billion years ago, almost immediately after the planet had cooled sufficiently for life to survive, so it didn't take vast spans of geological time for life to evolve, despite infinite odds against it happening by accident. This should lead us to look for another route as to how it began.

One reasonable alternate was suggested early in the century by Svante Arrhenius, and it was promptly ignored. A Nobel prize winner in 1903, he suggested that the earth could have been seeded by spores arriving from interstellar space. Sir Fred Hoyle and Chandra Wickramasinghe have further investigated the possibility and found it quite possible that bacterial spores and perhaps very small eukaryotic spores could survive the rigors of interstellar space and be carried by comets to the inner solar system where solar radiation pressure is sufficient to carry them to a soft landing on planets with atmosphere. It offers a credible mechanism by which life could be seeded on suitable

planets from an interstellar gene pool. There are also mechanisms by which dormant spores can be ejected from planets to maintain the pool. Asteroid impacts, for example, are common in the early life of planets and they can readily eject spores into interstellar space.

These efforts to investigate alternate origins to life on the planet have been largely ignored. The Darwinist lobby is powerful. Even though the findings make a lot more sense than bacteria forming themselves spontaneously by accident in a primordial inorganic soup, they are dismissed. Hoyle and Wickramasinghe conservatively computed the odds of producing by chance from twenty amino acids just the two thousand enzymes necessary for a simple bacterium to function. They are $10^{40,000}$ to one, against. There are no names for such vast numbers. It would take ten pages just to type out forty thousand zeros after a one. It is infinitely more than all of the electrons and protons in the universe. (That number can be written in a couple of lines.) And those odds only get us the enzymes. They do not tell us how the enzymes work together with DNA and RNA to produce the organized machinery of the cell.

But Darwinists turn their heads and go back to talking about chemical accidents, ignoring odds that a bookmaker wouldn't take if the planet had a billion billion years to work the result. It's more possible that life was seeded intentionally by advanced alien civilizations. The appearance of eukaryotic cells is as much a mystery as that of prokaryotes, for their level of complexity is several orders of magnitude greater. Even the "miracle" option is more possible than chance. It would entail a transcendent intelligence "moving on the face of the deep," directly assembling the first living cells and setting them about the task of replicating. There are surely organized energies of some kind at work in the cell that govern the complex migrations of chemicals to the right places at the right times as if they were all in communication in response to mutual needs. But it's not necessary to invoke this kind of speculation when the panspermia theory of Arrhenius, Hoyle and Wickramasinghe can be tested.²

In any case the development of the plants and their competition for resources did not deplete the planet's resources so much as enhance them. Plants capture the sun's energy and store it, in apparent defiance of the second law of thermodynamics, since even in death their decay products leave the environment more ordered. Each chemical reaction in a cell or a plant obeys the second law, leading to an increase in disorder, and yet the intelligent integration of all the interdependent reactions and

processes going in a cell, taken together as an integrated whole, generates an increase in order. It cannot be an accidental process attributable to atomic billiards. But however life got started it was a first threshold. We may assume that much.

Threshold 2 is the Phenotype Threshold. “On our planet, phenotypes are easily recognized as those parts of animal and plant bodies that genes can influence. That means pretty well all bits of bodies.” Now even single celled creatures have a complex cell body, and since we don’t find chemicals in nature replicating themselves nude, including DNA or RNA, how can this be assumed to be a threshold at all? The living record is replete with surviving examples of every other major step in the evolutionary process. The self-replicating mechanism, as we know it, is utterly dependent upon the complex machinery of the whole cell and there is no sound reason to expect that it has ever been otherwise. There are many hundreds of enzymes in the simplest bacterium that are necessary to catalyze the chemistry essential for replication together with the growth and maintenance of cells generally. Let’s set this threshold aside as redundant.

Threshold 3 is the Replicator Team Threshold, “...which may on some planets be crossed before, or at the same time as, the phenotype threshold. ...The genes work in teams.” Genes are obviously organized in some way to integrate information and to produce a coherent result, and again there is no sound reason to expect that it has ever been different. The simplest free-living cells, pleuromona, are estimated to have about a thousand genes, most of them committed to encoding the amino acid sequences in making the protein enzymes that are essential to catalyze the chemistry essential for replication, maintenance and growth. Escherichia coli, a more typical bacterium, has about 4000 enzymes. The latter translates to about 4,000,000 base pairs in precise sequence, a far cry from two links in the chain of a self replicating chemical under controlled conditions. A human being has about 2.9 billion base pairs in its genome, and for some strange reason the genome of the South American lungfish is about thirty-five times larger than that of the human. In any case there is a total absence of evidence to indicate a progression from replicating chemicals to a cell body with genes working in isolation, to genes working in teams. The evidence in fact indicates that Threshold 3 came at the same time as Thresholds 1 and 2, that the living cell is so interdependent on all of its working parts that it somehow appeared on the planet as a functioning whole.

But Dawkins doggedly pushes his point further: "...it is obviously tempting to leap to the assumption that Darwinian selection nowadays chooses among rival teams of genes—to assume that selection has moved up to higher levels of organization. Tempting, but in my view wrong at a profound level," he says. It is hard then to understand why a hundred and sixty million years of prolific reptilian evolution should be wiped out in favor of a few ancient rodents, asteroid catastrophe or not. Perhaps there is a fear that selection moving up to higher levels of organization directly implies that there is a more fundamental order to the creative process than random chance. That would be a crack in the armor that would bring down the Darwinian edifice. And yet there are hierarchies recognized in gene expression, since homeotic genes are known to activate teams of genes in concert.

Dawkins identifies Threshold 4 as the Many-Cells Threshold. He skips over the big event that made this possible, the appearance of eukaryotic cells. When cells divide, he observes: "If two cells do not separate fully but remain attached to one another, large edifices can form, with cells playing the role of bricks." He doesn't address the question of why cells should not separate fully, but remain in obvious intimate communication with one another and develop diverse specialized functions which mutually cooperate to some collective end. They are obviously more than insentient bricks.

He explains that "...many-celled organs acquire their characteristic shapes and sizes because layers of cells (bricks) follow rules about when to stop growing." Really! How are insentient bricks to follow rules? There must be a development plan that is communicated to all cells in the organ and the organism, all of which have identical genes. Some communication system must be operative to switch specific genes on and off in each cell at just the right time for it to assume a specialized function in relation to all the other cells. And genes themselves must be hierarchically ordered in an intelligent way if some are to act in a directing capacity over others.

It's good of Dawkins to make the admission that "Cells must also, in some sense know where they sit in relation to other cells. Liver cells behave as if they know that they are liver cells and know, moreover, whether they are on the edge of a lobe or in the middle." This is a clear admission that a communicative intelligence is at work in the collective organization of cells.

One can hardly assume from this, that how intelligence works is local to our planet. On the contrary intelligence displays all of the earmarks of being universal in its operation. But Dawkins has only lapsed back into double speak, for he then says, “Whatever the details, the methods have been perfected by exactly the same general process as all other improvements: the nonrandom survival of successful genes judged by their effects—in this case, effects on cell behavior in relation to neighboring cells.”

This is more jumping to Jupiter. Dawkins’ bucket just doesn’t hold water. You can’t write off obvious communication between cells as just “a difficult question” to be explained one fine day in the future, not when the evidence so obviously contradicts the only mechanism Darwinists allow to explain it. We may nevertheless accept that multicellular Threshold 4 represents another level up an intelligent hierarchy that is implicit in the evolutionary process, the first level being the living cell, that is, the combination of Thresholds 1, 2 and 3.

Dawkins now jumps several hundreds of millions of years in the evolutionary process, from the appearance of multicelled plants to the development of the neuron, which emerged with the invertebrates.

Threshold 5 is the High Speed Information Processing Threshold, which on our planet may be called the Nervous System Threshold. Dawkins believes in his theme, “...because now action can be taken on a timescale much faster than the genes, with their chemical levers of power, can achieve directly. Predators can leap at their dinner and prey can dodge for their lives, using muscular and nervous apparatus that acts and reacts at speeds hugely greater than the embryological origami speeds with which genes put the apparatus together in the first place.” Dawkins doesn’t see anything fundamentally meaningful in this development other than the survival of DNA, and the leverage it gains. But DNA survives comfortably in creatures without nervous systems, so where is the leverage?

But then again he turns around and among the consequences he acknowledges “...large aggregations of data handling units—‘brains’—capable of processing complex patterns of data apprehended by ‘sense organs’ and capable of storing records of them in ‘memory.’ A more elaborate and mysterious consequence of crossing the neuron threshold is conscious awareness, ...” So Richard does after all acknowledge that there is something mysterious going on in that mystic jelly called a brain,

at least to the extent that we don't yet understand it. He calls Threshold 6 the Consciousness Threshold.

Of course everything is mysterious until we understand it properly. Without mystery there wouldn't be science. We have seen, however, that awareness is associated with the evolution of an autonomic nervous system in concert with cerebral hemispheres, such that the vertebrates are able to reflect emotive patterns of behavior in cerebral awareness. Because all vertebrates are anchored to a common skeletal, sensory, motor, and visceral arrangement, we have access to the emotive feelings of others than our isolated physical selves. Awareness begins to transcend the self in awareness of others' feelings. We all empathize with domestic pets, and they with us.

Now what has that got to do with the blind survival of DNA? It's very difficult to see how it may convey a survival advantage if predators start to empathize with their prey. And if intelligent social creatures have evolved anywhere else in this vast universe, they too must have acquired an ability to reflect on experience and make sense of it. In humans this awareness of other than self is compounded by the development of language and the ability to abstract experience, to think and plan, incurring a need for intuitive insight into the dynamics of experience itself in order to function at all. And the meaning inherent in words is not genetically programmed. It is intuited from general experience that is independent of our individual genetic makeup, whatever the blessings or burdens endowed by the latter may be.

Dawkins calls Threshold 7 the Language Threshold, which may or may not be crossed on a planet. But if there is no conscious ability to deal with experience in abstraction, as we do with words, there can be no independent creative activity, no ability to consciously plan, and no consciously entertained collective social endeavors. These things are all dependent on three focal points to the process of thought, namely one intuitive, one emotive, and one behaviorally explicit. This allows for the conscious expression of the universal hierarchy *idea, routine* and *form*.

Dawkins sees all of this as a flat, mechanically interconnected networking system "...by which brains ...exchange information with sufficient intimacy to allow the development of a cooperative technology." Notice how he slips in that word intimacy, a value. How can there be intimacy without consciously abstracting meaning from experience and recognizing another as sharing similar conscious

intentions? Cooperative technology depends upon it. If this is all genetically programmed there is no meaning to the word intimacy.

But Dawkins goes on to Threshold 8, the Cooperative Technology Threshold. “Indeed it is possible that human culture has fostered a genuinely new replication bomb, with a new kind of self-replicating entity—the meme, as I have called it in *The Selfish Gene*—proliferating and Darwinizing in a river of culture.” It is all so easy, once one realizes the hypostatizing power of words. Just give cultural traits another name and make it out to be another progression of accidents devoid of any transcending meaning, now even divorced from DNA. Just pure greed proliferating through the cosmos! “Beautiful and inspiring!” No wonder he calls it “...too big a subject for this chapter.”

Threshold 9 is the Radio Threshold, “...the power to make an impact outside the home planet...” May God forbid! It might be better to hope that some alien intelligence may contact us with some constructive advice, especially in the sciences. Of course radio messages have been rocketing into space at the speed of light for nearly a century and in a mere sixty or seventy thousand years increasingly faint echoes of our collective global radio racket could begin reaching most star systems in our galaxy, but not in a meaningful form.

“After radio waves, the only further step we have imagined in the outward progress of our own explosion is physical space travel itself: Threshold 10, the Space Travel Threshold.”

But where are we going to go? The moon is barren, Mercury or Venus would boil our blood, Mars would freeze it, the outer planets would crush and smother us, and we can’t work things out where we are. The other planets in our solar system are also very unlikely to be populated by highly evolved intelligent creatures and the next nearest star system is over four light years away. To get there and return with our present understanding of the physics of the universe would take a lifetime, and the relative time distortion would mean that several life times had elapsed on Earth in our absence. Perhaps it is fortunate that there are built-in restrictions to space travel, lest our own barbaric ways become contagious before we mature to a responsible age. Our current science makes a celestial prison of our planet.

If interstellar space travel is possible for intelligent beings anywhere in the universe, they must have a vastly superior understanding of the cosmic order than the simplistic understanding we have so far devised. It is very unlikely that space travel could ever be a practical affair for

beings anywhere by traveling through space and time. But a proper insight into the cosmic order transcends space and time. In some vastly superior science this may ultimately make quantum leaps through space possible, but this brings with it other restraints. It is highly probable that intelligent insights into the cosmic order present value constraints of powerful proportions, associated with the mutually conscious evolution of beings from different star systems. It would undoubtedly be an awesome mind expanding evolutionary event. If it was not to have negative consequences for either or both parties, one would expect that it would require highly responsible preparation and planning, as yet far beyond our current capacity to comprehend or relate to.

For Darwinists the outward vision ends on a sadly impotent note, with a space capsule plummeting outward beyond Pluto toward the empty reaches of interstellar space, containing a picture of a naked man and woman. The coordinates of our planet are iconically engraved in relation to the galaxy, in the hope that this tiny craft will someday be met by an alien intelligence that can understand the message. The hope is far more remote than slipping a note in a tiny bottle and setting it adrift, for the ocean of space is immense beyond our accustomed conceptions. To a Darwinist we are forever condemned to the cell, imprisoned with the survival of DNA in the cell, and the whole vast universe can hold no meaning. Although the Ten Thresholds may at first appear to offer hope of more, it seems that Dawkins hasn't grasped the elements of an intelligent hierarchy after all. Dawkins' heart is obviously in the right place, for his hopes are high, but the Darwinist logic precludes their realization.

NOTES:

¹ A full description of the principles involved in structuring a business organization, and how to apply them, is given by the author in *Enlightened Management and the Organizational Imperative*.

² A description of the Panspermia Theory and evidence as to how it may work is given in *Evolution From Space*, by F. Hoyle and C. Wickramasinghe, Granada Books, London, 1983.

PART II

Introducing

AN INTELLIGENT FACE TO EVOLUTION

CHAPTER VII
Introducing Some New Ideas

Atoms, Stars, Galaxies:

It is not enough to harshly criticize the hard line Darwinian view and leave it at that. Anyone can find fault. It is necessary also to suggest a more meaningful alternative that is consistent with the evidence at our disposal. With this objective in mind let us proceed to examine in broad outline an intelligent face that seeks recognition in the evolutionary record. To do this it is also necessary to reach back to our origins in the stars, for that is where our story begins. We are creatures of the cosmos.

Earlier I introduced the idea of historic integration, the integration of space and time as a theme inherent in the evolutionary order. The plants have worked out the spatial integration of the *form* of cells working together, including a large variety of possible sizes and shapes in multi-celled plants. The invertebrates have explored time-like motor-sensory *routines* involved in actively integrating experience. They sense the environment and respond dynamically to it over a huge range of circumstances. Vertebrate evolution has focused on the integration of spatial and temporal organization in a relatively fixed body plan that can progressively modulate behavior at ever more conscious levels of *ideation*. This results in the integration of history according to the hierarchy *idea*, *routine* and *form* which is inherent in the evolutionary process to begin with. Self-similarity pervades the cosmic order.

The integration of history, of space and time, is also the cosmic theme in the universal theater wherein atoms, star systems and galaxies are the players faced with a similar challenge of integrating space and time. Galaxies possess no independent material form. They are the focus of an integrating *idea* translated through the *routines* of stars to *form* the atomic elements from primary hydrogen.

We may call the universal projection of hydrogen the *primary creative process*. The intimate relationship between the photon, the electron and the proton within each atom is different in kind to the random external relationship between different atoms. The intimate relationship is a more primary characteristic of the physical universe.

It is the level of photonic energy (*idea*), associated with Planck's constant, that directs the electronic *routines* in discrete orbits that determine the atomic *form*, centered in the proton of the hydrogen

nucleus. These discontinuous sub-atomic units that act as separate particles have a universal counterpart that tunnels through them, like quarks linking them up from within, sewing them into discrete sets, thus making up the hydrogen atoms of the universe. Hydrogen atoms are separate and distinct, yet all of them are the same. They are one and many, universal and particular. And so it is with all atoms.

They also come and go. They are discontinuous not only in space but also in time. Atoms alternately exist as particles then as quantized bits of energy, synchronously oscillating between these two modes. Atoms thus exist as spatially distinct particles with wave characteristics. Their wave character is determined by their oscillation back and forth to a quantum mode that is spatially indistinct. The very existence of atoms is an extremely rapid series of synchronous pulses, like the successive frames in a movie.

Max Planck didn't realize what he had discovered when he came up with the universal quantum of action at the beginning of the twentieth century, nor did anyone else. Why should the electromagnetic spectrum be quantized? It is a continuous spectrum, and yet the colors of a rainbow come to us as a very rapid series of synchronous pulses.

There can be only one explanation. The physical universe is itself going on and off synchronously, thus packaging the transmission of light into a succession of space frames in a cosmic movie. There is only the action of light and related electromagnetic activity within each space frame of the movie, just as there is only the action of light projecting each still frame onto the screen of an ordinary movie.

Each space frame in the movie is interspersed with a timeless quantum frame in which matter is quantized as spatially indeterminate energy. Each quantum frame is a vast indeterminate Void of balanced energies spanning history, spanning space and time—a master sensorium that integrates quantized elements of experience. All the atoms of the universe become bundles of energy without particulate form. The physical universe thus oscillates between particulate form and indeterminate quantized energy—the Void.

The Void is the Big Screen in the projection of the movie. Relative motions of physical bodies occur through a series of quantum jumps in relative position from space frame to space frame, just as in any movie. The progression of the movie thus moves from space frame to space frame to provide us with the concept of spatial events changing with increments of linear time.

We measure linear time by repetitive cyclic motions. The Earth revolves once on its axis to make a day. Time, as we measure it and deal with it, is a cyclic recurrent affair that we implicitly span in our mental processes. We are able to do this through our access to elements of experience in memory, in other words through our access to a master sensorium that encompasses the universe. Experience becomes quantized in convenient packages that we can recall as past events. The past is thus interpreted to anticipate the future in an ongoing synchronous present. The very experience of being integrates history.

But hydrogen atoms are a very fundamental kind of being. They define the nature of space and time. Space and time are not *a priori* entities in themselves. They derive from the primary projection of physical matter. Each atom is projected independently yet synchronously with all atoms. Light can only travel a certain distance in relation to each independent atom within each space frame so it has a universal velocity. It must also interconnect all atoms within each space frame so that light itself defines the very nature of space. Where there is no light there is no space. There is a black hole. Relative motions between atoms occur as quantum jumps in position between space frames and this introduces synchronous distortions in the primary projection of the movie that account for relativity effects.

Each space frame exists for a discrete length of time as determined by the action of light within each frame. Light thus defines a primary interval of time as well as a primary increment of space. A primary interval of time may be determined in terms of classical units of time, from quantum considerations in the primary atom of hydrogen. It works out to be 1.519×10^{-16} seconds. That's how long each space frame lasts in the primary projection of the cosmic movie.¹

But hydrogen atoms weren't created first in a primal birth scenario that brought the universe into existence with space and time. Space and time are not things in themselves. There is no such a thing as a space-time continuum. With all due respect to the brilliant mathematical mind of Albert Einstein, he was simply mistaken in attempting to generalize the theory of relativity by creating a space-time continuum.

I am not the first one to say so. Henri Bergson took issue with him over his concept of time. A quarter of a century earlier, Richard Dedekind pointed out fundamental intractable problems with the very concept of a continuum to space. Zeno's paradoxes exemplified the contradictions implicit in infinite regress twenty-five hundred years ago.

If Einstein were alive today to see where science is taking us he might well change his mind himself.*

Space and time are discontinuous and synchronous. They have quantum characteristics that are not infinitely divisible, placing limits on the calculus. Planck's quantum of action confirms it. So too does Heisenberg's uncertainty principle, for how can the position and momentum of a moving particle both be known at once, when the exact position depends upon a single space frame, while the momentum depends upon change in position over a series of space frames.

If there was ever a primal creative event, then we are stuck with the impossible question of how everything came into being from absolutely nothing. The Big Bang refutes the theories on which it is based. The Big Screen does not.

The creative process is eternal and the cosmic order requires an operating field. The cosmic order had no birth, while galaxies have been giving birth to new stars and recycling old ones forever. There are stars in our galaxy that seem to be older than the allowable maximum age of the Big Bang. And a significant number of galaxies have rates of star formation sufficient to replace their entire stellar populations well within the same time frame, some within a billion years. High rates of star birth are very likely a periodic phenomenon in galaxies.

Our own Milky Way apparently has a black hole at its center which appears to have ejected at least four enormous concentric rings of hydrogen, millions of years apart. They are moving outward from the center into the spiral arms breeding star formation. Meanwhile old stars appear to migrate back toward the center and star sized masses are observed being torn apart in an accretion disc very near the center. This picture has been pieced together by X-ray and infrared telescopes scanning the skies.² This strongly suggests that galaxies are in communication with their stellar populations, that they are cells of creative reflux and renewal. Their stellar populations are renewed by regenerating the primary hydrogen feedstock from old dense stars for the recurrent nucleo-synthesis of the heavier elements in the centers of stars.

