EVOLUTION

EVOLUTION: A CRITIQUE AND EVALUATION

Prepared by Ner Le'Elef

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EVOLUTION: A CRITIQUE AND EVALUATION

Table of Contents

SUGGESTED SHIURIM WHICH CAN BE CULLED FROM EVOLUTION NOTES

1. A Jewish Approach to Evolution - **Chapter C i - vi**

2. The Anthropic Principle - (The world seems to show design and purpose).
   Science: Chapter C k i
   Evolution Chapter B i-xi
   Evolution Appendix A - M (see in particular **A ii** and **M ii)**

3. Evolution Critique - **Chapters B** and **D**

4. The Age of the Universe - **Chapter E** (See also **Appendices N** and **O** for background material)

CHAPTER A: EVOLUTION

i-Description

i-Description

The idea that all organisms have developed from a single simple form dates back to the Greeks (Anexemander and Empidoceles). What Darwin offered was an explanation, **natural selection**, of how that had come about. Darwin stated that the mechanism of natural selection is through random selections[1] that are hereditary. An animal may have a random change and per chance, that change may make that animal more adaptive to the environment. Since the environment does not have enough resources to sustain all the different strains of species, only the fittest (i.e., the best adapted to their environment) will survive. The new strain of plant or animal, if it accidentally turns out to be an improvement of the older strain, is then more likely to survive, eventually replacing the older strain or at least existing alongside the older strain. Later, Gregor Mendel discovered the science of genetics which explained how random changes take place to begin with. In short, a change in the phenotype (physical structure) is a function of a random genetic mutation, i.e. a change in the genotype (genetic makeup). A chromosome (which contains the genes) may "accidentally" lose or gain or exchange some genetic material. The changes that take place do so in the form of many very small changes which take place over very long periods of time.

The theory of evolution usually referred to today has since the fifties been called the Synthetic Theory of Evolution (sometimes called Neo-Darwinism) so called because it combines Darwin's theory with the Theory of Genetics and a number of other things besides.

Anti-Religious

There is no question that evolution was an anti-religious doctrine, primarily because it did away with design in nature. In the words of Richard Dawkins: "Darwin made it possible to be an intellectually fulfilled atheist." (See below, B ix)

Edward O. Wilson, in his book On Human Nature stated that if humankind evolved by Darwinian natural selection, genetic chance and environmental necessity, not G-d, made the species.

Part of the problem is the inadmissablity of G-d as a scientific explanation for anything. As Robert Jastrow put it, when a scientist writes about G-d, his colleagues assume he either over the hill of going bonkers.

Some biologists delight in challenging the idea of the existence of G-d by showing how cruel nature can be. George C. Williams, in The Pony Fish's glow talks of how, amongst monkeys, sooner or later, a stronger male usurps the harem and the defeated one must join the ranks of celibate outcasts. The new male shows his love for his new wives by trying to kill their unweaned infants. For each successful killing, a mother stops lactating and goes into estrous…deprived of her

[1]Gerald Schroeder points out that randomness creates an impossible problem of prediction. Because evolution is primarily a study of the history of life, statistical analyses of evolution are plagued by having to assume the many conditions that were extant during those long gone eras. Rates of mutations, the contents of the "original DNA, " the environmental conditions, all effect the rate and direction of the changes in morphology and are all unknowns. One must never ask what the likelihood is that a specific set of mutations will occur to produce a specific animal. This would imply a direction to evolution and basic to all Darwinian theories of evolution is the assumption that evolution has no direction. The induced changes, and hence the new morphologies, are totally random, regardless of the challenges presented by the environment.

nursing baby, a female soon starts ovulating. She accepts advances of her baby's murderer, and he becomes the father of her next child. Do you think G-d is good? (We will deal with this issue later in the book.)

Several well publicized incidents in the States and England reinforced the general perception that Creationism and evolution were utterly opposed. The poor scientific knowledge of many of the spokesmen for Creationism added to the perception that they were anti-science at worst and at best certainly not scientific. On the other hand, there have always been highly respected scientists (a minority) who have been dissatisfied with evolution or parts thereof.

Time

Since nature operates very slowly, the Darwinists also began to posit first thousands then millions of years for our current state of evolution to have evolved. The issue of how old the universe is, when our solar system was formed and when life began is separate from the issue of whether life could have developed 'by chance'. Indeed, scientists generally bring more proofs for how old things are than they do for how they formed.

Darwin and Ethics

Although there was also some argument amongst Darwinists as to whether nature progressed toward the benefit of the world or not, all agreed that the struggle for survival meant that ethics in the old sense had been overturned - nature was now either non-ethical or it urged a new ethic of struggle and warfare. Since Darwinism occurred in the context of the beginnings of a new scientific revolution, many Darwinians felt justified in calling for the replacement of the clergy by the scientist (e.g. Huxley, Francis Galton)[1]. Julian Huxley went so far as to call for evolutionary theory to become the central core of the educational system.
This core would hardly make the world a better place, As Dawkins would have it, in an evolutionary world, "things might be neither good or evil, neither cruel nor kind, but simply callous-indifferent to all suffering, lacking all purpose."

[1] Baumer, Modern European Thought, pg. 337 - 349

CHAPTER B: CRITIQUE: THE ARGUMENT FROM DESIGN

i- Introduction
ii- The Evolutionary Tree
iii- High Improbability
iv- The Molecular Challenge - Complexity and Interrelatedness
v- Life - Principles of Complexity
a-Complexity
b-Organization
c-Uniqueness
d-Emergences
e-Holism
f-Unpredictability
g-Openness, interconnectedness and disequilibrium
h-Evolution
i-Teleology or teleonomy
j-Autonomy
k-Reproduction
l-Metabolism
m-Nutrition
n-Growth and Development
o-Information content
p-Hardware/software entanglement
q-Permanence and change
vi- The Tree of Life Seems to Have Direction
vii- The Beginnings Of Life
viii-Later Developments
a-Cumulative selection
b-The argument from design is unproven
c-The world did evolve - therefore the difficulties are only apparent
ix - The Extinction of the Dinosaurs
x- Man
xi- The World Seems to Have Been Pre-Programmed for Life
xii- The Principle of Plenitude
a-Microbes
b-Unicellular Organisms (Protozoa)
c-Insects
d-Animals
e-Viruses
f-The eye
g-Others
xiii-Secular Bias

CHAPTER B: CRITIQUE: THE ARGUMENT FROM DESIGN

i-Introduction

Evolution: A very good theory in its time which has become an article of faith:

Natan Aviezer states in reference to the general critique: "It should be emphasized that no-one is attacking Charles Darwin. One need only read On the Origin of Species to realize what a great scientist Charles Darwin was. He produced a new comprehensive theory which admirably accounted for the evidence known at that time - in the best scientific tradition. But 130 years have passed, our store of scientific knowledge has vastly increased, and Darwin's theory of evolution will simply no longer do. Men like Alvarez, Gould, Stanley, Eldridge, Raup and Hsu are serious scientists of the first rank. When they tell us that the current scientific data are completely different from the "old facts", we would do well to lay aside our biases and listen. It's time to move forward." [1] Indeed, Michael Behe has shown that an exhaustive survey of the Journal of Molecular Evolution shows that "none of the papers published in JME over the entire course of its life as a journal has ever proposed a detailed model by which a complex biochemical system might have been produced in a step-by-step Darwinian fashion"[1]. Behe shows the same for other journals, books and textbooks[2]. Stephen J. Gould, the leading proponent of the modified evolutionary theory called Punctuated Equilibrium, has made contradictory statements on this issue. Gould has written that the synthetic theory "as a general proposition, is effectively dead, despite its persistence as text book orthodoxy." But he has also stated that "Darwinian selection ... will remain a central focus of more inclusive evolutionary theories[3]."

However, most scientists in the world today would say that they do believe in neo-Darwinian evolution. For many, even though they may have serious doubts about aspects of evolutionary theory, it remains at bottom, an article of faith. Therefore, for every quote by a leading scientist against evolution, one could bring several scientists in favor. Typical is Francis Crick (awarded the Nobel Prize for the discovery of DNA): "An honest man, armed with all the knowledge available to us now, could only state that in some sense, the origin of life appears at the moment to be almost a miracle, so many are the conditions which would have to have been satisfied to get it going"[4]. Yet Crick still adheres firmly to the theory of evolution.

Or consider Dr. Harold C. Urey (Nobel Prize winning Chemist): "All of us who study the origins of life find that the more we look into it, the more we feel that it is too complex to have evolved anywhere. But, we believe as an article of faith that life evolved from dead matter on this planet. It is just that its complexity is

[1] Article in UJS booklet: Fifty Days for Fifty Years. It should be noted that these scientists have not moved away from evolution entirely. But they have felt constrained to modify it in significant if not revolutionary ways.

[1] *Darwin's Black Box*, pg. 176
[2] ibid. pp. 177-183

[3] (See Phillip Johnson's comments, *Darwin on Trial*, bottom of pg. 11; also chap. 5, the Fact of Evolution.)

[4] (Francis Crick, *Life Itself*, Simon & Schuster, N.Y. 1981, p. 88).

so great, it is hard for us to imagine that it did"[1].

These two advocates of the theory of evolution refer to the origin of life as a "miracle" and "too complex to have evolved anywhere", yet remain proponents of evolution as "an article of faith[2]."