To get a glimpse of how this works together, picture the primary projection of hydrogen as a universally synchronous process. Almost all

* In a letter to a friend the year before he died Einstein wrote "I consider it quite possible that physics cannot be based on the field concept, that is, on continuous structures. Then nothing remains of my entire castle in the air, including the theory of gravitation, but also nothing of the rest of modern physics."

hydrogen appears in stellar populations together with the giant clouds in galaxies, and it constitutes about three quarters of the mass of the universe. Galaxies like our own are in pinwheel motions about their centers, and yet they must also maintain a degree of synchronicity with other galaxies that likewise entertain various motions about their centers. These cyclic motions introduce a degree of dissynchronicity into the primary projection of space and time associated with hydrogen. The center of each galaxy gets out of synch with respect to its own periphery, because light cannot fully bridge the quantum jumps in position of the stars moving around with considerable speeds.

Perceptual gaps consequently tend to open in the centers of galaxies with respect to their outer reaches, in order to maintain a preponderance of synchronicity with the universe at large. These gaps can be compensated for to some extent if primary atoms of hydrogen condense space by doubling up. That way two atoms can occupy less than the space of one by becoming heavier atoms. This complex nucleosynthesis of the higher elements from hydrogen to helium to carbon and so on is what takes place in the centers of stars. It is driven predominantly by the angular momentum of galaxies.

But the nucleosynthesis of the higher elements is not enough to absorb all of the perceptual gaps in the projection of the cosmic movie. A black hole is left as a common feature in the centers of galaxies. The space frames at the center vanish into the peripheral gaps opened by circular peripheral motions. This mends together the spatial closure of the galaxy as an integral whole that is predominantly synchronous with the universe at large. It results in an integrated space-time fabric.

It is true that this tends to lend local curvatures to space and time if we consider them as a continuum. But on a cosmic scale the assumptions on which General Relativity is based are invalid. They cannot be extended to the universe at large. The singularity at the center of a galaxy is shared alike with all galaxies in the universe as a single synchronous event. A very different cosmology necessarily results.

Solar systems themselves are also in rotation about a center, and we know in our own solar system that the sun constitutes about 99 percent of the mass of the solar system, while about 98 percent of the angular momentum resides in the planets. Why is most of the momentum in the peripheral planets and not in the much more massive sun? This strange phenomenon is manifest within the sun itself, since its poles rotate in thirty three days while its equator takes only twenty five.

This is the opposite of what one might expect from classical dynamics. For example when a skater goes into a spin with arms extended, their rate of spin increases as the arms are pulled into the body. In a similar manner, when the solar system condensed from a cloud of gas and dust it should be spinning faster at its center where the bulk of the mass has become concentrated. There must be a process which retards rotations at the center of the sun with respect to its own periphery and the peripheral planets.

Part of this effect is due to the nucleosynthesis of hydrogen into helium and heavier elements, which effectively concentrates space at the center of the sun with respect to its periphery. The other part may be due to a force of retardation at the center of the sun to compensate for and reduce the skipping of space frames at the center and thus preserve synchronicity with the universe at large. In both cases it can be seen that events within stars are linked via events in the centers of galaxies to the universe at large. Galaxies are in communication with their stellar populations through their need to be synchronous with the primary universal projection of matter.

This approach to physics has been much more fully developed in *Science and Cosmic Order: A New Prospectus*. The ideas are briefly reviewed here to show their general relevance to biological evolution on the planet.

We may now return to the universal hierarchy that pervades the cosmic integration of experience. Galaxies themselves are integrating their history, encompassing the whole of space and time. The creative *idea* of oneness is what lends integrity to the wholeness of anything. Their unifying *idea* is translated into their various *forms* through their angular motions linked to the *routines* within stars, and to stellar cycles of birth and death. Galaxies are like communities that see successive generations of people and buildings come and go, while they themselves are the elusive communications network that makes it all work together without benefit of independent physical substance. Galaxies can go on forever, but not the stars that constitute them. While the bulk of stars may be beckoned into being by the cohesive power of gravity, they are ignited by the need for the synchronous being of matter.

The unifying power of gravity and angular momentum initiates the integrating *idea* of a solar system. The nucleosynthesis of the elements physically knits together space and time through fusion *routines* that create new *forms* of atoms with concentrated gravitational mass. The

integrating *idea* holds the planets in their orbital *routines* and energizes their physical *forms* with rhythmic tidal forces and a flood of electromagnetic radiation. The planets themselves are formulated from heavier elements synthesized through the integrating power of previous generations of giant stars that expend their energies faster, ending in a supernova that enriches the clouds from which succeeding generations of star systems condense.

Planets have an independent yet related integrating *idea* realized in their gravitational *form* through dynamic *routines* generating magnetic fields, regulating plate tectonics and atmospheric patterns. Planets are thus constituted as complex chemical laboratories, furthering the *idea* of integrating space and time by linking up atoms through their electronic *routines* into an unlimited variety of molecular *forms*.

This chemistry is greatly elaborated in its variety by the complex mechanisms of life, when a biosphere is born enshrouding a planet. The biosphere must be seeded by the integrating *idea* of the universe at large, for that is what it's all about—the integration of space and time—the integration of history. The germination of life is a cosmic affair. Life integrates the potential of the universe to know itself through the self-similarity that pervades the cosmic order.

All of this happens according to the universal hierarchy *Idea*→*Routine*→*Form*, wherein each member of the hierarchy displays properties of self-similarity to the whole hierarchy, providing intelligent links. For example we find that stellar *routines* in galaxies are linked to planetary *routines* in solar systems that are linked to biospheric *routines* in planets. The same pattern keeps emerging again and again.

The Mandelbrot Set in Chaos Theory is a man made expression of the universal hierarchy. Its distinctive *form* is generated via the *idea* of successively integrating an invariant *routine*. This generates a geometrically patterned boundary between the inside and outside of the whole set that regresses infinitely within itself, with the same pattern recurring again and again at different levels of magnification.

The Cosmic Order and The System:

The cosmic order is not the simple affair that the Mandelbrot set is. There is much more involved than repeating an invariant routine. The cosmic order elaborates on itself in discrete stages associated with reconciling multiplicity to unity. The simplest expression of this is the

progression of the natural numbers, wherein each progressive number must be reconciled with unity.

Numbers, like everything else, don't exist as isolated entities in themselves. They are derived from the experience of multiplicity around us and we invent them to integrate experience by counting. The integrating *idea* of counting involves the invariant *routine* of adding one more to *formulate* each successive symbol that names the number of things counted.

There are five cows in the field. The symbol five qualitatively defines the quantitative number of cows in the field. They are grouped together, integrated. We know what five means as an integral whole. Each number has an integrated meaning and so it is also with the cosmic order when it comes to reconciling multiple interacting processes with unity. There is a series of discrete systems to the cosmic order that we may designate as System 1, System 2, System 3, System 4, System 5, and so on. It is the nature of this order that each higher system is transcended and subsumed by the systems that precede it, so that each higher system is a progressive elaboration of unity.

Numbers, however, have characteristics of their own. They repeat. For example the digits from 0 to 9 form the basis of the decimal system. We count from zero to nine, then we come to ten, a one and a zero, and start over again until we come to twenty, whence we start over again until we come to thirty, then a hundred, a thousand, and so on. The pattern repeats. We take it for granted. But the digits are like fractals of unity, coming back to zeros and ones repeatedly ad infinitum. There is self similarity in the process, and the integrating capacity of the Void keeps expressing itself in counting through the recurrence of zeros and ones, emptiness and form, as an integrating mechanism.

The phenomenon transcends numbers and counting. Numbers are a man-made contrivance that allows us to count things and thus abstract experience and span space and time. The digits involved reflect integrating characteristics of the cosmic order. They display harmonics of the cosmic order that manifest in human experience, but the cosmic order itself may not be reduced to numbers or mathematics. Many have tried this without success, including our current throngs of cosmologists that still believe they are hot on the trail, inventing ever more obscure mathematical theories.

The cosmic order is something else altogether. We have seen how it is expressed by the three step hierarchy *idea*, *routine*, and *form* in the

primary projection of the universe, and we may call this System 3, because there are three steps in the hierarchy. System 4 is an elaboration of System 3. It has four steps in the hierarchy because a *knowledge* level becomes distinct from the *idea* level. System four is considerably more elaborate in its integration than System 3. There are more ways that four distinct levels of activity can interact with one another and not all of them are hierarchical, even though the four levels are universally integrated through the universal hierarchy.

Each level of activity has an inside and an outside with respect to the others. For example, if you draw four circles on a page, there are only nine ways of arranging the four circles inside and outside of one another, and each way can be designated as an independent *term* that is related to the other *terms* in a dynamic pattern of interaction. You can draw one inside a second, inside a third, inside a fourth. This term is the universal hierarchy, such that *idea* is within *knowledge* which is within *routine* which is within *form*. The hierarchy finds direction from an active inside towards a passive outside. In this way the *idea* finds translation through *knowledge* and *routine* into *form*.

One can also draw circles one and two separately inside a third, inside a fourth. Or one can draw one and two separately inside a third, separately from a fourth, and so on. Nine different ways! Only nine! If these four circles each represent active interfaces between an inside and an outside, the interfaces can said to be in mutual communication. Each has an active center and may be called a center.

For example, consider a first active interface to be the electronic activity in our nervous system. A second interface would be the patterned organization of our nerve cells within our nervous system that results in coherent patterns of knowing. A third interface, or center, would be the muscular linkages that animate our body parts. The fourth interface would be the external form of our body with respect to the environment. Now it is not hard to see how the universal hierarchy described here determines how we function. The *idea* implicit in the electronic cerebral activity of our brains directs the *knowledge* implicit in the patterned organization of our motor neurons and their interconnections to activate the muscular *routines* that animate the physical *form* of our bodies with respect to the external environment.

This represents just one of the nine possible ways the four interfaces mutually relate. As it turns out each of these nine terms implicitly delineates a specific patterned basis to meaning. There is a different

meaning inherent within each term that is clearly determined by how the four active interfaces relate to each other as a whole term. For example the universal hierarchy delineates how discretion works. *Idea* gives direction to *knowledge* which gives direction to *routine* which gives direction to *form*. There is always an idea behind the knowledge and routine that gives rise to every form of behavior. It is universal.

The nine terms interact in specific ways to delineate a creative matrix of interactions. This matrix of dynamic interaction is a universal pattern to the creative process. Three of the terms are universal and six of them are particular. The universal terms regulate and integrate the patterned interaction of the particular terms. The six particular terms, for example, are represented by the six major departments that break out in the evolution of a business to four levels, like Hank's company, while the company president is the focus of the universal terms that direct the integration of the company's activities, resources and infrastructure as a whole. The nine terms go through three interrelated sequences of transformation from term to term that are integrated synchronously with one another and with the space frames of the cosmic movie. These dynamics of the creative process at the level of System 4 have been fully developed in *Science and Cosmic Order: A New Prospectus*.

If we think of System 3 as specifying the primary projection of star systems in the heavenly theater, System 4 elaborates more specifically on the evolution of the players of biological life on the planetary stage. It is a cosmic movie with players that have very specific roles to play, as they probe and explore every secret niche of the biosphere. It is a drama of intelligently discovering the great mysteries of life through the integration of history.

It is beyond the scope of this book to explore the dynamic matrix of all nine terms as they are involved in evolutionary biology. It will suffice for our present purposes to show that the universal hierarchy of System 4 is abundantly evident both in the fossil and in the living records. It will also become clearly evident that self-similarity of the hierarchy is manifest within each level of the hierarchy. In other words there are four levels within each level that display the same pattern within each level.

Biospheric Evolution:

Let's look more closely at the biosphere and the evolutionary process from plants to invertebrates to vertebrates to humans. We have previously seen that this represents the progressive delegation in steps

back up the hierarchy *idea*→*knowledge*→*routine*→*form*, similar to the way it worked in Hank's company.

For our present purposes we may relegate the prokaryotic bacteria to a fifth level at the bottom of the hierarchy and ignore it for now. Prokaryotic cells are much simpler in structure and smaller than the eukaryotic cells employed by all plants and animals. We may designate them as part of System 5. System 5 is considerably more complex than System 4. It works like two reciprocating System 4's, one open to broader vistas of diversification, and the other one closed to a more confined format that works behind the scenes. Although there may be more species of bacteria than all species of eukaryotic life combined, the eukaryotes are open to broader horizons while the prokaryotes are forever confined to the microscopic realm. Even bacteria that appear microscopically similar in a pinch of soil from America and Australia can be as different genetically as a mouse and an elephant. They generally focus on exploring immensely diverse forms of chemical synthesis within a comparatively limited range of microscopic physical forms, everywhere on the planet. So we will only look at the System 4 that we are most familiar with, the one we can normally see in the natural world from the plants to humans.

The self-similarity of the System has been pointed out. In System 4 it means that we should be able to identify four levels within each level in the hierarchy. Let's begin with a brief introduction to the plants, and then we will explore them more thoroughly in the next chapter.

Plant cells, like bacteria and unlike animal cells, have a cell wall protecting their membrane, but plant cells, unlike bacteria and like animal cells, have their genetic material contained within a nuclear envelope and they are very complex in their internal design. All plants and animals consist of eukaryotic cells. Plants evolve by exploring the usually static spatial forms of the eukaryotic cell, although a few rare species of higher plants have adapted simple motor-sensory mechanisms in branches and flowers. The Venus Flytrap is a well known example.

Each of the levels in the natural order continues to evolve and change in interaction with higher and lower levels of sentient evolution. This functions like an energy refinery, similar in a way to a fractionating column in an oil refinery, with the efflux and reflux of patterned energies moving respectively up and down the hierarchy. These energy flows that percolate up and down the levels continually strive for equilibrium, as new factors keep coming into play. Energy disseminates and returns from

level to level of the hierarchy in the process of coming to harmonic balance in the biosphere.

What follows is not intended as a new system of taxonomy, although it may lend meaning and guidance to existing systems. Because of difficulties in clearly categorizing plants and animals at the most primary levels, biologists frequently group them separately as protists or protozoa. For our purposes here we will distinguish them as either plants or animals according to criteria to be described in the next chapter.

The first ventures in the evolution of plants explored unicellular forms that employed chlorophyll to capture the energy they needed from the sun by storing it in the chemical bonds of sugars and starches. This process of photosynthesis is common to the evolutionary variant of plants. Unicellular forms began cooperating in loosely knit communities then multi-celled organisms emerged. Individual cells became dedicated to specific roles in the plant's overall structure, as they evolved more highly developed organs, such as roots, stems and leaves.

Let's keep in mind that we have generally identified the role of plants as exploring the primary *forms* that eukaryotic cells may take, individually and collectively. Even though we will move up a hierarchy in plant evolution from *form* through *routine*, and *knowledge* to *idea*, this hierarchy exists within the context of the organized forms that plant cells can take. Accordingly we may speak of a *form-form* level, a *form-routine* level, a *form-knowledge* level, and a *form-idea* level. Although these levels may not always be consistent with classifications established by systems of taxonomy, this is not important here. It will simply be shown that four levels within each of the four major levels can be clearly distinguished and identified, in accordance with the organizing principle of self-similarity. This much alone is powerful evidence of an intelligent universal order at work in the evolutionary process.

NOTES:

¹ The primary interval of time is derived in *Science and Cosmic Order: A New Prospectus*.

² Bart Bok gave a summary in The Milky Way Galaxy, *Scientific American*, March, 1981.

CHAPTER VIII

The Plants

Exploring the spatial forms of the eukaryotic cell.

Form-form:

This first level in the universal hierarchy includes primitive plants, consisting of the huge variety of algae, from microscopic unicellular varieties to giant kelp (apart from the cyanobacteria, often called blue-green algae, but which are in fact photosynthetic bacteria). Also included in this *form-form* level of plants are the fungi, slime molds, and the lichens.

Fungi will be considered as an involutory variant of early plants that subsequently evolved in parallel with them. Fungi cannot photosynthesize the nutrients that they need so they are dependent on green plants for food. But their spores are everywhere, growing whenever they find a food source such as dead plant life, and they assist the decay of organic matter through their digestive processes that extract the energy they need. They provide a vital function in this involutory process of decay. Most fungi are thus benign saprotrophs utilizing the waste of evolutionary variants, but some are parasites on living plants and animals.

The algae, in parallel with the fungi, explored the eukaryotic format, predominantly in the sea and fresh water lakes and streams. Small simple forms first began to pioneer on land about five hundred million years ago. The simplest unicellular forms of algae reproduce by cell division with more complex forms developing alternate sexual and asexual generations, called the gametophyte and the sporophyte. Both sexual and asexual reproduction of some kind generally occurs in algae.

The reproductive processes of fungi are considerably more varied, especially since the mycellium or body of many fungi is not partitioned into separate cells, but consists of branching hyphae, or filaments. These filaments grow at their tips, like a maze of intertwined tributaries, to form the body of the fungus. The cytoplasm circulates nutrients through the mycellium which may have many nuclei containing different genetic material. Two groups of higher fungi, the Basidiomycotina, such as toadstools, coral fungi and fairy clubs, and the Ascomycotina, such as morels and truffels, produce elaborate fruiting bodies made up of a mass of hyphae that rise like a crown above a base. They pioneered the classic

root-trunk-top structure that is so typical of terrestrial plants, but without highly differentiated cell types employed in their separate organs.

Fungi generally lack cellulose, a common component of cell walls in green plants, and many use chitin instead, a component also found in the exoskeleton of arthropods, such as insects. The algae store food in a variety of starches, polysaccharides and oils, while fungi never use starch.

As pointed out in the last chapter, biologists have difficulty clearly classifying some organisms, especially single-celled creatures. For example the unicelled Euglenida photosynthesize energy from the sun, just as plants do, but they also swim with a tiny tail and have a mouth and gullet to ingest food. These tiny one-celled creatures cannot survive by photosynthesis alone. They also eat. Cells of this general kind are often called protists, or protozoa, since they have characteristics that are both plant and animal. Fungi are also sometimes classified as protists rather than plants, however they are considered as an involutory variant of plants for our purposes here.

For our purposes at present we may consider protists that use photosynthesis under the general umbrella of plants, even though they may swim, have a mouth, gullet and eat. They emerged at a point early in evolutionary history where animals began to diverge. Sublevels of delegation such as these are comparatively limited in kind and they are generally associated with transitional stages between levels.

We shall see that it is a common feature of evolution for higher levels to begin diverging in the early stages of a previous level, and only begin diversifying widely at some point considerably later. We shall point out examples of this pattern again and again.

Protists or protozoa that do not use photosynthesis and that are motile and ingest food will be considered animals. Amoebas and most of the ciliates are examples. The common paramecium is a single-celled ciliate that uses the many hair-like cilia covering the cell surface to swim.

The life cycles of algae generally show great variation and all algae types, except red algae, have flagellated motile cells at some stage in their life cycles that are much like some of the swimming protists.

Eukaryotes have explored an enormous range of size at the *form-form* level. Some one-celled fungi are only about ten times larger than bacteria, while some algae produce giant cells. The Mermaid's Wineglass is a single cell about 7 centimeters long with a single nucleus and some multi-nucleated cells may become much larger. Brown, green and red algae have explored many diverse forms, including sheet like

leaves, filaments, hollow tubes, bushy branched types, stalks with branchlets of many kinds, in a vast array of shapes and sizes. The largest seaweeds, brown algae and kelp, have highly developed multicellular structures, some that are fifty meters or more in length. A group called the diatoms, golden-brown and yellow-green algae types, have a rigid cell wall consisting of pectin impregnated with silica and they are generally restricted to single cells or loose colonies.

Lichens consist of two organisms in an intimate partnership, namely a higher fungus and an alga (sometimes a cyanobacteria takes the place of an alga). The alga is entrapped in the body of the fungus but is allowed enough light for photosynthesis. The fungus thus feeds on the alga and the two grow and reproduce together, although the algae can get along quite well on their own.

Slime molds are especially strange. They are unlike either fungi or algae, although they are closer to fungi. They come in two types. One type flows as a single mass of protoplasm over decaying plants and trees, devouring microorganisms and plant matter. This protoplasmic mass, called the plasmodium, resembles a single cell containing many nuclei. When its food source begins to dry up it produces a fruiting body.

The other type of slime mold has no plasmodium and spends most of its life cycle as a proliferating collection of single cells just like amoebas, engulfing food and dividing. As food supplies dwindle the amoebae cells congregate into a mobile slug-like mass, called a pseudoplasmodium, that can respond to heat and light and move, just like an animal. Once this slug-like collection has found a suitable place to its liking, the cells at the head end form into a stalk that rises from a base, to elevate cells at the top. The fruiting body at the top then develops into spores for dispersal, just as in the classic base-trunk-top structure of many plants. For our purposes here slime molds will be considered an involutory variant of plants, similar in this respect to fungi, since they facilitate the process of decay.

There is clearly a certain capacity at this level to span space and time in working out the spatial forms of the eukaryotic cell and its development in time, from swimming protists, to slime molds and fungi, to giant kelp.

The evidence also indicates that divergence to the animals took place from this most basic functional level of the eukaryotic cell, from the single-celled protozoa, and not from more highly evolved levels in the plant kingdom. We shall see repeatedly that each higher level tends to

diverge from the early stages of a previous level. It is a recurrent pattern. The emphasis here is on the task cycles of plant cells rather than on product cycles of host plants with highly differentiated organs.

It is apparent that this *form-form* level of plants explores a vast range of size, shape, and type of eukaryotic cell and its processes, including energy acquisition and storage, reproduction, and an immense array of multi-cellular forms. This level generally lacks a developed vascular system associated with integrated circulation routines for the whole plant. It requires an aquatic or very moist environment, apart from a comparatively few small algae, fungi, and lichens.