A theory can have problems and still be the most scientifically acceptable

These scientists would say that the fact that there are problems with the theory, does not mean that, from a scientific perspective, automatically the whole theory has to be rejected. A theory can have problems and still, scientifically speaking, be the best theory on the market.[1] It is scientifically legitimate to challenge your challenger with an alternative and to hold onto your own theory, while recognizing its problems until a better theory would come along. Science, unlike the Torah, never claimed to be stating the final truth about any issue, only the theory that comes closest to explaining all the currently available facts.

However, there is a difference between what the scientist, working from within any scientific paradigm, accepts and works with, and the critical outsider, perforce a layman to that area.[2]

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[1] Interview in Christian Science Monitor," January 4, 1962.

[2] (2001 Principle)

[1]This is in fact one of the arguments made by Robert Pennock in his 1999 book, *Tower of Babel*, subtitled, *The Evidence against the New Creationism*. He states that "intelligent design" cannot be considered a scientific theory because it makes no predictions and there has not been a single scientific experiment run according to its unique tenets.

[2]David Hazony in Azure, Winter 1999 put it as follows:

The fields of so-called "hard" science are as varied in their methodology and standards as in their subject matter, and while it is to be expected that the vast majority of scientists spend their careers under the paradigmatic umbrellas of the leading theories in their fields, this does not mean that an outsider looking in should necessarily take these theories seriously, inasmuch as they may bear on his beliefs or values. Put simply: As a layman, I am much more likely to alter radically my behavior on the basis of the latest developments in oncology than those in paleontology. The former, while by no means infallible, are based on a wide body of corroborated experimentation, and have been held to the test of practical implementation; the latter, even if highly regarded by the most ingenious of paleontologists, are based on such scant evidence, guesswork and fundamentally untestable hypotheses, that no serious thinker should entrust his or her religious beliefs to their graces.

When, for example, was the last time you encountered a brontosaurus? A brief visit to the children's section of a local bookstore will reveal that the entire retinue of dinosaurs most of us grew up knowing and loving have recently suffered a new extinction: Gone or forgotten are the stegosaurus, dimetrodons and pterodactyls upon which an entire generation of museums, toys and picture books were built. Like a giant asteroid crashing down upon the earth, radical new works such as Robert T. Bakker's 1986 *The Dinosaur Heresies* have succeeded in shifting the most famous paradigm of paleontology: Dinosaurs, it now turns out, never really were the slow, stupid, cold-blooded reptiles they made themselves out to be. They were nimble, smart, warm-blooded and bird-like, probably looking a lot more like Spielberg's velociraptors than anything else. The trusty, timid brontosaurus is no more, supplanted by the "apatosaurus," a fearsome monster which roamed in packs, was athletic enough to be able to swim, and could vanquish its enemies by rearing up on its hind legs and thrusting the fullness of its thirty-three-ton body onto its adversary, or by whipping him with its fifty-foot-long tail. ...

None of this is meant to imply that paleontologists ... are necessarily bad scientists; given the questions they are asking and the kind of data they have to work with, things could hardly be otherwise. What it does show is that anyone who takes the Bible seriously as

Secondly, even from within the scientific community, it ought to be said that the totality of problems facing evolutionary theory today, do require a significant modification of the theory, a fact which opens the door for it's accommodation to a more תורה true perspective. In **Section C** below we will show that the mainstream commentators do hold by some evolutionary development in the creation process. However, we explained there a number of differences between the type of evolutionary development that a mainstream Torah approach might take and the current concept of Synthetic Evolution. However, the biggest problem remains the association of the theory with a radical secular doctrine.

Therefore, debunking evolution "by quotation", popular in some תורה publications is a little misleading. Quotes are excellent journalistic devices, but the issue needs to be decided on the merits of the scientific evidence available.

Alternatives to Evolution

1. *The Torah Approach*

This we will explain in Chapter C. It is quite different to way other religions, who also claim a 'Biblical' interpretation, see things.

2. *Intelligent Design*

Intelligent design is the theory that life was created by a designer. The theory does not attempt to understand the nature of the designer, and thus it is independent of religion[1].

Intelligent design falls within the domain of science because it can be tested with mathematical models and computer simulations. Evolution assumes that every event has a naturalistic explanation. That is evolution rules out the possibility of a designer by assuming, as an axiom, that one does not exist. This assumption is not a self-evident truth - as only atheists embrace it. Nevertheless, this assumption has become a central axiom in modern science.

Unlike evolution, intelligent design starts by considering that life either evolved or it was designed, and then it attempts to differentiate between the two possibilities. Unlike evolution, it does not assume that one possibility is impossible, and then blindly accepts the other.

The difference between intelligent design and creationism:

Unlike *creationism*, intelligent design accepts the fossil and genetic evidence for descent with modification. It accepts that man evolved from apes, which in turn evolved from lower primates. However, intelligent design rejects the idea that this process was fully under the control of naturalistic processes.

Progressive creationism asserts that God's hand drove evolution. That is life may have evolved, but God directed it. Like intelligent design, progressive creationism is consistent with the scientific evidence. Unlike intelligent design, progressive creationism is specific to Christianity.

Information Theory:

Intelligent design relies heavily on information theory. Information theory is a branch of mathematics used to calculate the information found in messages. Before

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an eternal source of wisdom should not dream of trying to understand it with the current scientific tools employed - tools which of necessity are prone to massive revision every few years if the scientists are doing their job right.

[1]The following has been adapted from the web site theory-of-evolution.com:

proceeding, it is necessary to show that information and order are different. Information implies design whereas order does not. Order is characterized by regular patterns. But order need not contain any information. By contrast information implies a message. A message need not form an ordered pattern. Energy sources can create order. But these same sources do not necessarily create information. Thus, while information implies a designer, order does not.

Examples of order are winds in a hurricane or tornado, a diamond, ice, any crystal, a Bernard Cell, Kaufmann's Lights, the final state of the letters on the right in the animation above.

Examples of Information: the message in the genes of all animals and plants, a newspaper, a book, an encyclopedia, the final state of the letters on the left in the animation.

Recently, a few scientists have started to investigate systems, which create spontaneous order and suggest that such systems may be responsible for the origin of life. Proponents of intelligent design claim that theories of complexity fail to understand the problem. Life, they say, is not ordered, it is complex. This complexity comes for the information found in life's DNA[1].

[1]The information of life is contained in a unit known as a gene. It follows that for evolution to create new information, it must create new genes. Life cannot increase in complexity (evolve) without this new information.
Animals and plants that are best adapted to a specific environment are said to have a selective advantage which allows them to produce the most descendants. Over time, this ensures that the genes of the best adapted are preserved. This process is called natural selection. Natural selection happens. It has been observed and documented in numerous scientific experiments. Genes are optimized by natural selection.

Before such optimization can begin, chance must first create new genes. The logic is as follows:

- A gene that does not exist cannot offer a selective advantage.
- Natural selection has no way to operate on genes that do not exist, because they offer no advantage.
- Chance is responsible for the origin of new genes and the information found in these genes.
- Chance is responsible for the evolution of complexity.

Design Best Explains the Complexity of Life

Since natural selection does not explain the complexity found in life, design should be inferred. Logic dictates that design is implicated.

iii-Punctuated Theory of Equilibrium

Originally proposed by Niles, of the NY Museum of Natural History and Steven Gould of Harvard, by the 1990's, puncuated equilibrium had risen to the status of textbook orthodoxy[1].

The theory accepts that the gaps in the fossil record do not exist and that therefore evolution took place in relatively concentrated leaps with longer periods of stagnation in between.

The theory is an alternative theory of evolution and not, as many religionists have wished, an alternative to evolution.

iv-Creationism

Literal creationism takes the six days of creation as distinct, separate acts of creation and leaves no room for evolution at all. We will see that the main-stream Torah commentators do not take this view.

v-Complexity or Emergence

[1] *Finding Darwin's G-d*, by Kenneth Miller, Pg. 84,

Complexity theory, which includes chaos theory, has become a major study of science. The basic prinicple is that certain things like ant colonies or the human body or a city of people can be regarded as having a type of collective intelligence, without any any/body part/person realizing this. These greater wholes can be regarded as organisms which learn and progress.

Stuart Kaufman and others have created computer programs which mimic this and some have thought that this theory has potential to explain the emergence and development of life. However, at this stage, no serious attempt has been made to do so.

A variation of this is Lynn Margolis' proposal that organism's operate in wholistic and cooperative fashions.

ii-The Evolutionary Tree

The Synthetic Theory posits a very specific evolutionary tree, one species (kingdom, phylum, class, order, family, genus) evolving from another. This is drawn from the fossil record. Kenneth Miller[1] explains that, when one looks at digs rich in fossil material, one see that there are fossils unique to each layer. This leads to "the idea that fossils are laid down in a pattern that serves as an index to living history…In the most recent fossils, ones recovered from the uppermost layers of sedimentary rocks, naturalists could recognize organisms nearly identical to those of the present day. But as they went deeper, they found differences, some slight, some profound…This fossil record told an unmistakable story- life had changed over time, changed dramatically. … [This led to the] unavoidable conclusion that some organisms had become extinct and new ones had appeared to take their place."

Miller concludes: "Natural history revels a succession of living organisms that are linked in a stunning pattern of relatedness[2]." That pattern indicates that species continued, throughout time, to develop. "Those early fish…covered with thick scales but lacking jaws or bones. Primitive jaws appeared gradually [and these in turn underwent gradual modification] to produce a structure that could open and close the mouth at will."