Form-routine:

The routines essential to evolving higher plant forms on land required the development of vertical support with an efficient vascular system to transport nutrients between roots, trunk and top structure. This overall vascular integration of plant structure required convergence to common reproductive routines also. Vascular systems were essential to the distribution of nutrients within land plants destined to rise fifty meters and more into the air.

However, before vascular land plants could get started plants first had to colonize the land. The first true pioneers were probably the liverworts, hornworts and simple mosses that grew in moist shaded areas near water. They also developed rhizoid type structures to absorb nutrients from soil, short stalks with thickened cell walls for a degree of support, and leaf-like structures.

The earliest vascular plants appeared over four hundred million years ago, during the Silurian period, and they developed throughout the Devonian period. The first forms were small leafless stems lacking real roots. Ancestral mosses elaborated with root-like and leaf-like structures, while the club mosses, horse tails and ferns built on the scheme. These ancestral plants took their leap for the sky at the end of the Devonian and during the Carboniferous period, from three hundred and fifty to two hundred and eighty million years ago. Tree sized versions, forty meters or more high, proliferated in abundance in extensive swamp lands before they became almost completely extinct, with only small modern versions remaining among the horsetails and club mosses.

Up until five hundred million years ago the Earth had not yet been colonized to a significant extent by plants. It was essentially a vast desert during the first great convergence of the continents into a single super-

continent. The first land pioneers near lakes, streams and bogs were probably little more than collections of algae-like cells with root-like projections beneath them and upright spore-bearing structures protruding from their upper surfaces. The liverworts, hornworts and mosses that followed elaborated with similar features.

The cells of the spore bearing structures are fundamentally different from the cells of the main body of the plant. The spores have only one set of chromosomes while the main cells of the body have two sets. The spores are said to be haploid rather than diploid. Cell division of a type that produces four daughter cells, called meiosis, precedes spore production, as it does in algae.

The spores then germinate asexually to produce a new haploid gametophyte generation of the plant with only one set of chromosomes. The sexual gametophyte generation of mosses and liverworts requires a sperm to swim to an egg, so these plants must stay close to the ground in moist habitats, to produce in turn the sporophyte generation again with a diploid set of chromosomes. Haploid spores are then released from elevated stalks to promote dispersal in the wind.

This alternation of two generations is a common feature of all terrestrial plants, although in the flowering plants the gametophyte generation completes its short life within the tissues of the sporophyte generation. The point is that all future variation in the reproductive routines of terrestrial plants became confined within these fixed constraints, allowing also for vegetative reproduction from new shoots in many cases.

As plants colonized land by this reproductive pattern, they turned their focus to developing vertical support which required a vascular system to transport water and nutrients. One of the first pioneers over 400 million years ago, was a plant called *Cooksonia*. It had developed specialized fiber-like elements in its stem, called xylem, which were the forerunners of wood. These tube-like elements contain lignin for support and can also be used to transport water through their capillaries, since they are dead and contained within a dense layer of protective outer cells.

By 50 million years later, toward the end of the Devonian period about 360 million years ago, this support and conducting system was reaching for the sky. The giant club mosses and horsetails proliferated in swamp forests to heights of 40 meters or more, forming the coal beds of the earth with their abundant remains. The present day descendants of horsetails reach heights of only three feet, the club mosses only one foot.

The ferns, with compound fronds radiating from a stem or trunk, also evolved during Devonian times. The tree ferns, up to sixty feet or more high, have survived to the present day, along with many smaller fern varieties.

One species of surviving club moss, *Selaginella*, produces both male and female spores from separate spore producing organs called sporangia. Instead of germinating when they are shed, the female spores develop haploid tissue within the spore, where they produce egg cells. The smaller male spores release swimming sperm which must find and fertilize the eggs. This separation of male and female gametophytes, and their contraction in size and duration is a significant development for the reproductive routines of subsequent plant evolution.

The reproductive and vascular routines of plants which developed together at this *form-routine level* in their history concerned the integrated organization of more specialized cell types within the whole plant. This emphasized *product cycles* of the host as opposed to the collective *task cycles* of cells. It focuses on product *routines* of the whole plant, rather than task cycles associated with basic cell *forms*. As we shall soon see, this development anticipated evolutionary events to follow that incorporated the knowledge gained by specific routines of plant growth in a more refined and coherent manner. It works much like the evolution of a company from the *supervisory routine* level to the *administrative knowledge* level.

The focus at this *routine* level of *form* is clearly on prioritizing the commitment of available resources to specific *routines* of reproduction, support and vascular circulation within the whole organism. This is similar to the supervisory level of work where available resources must be appropriately distributed for a variety of tasks. Plants re-explored the limits to size within this context.

Form-knowledge:

The collective knowledge gained by early vascular plants and their reproductive methods was reformulated into more refined versions that replaced them by the end of the Carboniferous period. Some two hundred and eighty million years ago the gymnosperms appeared, including the cycads, ginkgos and conifers.

The gymnosperms, especially the conifers, liberated plants from a dependence on wet swampy terrain in their gametophyte generation. They did this by developing the pollen grain and the seed. Seeds took

over the task of dispersal, in the fern as well as in the gymnosperms which eventually outpaced them.

Both had an ancient origin typically diverging comparatively early in the development of the previous level. The gymnosperms were thus slow to capitalize, replacing ancient forms only after a hundred million years. Yet they integrated the knowledge accumulated by ancient giant forms of horsetails and club mosses and capitalized on it. They were thus able to incorporate features of the *form-routine* level that emerged subsequent to their divergence. It was not a gradual linear development of progressive DNA survival according to Darwinist rules.

Knowledge became manifest in more refined organs generally, not only in sexual reproduction but also in woody vascular systems, and a variety of hardy leaf structures in the conifers. More refined organs became more independently formed, such as highly structured needles, cones, bark and branches. These distinctively integrated plants of many species thrived for another two hundred million years, into the late Cretaceous period. This includes many that have survived to the present day, such as the pine, spruce, cypress, hemlock, and so on that we are familiar with, especially in colder climates.

The mosses, horsetails and ferns at the *form-routine* level depend upon a wet environment for sexual reproduction in their gametophyte generation. This seriously restricts them as land plants. The development of the pollen grain and the seed in the sporophyte generation integrated knowledge of many factors extended in space and time to overcome this restriction in a much broader context.

The first step was the production of separate male and female spores, as in the club moss *Selaginella*, producing separate male and female gametophytes. The gametophytes had to be protected from drying up, however, if they were to survive in drier terrain. This required protection which was provided for in the conifers by retaining the female on the sporophyte generation securely wrapped in tissue. This meant that the male gametophyte had to travel further, often in a horizontal direction. The male gamete also had to penetrate the sporophyte tissue protecting the female egg cells. The pollen grain constituting the male gametophyte thus had to be small enough to be carried on the wind, and likewise encased in a waterproof covering. So these modifications required knowledge of weather processes and how to exploit them by methods extended in space and time beyond the plant and its current environment. It can not be explained by random mutations since parallel

mutations acting in concert are needed to meet many parallel needs. No process of selection pressure to promote gradual random changes can be demonstrated.

Conifers have male cones carrying microsporangia (pollen sacs) and female cones carrying megasporangia (nucelli), producing pollen and eggs respectively. Many diverse and complex factors had to be biochemically incorporated for this to happen. Could it really have happened gradually by a long series of accidental mutations?

When a pollen grain is carried inside the female cone it is drawn to the nucellus by a drop of extruded fluid. One of the cells in the pollen grain grows through the nucellus to produce a pollen tube reaching down into the egg. The sperm cell from the pollen grain then passes through the tube to fertilize the egg. The fertilized egg develops into an embryo of a new sporophyte generation inside a covering of nutritional material provided by the gametophyte generation. This gives the new sporophyte a start when it is seeded in a new location. This whole process is slow, taking two years in some cases. The outer coat of this seed is derived from the old sporophyte generation. Repeated complex sets of mutations are required for these developments to happen.

Since the task of dispersal now falls to the seed they sometimes develop wing-like appendages to help them travel on the breeze. How did a detailed wing structure happen by accident without some sort of feedback to inform the plant?

In the junipers, the cone scales swell into an edible covering attractive to animals and birds which transport the seeds. Again there is knowledge of animal needs and how to meet them implied, that is extended in space and time.

Some cycads still survive in tropical regions. The cycads produce swimming sperm, requiring a moist surface on the female cone to fertilize the egg cell. The ginkgo also produces swimming sperm released from pollen borne on the wind to the female sporangia. These female organs are naked at the tips of special shoots and not protected by cones. These ancient forms were outpaced by the conifers that still survive in great abundance today.

The conifers are much more elaborate in their organization. Many produce spreading crowns supported by huge trunks reaching heights of 100 meters, such as the giant redwoods that span a few thousand years in their life cycles. Evergreen needles provide most conifers with a distinct advantage in the short growing season at higher latitudes. Different root

systems have been explored for varying conditions of moisture, frost, and need for support. The conifers have various other refinements of structure including a resin filled system of ducts in their stems and leaves to inhibit attack from microbes and insects. The resin produces spruce gum, amber and the familiar aroma of pine forests.

All these developments of *form* incorporate *knowledge* of many very diverse factors that go beyond the prioritized commitment of resources to *routines* in the host plant. Not only do they incorporate *knowledge* of biochemical properties but also a knowledge of complex environmental processes extended in space and time, from preventing the dehydration of eggs and sperm, to the flight characteristics of seeds, the feeding habits of animals, birds, and insects, and the climate of the new terrain to be colonized. These diverse factors must be brought together and integrated coherently into the facilities and infrastructure of the whole plant.

To an impartial observer it should be unnecessary to numerate the number of false sets of trials by accidental mutations in concert that would be required before successful combinations of so many factors converged without benefit of intelligent feedback and input. This is especially so when the result is consistent with such an obvious self-similar pattern that clearly implies intelligence at work in the evolutionary order. The complete plant implicitly reflects the *knowledge* inherent in its living *form*. Its various organs must relate to one another coherently and appropriately. The integration of space and time thus takes another major step forward at this *form-knowledge* level.

Form-idea:

The *idea* level of the plant kingdom is not an isolated venture. As plants evolved at this level they also provided nutrients for species of animals higher up the ladder of sentience. Without this food the animals could not have evolved in tandem. Even the insects couldn't have diversified. The higher sentient levels, especially the higher mammals and birds, needed more concentrated food provided by flowering plants.

The seas were already teeming with many species of invertebrate and vertebrate animals in the Carboniferous period, some three hundred million years ago. Carboniferous bogs were crawling with amphibians and giant cockroaches, with giant insects droning overhead. It was only at the end of the Cretaceous, with dinosaurs at their zenith, that the flowering plants, called angiosperms, began to diversify. A few species

of magnolia and water lily had been around much longer, having diverged typically early in the previous level, but widespread diversification waited for the demise of the dinosaurs.

In the angiosperms the pollen grain germinates on the flower's stigma, producing a pollen tube that grows down through it to the ovary, where the female gametophyte is housed. The male gamete then flows down the tube and fuses with the egg. As the seed matures, the carpel that surrounds it grows into a fruit. Flowers are thus adapted to attract an insect pollinating vector, and their fruits are often designed for dispersal by animals by providing them food not essential to the seed.

These plants also refined their vascular systems with more efficient water conducting vessels, and their foliage, stems and roots usually have concentrated nutritional value. The flowering plants thus exploit new *ideas* that integrate processes extended in space and time that are of critical value far beyond their own survival concerns. The angiosperms are essential to the progression of the whole evolutionary process, and they constitute two thirds of all living land plant species today. Virtually all land mammals and birds are dependent on the more concentrated food supplies offered by flowering plants to support their higher metabolic rates.

The earliest angiosperms were probably woody shrubs. Although there has been some disagreement on whether the first angiosperms evolved from gymnosperms or seed ferns, they typically evolved from an early variety of seed plant, not from a highly evolved gymnosperm at the top of the *form-knowledge* level. So all that digitized information encoded in DNA would again be lost to them if the Darwinian theory is right.

There is evidence that the magnolia is ancient and that the first flowers were probably upright cone-like structures with flower parts derived from leaves arranged in a spiral sequence. The uppermost leaves harbored female ovules, which they enclosed to form the carpel. The next set of leaves became modified into male stamens surrounding the carpel. Next came the petals which became modified in color, many developing sugar secreting nectaries to attract insects. Last came the green sepals that provide a protective covering for the bud and a base for the flower together with the receptacle. A great variety of floral types have evolved from this basic format.

The carpel typically consists of a sticky stigma that receives the pollen, connected by a stalk (style) to the ovary that contains one or more

ovules. In insect pollinated flowers the stigma is contained within a colorful flower, while in wind pollinated flowers, such as in grass and silver birch, they are exposed, with the petals and sepals reduced or absent. A few flowers fertilize themselves. Upon fertilization the ovules develop into seeds and the ovary wall develops into a fruit containing the seed(s). The enclosing fruit distinguishes angiosperm seeds from naked gymnosperm seeds.

Fruits fall into two general types, dry or succulent. Dry fruits are dispersed by mechanical means. The dandelion and thistle have a parachute to carry them on the wind, the sycamore and maple have wings attached, burrs hitch a ride on animals, peas and beans disperse from a pod.

Plums, mangoes, acorns, citrus fruits, almonds, coconuts, etc., are succulent fruits. They may contain one seed as in a cherry or many as in a berry. The fleshy succulent part of a fruit may also develop from the receptacle as in a strawberry and apple. Sometimes seedless fruit can form without prior pollination of the flower, as in bananas and pineapples.

Fruits come in large variety and are often dependent on animal dispersal. Some violet fruits are carried by ants back to their burrows, where just a small droplet of oil produced by the seed for the purpose is consumed by the ants, thus planting the seed intact. A clever idea, employing a *knowledge* of preferences in the ant's diet and also of the complex biochemistry to produce it.

The succulent fruits are not essential to the germination of the seeds they contain. And they are produced in such abundance with such a generous allotment of fleshy food stores, that it is hard to believe that they evolved solely by accident and selection pressure with such a large amount of wastage for self-serving seed dispersal. There is also a considerable variety of food storage in root systems such as the potato, turnip, beet, carrot, onion, peanut, yam, tapioca and so on. This allows some of them to reproduce vegetatively as well as by seed, in the process also providing abundant stores of food for animals.

Many flowers have developed fused floral parts, for instance tubular sheaths around nectar bearing organs that target only certain pollinators, such as humming birds with long curved beaks, and exclude others. Honeysuckle and sweet tobacco flowers are adapted to the long proboscis of a pollinating moth, but excludes bees and flies. It's hard to see any advantage to the plant here. The fig is completely dependent on a

certain wasp for pollination, and in winter produces sterile fruit solely to ensure the survival of its wasp pollen vector. *Coryanthes* orchids have a reservoir of fluid in the bottom of a deep chamber in the bloom that drugs bees, making them groggy and fall in. There is only one possible exit from the chamber at the fluid level, directly beneath the stigma and stamens. On its first encounter two pollen sacs are glued to the bee's back as it crawls out through this single long passageway to a higher exit, giving it time to regain its senses. On the next encounter another orchid's stigma picks up the pollen from the bee. This is an extraordinary idea that could hardly have evolved by chance. Of the millions of organic compounds possible, the flower must hit on a drug that is strong enough but not too strong, and yet not discourage the bee from trying again. Its fluid consistency must allow the bee to swim for the exit, the dimensions of which must be precisely positioned with respect to stamens and stigma. Many factors must be just right and evolve in concert to produce the result. Otherwise there is no selection pressure.

As soon as a pollen grain attaches to the stigma of the carpel during the pollination of a flower, it begins to grow a male gametophyte pollen tube down through the stigma and the style into the ovary at the base of the carpel. It grows very quickly, an inch an hour or more. Once the pollen tube locates a female gametophyte embryo sac, not one but two male gametes flow down the tube. One fuses with the egg cell to begin producing the new embryo plant. The other fuses with two more haploid nuclei in the embryo sac, to begin producing the endosperm, a rich food reserve in endospermic seeds such as the cereal grains. In non-endospermic seeds the food is absorbed by the embryo, especially the seed leaves, called cotyledons, which are likewise designed to give a germinating seed a head start once it is dispersed. This provision of food stores for the germinating seed is a main feature of angiosperms, clearly anticipating future needs and thus spanning space and time.

Angiosperms have a more highly differentiated vascular system than gymnosperms. They have continuous water conducting vessels formed of dead cells connected end to end by perforated plates to make a continuous duct, allowing for freer more organized flow. Growth processes and vascular bundles consisting of xylem and phloem tissues are more intricately arranged. Xylem vessels transport water and nutrients from the soil. Phloem vessels transport food from production sites in leaves to growing points where they are needed.

Many angiosperm leaves have elaborate protective measures, as in poison ivy, nettles and thistles. Some plant leaves and branches are sensitive with motor responses and fold up when touched. Some leaves are thick and succulent for storage of food and moisture. The leaves of carnivorous plants trap and digest insects. Again these ideas exploit *knowledge* of complex processes extended in space and time.

In general the angiosperms have a greater differentiation of organs and organ parts than do the gymnosperms, and they have developed into a much greater diversity of different plant forms, spanning space and time on a broader scale. These *forms* have implicitly re-assimilated the *routines* and *knowledge* explored by earlier plant species according to a host of new *ideas* that are extended in space and time, far beyond the plants themselves and even beyond their own survival needs.

These developments came at a time when the continents were coming under compression forcing up new mountain ranges and plateaus throughout the planet, preparing the way for the next phase of vertebrate evolution in the mammals and birds, with major repercussions throughout the evolutionary hierarchy as it moved inexorably toward a new balance. The arrival of the flowers, together with the diversification of pollinating insects, signaled the departure of the dinosaurs, and heralded the coming of more refined and sentient creatures.

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Commentary:

From the above we can begin to see that there is a progression through the evolution of the plants that parallels higher levels in the animals and complements their needs on ascending levels in the sentient hierarchy, especially on land.

The levels, described as successive levels of delegation apparent from the historical record, do not mean that flowers give explicit direction to conifers, which give direction to horsetails, which give direction to algae, any more than we should think that the president of General Motors gives direction to a local restaurant.

Each species has a distinctive number of levels delegated within its own biological organization. We may think of it as a single-celled algae functioning like a one man company, whereas an apple tree or a rose functions like a larger more sophisticated four level company. Within an apple tree the *idea* level integrates extended processes in space and time, from weather, to pollinating insects, to providing animal food. The

integrating *idea* of the apple tree directs the accumulated *knowledge* essential to the development of its organs, which in turn directs its *routines* such as circulation through its vascular system, which in turn directs the *formation* of its cells in new growth consistent with available resources and needs. The direction is implicit in the plant's organization.

There is also a larger sense in which the higher species do give direction to the lower species, with feedback in the opposite direction, just as General Motors has needs in order to make cars that are provided for by a host of interdependent industries. Likewise every species is concerned with energy transformations up and down the evolutionary hierarchy, forever seeking a balance, so that major evolutionary developments at the top affect the whole hierarchy. The biosphere seeks dynamic balance within itself through biospheric resonance. It is in communication with itself and it seeks harmony. The whole hierarchy is humming in accord between levels, allowing members in each level to profit from the lessons of members on different levels. Otherwise the digitized information of DNA could only be progressively lost. Progress could not be recognized in the evolutionary process.

CHAPTER IX
The Invertebrates

Exploring sensory-motor routines in space and time.

Once again we may define subsumed levels within the *routine* level associated with the invertebrates, so that we may speak of a *routine-form* level, a *routine-routine* level, a *routine-knowledge level*, and a *routine-idea* level.

Routine-form:

The parallels that derive from the self-similarity of the evolutionary hierarchy become clearly evident as we proceed to the *routines* worked out by the invertebrate animals. The hierarchy keeps elaborating within itself in a self-similar way.

As we mentioned with the discussion on early plants, we can include as invertebrate animals the single-celled protists or protozoa that do not photosynthesize energy from the sun and that have a degree of motility and ingest food, such as the amoebas and the ciliates. We may say that these early invertebrate animals were the first to diverge from plants, and that they were the first to sense their environment and actively respond to it in order to acquire their needs. The basic *form* of the *routine* level of sensory-response was thus first explored by these early invertebrates.

The ciliates, such as the paramecium, are especially interesting. They generally have two sets of nuclei, a large macronucleus and from 1 to as many as 80 micronuclei. Paramecia reproduce by cell division, but they also have elaborate sexual behavior. Two of them occasionally fuse tightly in the oral region of the body and each exchanges an equal amount of DNA before again going their separate ways with a revised set of genetic material. This is a sexual process of genetic recombination but it is not a reproductive process. No new cells are created. However if they are not allowed to conjugate periodically in this way they cannot live through more than about 350 cell divisions.

Some ciliates have the equivalent of legs. The hair-like cilia that protrude from their cell membranes fuse together and move in a coordinated manner that allows them to walk over surfaces.

Some ciliates are amazingly complex for single cells. One called "*Diplodinium dentatum*" has complex mouth parts leading to a gut, with a contractile esophagus and anus. It also has a skeleton, like a tiny

backbone within the cell. Some of these highly specialized ciliates live in the digestive tracts of cows and other hoofed mammals, and may be examples of resonant developments between lower and higher levels in the evolutionary hierarchy, as the mammals evolved.

The first multi-celled invertebrate animals, generally called metazoans, evolved during Precambrian times, well over six hundred million years ago. Single-celled protozoa began to cooperate in colonies, with various cells having some specialization of function. As these became more distinctive, they crystallized into integrated creatures with a variety of essential organs.

The protozoa were highly successful in their own right, probably having existed for hundreds of millions of years before the multi-cellular animals came on the scene. The single-celled protozoa are limited in size, however, because nutrients must diffuse through their protoplasm without benefit of a circulatory system.