"The first amphibians looked more like fish than any amphibian species that would follow them. … The first reptiles to appear in the fossil record are more amphibian-like than any reptiles to follow. The first mammals have a set of reptilian characteristics so pronounced that they are commonly known as the reptile-like mammals. The first birds are so similar to another group of reptiles that some paleontologists have formally proposed that birds be classified as a subgroup of the dinosaurs[3]."

All of this points towards an evolutionary development from fish to amphibians to reptiles, to mammals and birds.

Furthermore, we see that each continent or ecological environment has similar animals around it, quite different to those in other parts of the world. Miller again: Darwin [showed that] South America had proven to contain a fauna that was strikingly unique…South Africa also contained a fossil record packed with those animals' closest anatomical relatives. Why, one might ask, should such a unique set of animals be found in exactly the same place as their closest fossil relatives? There could be just on answer- a process of decent with modification. Exactly the same consideration can be applied to the fossil animals of North America, Eurasia, Africa, and especially Australia"[4].

Ultimately, the evolutionary tree, which says that everything can be traced back to some simple single-cellular organism.

Even those scientists who challenge the explanation of how evolution

[1] Finding Darwin's G-d, pg 33

[2] Ibid, pg. 38

[3] Ibid, pg. 40

[4] Ibid, pg. 41 - 42

has occurred regard it as a given fact that there was a history of such descent, so much so that they call this doctrine of descent the fact of evolution. The truth is that no independent proof exists of this. Fossils do exist in layers that are consistent with the evolutionary tree, but this is not the only explanation for their existence in this form. Lee Spetner shows that a theory of inter-species hybridization, such as before the flood, is more consistent with the fossil record than the evolutionary tree. However, it should be recognized that the argument for evolution is a powerful one.

What this argument fails to do is to account for the odds of such a thing happening. We look at this next.

ii-High Improbability

Many investigators feel uneasy about stating in public that The origin of life is a mystery, even though behind closed doors they freely admit that they are baffled. Paul Davies[1]

Life is so extraordinary in its properties that it qualifies for the description of an alternative state of matter. (ibid. pg.19)

The odds of a particular message arising by chance can be calculated with probability theory. For example, the statement "Darwin was wrong" could be a string of random letters that just happens to contain a message. But the odds are slim, 1 chance in 700,000,00,00,000,000,000,000,000,000. In this case, the slim odds imply that somebody (a designer) arranged the letters so that they contain a message.

The information found in the gibbon's DNA is infinitely more complex than that of the simple message "Darwin was wrong." Inferring design should be easy. Nevertheless, many refuse to infer design, because the designer is no longer a person. The ideological underpinnings of science make it inadmissible to use G-d as an explanation for anything.

Evolutionists will argue that the gibbon is different from the "Darwin was wrong" message because natural selection did not play any role in the creation of "Darwin was wrong." However, it has not been shown that natural selection creates information. Therefore, natural selection does not explain the evolution of information.

Using probability theory is possible to calculate the odds that a new gene with a certain amount of information will arise by chance. The results raise serious questions about the theory of evolution.

As time has gone on, scientists keep on unfolding layers of complexity of life. We will deal with some of these in the next chapters in greater detail.

First there are the <u>*genes:*</u> *The peculiarity of biological complexity makes genes seem almost like impossible objects-yet they must have formed somehow. I have come to the conclusion that no familiar law of nature could produce such a structure from incoherent chemicals with the inevitability that some scientists assert.* – Paul Davies[2]

Then there is the <u>*cell:*</u>

A law of nature could not alone explain how life began, because no conceivable law would compel a legion of atoms to follow precisely a prescribed sequence of assemblage. – Paul Davies[3]

Then there is the <u>*consistency of life with the laws of nature*</u>:

For decades there has been a suspicion that life is so amazing that it must circumvent the laws of thermodynamics. In particular, the second

[1] *The Fifth miracle The Search for the Origin and the Meaning of Life* (Simon and Schuster) Pgs. 17 -18

[2] Ibid, pg. 20

[3] Ibid, pg. 30

law of thermodynamics, arguably the most fundamental of the laws of nature, describes a trend of decay and degeneration that life clearly bucks[1].

The odds of something developing against the trend of known laws of nature are very low indeed.

Other Principles of Complexity

Below, in Chapter V, we have brought a fuller detailing of the complex principles of life. For example, living organizsisms all have the ability to harness energy and process it so that it becomes available for the organizm to carry out the tasks it needs to do. (This is called metabolism). Organisms almost always can reproduce, which includes a copy of the replication aparatus. When they do reproduce, they do so in predictable ways, according to a preordained plan or blueprint. (By contrast, we could never predict the next snowflake, because there is no blueprint for snowflakes, even though each individual snowflake has great order.) Higher organisms seem to have unique properties, such as consciousness, will and choice. The complexity of an organism is such that all the component parts cooperate with each other in a highly organized fashion. And so on.

All of these, and other factors would have to be calculated into the odds. It is extremely difficult to come up with a number, though we do bring figures below. What is clear is that Darwinists are suggesting a theory, which requires fantastic odds to have happened. The probability of life, as we know it today, having simply evolved is extremely small. Secondly, the highly structured, complex and inter-related nature of the universe points to a "Designer".

For the first 100 years after Darwin proposed the theory, no calculations were made as to the mathematical probability of a Darwinian world coming about. It was only recently that the mathematicians got to work and showed how unlikely the whole proposal is.

The statistical problem is three fold:

a-The beginnings of life (v below)
b-Later developments (vi below)
c-Man (vii-below)

In a fascinating article, Joseph Benmaman[1] describes early attempts at calculating the odds:

In his article ORIGIN OF LIFE published in the prestigious journal Scientific American (August 1954), George Wald, Nobel Laureate[2], Professor of Biology at Harvard University, maintained that life on earth was originated by random chemical reactions during billions of years. He stated his opinion saying:

Given so much time, the "impossible" becomes the possible, the possible probable, and the probable virtually certain.

This statement reinforced the beliefs of the evolutionists.

[1] Ibid, pg. 19

[1] Professor Emeritus of the Medical University of South Carolina in an article for Magen, Journal for the Center of Sephardic Studies, Caracas, Venezuela, 1999. The article is part iv on a series entitled *Eternal Judaism*. We have adapted and shortened the article here.

[2] Professor Wald demonstrated the reaction to light of the substance retinal in the retinal rods, thus helping to explain the changes that take place in the eye during light and darkness. He showed that the lack of retinal, which is formed from vitamin A, brings on night blindness in a person whose diet is deficient in that vitamin. Wald was rewarded for his contributions. He shared the Nobel prize for Medicine or Physiology (1967) with Granit and Hartline.

Wald claims that random events originated life and natural forces directed only by chance or by accident led to the appearance of the most simple form of life, a single-celled bacterium. From this bacterium, all the living species of the Earth were derived by billions and billions of random transformations through billions and billions of years. According to the theory of evolution, all living forms have a common ancestor.

Wald's assertions were not based on any discovery he made. They were only speculations. And these speculations were not in his are of biology, but rather the mathematical calculations of probability. Yet, due to his great scientific prestige, his article was published in such a prestigious journal, *Scientific American*[1].

After the publication of Wald's article, Harold Morowitz, professor of physics, Yale University, published his book *Energy Flow and Biology* (1968), demonstrating the computations of the time needed for random chemical reactions to originate life in the form of a simple bacterium, on cell organism. According to these calculations, this time surpasses the 15 billion-year age of the universe. And this is only for one single cell! Other complex organisms like man contain millions and millions of cells.

Three years later, Elso Barghoorn, professor of paleontology, Harvard University, discovered fossils of bacteria in sedimentary rocks 3.5 billion years old. The oldest sedimentary rocks are 3.8 billion years old. Sedimentary rocks are formed by the corrosive action of water on other primary rocks. With reference to rocks, we will say that according to scientists, when the world was created from a big bang, the minerals were melted at a very high temperature that did not allow the presence of water. The cooling of the Earth occurred 4.5 billion years ago. This cooling allowed the appearance of liquid water that contributed to the formation of sedimentary rocks and the emergence of life in the form of single cell organisms, the bacteria.

The presence of water is indispensable for life. Life appeared 3.5 billion years ago. This number is much smaller than the one calculated by Morowitz, over 15 billions. Therefore it is completely impossible that chance could cause life to come into existence.

The findings of Morowitz and Barghoorn proved that Wald was wrong. Consequently, his article published in 1954, was retracted by *Scientific American*. Never before a scientific journal has published a retraction of a Nobel Laureate. Nevertheless, this is what happened when *Scientific American*, in a special publication *Life: Origin and Evolution* (1979) reprinted Wald's original article in 1954 with a categorical disavowal.

Afterwards, (February 1991), *Scientific American* published a review article confirming the opinion of most scientists that life could not be produced by random chemical reactions.

Some scientists have argued that, given enough time, even apparently miraculous evens become possible, such as the spontaneous emergence of a single-cell organism from random couplings of chemicals. Sir Fred Hoyle, the British astronomer has said such an occurrence is about as likely as the assemblage of a 747 by a tornado whirling through a junkyard. Most researchers agree with Hoyle on this point.

Wald's statements were wrong. He assumed that life was produced by random processes through billions and billions of years. There were not so many available years, life appeared as soon as the conditions were favorable for it. Yet, it would seem that it is mathematically impossible for life to emerge by random

[1] In those days, Scientific American was a far more serious magazine than it is today. Still, it ought to be noted that Scientific American is a magazine for the educated layman.

events in such a short time. Wald was correct in saying that given enough time, life could be formed by random chemical reactions. But the amount of time for this to happen (more than 15 billion years) were not available.

iii-The Molecular Challenge - Complexity and Inter-Relatedness

In *Darwin's Black Box*, Michael J. Behe states that since all change ultimately takes place at a molecular level, evolution has to explain how changes take place at this level, which, he shows, it clearly does not do. In Darwin's day, and in fact until very recently, a molecular explanation of how things work was simply not available. The presumption was until about forty years ago, that most structures were very simple at this level and that there wasn't that much to explain. Today, we know just how enormously complex things are.

The Eye

Behe brings as an example of this, the *eye*. When a photon of light hits the retina of the eye, it immediately interacts with a certain molecule causing it to instantly change its structure. This changed molecule then forces a protein to change its shape which changes its behavior allowing it to stick to a second protein. This protein is in turn altered, allowing another molecule to stick to it and this new combination now binds to a third protein. This whole package in turn binds to a set of molecules, leaving a reduced amount of them unbound in the cell. They are further reduced by combination to a fourth protein the results of which are to prevent charged sodium ions from entering the cell. There is now an imbalance of charge across the cell which causes a current to be transmitted down the optic nerve. The result, when interpreted by the brain is vision. There is then an equally complicated set of mechanisms to restore the cell to its original state. There are additionally dozens of complex proteins involved in maintaining cell shape, and dozens more that control extra-cellular structure, ultimately giving the eye shape. Evolution offers no explanation of how such mechanisms take place. At best, evolutionists attempt to explain things at a macro level. Animals first developed light sensitive spots which developed into primitive eyes whose slight curvature enabled them to sense the direction from which the light is coming and so on. Behe says that this can be compared to answering the question "How is a stereo system made?" with the words "By plugging a set of speakers into an amplifier and adding a CD player, a radio receiver, and tape deck."

Another example Behe brings is the *bombardier beetle*[1]. (pp. 31-36) When threatened, this beetle squirts a boiling hot solution at its enemy, which it does by mixing two chemicals. Ordinarily these chemicals react very slowly and therefore can be kept together in a storage chamber. When released into the explosion chamber, however, the chemicals are mixed with some enzyme catalysts, which set off a series of chemical reactions, releasing a great deal of heat in the process. This heats the mixture to boiling point which includes a toxin, all of which lands on the unfortunate aggressor. Evolutionists have come up with general explanations of how the animal developed its chemicals and chambers, showing the utility of each stage. On this Behe has the following to say: "Saying that 'the beetle would benefit from concentrating the hydroquinone in a holding space' is like saying 'society benefits from concentrating power in a central government'. In both cases the manner of concentrating and the holding

[1]Bomby, The Bombadier Beetle is also a children's book written by a Creationist author. Richard Dawkins in The Blind Watchmaker delighted in correcting the author of this book on some inaccuracies.

vessel are unexplained, and the benefit of either would depend sharply on the details. The collecting vesicle, the sphincter muscle, the explosion chamber, and the exit port are all complex structures in their own right, with many unidentified components. Furthermore, the actual processes responsible for the development of the explosive capability are unknown: What causes a collection vesicle to develop, hydrogen peroxide to be secreted, or a sphincter muscle to wrap around?"

"All we can conclude at this point is that Darwinian evolution *might have* occurred. If we could analyze the structural details down to the last protein and enzyme, and if we could account for all these details with a Darwinian explanation, then we could agree with Dawkins. For now though, we cannot tell whether the step-by-step accretions of our hypothetical evolutionary stream are single-mutation "hops" or helicopter rides between distant buttes."

The point here is that the claims being made by evolution are far too bold to be considered scientific by the normal standards of science. Many of the claims which evolution make are possible - but either improbable or totally unprovable. And yet the evolutionists do not label them as such. In his book, Behe brings many examples of molecular structures, which are well known - unlike whole organisms such as the bombardier beetle or whole structures such as the eye - and shows just how little evolution can explain of their origins.

iv-Life - Principles of Complexity

In two books Paul Davies gives an excellent overview of some of these principles of complexity common to organic organisms in general.[1]

a-Complexity

All known forms of life are amazingly complex. Even single-celled organisms such as bacteria are veritable beehives of activity involving millions of components. The degree of complexity in living organisms far exceeds that of any other familiar physical system. The complexity is hierarchical, ranging from the elaborate structure and activity of macromolecules such as proteins and nucleic acid to the exquisitely orchestrated complexity of animal behavior. At every level, and bridging between levels, is a bewildering network of feedback mechanisms and controls. In part, it is this complexity that guarantees the unpredictability of organisms.

b-Organization

Maybe it is not complexity *per se* that is significant, but organized complexity. The components of an organism must cooperate with each other or the organism will cease to function as a coherent unity. For example, a set of artery veins is not much use without a heart to pump blood through them. A pair of legs will offer little locomotive advantage if each leg moves on its own, without reference to the other. Even within individual cells that degree of cooperation is astonishing. Molecules don't simply career about haphazardly, but show all the hallmarks of a factory assembly line, with a high degree of specialization, a division of labor, and a command-and-control structure.

c-Uniqueness

Every living organism is unique, both in form and development. Unlike in physics, where one usually studies classes of identical objects (e.g. electrons),

[1]The first is his book on chaos, *The Cosmic Blueprint*. The second is called *The Fifth Miracle*, Simon and Schuster, 1999.

organisms are individuals. Moreover, collections of organisms are unique, species are unique, the evolutionary history of life on earth is unique and the entire biosphere is unique. On the other hand, we can recognize a cat as a cat, a cell as a cell, and so on. There are definite regularities and distinguishing features that permit organisms to be classified. Living things seem to be both special and general in a rather precise way.

d-Emergence

Biological organisms most exemplify the dictum that 'the whole is greater than the sum of its parts'. At each new level of complexity in biology new and unexpected qualities appear, qualities, which apparently cannot be reduced to the properties of the component parts.

e-Holism

A living organism consists of a large range of components, perhaps differing greatly in structure and function (e.g. eyes, hair, and liver). Yet the components are arranged and behave in a coherent and cooperative fashion as though to a common agreed plan. This endows the organism with a discrete identity, and makes a worm a worm, a dog a dog, and so forth.

f-Unpredictability

Although many biological processes are essentially automatic and mechanical, we cannot predict the future state of a biological system in detail. Organisms - especially higher organisms - seem to possess that intriguing 'will of their own'. Moreover, the biosphere as a whole is unpredictable, as evolution throws up novel and unexpected organisms. Cows, ants and geraniums were in no way inevitable products of evolution.

g-Openness, interconnectedness and disequilibrium

No living thing exists in isolation. All organisms are strongly coupled to their inanimate environment and require a continual throughput of matter and energy as well as ability to export entropy. From the physical and chemical point of view, each organism is strongly out of equilibrium with its environment. In addition, life on earth is an intricate network of mutually interdependent organisms held in a state of dynamic balance. The concept of life is fully meaningful only in the context of the entire biosphere.

h-Evolution

[Editors note: Although we may argue on the scientific validity of evolution, the author's point shows that belief in evolution is ironically yet another point in favor of the argument for intelligent design. Recognizing this, Stephen Gould has argued against the point brought below.]

Life as we know it would not exist at all unless it had been able to evolve from simple origins to its present complexity. Once again, there is a distinct progression or arrow of time involved. The ability of life to evolve and adapt to a changing environment, to develop ever more elaborate structures and functions, depends on its ability to transmit genetic information to offspring (reproduction) and the susceptibility of this information to discrete changes (mutation).

i-Teleology or teleonomy

As noted by Aristotle, organisms develop in a purposive way, as though guided towards a final goal in accordance with a preordained plan or blueprint.