Collections of some protozoa began to cooperate as the evolutionary process began to move toward more sentient levels in the hierarchy. The way had been prepared. Plants and protozoa had been busy changing the early atmosphere and land masses of the planet. For example single-celled marine creatures, called *foraminiferans*, make shells of calcium carbonate that are discarded when they divide. These discarded shells are made of calcium and carbon dioxide and they have accumulated to make up extensive limestone deposits thousands of feet thick covering millions of square miles in various parts of the world. As processes such as these were reducing carbon dioxide levels in the atmosphere by building the continental shelves, plants were elevating oxygen levels and preparing the atmosphere for more sophisticated creatures to come.

The simplest of multi-celled animals are probably the sedentary porifera or sponges, consisting of a cavernous gut structure through which water is moved by ciliated cells lining the interior and acting together. A single flagellum, like a tail on each cell, thrashes back and forth to move water containing nutrients through the gut structure.

In the jellyfish, anemones, corals, and hydra, collectively classified as cnideria (formerly called coelenterates), the simple two layered format of sponges, with a gelatinous layer between, is elaborated upon. Jellyfish and other cnideria have a nervous matrix of elongated cells that integrate coordinated action. They have bodies that can move. They also have gut cells that secrete enzymes to initiate extra-cellular digestion.

The hydra and jellyfish have alternate sexual and asexual generations. The polyp stage is fixed to the sea bottom with only one opening, functioning as both mouth and anus, and surrounded by tentacles. The polyp buds off a free swimming medusa which is similar in structure. The medusa in turn produces eggs and sperm which develop into new polyps upon fertilization.

In jellyfish the medusa stage dominates. In hydroids the polyp stage dominates, while in anemones and coral the medusa stage has been lost. Sea anemones are a single large polyp, while corals are colonies of many small polyps enclosed in a calcite skeleton. Hydroids may be either colonial or individual.

Tiny moss animals are similar to corals and colonial hydra but are more complex, possessing a fluid filled body cavity known as a coelom, a feature common in higher invertebrates and vertebrates.

The flatworms are more clearly three layered, the middle layer forming muscle and connective tissue with nerves running as lateral cords connecting to a concentration of nerves at the head end. Lacking gills or a circulatory system, the surface area of their flat body provides for oxygen uptake and distribution. Their gut is often branched but without an anus distinct from a mouth, so that there must be bi-directional flow as in jellyfish and hydra. Most flatworms, such as the flukes and tapeworms, are parasites.

The nematodes, or roundworms, have an unbranched gut with a muscular pharynx that pumps food in from a mouth end to a contractile anus at the tail end, allowing for limited specialization in digestion along the way. Most are small but a few are many feet long. The largest known roundworm reaches a length of 9 meters and is found in the placenta of female sperm whales. But most are very small. For example a single rotting apple was found to contain 90,000 roundworms. Muscles are organized to allow horizontal swimming type flexion that also moves blood through a primitive circulatory system. The sexes are separate and a few have light sensitive eye spots. They are in all marine and fresh water sediments, and are parasitic in almost all animal and plant species. There are six other similar phyla of small worms that exhibit structural variety, but are much less common.

Starfish, sea urchins, sea cucumbers, brittle stars and sea lilies are called echinoderms. They have a fivefold radial symmetry, a calcareous exoskeleton of fixed or movable plates, each plate consisting of a single crystal of calcium carbonate. Hundreds of hydraulically operated tube

feet protrude through holes in the skeletal plates and they often contain suckers to grip surfaces.

Many starfish prey on shellfish such as scallops, using their tube feet to pry the shells open. Tube feet also serve as tactile and taste organs, and they can take up oxygen. At the tips of the starfish arms a few of the tube feet are modified into eye spots. They have a nervous ring around the mouth but no brain. They have a coelom adapted to a multipurpose water-vascular system used in locomotion, respiration, food gathering and sensory perception.

The brittle stars use their arms as oars to row about. Sea urchins have dispensed with arms and some have spines for protection and to assist in locomotion. The sausage shaped sea cucumber has modified tube feet that act as feeding tentacles. So has the sea lily which is permanently attached to the sea bottom.

Perhaps the most remarkable thing about echinoderms is in the early development of their embryos. As a fertilized egg begins to divide it forms a hollow ball called a blastula. The first opening in an echinoderm blastula is an anus, not a mouth as in other invertebrates. This is a feature shared only with the chordates, which includes the vertebrate animals from fish to humans. The embryos of both groups also have radial cleavage in which cell division takes place in line with or perpendicular to the polar axis, and they both form a coelom body cavity in a similar way. These features point to a common origin with the chordates. In contrast the annelids, arthropods and mollusks all show spiral cleavage.

At some stage in their lives all chordates have a strong but flexible spine called a notochord with a dorsal nerve cord right above it. They also have gill slits just behind the mouth at some stage in their development, reflecting their evolutionary history. Only two living groups of chordates lack the bony spine of the vertebrates, namely the tunicates or sea squirts and the filter feeding lancelets. The latter is a small invertebrate fish-like creature with little in the way of a brain or sense organs. It can nevertheless swim by flexing like a fish. As with the vertebrates they have also adopted the organic chemical phosphocreatine in the regeneration of ATP, the molecule that is used in providing energy to the cell. Most other invertebrates use phosphoarginine, which is less plentiful. So it is possible that a similar chordate was a vertebrate ancestor.

The tunicates have a protective “tunic” of cellulose-like material, and the notochord and dorsal nerve are present only in the free

swimming tadpole-like larva stage. The adult tunicate filter feeds attached to the sea floor, using inhalent and exhalent siphons to filter food through its gills. Some biologists hypothesize that the chordates evolved into vertebrates from a tiny free swimming larva stage that developed a capacity for sexual reproduction, thus dispensing with the mature sessile stage attached to the sea floor.

The vertebrate animals are at the higher *knowledge* level in the overall evolutionary hierarchy. It is again significant that they should have diverged at this early *routine-form* level of the invertebrate animals, and not as a linear gradual development from the higher invertebrates as suggested by the Dawinian hypothesis. Accordingly all the accumulated knowledge of the higher invertebrates, digitized in DNA, should be lost to the higher levels, unless there are resonant processes at work in the biosphere that facilitate communication spanning time between levels.

The precursors of independent organs geared to sensory response are thus worked out at this *form* level of the invertebrate *routine* level, but at this stage they are not highly differentiated in their organization. The integration of processes extended in space and time is comparatively simplistic and related to task cycles essential for immediate survival. Crude forms of feeding, digestion, locomotion and sensing the environment are nevertheless explored, with variations in embryo development and energy production that are essential to more developed *routines* of sensory response to follow in the higher invertebrates.

Routine-routine:

The annelids, or segmented worms such as earthworms and leeches, also had origins reaching back to Precambrian times, although their development was dependent upon the prior achievements of the unsegmented worms and various other developments at the *routine-form* level as they began to evolve together in tandem.

Most of the unsegmented worms are very small, and the segmented worms capitalized on the advantages of size by duplicating the same structural *forms* of *routine* over and over in repeated segments, all integrated into a more complex creature. Thus the annelids must focus on the commitment of resources to recurrent routines associated with the interconnected workings of the whole animal. Individual task cycles developed in the *routine-form* level must become more integrated into more complex product cycles, whether it is moving by wiggling a succession of segments in the right sequence, distributing the proper

allotment of nutrients to them, or appropriately interpreting multiple sensory inputs and feedback.

The annelid worms explore many kinds of organs, including various kinds of light sensitive eyes, sometimes distributed along the length of the body. They generally display a higher level of integrated function, with a brain branching to eyes, palpi and antennae, and a ventral cord that is often ganglionated into collections of nerve cells that distribute to each segment. Some have hardened jaws. Their straight gut is differentiated into pharynx, esophagus, stomach and gut, with independent excretory organs that use fluid pressure to double as a hydrostatic skeleton. Peristalsis, in which each segment becomes in turn long and thin then short and fat, offers new methods of locomotion. With lateral extensions protruding from each segment like tiny legs, a form of walking becomes possible. In some polychaete worms these lateral parapodia are long muscular paddle-like extensions.

The leeches are predators and parasites with suckers at both ends that may also be used in locomotion. These annelids have a circulatory system with contractile portions, sometimes with a heart that disposes of blood wastes. Some annelid worms employ bioluminescence. They reproduce sexually and asexually, and severed portions can sometimes be replaced or regenerate into the whole organism.

The arthropods, including centipedes, millipedes, shrimps, crabs, scorpions, spiders and insects, are a huge group, constituting eighty percent of all animal species. Only the lower arthropods belong at this *routine-routine* level. The trilobites are an ancient long extinct group that thrived in Cambrian times five hundred million years ago, along with a host of other early varieties.

Simple arthropods, such as centipedes and millipedes, probably emerged to colonize land at the end of the Silurian, about four hundred million years ago. They add speed to a segmented body plan with more elaborate tracheal and circulatory systems, and mandible and maxilla mouth parts, often with prehensile pincers on the head end. The arthropods also add an external skeleton composed of chitin to the segmented plan. Besides providing protection and leverage for the muscles, the skeleton offers support for the internal organs. A form of chitin skeleton also lines the fore and hind sections of the gut, part of the reproductive system and the respiratory system in terrestrial arthropods such as the insects. In many arthropod species the exoskeleton must be replaced as they grow, through a process of molting.

There is an evolutionary trend toward specialization in a reduced number of segments in the arthropods, such as a thorax with legs that is distinct from an abdomen without legs, mouth parts that develop from legs of the front four segments, while legs of the last three segments develop into ovipositor or male genitals. This is seen in the wingless insects which belong at this *routine-routine* level. Some wingless insects such as the silverfish, have tiny vestigial limbs on their abdomens.

The tiny water bears that live in a thin layer of moisture on moss, present something of a mystery. The largest being less than one millimeter in length they nevertheless have a nervous system, specialized mouth parts, a digestive tract, legs with hooked claws, a chitinous exoskeleton and they show signs of segmentation. They have been known to withstand desiccation for more than a century, and can perhaps survive for much longer.

Like the annelids, the mollusks also developed into larger creatures from small unsegmented worms but in a very different way. They are not segmented and developed a characteristic shell for support and protection. Since covering even part of the body limits gas exchange through the skin, the development of gills was essential for the collection of oxygen, together with a circulatory system. The delicate gills are enclosed in a mantle cavity beneath the shell.

Lower mollusks, such as snails, clams, mussels and oysters, first appeared in the lower Cambrian over five hundred and fifty million years ago. In the bivalves (clams and mussels) the gills are much enlarged to collect suspended food particles, which are then moved by cilia to the mouth. In the snails the mantle cavity is at the front allowing the animal to retract its head inside. In many terrestrial snails the mantle cavity acts as a lung.

The chiton group of mollusks are especially curious, since their shells are divided into eight articulated segments which allow them to curl up in a ball for protection. They are simple primitive mollusks and their segmented shells used to be considered as evidence of a segmented ancestry for all mollusks, although this view is now largely disputed. If this is not so, then the chitons are evidence that the segmented experience of the annelids is available to adaptation by the non-segmented mollusks, even though they do not share the same lineage. The same is true of inhalent and exhalent siphons common to both mollusks and sea squirts even though they are of separate lineage. In fact the whole arthropod group is now considered to have evolved independently in three separate

lineages that for some unexplained reason share many features in common.

The evolutionary record is replete with examples of complex structures appearing spontaneously in a separate lineage in a well developed form. It is not enough to simply call this convergent or parallel evolution on the biased assumption that common characteristics evolved again from scratch, often with improvements, but completely by random chance. All of these instances argue strongly in favor of cross-lineage communication at work in the evolutionary process. Experience gained in one lineage may be intelligently integrated into another in a self-similar way within the evolving context of the hierarchy as it develops and seeks balance through biospheric resonance.

The early cephalopods appeared in the upper Cambrian and Ordovician, about five hundred million years ago, the nautilus being the only surviving genus. In this remarkable creature the foot has moved forward to surround the mouth with thirty-eight prehensile tentacles. The digestive tract is U-shaped so the viscera form a hump in a fleshy mantle with gills, all fitted into a many-chambered shell that is used to adjust buoyancy so they can float at any depth. Some long extinct species reached lengths of four meters and were the first large animals. They move by forcibly ejecting water, as do the cuttlefish, squid and octopus which have discarded or internalized a much reduced skeleton. They belong at higher levels within the overall *routine* hierarchy.

Simple crustaceans such as the small bivalved ostracoda, add jointed legs to carry around their two piece shells. Tiny water fleas and copepods, both freshwater crustaceans with transparent shells and without legs, use their antennae for locomotion. The barnacles have reorganized the familiar crustacean body plan of a shrimp into a sessile filter feeder with a strong shell. The free swimming larva of many crustaceans, called the nauplius, has an unsegmented body with a single eye in front, three pairs of legs and antennae.

Pycnogonids or sea spiders, have no real body so that many of the internal organs extend into the legs. Arachnids (spiders) and insects are generally confined to land and most belong to the next level, while the only crustaceans to colonize land are woodlice. Comparatively few crustaceans belong to the next level.

In general, the essential organic *routines* associated with sensory-motor responses to the environment are integrated as well differentiated organ systems at this *routine-routine* level. Although the focus is on

simple, and often slow, reactionary responses to the immediate environment there is an integration of related processes extended in space and time that is essential to the assimilation of *routines* for the coordinated activity of the whole creature. The focus at this *routine-routine* level is on product cycles integrating more highly differentiated tasks extended in space and time, as opposed to the primary focus on task cycles at the *routine-form* level. From centipedes and mollusks to early cephalopods and shrimp, the focus is on product cycles at the supervisory level requiring the distributed commitment of resources to the integrated function of well differentiated parts. This invests them with enhanced mobile abilities to span and integrate space and time.

Routine-knowledge:

There are many ingenious inventions in the invertebrate animals which go beyond automatic responses to immediate environmental stimuli. They involve exploiting *knowledge* of processes extended in space and time far beyond the creature itself. For instance the plants developed flowers to attract a more efficient insect pollinating vector. But there had to be flying insects ready and willing before the idea could begin to succeed on a large scale.

Flight is a remarkable achievement that takes more than the development of wings and the muscles to move them correctly. It requires the rapid integration and processing of much improved sensory input, especially vision, and equally rapid and appropriate patterns of motor responses. Flight is no good if you can't focus on where you're going and steer in that direction.

According to Darwinian thinking these abilities didn't develop through a feedback mechanism of any kind. They always happen by rare random mutations that must occur in concert completely by accident if any selection pressure is to exert itself. It's not enough just to say that protective leg covers were first used to glide a bit and they gradually developed into wings with muscles for full fledged flight. Perhaps it did happen this way, but not without intelligent feedback and input. How did the proper movement of the wings come about for directed flight? How was this linked to the right size and shape of wing? How did the proper eyes come about to direct flight? How did the nervous integration of discrete visual images come about simultaneously? How did this remote sensing come to be interpreted accurately and quickly? How did it come to be translated into the appropriate patterned movement of wing muscles

in order to reach a location perceived remotely in space and time by continuous motion through space and time? How was this much more extensive knowledge of routines gained? How is it that all of these mutations were focused together to converge on flight and not move off in other random directions that would more quickly provide selection pressure?

Among the invertebrates only the insects have mastered flight and it has given them a considerable advantage. It also requires them to identify cause and effect relationships to integrate *routine* actions with a *knowledge* of events remotely extended in space and time. This involves more than just discovering that if they lean one way they turn that way. Flying insects must entertain specific extended objectives, more than just munching algae or lunging at a prey that happens along. Got to find the flowers. Got to find the right kind, right shape, color, and smell. Got to collect nectar and get it back to the nest. Got to feed the larvae. Got to sting the intruder. Got to migrate to Mexico with a million other butterflies. Got to find an animal and suck blood. Got to find shelter from the wind and rain. Got to return before darkness. Got to remember where the nest is. Got to build a nest, mate and lay eggs.

Of course these actions aren't reflected verbally in conscious awareness at an individual insect level, as they are in humans. They are nevertheless patterned energetic impulses to act in specific ways associated with the species. This may depend in part on genetic programming but it must also be spontaneously interpreted according to the ongoing stream of sensory input as the flow of circumstance is presented to each individual insect. There must be some element of transient memory operative in order for the individual insect to link events together into a coherent sequence as it maneuvers through space and time. In other words there must be some further enhanced capacity to span space and time, to integrate history.¹ Any capacity for memory can hardly be an accidental process caused in space and time if it inherently spans space and time. There is a level of order involved that transcends linear time by integrating a history of sensory input and related behavior in an extended spatial context.

Another remarkable feature of most insects is metamorphosis. Winged insects are divided into two groups, the endopterygotes and the exopterygotes. The endopterygotes constitute nearly ninety percent of winged species and they undergo metamorphosis in their development to adults, such as beetles, bees, wasps, ants, flies, butterflies and moths.

Upon hatching from an egg they pass through a larval stage as a caterpillar, maggot or grub, which are segmented creatures not unlike the annelid worms. Then they must enter a dormant pupa stage as they transform into an adult with quite different features although both have similar internal organs. The wings, mouthparts, segmented legs and reproductive organs of adults, all develop from the outer layer of the larva body cells.

The behavior of larvae can be remarkably varied and sometimes complements the adult stage in some way. Some larvae are parasitic, relying on the adult stage for dispersal. Some larvae burrow in soil or wood to survive winter periods that would be fatal for adults. Some larvae of the hoverfly family scavenge in the nests of bees and wasps, some cannibalize aphids, some feed on flower bulbs. One is aquatic, living underwater and breathing through a snorkel tube several inches long. In general the metamorphosis of insects spans and integrates the history of their evolutionary development to some degree, from segmented worm to airborne freedom.

The endopterygotes evolved from the exopterygotes which hatch from eggs as miniature adults but without wings or reproductive organs. The exopterygotes pass through a series of molts in their development. The dragonfly nymph spends two or three years living underwater before its final molt into an adult liberates it into the air. Also included in this group are mayflies, grasshoppers, termites, bugs, and cockroaches.

Insects have a chitinous exoskeleton with internal muscles, leaving fossil evidence of flight in the Carboniferous period three hundred million years ago. By the end of the Permian, over two hundred million years ago, they had perfected processes of metamorphosis and more sophisticated insects had articulated wings which could fold back over the abdomen. Most arthropods are small, having built in limitations to size, such as a ventral nerve cord, and the obvious advantages of light weight to flight and maneuverability. The limits to size have nevertheless been explored on each level and some insects reached dimensions of two feet during the Carboniferous. Flying insects were well developed in their own right long before flowers came along. But they hadn't diversified for the purpose of pollination until the opportunity was right.

Of course it isn't just insects that developed a capacity for knowledge that spans space and time. Spiny lobsters of the western Atlantic migrate to deep water for the winter by moving in single file, each placing an antennae on the abdomen of the one in front.

Some arachnida take an easier but equally clever approach. Spiders spin their silk web and wait. But silk is used for many purposes and some spiders living underwater carry a reserve of air in a silken ball, the first aqualung. Most spiders have six or eight simple eyes, and no compound eyes as in insects and crustaceans. They can see in various directions and somehow they make sense of the input.

And what possesses a caterpillar to begin spinning itself into a silken cocoon? Then there are the aphids, which are especially considerate insects that feed on the phloem sap of plants. Since it is overly rich in sugar compared to protein, most of it must be excreted as waste, which ants come to eat, perhaps warding off predators in the process. The appreciative aphid retains the honeydew until the ants arrive to stroke their abdomen with antennae.

Many complex behaviors emerge in this invertebrate level that implicitly display an integration of *knowledge* that spans space and time, often in ingenious ways. This corresponds to conscious awareness that emerges among individuals in the higher mammals, but in the invertebrates this kind of *knowledge* is not delegated independently to individuals. It relates to whole species and individuals are programmed accordingly. At the *routine* level of invertebrate animals the sub-level of *knowledge* compares with the administrative level responsible for developing the infrastructure of a sizeable business organization. It empowers species to span space and time in an extended framework of interaction with their environment. It allows them to integrate history in their *routine* behavior over a much greater expanse of space and time, or in more complex and ingenious ways.

Routine-idea:

At the *idea* sub-level of the *routine* level associated with the invertebrates we find that two very different approaches have evolved for spanning space and time. One is highly social and involves the collective behavior of small social insects. The other is highly individualistic in large cephalopods (octopus and giant squid) that survive by their wits as loners. Both cases concern the evolution of *ideas* that give direction to *knowledge*, *routine* and *form*. But one is collective and the other is individual, reflecting the universal and particular aspects of experience that pervade the whole evolutionary process. It is as if they had to be independently explored in the biosphere at this invertebrate level of evolution.

The collective aspect has been explored in the social insects that cooperate together in order to survive as a community. But they are not all the same individually even though they may belong to the same species. Social insects practice division of labor, managed through the integrating *idea* of surviving collectively as a structured colony.

For example in a termite colony, kings and queens are produced in large numbers which leave the colony in a swarm. Although they have compound eyes and wings, they are poor fliers and most are eaten or meet other fates. Their wings break off after they land, and mated pairs start new colonies, excavating a chamber in wood or soil. They may remain paired for two or three decades, until one or both of them die and are replaced. Large colonies may have multiple kings and queens. A mature queen may produce as many as thirty thousand eggs a day. Some family!