Many inanimate systems have lifelike qualities - flickering flames, snowflakes, cloud patterns, swirling eddies in a river. What is it that distinguishes genuine living systems from merely lifelike systems? It

is not merely a matter of degree. ... if a chicken lays an egg, it is a fair bet that the hatched fledgling will also be a chicken; but try predicting the precise shape of the next snowflake. The crucial difference is that ... there is no gene for a snowflake. Biological complexity is *Instructed* Complexity. (Paul Davies: *The Fifth Miracle: The Search for the Origin and the Meaning of Life* Simon and Schuster, pg. 31)

j-Autonomy

Living beings seem to be self-contained, autonomous beings. As much as they are dependent on their environment, each living being has its own, separate identity.

k-Reproduction

A living organism should be able to reproduce. However, some nonliving things like crystals and bush fires, can reproduce, whereas viruses, which many people would regard as living, are unable to multiply on their own. Mules are certainly living, even though, being sterile, they cannot reproduce. A successful offspring is more than a mere facsimile of the original; it also includes *a copy of the replication apparatus*. To propagate their genes beyond the next generation, organisms must replicate the means of replication, as well as replicating the genes themselves.

l-Metabolism

To be considered properly alive, an organism has to *do* something. Every organism processes chemicals through complicates sequences of reactions, and as a result garner energy to enable it to carry out tasks, such as movement and reproduction. This chemical processing and energy liberation is called metabolism. However, metabolism cannot be equated with life. Some micro-organisms can become completely dormant for long periods of time, with their vital functions shut down. We would be reluctant to pronounce them dead if it is possible for them to be revived.

m-Nutrition

This is closely related to metabolism. Seal up a living organism in a box for long enough and in due course it will cease to function and eventually die. Crucial to life is a continual throughput of matter and energy. For example, animals eat, plants photosynthesize. But a flow of matter and energy alone fails to capture the real business of life. The Great Red Spot of Jupiter is a fluid vortex sustained by a flow of matter and energy. Nobody suggests it is alive. In addition, it is not energy as such that life needs but something like useful, or free, energy. More on this later.

n-Growth and Development

Individual organisms grow and ecosystems tend to spread (if conditions are right). But many nonliving thins grow too (crystals, rust, clouds). A subtler yet altogether more significant property of living things, treated as a class is development. The remarkable story of life in Earth is one of gradual evolutionary adaptation, as a result of variety and novelty. Variation is the key. It is replication combined with variation that leads to Darwinian evolution. We might consider turning the problem upside down and say: if it evolves in the way Darwin described, it lives.

o-Information content

In recent years scientist have stressed the analogy between living organisms and computers. Crucially, the information need to replicate an organism is passed on in the genes from parent to offspring. So life is information technology writ small. But , again, information as such is not enough. Though there is information aplenty in the positions of the fallen leaves in a forest, it doesn't mean anything. To qualify for the description of living, information must be meaningful to the

system that receives it: there must be a "context." In other words, the information must be specified. But where does this context itself come from, and how does a meaningful specification arise spontaneously in nature?

p-Hardware/software entanglement

As we shall see, all life of the sort found on Earth stems from a deal struck between two very different classes of molecules: nucleic acids and protein. These groups complement each other in terms of their chemical properties, but the contract goes much deeper than that, to the very heart of what is meant by life. Nucleic acids store life's software: the proteins are the real workers and constitute the hardware. The two chemical realms can support each other only because there is a highly specific and refined communication channel between them mediated by a code, the so-called genetic code. This code, and the communication channel - both advanced products of evolution - have the effect of entangling the hardware and software aspects of life in a baffling and almost paradoxical manner.

q-Permanence and change

A further paradox of life concerns the strange conjunction of permanence and change. This ancient puzzle is sometimes referred to by philosophers as the problem of being versus becoming. The job of genes is to replicate, to conserve the genetic message. But without variation, adaptation is impossible and the genes will eventually get snuffed out/ adapt or die is the Darwinian imperative. How do conservation and change coexist in one system? This contradiction lies at the heart of biology. Life flourishes on Earth because of the creative tension that exists between these conflicting demands; we still do not fully understand how the game is played out.

Thus geneticist Giuseppe Montalenti:

"Structural and functional complexity of organisms, and above all the finalism of biological phenomena, have been the insuperable difficulty, the insoluble aporia preventing the acceptance of a mechanistic of life. This is the main reason why in the competition of Aristotelian and Democritean interpretations the former has been the winner, from the beginning to our days.

"All attempts to establish a mechanistic interpretation were frustrated by the following facts: (a) The inadequacy of physical laws to explain biological finalism: (b) The crudeness of physical schemes for such fine and complex phenomena as the biological ones: (c) The failure of 'reductionism' to realize that at each level of integration occurring in biological systems new qualities arise which need new explanatory principles that are unknown (and unnecessary) in physics.

v-The Tree of Life Seems to Have Direction

All scientists today agree to the existence of the Anthropic Principle, i.e. that the laws of nature are set up in such a way that they have direction. (For the most powerful presentation of this sort, see *Nature's Destiny*, by Michael Denton. We have given a fairly detailed summary of this book in the Appendices.) Nature turns out to be very exactly tuned - change any law of nature even slightly, or change the initial conditions and it becomes impossible for life to have emerged at all. Denton shows that water, oxygen, minerals and many other things are perfectly suited in multiples of ways for the task for which they fulfill. In fact it is impossible, in each case, to even imagine a theoretical substance which might do a better job.

But it is not only this or that variable that makes this argument so impressive. It is the accumulation of all the variables, all being there in exactly the proportion that they need to be, the lack of any one of them rendering life impossible.

This has led many leading scientists to claim that the world was "designed" for life (e.g. Ernest Sternglass) even if they are careful not to say that G-d was behind that design.

This includes energy levels of the carbon atom; the rate at which the universe is expanding; the four dimensions of space-time, carbon, DNA, proteins, even the exact distance between stars in our galaxy.

These arguments are not, of course absolute proof that G-d made the world. We could always say that all of this is only by chance. Nevertheless, as more and more exact conditions emerge, this argument does become increasingly more powerful. Even hardcore evolutionists are increasingly subscribing to the anthropic principle. One such person is Conway Morris, professor of evolutionary paleobiology at the University of Cambridge and one of the leading evolutionists in his field. In his book, *The Crucible of Creation: The Burgess Shale and the Rise of Animals* (Oxford University Press, 1998), he argues that if the tape of life were rerun form the Cambrian time, we would get almost exactly the same outcome as we have today. "I believe it is necessary to argue that within certain limits the outcome of evolutionary processes might be rather predictable." And this for a theory, which started out saying that everything, is a function of random, chance events!

The issue is not whether we can come up with a scientific explanation for what took place. The fact that all these factors are so precise and perfect for the world we need, support the fact that this was a planned and guided event; the fact that this plan followed principles, intelligible to us up to a point, is only to be expected from what we know of how the Almighty made His world.[1]

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[1]The possibility of such a directed evolution was increased by the discovery that different species represent only minor changes in the DNA. It makes each DNA sequence capable of specifying a different life form where all sequences appear interrelated in some way. The fact that genes direct the development of any species from inception to adulthood, also lends itself to the possibility that they have been programmed to direct evolutionary change, i.e. the unfolding of different species according to a given plan. This is supported by the fact that most evolutionary change had been largely a matter of the rearrangement of pre-existing genes rather than the emergence of new genes. In addition, we know that cells measure time during development and count the number of cell divisions that have elapsed since a particular developmental event. So too, it may be possible that the course of evolution went according to specific preprogrammed genetic arrangements at specified times. Today we have discovered gene families, where copies of identical genes occur throughout a species, allowing for synchronized genetic changes in all members of the population. Moreover, as we show in the appendix, the environment in which life developed is quite specific and must adhere to very rigorous parameters. This would further predetermine the projectory of evolutionary development. (pp. 276-282)

Further, the ecological balance of any ecosystem is also very finely tuned, implying that the mapping out of the genes was not just from species to species, but reflected a coordinated succession of coordinated biospheres.

Many of the physical forms which living species express are functions of physical laws. For example, spiral leaf and flower arrangements seem to invariably belong to a mathematical series known as the Fibonacci series. If things just developed by chance as the evolutionists would have it, then we should expect many different kinds of spirals. But there seem to be mechanical constraints determining the outcome, making for direction rather than chance. (pp. 283-4)

Believing in G-d us certainly not necessary to understand biological evolution. But for Conway Morris, one of the foremost paleontologists of his time, the world becomes a richer and more meaningful place if we do. Though he is skeptical about finding advanced life elsewhere, should we someday encounter intelligent aliens, Conway Morris says, "in all probability they will very much like us."

According to Morris, biologists have overlooked the significance of evolutionary convergence. That's the phenomenon where by wildly different organisms independently arrive at the same "solutions" to life's challenges: e.g. the camera-type eyes found in both mollusks (squid and octopuses) and vertebrates (you, your dog, and your goldfish).

The repeated emergence of everything from legs and wings to intelligence, social behavior, and even play, he argues, shows that biology has a limited number of solutions to the problems that organisms face-feeding themselves, finding mates, sensing their environment. That suggests that once life originates, evolution proceeds in repeated, predictable ways, from simple forms to complex, for example. "Evolution has trajectories," he writes, "and progress is not some noxious by product of the terminally optimistic, but simply part of our reality."

A comparison of the Australian marsupials (kangaroos and the like) with placental mammals (regular mammals who give birth) is very instructive. There is a marsupial lion, cat, wolf, mole, anteater, jerboa and flying squirrel. There is an extinct marsupial equivalent to the rhino. The physical similarities between the two are very striking. similar situation exists in South America. Denton brings other examples as well. None of the examples, he states, are exact replays of the tape, but they suggest that evolution is very highly constrained in very specific ways. (pp. 287-8)

More radically, even those characteristics we consider uniquely human-large brains, culture, sentience- show up in other lineages, all part of "humanness" appear to be inherent in biology. "In a very real way, humanity was inevitable." The notion of "inevitable humans in a lonely universe" helps restore humanity's place at the center of "creation." The fact that we descended from apes rather than angles- "does not belittle us."

vi-The Beginnings Of Life

Francis Crick, co-discoverer of the double-helix of the DNA, commented in his book, Life Itself:

An honest man, armed with all the knowledge available to us now, could only state that the origin of life appears at the moments to be almost a miracle, so many are the conditions which would have to be satisfied to get it going.

The fact that life emerged on earth as soon as conditions could support it (shortly after the cessation of the meteor bombardment associated with the formation of the solar system) suggest that life's origins was a highly probable event which was perhaps even inevitable. (Denton, *Nature's Destiny* pg. 295)

Sir John Maddox (in Scientific American, December 1999, pg. 35)

Understanding all the genomes whose complete structure is known will not, in itself, point back to the origin of life as such.

Evolutionists have to show how life spontaneously generated from whatever

chemicals or whatever existed in the world at that time[2]:

There are two problems here:

a - Whether this could have been done under any conditions;

b- What the likelihood is that this scenario actually took place.

a - Whether this could have been done under any conditions;

The Fifth Miracle, by Paul Davies, chapter 3, Out of the Slime:

[In 1953, Harold Urey and Stanley Miller did a number of experiments to show that life could have been generated from the chemical soup which existed at that time on earth. Urey and Miller] excluded oxygen, deciding on a mixture of methane, hydrogen, and ammonia. Miller, [who actually did the experiments,] filled a glass flask with the chosen gases plus some water, then passed an electric spark through the mixture to simulate the effects of sunlight (or of lightning). Over the next week, he watched with fascination as the water cycling through the apparatus slowly turned reddish-brown. Eagerly he set about analyzing the fluid and, sure enough, he found it to contain several of the organic chemicals known as amino acids, the building blocks of proteins, and basic ingredients in all terrestrial life.[3] Variations of the experiments led eventually to almost all the amino acids to be produced. Other experiments showed that hydrogen cyanide was capable of reacting with itself to produce some components which ultimately make up RNA & DNA.

Miller's intriguing results were widely hailed as the first steps on the road to the creation of life "in a test tube."

Alas, the euphoria over the Miller-Urey experiment turned out to be somewhat premature, for a variety of reasons. First, scientists...no longer think that the early atmosphere resembled...in Miller's flask.

The current best guess for the Earth's early atmosphere is that it was a neutral mixture of carbon dioxide and nitrogen. These gases don't readily yield amino acids.

A second reason for casting doubt on the Miller-Urey experiment is that amino acids are not all that hard to make. But there is a world of a difference between building blocks and an assembled structure. Just as the discovery of a pile of bricks is no guarantee that a house lies around the corner, so a collection of amino acids is a ling, long way from the sort of large, specialized molecules such as proteins that life requires.

Two major obstacles stand in the way of further progress towards life in a primordial soup. One is that in most scenarios the soup is far too dilute to achieve much. Haldane's vast ocean broth would be exceedingly unlikely to bring the right components together in the same place at the same time. Many imaginative suggestions have been made on how to thicken the brew. However, it is far from clear whether any of these suggestions is realistic in the context of the early Earth.

The other obstacle is even deeper...this law describes a natural tendency towards degradation and corruption, and away from increasing order and complexity. The crystalline solid is a more ordered arrangement of atoms that a liquid, so it has less entropy. The formation of a crystal is accompanied by a release of heat into the environment which raises the entropy...Same applies to amino acid synthesis...it lowers the energy

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[2] Darwin himself wrote: "I have met with no evidence that seems in the least trustworthy, in favor of so-called Spontaneous Generation." The eminent British physician Lord Kelvin dismissed the whole idea as "a very ancient speculation," opining that "science brings a vast mass of inductive evidence against this hypotheses."

[3] There are 20 amino acids required for life

of a system,--i.e., if it goes "downhill"...Water runs downhill, not uphill. You *can* make water go uphill, but only if you work for it. A process that happens spontaneously is always a downhill process. Amino-acid production has this character of being a downhill process, which is why amino acids are so easy to make.

But now we hit a snag. The second step on the road to life, or at least the road to proteins, is for amino acids to link together to form molecules known as peptides. A protein is a long peptide chain, or a polypeptide. Coupling amino acids together to form peptides is an uphill process. It heads in the wrong direction, thermodynamically speaking. Each peptide bond that is forged requires a water molecule to be plucked from the chain. Obviously a peptide formation is not impossible, because it happens inside living organisms. But there the uphill reaction is driven along by the use of customized molecules that are pre-energized to supply the necessary work. In a simple chemical soup, no such specialized molecules would be on hand to give the reactions the boost they need. So a watery soup is a recipe for molecular disassembly, not self-assembly.

Just throwing energy at the problem is no solution. The same energy sources that generate organic molecules also serve to destroy them. To work constructively, the energy has to be targeted at the specific action required. Uncontrolled energy input, such as simple heating, is far more likely to prove destructive than constructive. The situation can be compared to a workman laboriously building a brick pillar by piling bricks one on top of the other. The higher the pillar goes, the more likely it is to wobble and collapse. Likewise, long chains made of amino acids linked together are very fragile. As a general rule, if you simply heat organics willy-nilly, you end up, not with delicate long chain molecules, but with a tarry mess, as barbecue owners can testify.

It has been estimated that, left to its own devices, a concentrated solution of amino acids would need a volume of fluid the size of the observable universe to go against the thermodynamic tide and create a singe small polypeptide spontaneously.

One possible escape route from the strictures of the second law is to depart from thermodynamic-equilibrium conditions. The American biochemist Sidney Fox has investigated what happens when a mixture of amino acids is strongly heated. Driving out the water as steam makes the linkage of amino acids into peptide chains much more likely. The thermal-energy flow generates the necessary entropy to comply with the second law. Fox has produced some quite long polypeptides, which he terms "proteinoids," using this method. Unfortunately, the resemblance between Fox's proteinoids and real proteins is rather superficial. For example, real proteins are made exclusively of left-handed amino acids, whereas proteinoids are an equal mixture of left and right.

There is a more fundamental reason why the random self-assembly of proteins seems a non-starter. Proteins do not consist of any old peptide chains; they are very specific amino-acid sequences that have specialized chemical properties needed for life. However, the number of alternative permutations available to a mixture of amino acids is superastronomical. A small protein may typically contain a hundred amino acids of twenty varieties. There are about 10130 (which is one followed by 130 zeros) different arrangements of the amino acids in a molecule of this length. Hitting the right one by accident would be no mean feat.

Making a protein simply by injecting energy is rather like exploding a stick of dynamite under a pile of bricks and expecting it to form a house. There is

little hope of producing anything other than a chaotic mess.

So far I have just been talking about making proteins by linking amino acids into peptides. But proteins are only a small part of the intricate fabric of life. There are lipids and nucleic acids and ribosomes, and so on. And here we hit yet another snag. It is possible that scientists, using complicated and delicate laboratory procedures may be able to synthesize piecemeal the basic ingredients of life. What is far less likely is that the same set of procedures would yield all the required pieces at the same time. Thus, not only is there a mystery about the self-assembly of large, delicate, and very specifically structured molecules from an incoherent melee of bits, there is also the problem of producing, simultaneously, a collection of many different types of molecules.

Let me spell out what is involved here. I have already emphasized that the complex molecules found in living organisms are not themselves alive. A molecule is a molecule is a molecule; it is neither living nor dead. Life is a phenomenon associated with a whole society of specialized molecules, millions of them, cooperating in surprising and novel ways. No single molecule carries the spark of life, no chain of atoms alone constitutes an organism. Even DNA, the biological super-molecule, is not alive. Pluck the DNA from a living cell and it would be stranded, unable to carry out its familiar role. Only within the context of a highly specific molecular milieu will a given molecule play its role in life. To function properly, DNA must be part of a large team, with each molecule executing its assigned task alongside the others in a cooperative manner.

Acknowledging the inter-dependability of the component molecules within a living organism immediately presents us with a stark philosophical puzzle. If everything needs everything else, how did the community of molecules ever arise in the first place? Since most large molecules needed for life are produced only by living organisms, and are not found outside the cell, how did they come to exist originally, without the help of a meddling scientist?

Michael Behe (pg. 168-9) brings the following critique:

"Suppose a famous chef said that natural random processes could produce a chocolate cake. In his effort to produce it we would not begrudge him taking whole plants - including wheat, cocoa and sugar cane - and placing them near a hot spring, in the hope that the heated water would extract the right materials and cook them. But we would become a little wary if the chef bought refined flour, cocoa and sugar at the store, saying that he didn't have time to wait for the hot water to extract the components from the plants. We would shake our heads if he then switched his experiment from a hot spring to an electric oven to "speed things up". We would walk away if he then measured the amounts of the components carefully, mixed them in a bowl, placed them in a pan, and baked them in his oven. The results would have nothing to do with his original idea that natural processes could bake a cake."

"The trick for the researcher is to choose a probable starting point, then keep his hands off, minimizing intelligent direction as far as possible."

"Stanley Miller did nothing of the sort. In fact he had to do his highly controlled experiment a number of times changing the variables, to get the desired results. Of course, it is not impossible that Stanley Miller's result could have taken place; but his experiments, rather than proving origin of life, prove just how unlikely it is to have come about." (See below **ii** - where we bring statistical probabilities.)[1]

[1]Recently, a growing group of researchers have been looking to at the possibility that outer space may be the source of the original molecules necessary for life. Hundreds of tons

of dust drift down to the earth's surface every day. These dust particles bring in gases and water, but they may also bring in organic materials. So too, when a comet passes through the warm inner solar system, part of it boils away as gas and dust, some of which is pulled to the earth. These comets also carry organic compounds. (Scientific American, July 1999, pg. 26-33). However, nobody has been able to say whether these organic substances had anything to do with early life, and if they did, what role they played. Nor can they say where they came from to begin with, though a number of possible, speculative theories abound. (For example, there is some infrared evidence that dark cosmic clouds contain some organic substances, though this is not certain.) Besides, a huge gap yawns between even the most complex organic compounds and the genetic code, metabolism and self-replication that are crucial to the definition of life (ibid.).