When the nymphs hatch in two or three weeks they are fed secreted liquids and feces because they need to ingest the bacteria or protozoa essential for their digestive processes. Castes are selected, according to specific social needs, by growth inhibiting pheromones that are secreted by reproductives (royals), determining whether nymphs will be soldiers, workers, or reproductives. Sometimes nymphs are workers at one stage of their development before they assume another role. Soldiers and workers lack compound eyes and wings. Soldiers have heads as large as their bodies, with strong mandibles used in defense, yet they cannot feed themselves. They guard the entrances and some squirt a sticky poisonous secretion. Workers forage for food, feed the royals, soldiers, and young nymphs, build and maintain the nests, care for the eggs, and groom the queens. These tasks too must be divided up, because it wouldn't do if they all groomed the queen and nobody took out the garbage. Some termite mounds can reach a height of forty feet. How did these complex social relationships evolve by accident through selection pressure if communication and intelligence are not involved?

Although endopterogote ants are very different to exopterogote termites, many ant colonies are similar to those of termites, another of many indications of cross-species communication. After a maturing flight of females and males, the male ants die, and fecundated females start new colonies, laying eggs for up to fifteen years, fertilizing most with stored sperm to produce females, whereas males develop from unfertilized eggs. Larvae are helpless when they hatch and must be fed, cared for and carried by adults. Some pupate in a cocoon. Colony

populations can vary from a few dozen to many hundreds of thousands. As with termites, nutrition determines whether a female will become a potential queen or a worker, and workers may become soldiers or other castes in many species.

Slave-making ants raid other ant species and carry off larvae or pupae to serve as workers for them. Some slave-making adults cannot feed themselves. Harvester ants eat and store seeds. Leaf cutter ants feed on fungi grown in their nest on leaves which they carry to their nest and macerate for the purpose.

The integrating *idea* directing social insect behavior has an implicit capacity to exploit and direct a *knowledge* of processes remotely extended in space and time, all according to a social division of labor *routines* for the colony's collective survival in a coherently organized *form*.

In the collective organization of colonies such as termites, ants, bees and wasps, members share a common integrating *idea* in which their diverse activities suit the needs of the whole community.

The individual approach to an integrating *idea* directing invertebrate behavior has been explored by the giant cephalopods, with highly developed nervous systems. A problem similar to that of integrating diverse functions within social colonies arises within very large, complex, individual members of the cephalopods, namely the giant squid and octopus.

Although the comparatively primitive nautilus has thirty-eight tentacles, they aren't used with the same level of sophistication as in the octopus with eight or the giant squid with ten. It can't be an easy thing to fluidly manipulate eight or ten powerful, independently mobile prehensile tentacles fitted with rows of suckers, especially when one of the tentacles also functions as a male sex organ. In mating the male inserts a packet of sperm at the end of one tentacle, called the hectocotylus, into a special pocket in the female's mouth. The end breaks off and regenerates itself.

The cephalopods are predators, sometimes preying on one another, and they are fast and clever. Some octopi erect stone barricades for protection and they squirt an inky smoke screen both for protection and predatory advantage. They can make waves of color wash over them at will, indicating an emotional capacity independent from physical action. Their exceedingly agile use of their tentacles enables them to catch, hold and manipulate prey while they eat it. Octopi and squid have the largest

neurons in the animal kingdom since rapid signal transmission is required to contract the mantle muscles in swimming. They have well developed central nervous systems, their brains being housed in a cartilaginous cage. Their eyes and balance organs are very similar to those in vertebrates, but the cephalopods lack hearing organs. They are deaf. This may be attributable to their nautiloid and ammonite ancestry which inhabited shells and had little need for ears, when the sensory routines of cephalopods were being worked out at the *routine-routine* level.

Giant squid can reach fifty or sixty feet long and various species range the ocean depths, some of them with light producing organs. They swim by jetting water forcibly from their mantle cavity out through their funnel using their powerful mantle muscles. Some can attain speeds of fifty kilometers an hour. The funnel is flexible through 180 degrees so that they can swim either forward or backward. Deafness may be a defense against toothed whales which are thought to stun their victims with intense bursts of sound. However, whales have been found on occasion bearing large sucker marks on their hides, so they may not always be the predator. Roaming endlessly in their vast, dim, silent world of mystery, encountering some gargantuan struggles, the giant squid must require a considerable degree of independent resourcefulness involving a capacity for generating ideas.

While social insects display divisions of labor designed to complement the collective *idea* of the colony, the giant cephalopods display a well developed level of individual intelligence, with a capacity for independent *ideas* suited to their predatory needs. These two aspects of *ideation*, one transcending the individual in the collective social structure of the colony, and the other one aggressively attuned to meeting the survival needs of the solitary individual, are together an evolutionary theme that seeks a common resolution in the climb up the ladder of sentience. It is introduced in the evolutionary drama at this *idea* level of invertebrate *routines*, and it becomes ever more important moving up through the vertebrate series, as we shall see.

* * *

Commentary:

This brief review of the invertebrates, although far from complete, clearly demonstrates the self-similarity of levels within each level of the

evolutionary hierarchy. The fossil and living evidence is there for anyone to see.

The parallels that stem from the self-similarity of the evolutionary order are also apparent in comparing the plants with the invertebrates, for they share an affinity, just as do the vertebrate animals and humans. The four levels of the hierarchy tend to be paired, so there is a certain consistency that emerges between the corresponding levels in plants and invertebrates. For example, the *form* levels are predominantly confined to an aquatic environment, the *routine* levels colonize land, the *knowledge* level in plants takes to the air for cross pollination while insects develop flight, and then the *idea* levels become mutually dependent, with the social insects becoming an important pollinating vehicle for the flowering plants. We will find ever mounting evidence that the hierarchy is the basis of an intelligence that is inherent in the whole natural order.

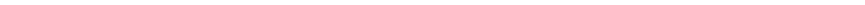
When we turn to the *knowledge* level, represented by the development of the vertebrates, we begin with the primitive fish. Fish are vertebrates, complete with a spinal cord, tiny head brains, and a rudimentary autonomic nervous system.

In seeking an origin for vertebrates, it is interesting that biologists once again must skip back about four hundred and fifty million years in evolutionary history to primitive chordate larvae. They postulate that these tiny larvae, such as the free swimming tadpole-like larvae of the sea squirts or their primitive tunicate cousins, achieved sexual maturity without growing up.

However they started, fish don't have legs, and not always do they have two sets of paired ventral fins which could be adapted to walking under any conditions. There are various arrangements of fins in fish, so that their behavior differs from other vertebrates in that it is fluid and not harnessed to a quadruped structure. The quadruped format consolidated with the amphibians that took the vertebrate scheme ashore, and it stuck, even when the porpoises and whales returned to the sea after more than three hundred million years. Behavior in the vertebrates thus became focused almost exclusively on the manipulation of four limbs attached to a relatively fixed skeletal, visceral, sensory and motor arrangement. The only significant exception is the snake, which regressed from a quadruped ancestor. Earlier we touched on the reasons for a quadruped structure, which will become more explicit as we proceed.

NOTES:

¹ A capacity for memory is associated with the quantization of experience as timeless elements of technique in a master sensorium, referred to as the Void. (See Chapter VII.) In this way elements of experience are stored as timeless packages of ordered energy that can be accessed and recalled when needed. This timeless and formless reservoir of experience, underlying the physical world and spanning history, is also associated with a dynamic and highly structured interdependence between the individual insect and its species. Each species is similarly related to progressively more universal orders of organization that are each related to a higher level, up through the genera, family, order, class, phylum and kingdom. In other words a dynamic interdependence between particular and universal aspects of organized experience pervades the evolutionary order in the task of integrating history. It is this timeless and formless reality underlying the physical world that provides a *modus operandi* for biospheric resonance to work its magic.



CHAPTER X
The Vertebrates

Exploring *knowledge* of emotive behavior.

Knowledge-form:

The hagfish and lampreys are the last survivors of the earliest vertebrates: the jawless fish, called agnathans. Early versions of jawless fish became widespread in the seas of the Cambrian and Ordovician periods some 500 million years ago, but they were quite different from their modern descendants. They had thick bony plates covering their bodies that probably evolved as a defense against giant sea scorpions two meters long with pincers that could crush an unprotected animal. These early fish began to give way to the cartilaginous fish, such as the sharks, and the bony fishes, beginning in the Devonian period, about 400 million years ago.

By the mid Devonian, about three hundred and eighty million years ago, some species of fish had developed both gills and lungs, together with fins that were attached to four lobes that contained bones and muscles inside. These lobe fins could be used for crawling, so these fish could breathe air and drag themselves over land for short distances. It is believed that amphibians developed in a gradual way from these lobe-finned fish by random mutations, although amphibians go through a tadpole stage and their skeletal structures are refined into leveraged jointed legs and digits, together with a host of other differences.

In any case, by the late Devonian a few amphibians had established themselves on land with the well defined jointed quadruped limb structure that we know today. They could lift their bodies off the ground and walk, and they had a strong rib cage with adaptations to keep their organs from collapsing under their weight. They also had a shoulder collar separate from a head, so that they could move the latter independently. Amphibians became dominant land animals in the swamp forests of the Carboniferous period, a few reaching lengths of over four meters. They were weak-jawed lizard-like creatures that developed through a tadpole stage.

The vertebrate head brain consists of cerebral hemispheres that have blossomed above primary structures closely associated with the brain stem at the top end of the spinal cord. The autonomic nervous system also developed in concert with the cerebral hemispheres. The cerebral hemispheres became progressively more convoluted as their surface area

increased in the higher vertebrates. The external surface layer of the hemispheres is associated with higher levels of consciousness and intelligence. This outer rind of the hemispheres consists of densely packed layers of nerve cells a few millimeters thick, called the cortex, hence the term cerebral cortex. In humans it contains a few hundred billion nerve cells. The two hemispheres function with a degree of independence and yet they are interconnected through nerve bundles called commissures, the largest by far being the corpus callosum.

Previously it was pointed out that the cerebral hemispheres, including the cortex, developed in three stages associated with the reptile, the lower mammal and the higher mammal. These three developments, old, median, and new, correspond to what are called the archicortex, the mesocortex, and the neocortex, all of which were present in undeveloped form in early vertebrate amphibians. Although the three brains were undeveloped, they represented an indication of developments to follow. In other words they indicated a development plan anticipating events far in the future.

The reptiles largely replaced the amphibians after about eighty million years, during the Carboniferous period as forests appeared. They developed a watertight egg that freed them from a tadpole water stage, allowing them to become fully terrestrial. The amniotic egg has an outer shell that protects the developing embryo with the help of three additional membranes within. One membrane encloses the embryo itself. Another membrane acts as a collecting bag for waste, also functioning as a respiratory organ. The third encloses the other two together with the yolk, thus separating them from the albumen, a reservoir of water and protein. The reptiles also developed a modified skull with powerful jaws and teeth. At the same time the continents were converging into the supercontinent Pangea, and this allowed a common vertebrate format to become established throughout the world.

It's a curious thing that very early in their development the reptiles explored mammalian characteristics. The pelycosaurs included both mammal-like carnivores and herbivores and were replaced in the early Permian, about 260 million years ago, by more advanced mammal-like reptiles, the therapsids. Some species, up to five meters long, lost most of their teeth and developed beaks, becoming the dominant herbivores. Some early carnivores were like saber-toothed cats, some were dog-like, others were smaller shrew-like creatures. More advanced carnivores may have had hair, and some of them may have been warm blooded. They

had longer legs which later moved under their bodies, rather than sticking out sideways as in living reptiles.

Although they may have been mammal-like in form, it is very unlikely that these early reptiles were mammal-like in behavior. They lacked the cerebral capacity to select a variety of behavioral patterns and moods and thus were more limited than mammals in their ability to modulate their behavior. They integrated experience more directly at a spinal level, with minimal conscious input. In this way each species was more stereotyped in a reptilian way, being locked into fixed behavioral responses to their environment. The large variety of species nevertheless explored a broad range of behavioral forms

Just before Pangea began to break up, about two hundred million years ago, toward the end of the Triassic period, there was a mass extinction in which many species disappeared, including most mammal-like reptiles that had evolved a variety of mammalian features. During the Jurassic and Cretaceous periods that followed two archosaur lines, the crocodiles and dinosaurs, emerged as dominant. The dinosaurs began as small and medium sized creatures, however their legs moved underneath the body allowing them to later support enormous weights as they explored the upper limits to size. Some dinosaurs reached lengths well over a hundred feet. One flying pterosaur reached a wing spread of forty-nine feet. They all became extinct at the end of the Cretaceous, about sixty-five million years ago. By then the flowers had arrived in abundance to foretell their doom.

It is noteworthy that a study by M.J. Benton shows that the Cretaceous extinction didn't have a major impact on other land animals and plants, although it affected marine life.¹ Yet the dinosaurs were exterminated. If the extinction was caused by a huge asteroid impact bringing on a nuclear winter scenario, as some believe, then why wouldn't many species of plants, and most other land animals be eliminated also? There have been other large asteroid impacts in geological history that didn't bring mass extinctions.

Be that as it may, reptilian evolution remained anchored to a common skeletal, visceral, sensory and motor arrangement. None developed six legs or four eyes as some invertebrates did. The archicortex of the reptiles blossomed, and there was a lesser expansion of the mesocortex associated with the lower mammals, with little change in the neocortex. Mammalian features survived, consolidated in a few small rodent-like mammals that made their appearance well over two hundred

million years ago. Typically, the mammals diverged early in the reptilian period and not as a gradual evolution from the dinosaurs that came later.

The cerebral expansion of the reptilian archicortex and the lower mammalian mesocortex in the reptiles was complemented by comparable refinements to the autonomic nervous system. The latter is geared to the automatic function of the body to fuel its emotive and emotional needs. It provides energy to the body's organs and muscles in patterns suited to certain actions, while at the same time providing patterned emotional feedback to conscious awareness. The cerebral hemispheres work something like a TV screen upon which emotional energies can be reflected for conscious observation.

So the reptiles developed a limited cerebral capacity to consciously reflect on their needs as they relate to the behavioral *form* of the body and its functions. They acquired an awareness of exertion or the lack of it, and of the pattern of energy associated with specific actions. Each species explored their patterns of behavior to their limits. There is awareness of lunging after prey, struggling to escape, fighting, seeking shelter, basking in the sun, suffering hunger, thirst, injury, birth, death, all relating to the many reptilian species of vertebrate form.

A broad spectrum of experience was explored in the conscious awareness of reptiles. These patterned energies that were reflected in awareness integrated a vast spectrum of behaviors that span space and time, since each energy pattern involves action through space and time. Although behavior was stereotyped according to species, many species appeared during the reptilian reign of more than two hundred million years. In the reptiles there was thus an exploration in conscious *knowledge* of the basic vertebrate *form* in a huge variety of species of all shapes and sizes under many conditions. To a lesser extent this is true of the fish and amphibians also, from which the reptiles emerged.

Knowledge-routine:

A reptile is not a very expressive beast. A crocodile sleeps, swims, or eats without showing a variety of moods or emotional modulation in the character of its behavior. Its emotive energies are reflected in cerebral awareness through an expanded archicortex, but it can't do much to alter their pattern because the mesocortex is less developed, and the neocortex is undeveloped. A reptile's somatic motor functions are largely integrated at a spinal level with minimal conscious involvement. It is not much different to a fish or an amphibian in this respect and it has

minimal capacity to transcend the organic dictates of its species. It can't reflect well on the pattern of reflection.

The mesocortex blossomed with the lower mammals, together with limited but significant expansion of the neocortex. With it came a much improved capacity to modulate their emotive energies. Anyone who has ever watched young colts, or calves, or lambs romp and frolic can attest to this. They play at mock aggression and the chase, or simply thrill at their own antics. These animals can also emotionally bond to humans, sense our moods and intentions, and be trained to some extent. Crocodiles don't care much about the feelings of anything else.

As the dinosaurs perished, the mammals rapidly diversified in three groups. A few egg laying monotremes, the duck-billed platypus and the spiny anteaters, still survive. In the pouched marsupials, the labor of birth falls to the tiny undeveloped fetus which must crawl unaided into the mother's pouch and attach itself to a nipple for the remainder of its development. In the placental mammals the fetus develops in the womb and the labor of birth falls to the mother. The placenta derives from the second membrane in the amniotic egg, the fetus receiving oxygen and nutrients from it and discharging wastes into it, without the mixing of blood between mother and infant. All mammals nurse their young, including the few surviving species of monotremes. Although monotremes have no nipples, milk is secreted from pores on the mother's belly. There is a period of parental supervision in all mammals that increases with more evolved species of placental mammals.

There are many anatomical and physiological modifications in the mammals. For example, unlike most reptiles (not all), mammals have a four chambered heart, two auricles and two ventricles, with separate circulation to the lungs for the more efficient respiration needed to support a higher metabolic rate. Mammals have internal temperature control, usually assisted by a warm layer of body hair, they have improved kidneys, a better system of bone growth that allows highly leveraged activity in the young, and they generally have more efficient organs. These anatomical refinements made a much greater diversity of behavioral routines possible, from the seasonal migratory patterns of caribou, to the mastery of flight.

The lower mammals, small at first, re-explored the limits to size after the dinosaurs. The early dog-sized rhinoceros of the Eocene period grew into a sixteen ton *Baluchitherium* that stood eighteen feet high at the shoulder. The similar sized *Indricotherium* or "giraffe-rhinoceros" had

had a long neck in addition and could graze from the tops of moderately sized trees. They lived during the Oligocene epoch among lesser giants, about thirty million years ago. In those early days there were also some fearsome carnivores, such as the wolf-like *Andrewsarchus* that was sixteen feet long with a head three feet long. During the Miocene there was *Dinohyus*, a pig as big as an ox, and *Moropus*, an oversized horse-like creature with claws. Giant building continued in successive waves into the Pleistocene epoch of the ice ages, with *Daedicurus*, an armadillo over ten feet long, and the six meter tall Giant Ground Sloth. The marsupials also produced a few giants during this time, including the *Diprotodon*, a wombat as big as a grizzly.

Many parallels were explored between the marsupial and the placental mammals even though they diverged shortly after the demise of the dinosaurs. The marsupials evolved forms very similar to many species of placentals in complete isolation from them, especially in Australia, which has been isolated from the rest of the world for about sixty million years, since the end of the Cretaceous. There have been marsupial counterparts to the wolf, cat, mouse, rat, mole, bat, anteater, bear, squirrel (including a gliding version), monkey, and others. This is another strong indication of cross species communication in a global evolutionary context. That the same forms should have evolved, together with very similar equipment, from nostrils to eye lashes, to complex neurological organization and function is uncanny evidence of biospheric resonance at work. In light of this obvious parallel evolution in a common form and pattern of integration, even the most biased observer should find it very hard to believe that this could be the result of countless sequences of random chance, especially when other major fundamental differences have persisted between the two groups.

One remarkable difference in the marsupial brain is the lack of a corpus callosum, the huge nerve bundle that interconnects the cortex of the right and left cerebral hemispheres in the placental mammals. In marsupials the two hemispheres are required to function independently, at the same time being anchored to a common emotional apparatus and receiving similar sensory input. No significant degree of bilateral polarization of function, such as that so markedly associated with language in humans (and probably to a degree in some higher mammals and birds), could occur in the marsupials. In the placentals the two hemispheres are intimately hard wired together. This means that the intuitive planning of marsupial behavior, distinct from the explicit

formulation of behavior, has to be worked out twice, once in each hemisphere. Moreover the two versions have to complement one another in the bilateral integration of movement. One arm or leg on one side of the body must know what the arm and leg on the other side are doing in order to coordinate movement. This is basic to *routine* behavior.

The situation in the placental mammals is similar, so far as working out separate yet complementary behavioral patterns for the two sides of the body is concerned, except that one side may be used as a hard wired referent by the other side via the corpus callosum. This works much as we take each step forward by thrusting against the other foot. We consciously sense the position of one foot in relation to the other, since the body is represented topologically in the neocortex of both hemispheres, and these sensory and motor areas are interconnected through the corpus callosum.

The sensory areas, operating in polar relation to motor areas, assimilate the intuitive patterns for each sequence of movement for each half of the body. This is then translated into specific action by the primary motor area on one side of the new brain which transmits the pattern to the muscles on the opposite side of the body. The change in position of one arm or one leg is monitored by proprioceptive feedback to the sensory areas which assimilate the next sequence of movement, and so on.² The proprioceptive nervous system feeds back information about the relative position of the body in space.

There are also other smaller commissures interconnecting the primitive parts of the archicortex and mesocortex in opposite hemispheres, such as the anterior commissures and the hippocampal commissures. They provide routes to the hypothalamus and the reticular system that regulate the activity of the autonomic nervous system. These cross connections between the hemispheres of the reptilian part of the brain were essential for the integration of reptilian behavior.

In the mammals these cross connections between the hemispheres of the ancient parts of the brain facilitate the independent integration of autonomic function, including emotional feedback to cerebral awareness. The independent capacity of the new brain to reflect upon and modify the emotional patterns of the reptilian brain provides the mammals with an enhanced degree of freedom to tailor their actions to better suit the needs of circumstance.

The spinal cord is also organized in distinct sensory and motor areas with proprioceptive input that allows for local spinal integration of

simple motor-sensory behavior. This requires minimal conscious participation on the part of the host, as in the more stereotyped behavior of the reptiles. It requires minimal conscious participation even in humans when repetitive motions such as walking or swimming have been automated and delegated to the spinal level.

The absence of a corpus callosum places marsupials under a considerable handicap when it comes to consciously integrating complementary behavior on the two sides of their bodies. This is undoubtedly connected with a need for the topological representation of the body in two distinct motor areas and two distinct sensory areas in the neocortex of each cerebral hemisphere.