Life Beyond Earth

Recently the discovery of about a dozen planets orbiting distant stars has rekindled optimism for the existence of life beyond earth. Yet none seem to resemble earth in size or any other conditions basic for life. Yet scientists have used this information to imagine that there must be a whole lot of other planets more similar to earth as yet undiscovered. In addition scientists have been boyed by the fact that life is more robust than once believed. Microscopic organisms have been foun to thrive in extreme conditions, from the ice of the Arctic to boiling vents at the bottom of the ocean to solid rock deep in the bowels of the earth. This makes the possibility of life on surfaces such as mars more credible. Yet it also ignores the fact that only the simplest, most primitive life froms can exist under such conditions. Yet scientists continue their earch as if they expect to find advanced life-forms, similar to humans, searching the skies for elctronic signals from outer space. In addition, a careful analysis shows that most stars and their planets exist under conditions beyond even these paremeters. A lot of stars burn too brightly. Some have a lifetime too short for life to evolve. And double star systems - 60 percent of all stars - are less likely to have stable planets. Planets can be battered so often by asteroids that life has no chance to evolve or to sustain itself, whereas Earth has been mostly protected by Jupiter and Saturn, ginats that swept up most of the threatening asteroids around. In addition we have shown how exact conditions of life are dependent on very exact conditons, highly unlikely to be duplicated elsewhere. If life exists on other planets, it would have to be completely different to the type of carbon/water based life we know here. But that is open seseme to imagine what we want. We have no indication that any other type of base is feasible for life. (Culled from CNN Oct. 15, 1998)

Other problems are as follows:

i-Chemists have shown that organic compounds produced by the early earth would have been subject to chemical reactions making them unsuitable for constructing life.

ii-The early atmosphere that the experiment was supposed to duplicate was, according to many, very different.

iii-There is no reason to believe that life would emerge, even if the right chemicals were present. Scientists, in ideal laboratory conditions have certainly not been able to produce such life.

"...The preparation of organic compounds is a feat of no profound difficulty, nor one of any great significance to life...the difficult step in the origin of life lies forever down the line, not here." [Meaning the coming into existence of the "first replicator" from organic molecules.] (Shapiro, *Origins*, p. 107) The Miller-Urey experiment dealt only with the creation of non-replicating organic molecules, "which is of no great significance to life." There is the gap between the enormous complexity of even the simplest living organisms we know and the components the earth was supposed to have first generated.

iv-Scientists have not been able to agree what it was of life that first emerged, DNA, RNA, proteins, etc. (Phillip Johnson, pg. 104-112)

v-Joining many amino acids together to form a protein which is useful is much more difficult than forming amino acids in the first place. Water, which was in abundance in the proposed early earth, readily dissolves amino acids. Suggestions by Sydney Fox and other to get around this have not been accepted by the broader scientific community. (Behe, 169-70; see also pg. 171-3 where he delivers a devastating critique on the so called RNA world. See Denton, *Nature's Destiny*, pg. 294 on the same.)

vi-For little known reasons and with rare exceptions, amino acids in living organisms are left-handed. Miller-type experiments is that they produce equal numbers of both forms.

b - What the likelihood is that this scenario actually took place.

One of the greatest astronomers, Fred Hoyle showed how difficult this is: If one thinks of the entire 4.5 billion year history of the planet as a 24 hour day, then life appeared in about half an hour. Apes were transmogrified (transmuted) into humans some 20 seconds ago and modern civilization sprang into existence in less than one tenth of a second.[1] You've got to discover DNA, you've got to make thousands of enzymes in that half an hour. And you've got to do it in a very hostile situation...The spontaneous generation of life on earth would have been as likely as if it had been created by a tornado passing through a junkyard. (in Scientific American, March 1995; see also his book, The Intelligent Selection) [Elsewhere Hoyle stated that this was as likely as a tornado passing through a junkyard assembling a Boeing 747.]

In every cell we have DNA which triggers one of twenty amino acids, these combine in different ways to form different types of proteins. There are usually 250 amino acids per protein, which are considered the building blocks of life. MIT physicist Murray Eden points out that the total number of possible protein combinations are 20 to the power of 250. (20 with 250 noughts after it). But not all proteins are good for life - Eden estimates that only 10 to the power of 50 would do the trick. That is a tiny amount compared to the total number. Evolutionary chance had to come across one of those lucky combinations to even stand a chance of using that protein. (See Gerald Schroeder, *Genesis and the Big Bang*, who makes exact calculations showing just how remote the likelihood of this happening is.)

Hoyle and Wickramasinghe:

"Rather than estimate the chances for an entire bacterium, they considered

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[1]In *Scientific American*, The Footprints of Extinct Animals, by David A. Mossman and William A. S. Sarjeant makes the calculation based on a year:

If one views the 4.5 billion years since the earth was formed as being a single year, with each day lasting for 12.3 million years, then, on such a time scale the earth's first forms of life-primitive plants resembling modern single-celled algae-appeared in the seas in early May. Many celled forms of life, however, did not arise until early November.

By about November 20 primitive fishes were swimming in the planet's waters. Towards the end of the month their descendants ventured onto the land. By December 7 reptiles had become the dominant terrestrial animals, and by mid-December the first mammals had appeared. At about 5:00 p.m. on the last day of the year two early hominids left their footprints in a fresh fall of volcanic ash on the Laetoli Plain of Kenya. Our own genus, *Homo*, did not appear until about an hour before midnight-some 500,000 years ago. Thus the entire span of vertebrate life on land occupies less that six full weeks of an earth-history "year." Even though that important interval spans some 360 million years, it is a very small part of the history of the planet.

only the set of functioning enzymes present in one. Their starting point was not a complex mixture, but rather the set of twenty L-form amino acids that are used to construct biological enzymes.[1] If amino acids were selected at random from this set one at a time and arranged in order, what would be the chances that this process would produce an actual bacterial product? For a typical enzyme of 200 amino acids, the odds would be obtained by multiplying the probability for each amino acid, 1 in 20, together 200 times. The result, 1 in 10 to the 120th power.

"To duplicate a bacterium, one would have to assemble 2,000 different functioning enzymes. The odds against this event would be 1 in 10 to the 20th power multiplied together 2,000 times, or 1 in 10 to the 40,000 power. We can understand why Hoyle changed his mind. His estimate of the likelihood of the event was that it was comparable to the chance that 'a tornado sweeping through a junk-yard might assemble a Boeing 747 from the materials therein.'

"In fact, things are worse. A tidy set of twenty amino acids, all in the L-form, was not likely to be available on the early earth. This situation has not yet even been approached by the very best Miller-Urey experiments. Nor does a set of enzymes constitute a living bacterium. Harold Morowitz, a Yale University physicist, has made a more realistic estimate [for spontaneous generation of life]. He has calculated the odds for the following case:

"Suppose we were to heat up a large batch of bacteria in a sealed container to several thousand degrees, so that every chemical bond within them was broken. We then cooled this mixture down slowly, in order to allow the atoms to form new bonds, until everything came to equilibrium... Morowitz asks, what fraction of the final product will consist of living bacteria? Or in other words, if a single bacterium was used to start the experiment... what would be the chances that a living bacterium would result at the end?

"The answer computed by Morowitz reduces the odds of Hoyle to utter insignificance: 1 chance in 10 to the 100,000,000,000th power... This number is so large that to write it in conventional form we would require several hundred thousand blank books. We would enter '1' on the first page of the book, and then fill it, and the remainder of the books, with zeros..." (Origins, pp. 126-128).

Shapiro calculates these odds for a situation where maximum chance is given for life to evolve, both in time and in available trials. On page 126, he state, "As a maximum estimate, we can assume that the entire earth was covered by an ocean 10 kilometers deep, which was available for experiments. Further, we will allow that space to be divided into small compartments (1 micrometer on each side) of bacterial size. We would then have 5 times 10 to the 36th power separate reaction flasks. If a separate try was made in each flask every minute for 1 billions years, we would have 2.5 times 10 to the 51st tries available."[1]

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[1]Actually the number of enzymes known to be involved in cell-division has been growing in the past few years at the rat of one enzyme a week. (Sir John Maddox in Scientific American, December 1999, pg. 35)

[1]Gerald Schroeder analyzed the problem as follows: The history of life teaches us that not all combinations of proteins are viable. At the Cambrian explosion of animal life, 530 million years ago, some 50 phyla (basic body plans) appeared suddenly in the fossil record. Only 30 to 34 survived. The rest perished. Since then no new phyla have evolved. It is no wonder that Scientific American asked whether the mechanism of evolution has changed in a way that prohibits all other body phyla. It is not that the mechanism of evolution has changed. ... To use the word of

Harvard professor Stephen Jay Gould, it appears that the flow of life is "channeled" along these 34 basic directions. Let's look at this channeling and decide whether or not it can be the result of random processes.

Humans and all mammals have some 50,000 genes. That implies we have, as an order of magnitude estimate, some 50,000 proteins. It is estimated that there are some 30 million species of animal life on Earth. If the genomes of all animals produced 50,000 proteins, and no proteins were common among any of the species (a fact we know to be false, but an assumption that makes our calculations favor the random evolutionary assumption), there would be (30 million x 50,000) 1.5 trillion (1.5 x 1012) proteins in all life. (The actual number is vastly lower). Now let's consider the likelihood of these viable combinations of proteins forming by chance, recalling that, as the events following the Cambrian explosion taught us, not all combinations of proteins are viable.