The topological representations, called homunculi, are paired in motor and sensory sets. Since one set is essential to developing the intuitive idea, another set is essential for its explicit motor enactment. Two sets are thus essential in each hemisphere if it is to function independently of the other hemisphere.³ This neural organization becomes essential in the lower mammals for the bilateral organization of more flexible and refined body movements in both the marsupials and the placentals. In more developed and consolidated form it is also essential for the bilateral polarization of brain function associated with language and the creative potential of humans.

In the marsupials, however, the complementary patterns for each hemisphere must be intuited completely independently, without benefit of a hard wired referent to the other hemisphere. It seems likely, therefore, that the exploration of a variety of marsupial forms with close placental counterparts facilitated the bilateral organization of brain function in both classes of mammals. It appears that patterned energies have been mutually accessible to similar species of different classes, facilitating both their biological and their behavioral evolution. Otherwise there would be no mutual referents to independent yet complementary motor patterns by which to refine behavior consciously, either in the marsupials or in the placentals. The marsupials needed the placentals to refine complementary topological patterns, while the placentals needed the marsupials to refine independent topological patterns. Without this interplay, accessible through biospheric resonance⁴, they would be left completely to the vagaries of trial and error. It appears that placental evolution has been globally enhanced as a consequence. The higher placentals have clearly outpaced the marsupials and birds.

The above discussion illustrates problems associated with hard wiring *routines* of behavior genetically that are subject to volitional control, since it can't be done solely either with or without the conscious participation of the animal. Behavioral patterns are subject to change at the individual creature's discretion, utilizing the same anatomical and physiological organization.⁵ This becomes increasingly significant with the lower mammals. Even at this level mammals are not complete slaves of their genetic programming. They are sentient creatures capable of sensing a variety of patterns and modulating their behavior in the task of integrating space and time. Complementary *routines* of behavior are thus worked out in *knowledge* at this *knowledge-routine* level of the lower mammals.

Knowledge-knowledge:

In the higher mammals there is an explosive development of the neocortex, or new brain, such that it outreaches the mesocortex and archicortex of the lower mammals and reptiles and enfolds them inward around the top of the brain stem. The archicortex and mesocortex form the edge, or limb, of the hemispheres and together with certain structures in the brain stem become a functionally integrated apparatus, known as the limbic system. The limbic system works in close association with the autonomic nervous system.⁶ (See Appendix I.)

In the development of the brain in higher mammals the old brains don't get thrown away. Rather they get rearranged to incorporate control over emotive energies, that is over "feelings" that have ancient origins and the corresponding patterned energies that mobilize the body.

We still have emotional access to these patterned energies explored by our reptilian and lower mammalian roots. They become especially apparent during moments of raw unbridled reactions, as in moments of rage, fear, fervor, lust, greed, hunger, satiation.

We remain indebted to ancestors that have long since perished from the planet, and in a sense we are obliged to repay the debt. We continue to refine and tailor their primitive energies in more appropriate ways in everything that we think and do. We still have their primitive brains incorporated into our limbic system that fuels the emotional energy for our every action. This reflux and refinement of behavioral energy seeking balance up and down the levels of the evolutionary hierarchy has been going on for hundreds of millions of years, and its character has evolved at each level as the process proceeds. As the most recent player

on the highest level of the hierarchy we span the greatest expanse of history, and we face the greatest challenge in its integration. The human heart is an ancient thing indeed, and we are biologically obliged to consciously cope with primitive energies and emotions.⁷

Even within this primitive limbic system there is some degree of emotional regulation at a lower mammalian level of awareness. The mesocortex that bloomed with the lower mammals is somewhat more developed than the reptilian archicortex and it has some degree of independence from it. So there can be a degree of emotional reflection on primary reptilian emotions, albeit within the context of the emotional apparatus of all mammals. Keep in mind that the cerebral cortex is like a screen on which emotional experience is projected in conscious awareness. Since the lower mammalian screen has a degree of independence from the reptilian screen, there can be a degree of emotional awareness of emotion. This is especially true in the higher mammals and humans. We have an emotional brain that is distinct from and yet related to, the new brains of our two hemispheres.

At this point it should be emphasized that the limbic cortex is structurally primitive compared to the neocortex, and it shows a similar degree of organization in all mammals. Unlike the neocortex, the limbic cortex has strong reciprocating connections with the hypothalamus which integrates autonomic functions. (See Appendix II.) This means that there is a strong projection of visceral emotions onto the limbic screen that colors sensory perceptions.

By contrast the neocortex or new screen has expanded immensely with the development of the higher mammals, with consequent enhancement of our intellectual potential. The neocortex integrates sensory impressions of the external world, and the body's relation to it, with minimal emotional content. The limbic cortex and the neocortex thus function in independent realms, even though they are part of the same brain.

P. D. MacLean, who did much of the early research on the limbic system, called this split between the intellect and emotion a built-in schizophrenic physiology in humans.⁸ As Arthur Koestler put it, the immense intellectual capacity of our neocortex, capable of building atomic bombs and sending rockets to the moon, is biologically harnessed to the emotional capacity of a crocodile and a horse.⁹ Judging by our tragic history of destructive violence it seems an accurate assessment of our human situation.

One might like to hope that the main potential for emotional tailoring and regulation in the higher mammals derives from the much larger neocortex. It doesn't happen through hard-wired control of the neocortex over the limbic system, however, because the neural connections are just not there to allow it.

In all mammals emotional energies become reflected in cerebral awareness and they must be regulated through a degree of intuitive insight into the dynamics of experience that can find appropriate expression in explicit behavior. This process must be integrated through the motor-sensory topology of the neocortex according to the perceived needs of circumstance. Neither the neocortex nor the limbic cortex has dominion over the other. This simply means that emotion and intellect are constrained to live independently in the same house together and must seek a satisfactory balance in the integration of experience.

Thus we find that in dogs, cats, porpoises, whales, elephants, seals, monkeys, apes, and so on, there is a considerable degree of intelligent reflection and behavioral refinement of emotive experience. The higher mammals can modulate their emotive experience more flexibly over a wider range than the lower mammals can and they display more distinctive personalities. They can show anger, fear, joy, anguish, affection, contempt, interest, indifference, trust, a whole range of emotions of a similar nature to humans.

Values emerge with the higher mammals. A conscious evaluation and intentional selection of various emotional patterns becomes possible. This means that explicit *knowledge* of various emotional patterns is reflected for assimilation with other factors at a conscious level of *knowledge* so that appropriate discretionary choices can be made between them. There is thus a conscious anticipation of future options introduced into the process of integrating history.

It's worth pointing out that the body is also topologically represented by three homunculi in the cerebellum, the large folded structure to the rear of the brain stem at the base of the cerebrum. One homunculus is centrally inverted on the older part of the spino-cerebellar cortex. The other two are bilateral representations of each half of the body.

The cerebellum controls equilibrium and muscle tone and it is also involved in coordinating skilled voluntary movements. To do this it must reconcile spinal inputs, including proprioceptive sensory feedback from simulations in muscle spindles, with conscious simulations of anticipated

patterns of behavior. In short it must reconcile spinal cord and cerebral functions. It tends to be especially well developed in birds and bats in order to meet the challenges of flight. (Approximately one quarter of mammalian species are bats.)

Motor-sensory topology is closely related to the proprioceptive nervous system that monitors the relative position of the body's joints, tendons and muscles through feedback from complex sensory organs. It gives us our perception of the body's orientation in space. Included are muscle-spindle organs distributed throughout the muscles of the body that consist of special bundles of muscle fibers enclosed within a sheath. These relatively spindle fibers receive an independent "gamma" motor supply (small motor neurons) from the ventral horns of the spinal cord, regulated by descending tracts from the brain. These small gamma motor neurons constitute about 30% of the motor neurons in the ventral horns of the spinal cord.

This independent motor supply to the muscle spindles allows them to be flexed independently of the muscles they monitor. The spindles in turn transmit two kinds of sensory signals, measuring the degree and the rate of flexion, back to the dorsal horns of the cord at various levels. The same sensory feedback also has collateral branches extending into the motor centers of the ventral horns, as well as transmitting to brain centers, including the homunculi of the cerebrum and cerebellum.

This muscle spindle arrangement allows for an electronic "gamma" motor simulation in the ventral horns of the cord, initiating a simulation in the muscle spindles distributed throughout the muscles of the body, without affecting the skeletal muscles themselves. The simulation generates patterned feedback, via the large rapidly transmitting proprioceptive sensory fibers, thus allowing for anticipated future patterns of action involved in the selection of actual motor patterns.

We are often aware of sensing the simulation of the next action sequence prior to enacting it, even in the process of ongoing activity. We can also consciously simulate actions, as in learning dance steps, or any planned sequence of actions. We can also just feel the rhythm of music through the body, as if dancing or marching. The intuitive perception and planning of the body's movements thus needs one set of sensory-motor topology to integrate proprioceptive feedback distinct from a second set of motor-sensory topology for integrating the actual execution of movement in each cerebral hemisphere.

The passive cerebral reflection of emotive patterns of behavior in conscious awareness thus has another dimension added to it in the higher mammals with a more developed neocortex. The higher mammals can intentionally simulate and integrate a variety of behavioral patterns in anticipation of a future outcome, all within the biological format of a single individual.

The capacity to reflect on emotional experience is not confined to an individual's history, nor to that of the species. The higher mammals are quite responsive to the emotions that humans project. They pick up our feelings, emotions and intentions, and this certainly isn't hard wired across species. Some dogs assume characteristic traits of their masters. They can learn to understand verbal commands, and most higher mammals, as well as some birds, can be highly trained. We can also consciously pick up their feelings if we make a modest effort to be sensitive toward them.

And there needn't be a human involved, since social animals bond in groups. Some animals and birds chose one mate for life, and the period of adult supervision and training of the young in some higher mammals spans several years. Animals sometimes bond across species, even natural enemies like dogs and cats. Even in aggressive confrontation animals pick up the feelings of others. This capacity to tune into the emotive feelings of others is facilitated via the quantum sensorium, spanning space and time and integrating history.

It is obvious from these observations that the integration of experience is not just an individual or a species affair. As higher mammals we are attuned not only to private aspirations which influence human affairs, but also to the energies of other species with whom we share the biosphere, while sharing also a common basis to emotive experience through our limbic ancestry.

Among the higher mammals the significance of a common limb structure, together with a very similar visceral and neurological organization, becomes especially apparent. The motor-sensory topology of the neocortex, which must always seek a balance with the primitive limbic system, is instrumental in integrating the experience and history of the biosphere in the higher mammals and especially in man. This implicitly requires a common mammalian format with the evolved cerebral capacity to consciously span space and time in *knowledge* extended far beyond the constraints of individual concerns. The *knowledge* implicit in the mammalian format accesses *knowledge* across

epochs, eras, species, classes and continents as it seeks balance in biospheric resonance.

The relationship of the neocortex to the limbic system bestows a *knowledge of knowing* on the individual in the higher mammals, especially in humans. Through our often destructive endeavors the human being has assumed a position at the top of the biological hierarchy and we are just beginning to learn the responsibility attached. We are more than our social identities going back a few decades to when our mothers gave birth. The human heart is ancient, embracing the entire vertebrate lineage for four hundred million years of evolutionary history.

Knowledge-idea:

The conscious development of creative *ideas* which can give implicit direction to *knowledge, routine* and *form*, is a capacity that has developed from early primate origins, through anthropoid and hominid ancestors, to eventually find consolidation in one species, Homo sapiens. Not only are we humans able to create highly independent ideas, it seems that this has been the integrating *idea* involved in the whole evolutionary process over the last several billion years. We potentially have the capacity to become aware of our own evolution, to consciously participate in the process by learning to respond responsibly to one another and our role in the biosphere.

It is believed that primates diverged from primitive tree shrews that lived in the Cretaceous period during the hey day of the dinosaurs. Present day shrews are very small, from less than two inches to at most a few inches long. They are extremely active, aggressive, nervous, solitary and territorial. They are easily frightened to death. They have the highest metabolic rate of any animal on Earth, with a heart rate as high as 800 beats a minute. They must constantly search for food and will eat anything, sometimes preying on animals larger than themselves. If deprived of food most of them face starvation in a half a day. They in any case only live for about fifteen months, so if biologists are correct, we had rather shaky beginnings.

In any case small prosimians, or pre-monkeys, were common in North America and Europe during the Paleocene to the mid Eocene, from about sixty to forty-five million years ago. The first New World monkeys appeared in Argentina by the late Oligocene or early Miocene, about twenty-five million years ago. The Old World monkeys and apes, from which humans descended, seem to have evolved from different

prosimian stock, the earliest cat-sized fossils from Egypt being dated at about thirty million years ago. During the Miocene, from twenty-three to fifteen million years ago, several fossil species are known which were probably relatives of both human and African ape ancestors. The first evidence of a distinctively hominid line is found in the so-called ground apes, the first named *Ramapithecus* that appeared from fifteen million to about eight million years ago in East Africa, Eastern Europe, Turkey, Pakistan, India, and China.

Primates have several features which have contributed toward developing their intelligence. Their faces are flattened so that their eyes focus together to provide stereoscopic vision, with enhanced depth perception. Their hands and feet have fingers and toes capable of grasping, with flattened nails rather than claws. In many the thumb or toe works in opposition to the other four digits, facilitating the holding and manipulation of objects. They sit in an upright position and some are partially bipedal, freeing the arms and hands for separate tasks. Most live in trees where they use their hands and arms in swinging with a high level of agility. The primates tend to be anatomically unspecialized, so that the group as a whole is better characterized by increasing levels of dexterity and intelligence. All of the higher primates have some degree of social organization, they care for their young over extended periods, and possess a rudimentary level of communication.

Hominid species began to walk upright and clearly differentiate over four million years ago in Africa. Paleoanthropologists have dated fossils of *Ardipithecus ramidus* found in Ethiopia in 1992 and 1993 at 4.4 million years old, pushing the date back nearer to the time when hominids diverged from the chimpanzee line. Considered to be ancestral to the genus *Australopithecus*, it had many features in common with the chimpanzee and other features common to later hominids that indicated an upright stance. It lived at least part of the time in wooded areas, challenging beliefs that upright walking began in the open savanna.

Fossils of a number of species of *Australopithecus* dating from 4 million years to 1.25 million years ago have been found. At some point, just over 2 million years ago, a new genus, *Homo* (to which our species *Homo sapiens* belongs), evolved from one of the species of *Australopithecus*, and it appears from the evidence so far that two or three early species of *Homo* coexisted for a time.

Homo habilis used stone tools and had a significantly larger cranial capacity than *Australopithecus*, about 750 cc as compared to 600 cc at

most for the latter. Although the evolutionary tree has a tendency to grow branches as more fossil finds are made, *Homo erectus* came on the scene about 1.8 million years ago. He was larger, more adventuresome and brighter than *habilis*, with a cranial capacity ranging from 900 cc to 1050 cc and more near the end of his time. *Homo erectus* survived until at least two hundred thousand years ago, and perhaps later in places. He migrated out of Africa to Asia, Indonesia, and Europe, displaying considerable adaptability and ingenuity in employing tools and techniques to meet different circumstances. He hunted big game, made use of fire, and must have had some command of language to organize collective efforts, as in hunting.

He was followed, or perhaps paralleled, by archaic forms of *Homo sapiens*, assigned by some to the species *Homo heidelbergensis*. In any case the sparse fossil record indicates that we first emerged very close to our present form, with an average cranial capacity of 1350 cc, about 100,000 years ago or more in S. Africa, radiating north through Palestine and Lebanon, and appearing about 40,000 years ago in Europe.

However Neanderthal man, a sub-species of *Homo sapiens*, emerged mysteriously on the scene in Europe about 130,000 years ago. He was more robust than our sub species, which is sometimes called *Homo sapiens sapiens*. Neanderthals had large brow ridges, a receding chin, and a somewhat larger brain, up to about 1600 cc. They were contemporary with modern man and they had some language skills. They buried their dead with some evidence of ritual, indicating spiritual beliefs, but they generally left little evidence of an interest in aesthetic values. Neanderthals disappeared about 35,000 years ago, leaving us as the sole beneficiary of the human form. Our brain and body size also seems to have peaked about thirty thousand years ago and declined about ten percent since.

The upper paleolithic cultures of *Homo sapiens* were much improved, with finely crafted stone and bone tools, and shell and ivory jewelry. Human knowledge and values had advanced to appreciate beauty and craftsmanship in created ideas—clear evidence of efficient language skills coupled to discriminating intuitive perceptions.

The bilateral polarization of human brain function was well under way, with the energies of limbic reptilian and mammalian ancestors being refined anew. Early cave paintings, such as those at Lascaux and Altamira, show ample evidence of keen intuitive perceptions and the artistic talent and techniques to translate them meaningfully into explicit

forms. Their drawings focused almost exclusively on animals, accurately capturing their animating essence or spirit.

Unfortunately surviving artifacts are insufficient to indicate the specific nature of early human social organization and beliefs. What they do indicate is that human perceptions and creative abilities had matured to a level comparable to humans today. They could deal with experience in abstraction with a good degree of sophistication. This clearly indicates well developed left brain language skills differentiated from a right brain capacity for intuitive insight.

The neocortical expansion and development which has taken place with the lower and higher mammals was largely symmetrical in both hemispheres. It relates primarily to integrating the bilateral symmetry of the body and its consciously controlled movements. It's quite apparent in the higher mammals, and especially in the primates, that neocortical development has resulted in more fluidly perfected and automated behavioral patterns. Language superimposes upon this bilateral symmetry of the new brain the polarization of right brain intuition and left brain technique. The human capacity for generating creative ideas and translating them into explicit forms is not symmetrically organized in the neocortex of the brain.

This extraordinary fact of the bilateral polarization of the new brain in humans was most dramatically demonstrated by the experiments of Roger Sperry in the 1960's. He performed extensive tests on a number of patients who had undergone surgical disconnection of their cerebral hemispheres in an effort to control repeated severe epileptic seizures.¹⁰ These patients had their corpus callosum cut in two so that the epileptic focus that caused the seizures in one hemisphere could not transmit to the other hemisphere through this massive nerve bundle.

Following this drastic surgery, each hemisphere of these people's brains had to function independently, much like the brain of a marsupial mammal. Under normal conditions, however, both hemispheres are presented with the same sensory input, even though they are separated, and both remain harnessed to a common emotional limbic apparatus. There was therefore little noticeable change in their behavior, except that their epileptic condition was improved.

Sperry, however, devised a means of testing the visual perceptions of these people. If they focused at the center point of a screen, and a picture was flashed very quickly on one half of the screen, the image would only register on the opposite hemisphere of the brain. If a picture

was flashed on the left side, say of a pencil, it would only register on the right brain. If the person was then asked what they saw, they could not reply correctly. The right hemisphere cannot speak in right handed people. If then asked to pick the pencil out from a number of concealed articles by touch, their left hand could readily do it, since it is controlled by the right hemisphere. When the picture was flashed on the right screen, registering on the left hemisphere, the left hand could not pick the article out, yet the person could readily say what it was when asked. The left hemisphere has motor control of speech, but not of the left hand.

By extensive testing Sperry was able to show that there are different mental functions being performed completely independently in each hemisphere, each with a completely separate memory track. There are two minds in one body, so to speak, both of them harnessed to a third emotional or limbic mind that tends to respond through grunts and grimaces. The left brain in right handed people concerns explicit functions that involve language. This includes nearly all of human behavior, encompassing all socially learned techniques of performance, including science. The intuitive right brain excels at spatio-temporal organization, intuitive appreciation of art, music, aesthetics, the spiritual sense and the like.

So this pattern of three focal points to human mental activity is a very real and distinct thing. It is not genetically programmed because the meaning inherent in language must be learned through intuitive access to a reservoir of cultural experience associated with the social tradition in which the individual grows up. A Chinese infant adopted by American parents will become thoroughly American, and vice-versa. Even if there is a limited genetic component to the overall triadic pattern of thought and behavior, the genes are themselves determined by the self-similar universal pattern, not vice-versa.

Three focal points are inherently necessary for creative ideation. There must be an intuitive insight into the spatio-temporal dynamics of any process in order to develop an idea in abstraction. That idea must then find translation into an appropriate technique to make it an explicit reality. It's of little use to try to fly like a bird without an insight into the dynamics of flight, and without some means of developing the technique to actually do it. All the bird-like feelings of flying in the world won't accomplish the task, and yet the energy that fuels the necessary thought processes must derive from our limbic emotional apparatus, since we are spiritually animated creatures.

This fundamental pattern of three focal points involved in the creative process transcends space and time, since it integrates space and time. The pattern is a self-similar reflection of the cosmic order through which the whole of experience is integrated in a perpetual state of evolution and renewal. The creative process is in communication with itself and is therefore implicitly intelligent. We would be a long time waiting for monkeys to bang an airplane together by accident. (See Appendix III.)

We find then that by late paleolithic times human beings had arrived on the scene well equipped for abstracting experience through intuitive insight and giving direction to *knowledge* through creative *ideas*. As individuals they could independently perceive and communicate ideas from what they learned in experience. They became able to distinguish individual differences and similarities more acutely, but they were also aware that they needed to reconcile the gulf between self and other in order to meet the challenge of group survival. They could consciously develop independent *ideas* to integrate their collective *knowledge* and direct their *routines* in social *forms* of behavior. This capacity became the dominant factor in human social evolution. The universal and particular aspects of experience are always there, defining one another and seeking mutual reconciliation.

* * *

Commentary:

The parallels in the natural record continue to confirm the self-similarity implicit in the evolutionary order, from the *form* level in the plants, up through the *routine* level in the invertebrates, to the *knowledge* level in the vertebrates. We may expect the pattern to continue with humanity's cultural evolution at the *idea* level in the hierarchy, but we will not find four levels completely delegated within this level. We shall see that in our brief journey out of the jungle that we have barely reached the stage of developing global technologies associated with our collective *routines*. Even at this level we are threatening our own survival. Man's evolution is far from complete, but we are slowly becoming aware of our own evolution and the impact that our endeavors are having on the biosphere.

A few hundred thousand years ago, *Homo erectus* had a brain close to the size of our own. He lived and hunted in groups, erected dwellings, made use of fire, and hunted big game. He must have possessed at least rudimentary language skills to accomplish these things, and he could

make limited plans. These ground breaking achievements were the inheritance of Homo sapiens who brought sharper perceptions and talents to bear on the development of early human cultures. With the emergence of a single species, about thirty-five thousand years ago, human evolution graduated from our biological roots to become a distinctively cultural affair within a relatively fixed biological form.

Direct evidence of prehistoric cultures is limited to surviving artifacts that were often made with a utilitarian purpose in mind so that we are lacking direct evidence of belief systems and tribal organization that directed human culture in earlier times. Thirty thousand years ago there were less than ten million people spread throughout Africa, Europe, Asia and Australia. Widely separated cultures evolved independently in a diverse variety of ways that were still exploring the planet and coming to terms with great differences in geography and climate. They nevertheless hummed a common theme, as surely as if they had tuned to the BBC. Biospheric resonance was orchestrating the music.

The bilateral polarization of conscious thought associated with language was a common factor that joined them. Left brain practical concerns with techniques of survival had a polar relationship with right brain spiritual concerns. The latter spiritual concerns transcended physical events in space and time. These early spirit cultures were highly intuitive. They were attuned to energies around them, being influenced by the natural and spiritual environment with which they lived in intimate contact. This much we can gather from descendant spirit cultures surviving into the present in various parts of the world.

With the migrations of Homo sapiens out of Africa to Asia and Europe over 35,000 years ago, three distinct races emerged, each with distinctive qualities in their languages that reflected the three focal points of human thought. The Sino-Tibetan languages of East Asia are intuitive and tonal in nature. Meaning is assimilated holistically as a gestalt, being more closely attuned to the intuitive and spiritual concerns of our right brain. Asian cultures remain closely attuned to spiritual matters to this day.

In contrast the Indo-European languages are more suited to left brain logic, with articles, conjunctions, and tenses to verbs linking external physical events up in a linear flow through space and time. Even though these early cultures were spirit cultures, their languages are more suited to the material concerns of technique and technology. We shall soon see how these characteristics evolved historically.

Meanwhile the sub-Saharan African languages generally have some of the characteristics of both Asian and European languages. They are all tonal and they also have tenses to verbs. They are more closely attuned to the music of our ancient emotional hearts. Polyrhythmic music is a distinctively African creation. They are the oldest cultures on Earth to which we are all indebted.

All three races, with mixes between them, employ all three focal points of the human mind, of course, but the characteristics implicit in their languages meant that each focal point received special emphasis in different parts of the planet. Biospheric resonance was busy developing the fundamental requirements of the human mind consistent with the cosmic order.

NOTES:

¹ Benton, M. J., Diversification and Extinction in the History of Life, *Science*, **268**, 52, 1995. The evidence does not confirm a regular period to mass extinctions such as might be associated with periodic cataclysmic physical causes raining from the heavens.

² The description given here is very general. In the *System* there are three particular sets of centers that transform synchronously from term to term through the nervous system, synapse by synapse, in a twelve step sequence. There are twelve steps because each of the six particular terms of System 4 has an expressive and a regenerative mode. Seven of the steps are expressive, depending on automated or reflexive patterns of behavior determined through prior conditioning. Five of the steps are regenerative, being creatively formulated using sensory feedback from proprioceptive simulated action that anticipates the future. These expressive and regenerative modes interact in being played out by the three synchronous sets transforming through the sequence, thus spanning past and future and continually integrating history. Since the System directs the evolutionary process it has structured the nervous system to function precisely this way. For a complete description of how this works see *Science and Cosmic Order: A New Prospectus*. Ibid.

³ The intuitive idea is developed as a sensory pattern relating to a motor context, and the explicit technique is developed as a motor pattern relating to a sensory context. Idea development takes place to the rear of the central sulcus, motor development takes place in front of it. This complements the organization

of the spinal cord, where the sensory areas are in the dorsal horns and the motor areas are in the ventral horns.

⁴ Experience is quantized into discrete episodes that become structurally integrated as elements of memory in the quantum sensorium, the Void. Quantized elements are recalled to form in the oscillating dance between particulate form and quantized emptiness that makes up the cosmic movie. The biosphere is a living whole that seeks balance and equilibrium between the myriad living organisms on every level that make up the sphere of life that surrounds the planet. It seeks resonance and harmony with itself in its oscillating dance, as surely as beating a drum head or strumming a string on a banjo. Experience explored in one part of the biosphere does not exist in isolation, even though it may be geographically isolated. It is integrated with and accessible to experience in other parts of the biosphere through biospheric resonance. There are countless instances of evolutionary copying between unrelated species, wherever they can exploit a complementary niche in the biosphere. Simply calling this convergent evolution on the blind assumption that it happens by an incredible series of fortuitous accidents explains nothing.

⁵ Established behavioral patterns become quantized elements of technique and are preserved as elements of memory in the sensorium or Void. They are accessible through the structured relationship of the individual to the species, genus, order, class, etc., to the extent that taxonomy reflects the evolutionary order. They are also accessible between different lineages where resonance renders this feasible.

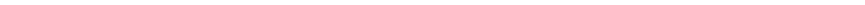
⁶ In 1878 Broca demonstrated that a large cerebral convolution which he called the great limbic lobe is found as a common denominator in the brains of all mammals, forming a border around the brain stem. Broca, P., *Anatomie comparée des circonvolutions cérébrales. Le grand lobe limbique et la scissure limbique dans la série des mammifères. Rev. Anthropol.*, **1**: 385, 1878.

⁷ Papez first advanced the idea that the limbic cortex and related structures provide the anatomical substratum of emotional behavior. Papez, J.W., A Proposed Mechanism of Emotion, *Arch. Neurol. & Psychiat.*, **38**, 725, 1937.

⁸ In 1949 Paul Maclean first introduced the idea that there is a built in schizophysiology between the neocortex and the limbic system, since the former has no built-in biological controls over the latter. Many articles including: MacLean, P.D., Contrasting Functions of Limbic and Neocortical Systems of the Brain and Their Relevance to Psychophysiological Aspects of Medicine, *The Journal of American Medicine*, 1958, **25**, 611.

⁹ Koestler, A., *The Ghost in the Machine*, Pan Books, London, 1970.

¹⁰ Many articles including: Sperry, R.W., Gazzaniga, M.S., and Bogen, J.E., Interhemispheric Relationships: The Neocortical Commissures; Syndromes of Hemispheric Deconnection, *Handbook of Clinical Neurology*, **4**, 1969. Sperry, R.W., Hemisphere Deconnection and Unity in Conscious Awareness, *Amer. Psychol.*, 1969.



CHAPTER XI

Humans

Exploring ideas integrating space and time.

Idea-form:

The *idea* at the top of the sentient hierarchy is the evolution of humanity with a capacity for creative ideation. It is abundantly apparent from our global undertakings that no other animal species has comparable creative capacities, even though some may be highly intelligent. With this capacity also comes a burden of responsibility, for as a species we must sooner or later learn to bridge the gulf between self and other, and exercise restraint to make room for our animal brothers. This imperative is already structured into our limbic system anchoring us firmly to our reptilian and mammalian roots in the biosphere. We become spiritually impoverished as we indiscriminately propagate, pollute, and push species after species to extinction. We cannot survive as a species alone. The biosphere lives in our heart.

At the same time, creative *ideas* must have a capacity to integrate experience in ways that help people to cope with the changing flux of circumstance. They require an insight into the cosmic order of things. Ideas must span space and time, in the sense that they must anticipate the future while at the same time finding a degree of consistency and harmony with our evolutionary roots in the biosphere. Ideas must join heaven and earth, so to speak.

Sustainable ideas about how best to cope with circumstance evolve through social implementation. Involutionary traits always creep in and they must eventually face resolution. In keeping with the universal and particular aspects of experience, ideas also have both collective and individual characteristics. This involves both left-brain social and right-brain intuitive mind sets that each individual uniquely explores in their own fashion. We are attuned like radio sets to cultural and spiritual themes, and our cerebral hemispheres are our biospheric antennae.

Ancestral cultures, prior to the time when farming and the first complex civilizations began to appear, explored many languages and with them the basis of conscious meaning. This included the fundamentals of human values that are woven into the fabric of humanity today. These early cultures encompassed a great span of humanity's conscious history and they continue to work their influence through the

bond that makes us all human, even across the years. For more than twenty-five thousand years since we became the sole beneficiaries of the planet, the only modern humans were tribal nomads that roamed the extremities of the planet seeking out their daily sustenance and gauging their impressions of the land.

Prior to what is recognized as the emergence of the first civilizations, in the Near East less than ten thousand years ago, spirit cultures had explored the farthest reaches of the planet. It is significant that for most of this time the Western Hemisphere was left untouched by human intrusions. The human adventure began there only as the last ice-age went into recession, about fifteen thousand years ago.

It seems that half the planet was reserved as the exclusive domain of animals while man was preoccupied with assimilating meaning and other matters of the spirit elsewhere. That was his master radio program required by the resonance of the biosphere. A process had already begun that linked the hemispheres of man's cerebral development to the geography of the planet. The biosphere was not integrating experience to the exclusion of our animal brothers who held dominion on the other side of the world.

Then no sooner had humans crossed to America and colonized to the ends of the Earth, thus making the human program global, than we begin to seek permanence. Nomadic life was difficult and brutally brief. We invented farming. We learned to domesticate animals, plant crops and stay in one place. It happened first in the fertile crescent of Mesopotamia. Sufficient food to support concentrations of population made permanent towns and villages possible, often sharing cultural similarities over large areas.

By about six thousand years ago the first cities began to arise with division of labor and complex organization. Tribal cultures became assimilated into city states which began to spring up, first in Mesopotamia. The process was accelerated by desert conditions which slowly developed around the globe following the last ice age. This encouraged a migration to riverine cultures in Egypt, Mesopotamia, the Indus Valley, and the Yangtze and Yellow River valleys in China.

Kingdoms arose, and with them counting. Things had to be kept track of. Large numbers meant that systems of measurement and records were essential, leading to the invention of writing. In Sumer the cuneiform system of writing was devised prior to 3000 BC. History could be integrated on tablets of clay, or scrolls of papyrus, that held

time captive in the present. Concepts and ideas acquired an eternal flavor, spanning centuries.

Human technology took a quantum leap and with it man's spiritual concerns reached out to the heavens. The priests of ziggurats and pyramids entertained concerns with the cosmic order. Systems of measurement were related to astronomy by exploring sacred geometries. They devised methods of measuring the Earth's relationship to the Moon and the Sun. In the Indus Valley, as in Egypt and Sumer, divinity was tied to the universal order. The cosmic order was seen as an expression of cosmic intelligence. Their spiritual insights provided the basis of their technology also.

Internal strife and foreign incursions kept Mesopotamia in flux until the Indus Valley was united with the eastern Mediterranean under the Persian Empire, about 540 BC. Ideas that had been cultivated over many centuries in the Indus civilizations were brought to Ionian shores. Greek thought thus flourished in opposition to Persia, while being nourished by contact with a rich history of Eastern ideas. The same philosophical and spiritual questions had already been explored for centuries in the Vedic tradition of the Indus civilization. Then in 325 BC, under Alexander the Great, the Greeks reversed the Persian conquest for another two centuries, bringing Greek civilization directly to the Indus Valley.

An interplay began here between East and West that is closely related to the bilateral right-brain versus left-brain development of human thought. Many Greek thinkers were influenced by intuitive concepts, very popular in the East, related to a transcendent order to experience. The cosmic order was known as the *rta* in early Vedic thought. The same spiritual tendency in Greek thought gained inspiration through Parmenides and Socrates, and became eloquently expressed in Plato's *Theory of Forms*. Archetypal forms were regarded as transcendent realities that determined the identity of specific physical things. For example, we identify a tree by its relationship to an archetypal concept that we intuitively have of all trees. There is an interplay between the universal and particular aspects of experience that determines the identity of all physical things.

Plato's most accomplished pupil turned it around, however. Aristotle rejected the mystical implications of Plato's transcendent archetypal forms. By maintaining that the essence of a thing resides concretely in the thing itself, he atomized the universe. All things were separate entities. Unity was gone and things had to be put back together

again. This led him on quite an excursion into classifying experience that essentially formalized concepts of space and time, cause and effect. These concepts were then transplanted westward by the Roman Empire where it struck a resonant chord with the regimented Roman mind. Aristotelian ideas thus conditioned Western thinking, with its left brain emphasis on explicit technique. This influence has been instrumental in the western development of the sciences into the twenty-first century.

In the East things took another course altogether. Although Greek cities were established in the Indus Valley, Greek thought didn't move east, although Greek art did. With the opening of the silk route, in the first century BC, Buddhism began moving into China but Greek philosophy was left on the doorstep. The Eastern mind was attuned to intuitive concerns of the spirit, especially the Sino-Tibetan language groups north and east of the Himalayan divide.

These languages are more attuned to right brain thinking, having no tenses to verbs, no sense of time, few articles or conjunctions to link things up in a flow through space and time. On the other hand they possess a system of assigning universal classifications to nouns. And they are tonal, adding a twist to intuiting meaning. Space and time were integrated as a conceptual gestalt. Ideas were grasped holistically, not as a reasoned series of deductions. Ideas were assessed by their intuitive fit, not by their rational justification through syllogistic argument. The Chinese were into the cosmic order too, but the Tao is a dynamic process in which the cycles of the heavens mesh together as a whole. The Chinese sought unity directly.

Slowly a pattern takes shape to the planetary development of the human mind, with antecedents that must have anticipated the process by many tens of thousands of years. The development of left brain technique became focused through western cultures in the Indo-European language tradition suited to assessing events in a space-time context. The development of right brain intuition became focused through eastern cultures, especially in the Sino-Tibetan language traditions of East Asia. These developments expanded above our limbic link to our ancient heart. The music of the human soul became focused through sub-Saharan African cultures where humanity was born. Their spiritual intuitions were more directly animist than those of East Asia with a cosmic bent. There is a self-similarity of three focal points within each focus, but the overall pattern is clearly there, expressed through three human races, with mixes between them.

It is thus apparent that the basic *form* of human *ideation* has been worked out within the whole biosphere as its operating field. Right brain intuition, left brain technique, and limbic emotion, have historically found a degree of independent development and focus through very distinct cultural and racial traditions. Had it been otherwise we would all be deprived the wealth of human diversity and a capacity for insight into the human condition.

Idea-routine:

Man's limited perception of the cosmic order has always been instrumental in developing *routines* of behavior by which to cope with the complexities of experience. The early spirit cultures were limited in the degree to which they could abstract spatial relationships and reassimilate them step by step into more complex behaviors. Their perceptions were too dynamic, too time-like and animated.

Their universe was teeming full with living spiritually animated patterns. They traded in this currency of behavior. Many of their shamans no doubt could access spiritual experiences of various degrees and kinds, but the cultures possessed the means to translate them only dynamically. It allowed them to select and adapt appropriate responses to their current circumstance, but not to freely and consciously invent them.

This situation began to evolve with the development of the riverine cultures and city states centered in Egypt, Mesopotamia, the Indus, and the Yellow River valley in China. Collective organization meant division of labor that had to be hierarchically integrated by leaders. Things had to be administered, measured and counted. Jobs had to be defined and assigned. With this need to both quantify experience and define behavioral territory, concepts became spatially extended. Dynamically oriented spirit cultures thus became tempered by spatial relationships that integrated collective behavior. Records and writing lent the whole process historical perspective and continuity through space and time.

From Egypt to the Indus religions acquired a different flavor from that of their shamanist predecessors. Behind the divine ennead of Egypt was a supreme creator Ptah, who worked through the cosmic order, represented by the goddess *Maat*. The early Vedic tradition gave the same cosmic order expression as the *Rta* associated with the supreme deity Varuna. In ancient Sumer this cosmic order was known as *Me* and equated with divine virtues and permanence, the structuring elements of God's world. In China the cosmic order was known as the Tao, a

manifestation of the Supreme One. In common accord across these cultures, the cosmic order was seen both as a physical order and a moral order that prevailed in the cosmos.

Things took another development with the ideas of Aristotle. His thoughts were influenced by the basic concepts of space and time. Space and time became abstractions in themselves, wherein all things assumed their identities as separate concrete realities, linked together by causality. These ideas, with corresponding developments in logic and geometry, were transplanted throughout Europe by the Romans, alongside the Christian message. They incubated in the Western mind for fifteen hundred years, before reawakening during the Renaissance when Western science found its beginnings.

Through the work of Copernicus, Galileo, Kepler, Descartes, Leibniz and Newton, western science was born through a new cosmic synthesis. Space and time were seen as endless concepts that served as a vessel within which physical events were linked through direct causal relationships. By trimming away three of Aristotle's four causes, reality was externalized, outside, apart from a mind as perceiver, inside.

The process gained momentum through the rediscovery of America and the expansionist mentality that gripped the western mind like a consuming fire. Spatial extension took on a new dimension. The West sought unity through cultural dominion over the planet and spiritual salvation in the afterlife.

In the East, the right brain intuitive mind took a different turn. The cosmic order found expression as the dharma and the tao, with a causal law of a different kind. The law of karma transcends events in space and time, although it is also linked to them. Karma works through cycles of recurrence engaged through the intention or spirit in which one acts, thus inviting good or bad karmic consequences in future. Right brain intuition sought unity with the cosmic order through conscious evolution to a better moral condition. The serious adept sought eternal realization and wisdom in a way that both transcended and integrated history.

The Chinese were nevertheless actively engaged in culturally assimilating tribal minorities into the Han tradition. They built the Great Wall to ensure their dominance against barbarous incursions from outside. Then early in the thirteenth century, a tribal chieftain jumped on a horse in Mongolia and decided to put a stop to it. He decided to conquer the world. Genghis Khan established an empire that stretched from the Pacific Ocean to Eastern Europe, just as the Renaissance was

beginning. He upset the oppressive intentions of Eastern culture by establishing cultural tolerance. Despite his barbarous ways he never imposed a belief system, although his own beliefs were conditioned by the spirit cultures of Mongolia. In both East and West the lid was blown off cultural ideas that sought to contain the behavioral routines of people. The spirit was in the air, blowing in a biospheric wind. A new mentality sought liberation from confining ideas in ossified forms. Men only gave it blind expression.

All of this is prologue to what has followed. Western technology found ways to ferret out the workings of the atom, the biochemistry of the cell, the physics of stars, and has invented a cosmology to gain ascendancy over religion. The left brain has matured to eclipse the spiritual strivings of the right brain, claiming the cosmic order as its own domain. In the West the Big Bang is held to be the initial creative event of all time and space, from absolutely nothing, predetermining the evolution of galaxies, star systems with planets and biological life. There is nothing else in the works, according to science, except causal connections of one kind or another in space and time.

Darwinists have rallied to the common cause to add life itself to the list of mysteries solved forever as a mindless series of causal accidents. For science, the quest for unity has resolved itself into one unknowable explosion in an unthinkable past that claims to put the nagging questions to rest so that we can get on with being economic consumers perpetuating our genes. We have integrated history from its big-bang beginning and have only to work out a few details about the final demise of the universe.

But there's no place in it for us, and no future either. It's a universe without values or meaning or morals. We have outgrown our primitive religious superstitions. They were nothing but anthropomorphic aberrations, the result of our clutching at narcissistic yearnings. Science with its armies of researchers has given us a new Bible that no one can ever master or fully comprehend.

The three focal points of the human mind are deprived the possibility of ever achieving balance. Balance is not in the works in the current scientific paradigm. Maximization is the theme. More! More! More! It's a runaway horse on a wild chase after a creative process that is leading us on faster and faster through linear time and space. It's a Big Bang, driving our left brain techniques in ever more frantic gyrations to satisfy the mindless demands of the paradigm. It's a self consuming

spiral that has caught us in a vortex of insatiable thirsts. We are trapped in the wheel of samsara with the social structures that hold us together pulling apart at the seams.

The whole emphasis in the development of science has been a concern with creative *routines* that will help us to materially survive in better ways. This it has done exceedingly well. Science has accumulated an immense fund of factual knowledge, but transcendent knowledge about the workings of the cosmic order is sadly lacking. In some incongruous respects we have succeeded too well. The more we know, the less we understand.

Through communications science has shrunk the world and brought us all together in global economic undertakings. Eskimos have traded huskies for snow machines. Transistor radios have invaded urts in Outer Mongolia. Pygmies in West Africa can see themselves on “*Discover Your World*.” Our world, we are told, but there is always something to sell and the *routines* of manufacture and distribution to be concerned with. Keep the wheels turning faster and faster for profit. Our routines have become the global routines of multinational corporations, serving burgeoning global populations, while global resources are depleting at a frightful rate with alarming impact on the biosphere.

Science itself has gone global, while the west has been invaded by Eastern philosophies and religions. There is still an East-West focus to intuition and technique but the one is rapidly interpenetrating the other, even though they are mutually incompatible. The contradictions that face us on every front are coming through to the individual.

Despite our ability to exploit *ideas* to organize our *routines* of behavior on a global scale, we still can't bring the bilateral polarization of thought to a balance with our biospheric roots. Our intuitive insight into the cosmic order is not sufficient to find translation into social endeavors that are in accord with our natural heritage. The three focal points of the mind can't find a satisfactory balance. Our *idea-routines* are running away with us, endangering the very living systems that support us.

Idea-knowledge:

We haven't reached this *idea-knowledge* level yet, although we are rapidly exhausting the resources of the previous level. The biosphere is the operating field and it is being explored to its limits by human *routines*. As the operating field becomes exhausted new developments in

the evolutionary process must come. We must open our minds to the *Idea-knowledge* level.

Although we have acquired a great deal of knowledge about the world since the Golden Age of Greece, we have learned to understand very little. Even the factual knowledge that we have accumulated through scientific investigations over the past few centuries, although immense, is generally fragmented, or at best tenuously stitched together by biased concepts and theories. Science hasn't yet begun to grasp how experience is organized and integrated. It hasn't yet begun to ask the right questions, since they are prohibited by current paradigms that channel all thinking. A practical alternative paradigm has so far remained elusive.

In general our intuitive processes are hopelessly simplistic, tediously self-centered and aggressively self-contradictory. They are preconditioned by a space-time paradigm in which we must contest for survival. We generally practice two sets of rules, one set for ourselves and one set for everyone else, even when we profess and believe the contrary.

This is especially true when thinking becomes institutionalized or idealized. Then we tend to identify with the institution or the ideal. This kind of identification tends to absolve us of personal responsibility for our thoughts and actions so long as we follow the accepted rules and conform to ideal expectations.

For example, we tend to identify with capitalism, or socialism, or individualism, or collectivism, or fundamentalism or whatever "...ism" or ideal we may find to our liking. Although it may be socially expedient, even necessary to do this in the circumstances, it generally biases everything that we learn and think that we know. It places powerful constraints on the development of our ideas, and for most of us there seems to be little option. When one's livelihood and the well being of one's family swings in the balance, the pressure to conform is especially strong.

A little impartial reflection will confirm that the knowledge we possess is largely culturally programmed. This hasn't led to a general improvement in our capacity for independent insight. Our personal world views are generally very confined. We are as sluggish in this department as we have ever been and there are no formal avenues provided to offer improvement. Knowledge of the cosmic order is not a subject that concerns very many.

Knowledge here does not mean book knowledge, although it may employ it. It is not intellectually manipulated ideas in the isolated arena of left brain thinking for intuitively entertained private motives. It is not getting an MBA in order to get a higher paying job in the corporate power structure and finance a more extravagant life style.

Knowledge here means knowledge of how experience itself is organized and integrated such that it can implicitly direct *routines* that will bring the three focal points of the mind to a satisfactory balance. A more fundamental level of awareness comes into play behind the conscious thought processes associated with the three focal points of the brain. One can still get an MBA and become a successful business man, but one will do it for a different set of reasons.

One may not be able to clearly express those reasons, even when they are clearly perceived. Language doesn't have access to all levels of experience. Language is a social tool, with a strong tendency to be mute in the intuitive arena. And the real reasons that one chooses a course of action are largely spiritual in nature, for they concern spiritual balance and harmony with one another in the biosphere.

To achieve this kind of knowledge, a quantum leap in the human perception of the cosmic order is essential. This requires a complete examination and re-assimilation of everything that we think we know. To accomplish this, our intuition must become opened to apprehend the cosmic order directly and become attuned to its workings in our own experience. One must gradually relinquish motives that isolate the self by opposing self to other, and perceive the dynamic interdependence of things on a universal scale. One can intuitively learn to directly sense the energy processes involved in the integration of experience, how they arise, transform and dissipate, and the consequences they bring.

One of the negative consequences of our technology and of our social capacity to cope with events in a space-time context is that we also tend to project ourselves as existing out there, in space and time, like atoms and everything else. We tend to think that we are another isolated thing in this fabricated notion of space and time that contains everything. Yet when we stop and think about it, we cannot isolate and identify space and time as real things. They have no independent existence themselves. Nevertheless we foster the idea of an independent self as a separate thing existing out there. We feel we have to sustain this idea of our independent self. We have to defend it and promote it over others to

achieve the feeling of unity. That feeling of unity is the source of all happiness.

This tendency to isolate the self in this way is compounded by the motor sensory topology of the neocortex and the proprioception of the body. The proprioceptive nervous system is designed to give us a perception of the body's orientation in space. Our other senses are integrated accordingly. We need this in order to move about and function as human beings. But this spatial perception of the body is not the self. It doesn't determine the ancient emotional patterns that animate us. It doesn't determine the ideas and thoughts that swarm through our minds. Nor are our sensory impressions of the external world the self. Nor are emotional patterns, ideas and thoughts the self, for they almost always have an historical and cultural origin, which means we are indebted to others for them. They are also in a perpetual state of flux and change over which we usually have little or no control.

This problem with identifying a self in a space-time context has been recognized from ancient times in both the East and the West. It continues to be a central theme of Buddhism and Hinduism. None of this means that there is absolutely no self. It only means that our thoughts about a "self" are bound to prove confounding because we are an intelligent product of the entire interdependent universe. We are a product of the self-similar cosmic order. Our particular aspects are defined by their relationship to universal aspects. We are both one and many such that there is a universal aspect of self in others.

In some respects it is as if we have been living in an invertebrate jungle since we became preoccupied with *routines*. Like millipedes, spiders and bugs, we have been exploring every thinkable technical response to the flux of circumstance with little capacity to reflect on the intelligent integration of those responses in the global theater. Social success has meant economic success, frequently at the expense of others and the environment.

After the invertebrates explored many motor-sensory routines, they became reorganized in the vertebrate format with a capacity for conscious reflection on emotive behavior. In a similar manner we now need to deepen and expand our level of conscious reflection by attuning our mind to the cosmic order through which we have evolved in the biosphere. We have the intuitive capacity to seek out universal insights and translate them into specific routines refined to complement our natural heritage. We can become conscious participants in the

evolutionary process. The power of the intuitive mind is not confined to our transient social affairs. Neither is it confined to the biosphere that gave us birth. It potentially has access to the energies of the cosmos.

This means that we need a new paradigm for our sciences, one that can bridge intuition and technique to bring behavior in line. It has been twenty-three hundred years since Aristotle contrived the basics of space-time causality and it has taken this long for the idea to exhaust its potential. Like the dinosaurs exploring the limits to the vertebrate format, science has explored space and time to its limits. The Aristotelian paradigm has achieved the needed objective of developing explicit left brain techniques independently of implicit right brain intuitions. Technology and spiritual insight have developed separately with separate emphasis in West and East. Now intuition and technique must find mutual balance in a more fundamental context.

The new paradigm must transcend space and time. It must encompass and delineate the specifics of how the creative process generates experience with space-time characteristics. In other words it must render processes that are perceived in space and time transparent. It cannot do this by elevating space and time to the status of *a priori* determinants of experience beyond the reach of conscious inspection. The space-time dimensions are *a posteriori* to the physical creation around us. They are ideas derived from our experience of the world around us. We define space and time and measure them by reference to the physical world. We create these concepts ourselves. They are not independent entities in themselves that can be interpreted as determining conditions of all creation in a primal explosion that we call "The Big Bang".

The need for a new paradigm brings us back to the self-similarity inherent in the universal hierarchy of the evolutionary order. The hierarchies are a first step toward apprehending a new paradigm that accurately reflects the cosmic order. The new paradigm is the *System*,¹ and through it we can access *knowledge* of the cosmic order directly. We have evolved to the point where many of us can meaningfully access and assimilate intuitions of this gravity and magnitude and we badly need the assistance. Delegation at this level in the hierarchy is just beginning. We may expect it to be another lengthy process, one which will open our minds to our cosmic destiny. Being is a cosmic phenomenon and we human beings are cosmic beings.

Idea-idea:

Given the time span and complexity of the evolutionary process on the planet it is impossible to judge when delegation will begin at this level in the hierarchy or what form it will take. If we can't get our act together at the *idea-knowledge* level it may never happen. Humanity may simply become an irredeemable failure and our terrestrial experiment terminated. We have already been close to terminating ourselves in a nuclear holocaust and we still retain the potential to do so. There are myriads of solar systems scattered through the firmament with no reason to believe that good fortune will somehow shine upon us despite our irresponsible ways. Even if we do survive as a species and make real progress toward bringing the three focal points of the human mind to balance in a constructive way, we can be sure that there will never be full delegation at this level in the hierarchy. Self similarity tells us that levels will tend to break out within this level in further stages of refinement that will affect the whole hierarchy. Although we may never be complete masters of ourselves or the planet our minds will be opened to our cosmic role. This role is played out in a theater beyond our wildest conjectures. As intelligent participants in an intelligent universe there are levels of realization possible that can transcend the whole of creation and transport us far beyond our humble beginnings on the planet Earth. Our journey has hardly begun.

* * *

Concluding Comments:

This completes our excursion through the universal hierarchy of the evolutionary order on the planet. The hierarchy itself gives us many clues as to the modus operandi of the creative process, especially when we draw parallels to the structuring of a business enterprise. The fact that this pattern is there in any creative process is itself compelling evidence of intelligence at work in the evolutionary process, just as it is at work in the organization and integration of experience generally. On whatever scale we may choose to examine living processes, similar hierarchies can be identified. This can hardly be the result of blind chance.

We have not undertaken to explore the terms, transformations, and symmetries of the System here, but they are very revealing. The author has thoroughly explored the first four *Systems* in books listed in the endnotes below. The complete delineation of the System, as it relates to

the biological evolution of life on the planet, is an enormous chore. It can nevertheless meaningfully assimilate the accumulated factual knowledge of the biological sciences and give them coherent direction. The missing piece in our scientific endeavors has been the question of how experience itself is organized. The *System* can provide this missing link by offering intelligent insight into the cosmic order.

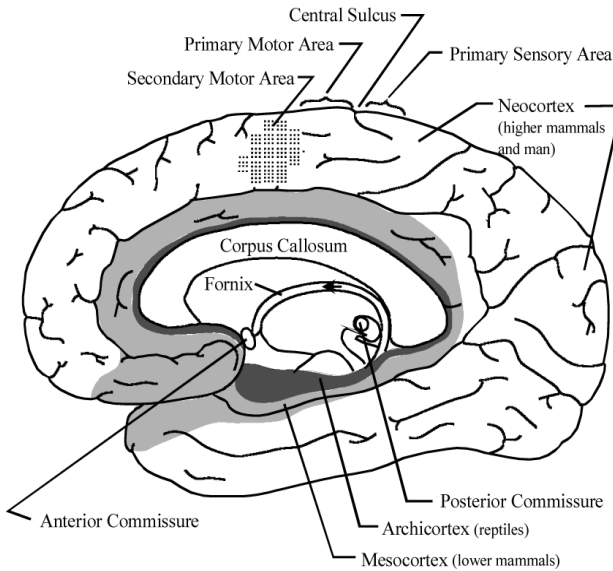
Perhaps the most remarkable thing about the cosmic order is that it can evolve sentient beings capable of knowing itself distinct from itself as a supremely intelligent *System* integrating the whole of experience on a universal scale. It is the universal basis of being. Everything in the universe is interrelated and interdependent in a bewildering maze of interactions, yet a conscious mind can rise through the ranks of biological evolution to transcend its own roots in the universe. By knowing the System as the intelligent pattern of being from which all creation derives, one can transcend with the System the whole of creation, the whole of space and time, the whole of history, in a way that defies definition or analysis. This eternal realization is the basis of all values, all truth, all goodness, all beauty, all inspiration. There is nothing outside it.

NOTES:

¹ The *System*, as an accurate expression of the cosmic order, has been explored and developed in a number of books by the author. Included are the following: “Fisherman’s Guide to the Cosmic Order” a revised edition of “*Fisherman’s Guide: A Systems Approach to Creativity and Organization*, Shambhala, Boston, 1985 (BN.com); “*The Hall of Two Truths*” (a novel) iUniverse.com, BN.com.; *Science and Cosmic Order: A New Prospectus; Enlightened Management and the Organizational Imperative*.

Appendix 1

(Copied from Fisherman's Guide)



THE LIMBIC CORTEX

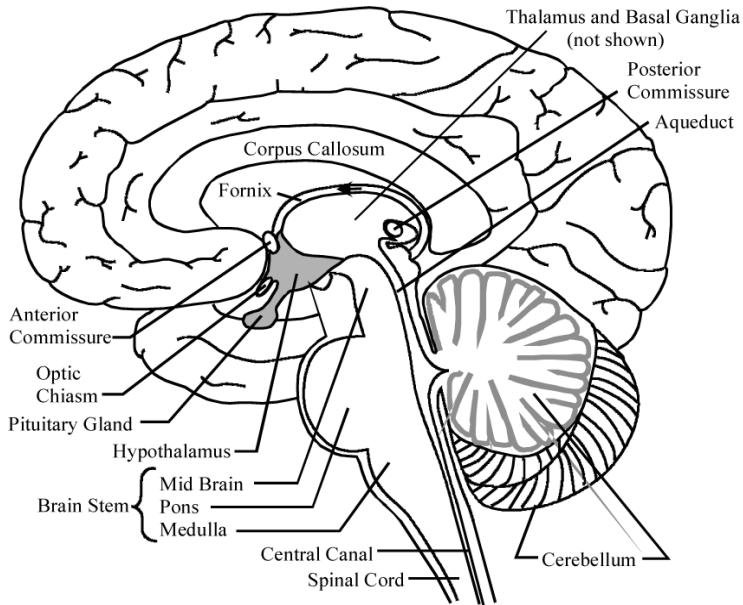
The Limbic cortex consists of the archicortex, shown in dark gray, and the mesocortex in light gray. These old brains form the limb or edge around the inside medial surface of the newer neocortex. They are directly connected to the autonomic nervous system and emotion via the hypothalamus. The neocortex, to which we owe our intellectual capacity, has no direct controls over emotion. Our creative intellect, capable of building atomic bombs or sending rockets to the moon, is thus harnessed to the emotional capacity of a crocodile and a horse structured into the primitive parts of our brain. Prof. P.D. Maclean contributed many research papers on what he called this schizophychology, a built in split between emotion and intellect that accounts for the human social dilemma.

The medial surface of the right hemisphere is shown, along with the secondary motor area, so that these areas of both hemispheres face one another across the central fissure. This allows one side to act as a referent for the other side in the bilateral integration of movement. The brain stem and cerebellum are omitted. The primary motor and sensory areas are shown on the top surface of the neocortex. The secondary sensory areas are on the outer sides of the cortex.

The neocortical hemispheres are extensively interconnected by the corpus callosum, a huge nerve bundle. The fornix projects from the archicortex to the hypothalamus. Some fibers cross to the other side, thus constituting a limbic commissure, interconnecting the limbic hemispheres, as do the posterior and anterior commissures. The primitive limbic brain can thus function independently of the neocortical (new) brain.

Appendix 2

(Copied from Fisherman's Guide)



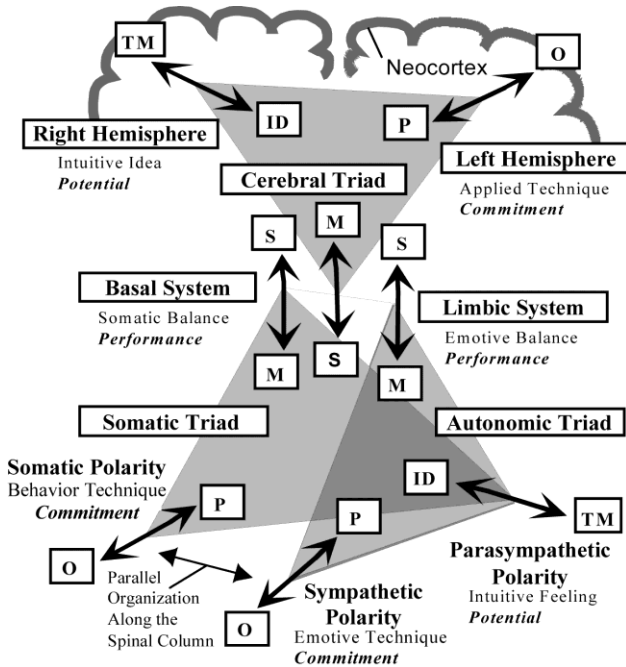
THE HYPOTHALAMUS & CEREBELLUM

The hypothalamus receives major inputs from the limbic system via several routes, including the fornix. It also projects back to the limbic cortex, maintaining two-way communication. The hypothalamus integrates visceral sensory information from the body's internal organs. Descending projections from the hypothalamus are relayed via descending tracts activating autonomic functions and also directly influencing somatic activity. Direct connection to the pituitary gland complements autonomic activation of the endocrine glands. The hypothalamus is thus centrally concerned with both the feedback of emotional input to thought processes and also with emotional expression via the autonomic nervous system to fuel the body's actions.

The cerebellum and brain stem are shown sectioned through their midline. The cerebellum receives dense inputs from the proprioceptive nervous system together with the motor and sensory areas of the neocortex, with widespread input from other areas of the central nervous system including all sensory systems. The cerebellum projects to the vestibular system concerned with balance and also to the motor systems by various routes, including both direct and indirect projections to the motor areas of the neocortex and to the motor horns of the spinal column. Other motor projections go to both descending reticulo-spinal tracts, one somatic and one autonomic. Since these tracts are multi-synaptic they allow for the integration of patterned activity at different spinal levels. The cerebellum is thus situated to assist a balance between the three focal points of mentation in their self-similar somatic enactment, parallel to the emotional balance.

Appendix 3

(Adapted from Science & Cosmic Order)



COMPANY & NERVOUS SYSTEM INTEGRATION

The same symbolism can be used to illustrate the structure of both a business organization and the human nervous system. Both are expressions of the creative process, a business organization being an extension of how we integrate experience ourselves. The right brain ID↔TM polarity focuses on Idea Development (ID) in the context of the Treasury/Memory (TM). The Treasury is the resource capacity needed to make the Idea a reality. A company treasury mirrors the facilities, resources and creative *potential*. The human treasury is Memory of both physical & mental creative capacities and thus human *potential*. Ideas must relate to the resources needed to make them a reality. Left brain *commitment* to technique then Produces the Ideas in explicit form in relation to our social Organization, as in the P↔O polarity. Production in a company works in a self-similar way in the context of the Organization structure to give insight into the *commitment* dimension. The S↔M polarity relates Sales *performance* to Market need. Humans likewise must emotionally balance behavioral *performance* with perceived propriety in the social and natural marketplace. The Basal System seeks a somatic balance of Ideation with Behavior that parallels the emotional Limbic balance. Note that the autonomic and cerebral triads are the Market for cerebral thought and vice-versa. Limbic polarities thus mediate balances between thought, feeling and behavior according to insight into the *potential, commitment & performance* dimensions. Learning from experience takes place on this basis, often through trial and error.

Appendix 4

Hierarchies in Nature's Energy Refinery

HUMANS Idea	Idea	Future delegation of cosmic <i>ideation</i> will open the human mind to levels of realization as yet undreamed of, with a new balance throughout the hierarchy.
	Knowledge	Delegation of direct <i>knowledge</i> of cosmic order requires a new paradigm for science. The three focal points of mentation must balance in the biosphere.
	Routine	Expansionist empires fueled western science & industrial <i>routines</i> that now dominate the planet through huge corporations, threatening global resources.
	Form	Spirit cultures explored the planet. Cities brought division of labor & writing. Three <i>forms</i> of ideation focused through Eastern, Western & African cultures.
VERTEBRATES Knowledge	Idea	African primates evolved through anthropoids & hominids to humans. Speech polarizes left and right brain. Limbic emotion fuels abstract <i>idea</i> for behavior.
	Knowledge	Higher mammals, dog, seal, etc., can select behavior. Topology of neocortex used to intuit action in <i>knowledge</i> . Ancient limbic system controls emotion.
	Routine	Lower mammals, horse, cow, etc., have limited capacity to modulate emotive <i>routines</i> . Mesocortex blooms. Marsupial counterparts lack a corpus callosum.
	Form	Reptiles explore quadruped <i>form</i> . Autonomic nervous system reflects emotive patterns specific to each species in cerebral awareness. Archicortex blooms.
INVERTEBRATES Routine	Idea	Ants, bees, etc., use the <i>idea</i> of division of labor for their collective survival. The giant squid's developed brain employs <i>ideas</i> for it's individual survival.
	Knowledge	Flying insects rapidly integrate extended <i>knowledge</i> in flight routines. Most span time via metamorphosis. Spiders & some crustaceans span time & space.
	Routine	Segmented worms integrate successive <i>routines</i> . Centipedes colonize land. Arthropods specialize body segments. Cephalopods & mollusks unsegmented.
	Form	Sponges, jelly fish, coral, flatworms, nematodes, starfish, & chordates explore <i>forms</i> of routine in motor-sensory responses, with embryo developments.
PLANTS Form	Idea	Flowering plants (angiosperms) with refined vascular systems, use extended <i>ideas</i> to attract animal pollinating vectors, and to produce fruit for dispersal.
	Knowledge	Gymnosperms integrate <i>knowledge</i> uniting the gametophyte generation within the sporophyte in pollen and seeds, allowing conifers to live in dry terrain.
	Routine	Giant horsetails & clubmosses on land explore <i>routines</i> with vascular systems and alternate sporophyte and gametophyte generations, leaving us coalbeds.
	Form	Algae, fungi, slime molds & lichens explore the <i>forms</i> of the eukaryotic cell, from microscopic to giant. Alternate sexual and asexual generations emerge.

Figure 8

(Copied from Fisherman's Guide)