Proteins are coils of several hundred amino acids. Take a typical protein to be a chain of 300 amino acids. There are 20 commonly occurring amino acids in life. This means that the number of possible combinations of the amino acids in our model protein is 20300 or in the more usual ten-based system of numbers, 10390 . Nature has the option of choosing among the possible 10390 proteins, the 1.5 x 1012 proteins of which all viable life is composed. Can this have happened by random mutations of the genome? Not if our understanding of statistics is correct. It would be as if nature reached into a grab bag containing a billion proteins and pulled out the one that worked and then repeated this trick a million million times. (Brought at the bottom of the web site *The 2001 Principle*.)

But this impossibility of randomness producing order is not different from the attempt to produce Shakespeare or any meaningful string of letters more than a few words in length by a random letter generator. Gibberish is always the result. This is simply

As a result, says Hoyle, "If one is not prejudiced either by social beliefs or by scientific training," the chemical soup theory "is wiped out of court. [It is time someone] blew the whistle' (Hoyle and Wickramasinghe, *Evolution From Space*, J.M. Dent and Sons Co. London, 1981, p. 24; Time Magazine, November 21, 1983, p. 49)

The Fifth Miracle, by Paul Davies Chapter 3:
The complexity of the living cell:

Each molecule has a specified function and a designated place in the overall scheme so that the correct objects are manufactured. There is much commuting going on. Molecules have to travel across the cell to meet others at the right place and the right time in order to carry out their jobs properly.

At the level of individual atoms, life is anarchy-blundering, purposeless chaos. Yet somehow, collectively, these unthinking atoms get it together and perform the dance of life with exquisite precision.

Over the past few decades, molecular biology has made gigantic strides elucidating which molecules do what to which. Always it is found that nature's nanomachines operate according to perfectly ordinary physical forces and laws. No weird goings-on have been discovered. It would be wrong, however, to suppose that molecules are all that there is to life. We no more explain life by cataloguing its molecular activities that we account for the genius of Mozart or Einstein by determining how a neuron works. The use the cliche, the whole is more than the sum of its parts. The very

because the number of meaningless letter combinations vastly exceeds the number of meaningful combinations. With life it was and is lethal gibberish.

word "organism" implies cooperation at a global level that cannot be captured in the study of the components alone. Without understanding its collective activity, the job of explaining life is only partly done.

A simple bacterium like *E. coli* contains a few million in its genome (a genome is a complete set of genes), enough to fill a thousand page book. Human DNA would require a whole library.

Why, out of the 1070 possible codes based on triplets, has nature chosen the one in universal use? Could a different code work as well? The British biologist John Maynard Smith has described the origin of the code as the most perplexing problem in evolutionary biology.

A coded message is only as good as the context in which it is put into use. The striking utility of encoded genetic information stems from the fact that amino acids "understand" it.

A lumbering kite is a (literally) hard-wired mechanism, whereas the more efficient radio-controlled plane in an information-controlled mechanism. In a living organism we see the power of software, or information processing, refined to an incredible degree. Cells are not hard-wired, like kits. Rather, the information flow couples the chalk of nucleic acids to the cheese of proteins using the genetic code. Stored energy is then released and forces are harnessed to carry out the programmed instructions, as with the radio-controlled plane.

Viewed this way, the problem of the origin of life reduces to one of understanding how encoded software emerged spontaneously from hardware. How did it happen? How did nature "go digital"? We are dealing here not with a simple matter of refinement and adaptation, an amplification of complexity, or even the husbanding of information, but a *fundamental change of concept*. It is like trying to explain how a kite can evolve into a radio-controlled aircraft. Can the laws of nature, as we presently comprehend them account for such a transition? I do not believe they can.

A functioning genome is a random sequence, but it is not just *any* random sequence. It belongs to a very, very special subset of random sequences-namely, those that encode biologically relevant information. All random sequences of the same length encode about the same *amount* of information, but the *quality* of that information is crucial: in the vast majority of cases it would be, biologically speaking, complete gobbledygook.

The conclusion we have reached is clear and it is profound. A functional genome is *both* random *and* highly specific-properties that seem almost contradictory. It must be random to contain substantial amounts of information, and it must be specific for that information to be biologically relevant.

No known law of nature could achieve this...

A solution from outer space?

Some evolutionists have answered this claim by saying that life must have come to earth from outer space![1]

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[1]Most prominently, Francis Crick. In *The 2001 Principle* the following is brought: One of the oldest and most prestigious scientific associations is Great Britain's Royal Society. At the end of the 1970's, OMNI Magazine asked members of the Society to list the five most "sensational" scientific advances of the decade:

"The most frequently mentioned paper in the biological sciences was that by Fred Sanger and his colleagues at Cambridge, England, wherein they described the entire sequence of nucleotides, or 'words,' in the DNA of a virus, PhiX-174 ('Nature', Vol. 265, 1977, p. 687). This achievement marked the first time ever that the complete chemical 'blueprint' of a living organism had been unraveled. An extremely simple life form, PhiX-174 proved to contain 5,375 words. revelation from this work was that the genes overlap. Like a

telegram with no spacing, the coded message read entirely differently, depending upon whether one began with the first, second or third letter. The fact the three messages were contained within one seemed to some researchers artificial or contrived, prompting Drs. Hiromitsu Yokoo and Iairo Oshima to revise the theory, first suggested by Dr. Francis Crick and Leslie Orgel ('Icarus', Vol. 19, 1973, p. 341) that life on Earth began from organisms sent here billions of years ago by extra-terrestrial civilizations that decided to 'seed' other planets. The Japanese scientists suggested that the gene sequence PhiX-174 might contain messages, or signals, as yet uncoded. In their reasoning, such overlapping messages would be a highly economical way to send information through vast tracts of space" (OMNI Magazine, in an article entitled, "Future Curves: OMNI Surveys the Royal Society").

In other words, the most sensational biological discovery of the 70's was that DNA, the "chemical blueprint" of a live form, was so "contrived," i.e. it exhibited such a high level of design and complexity, scientists were forced to conclude that the DNA had to have been produced by intelligence. The design compelled an intuitive appreciation which led them to hypothesize the existence of a mysterious extraterrestrial civilization. Here, again, we witness the same process of induction at work. The researchers had no prior knowledge that such an extraterrestrial civilization existed. The existence of this civilization is hypothesized by induction.

There is an important lesson here from Yokoo and Oshima. Neither researcher, nor any human being for that matter, could claim to have seen PhiX-174 actually being made. All anyone ever has seen is the final product -- the DNA itself. Clearly, however, not having seen the manufacturing process did not stand in the way of human perception that the live object under study was, in fact, "contrived" purposefully by intelligence. Not having experienced the manufacturing process did not stand as an obstacle to the "gut" intuitive reaction that the DNA was a design of a designer. Lack of experience did not matter. What is more, that the subject under study was alive did not matter either.

Actually, Crick and Orgel's true motives for suggesting the "seeding from outer space" idea was not because they believed in the concept. Rather, as Crick confided to NYU Professor of Chemistry, Robert Shapiro (author of Origins - A Skeptic's Guide to the Creation of Life on Earth, Bantam, 1987) Crick and Orgel themselves brought up the entire idea of seeding only to "increase public awareness" and "awaken" people to the demise of the chemical soup idea. Crick himself confided this to Shapiro in a private interview, saying: "We thought of this theory, but we're not completely sold on it... The object is to give the intelligent person an idea of what the problem really is, and this is just a tag to hang it on... Everybody, as they say in the state of California, can relate to certain ideas, and things like coming on an unmanned rocket -- or even bacteria, they think they can relate to" (Origins, pp. 227-228).

U.S. News and World Report, August 18-25, 1997, Is There Life on Other Planets?, by Victoria Pope, p.38

Astronomers calculate that hundreds of millions of Earth-like planets must exist throughout the universe. In 1960, Project Ozma in West Virginia began its quest to detect alien radio signals. The National Aeronautics and Space Administration committed $100 million...

Space exploration hasn't turned up life, either. When NASA's Viking landers examined Mars two decades ago, they found a dry, sterile environment. Venus was a blazing inferno. It was only the images from the Galileo spacecraft that raised a slight hope of finding suitable conditions for life elsewhere in our solar system: Jupiter's moon Europa appeared to have an ocean of liquid water covered with pack ice.

But recent findings from our own planet have led scientists to wonder if they've taken too parochial a view of life. Microbes have been discovered thriving under circumstances once thought impossible: in volcanic vents, in hot springs, in geysers. Antarctica's rocks, the cold waters deep beneath the surface of its frozen lakes, and the subterranean ground water below the basalt flows of the Columbia Basin may harbor terrestrial models for the rise of life on Mars and other planets. And some tantalizing, if still highly controversial, evidence from Mars at least hints that some similar forms of life may indeed have arisen there, even if they subsequently dies out. A

Martian meteorite found in Antarctica contains microscopic wormlike structures, dating form at least 3.6 billion years ago, that resemble fossilized bacterial forms found on Earth.
"Extremophiles"...the thermophiles, which thrive in searing heat; the halophiles, which love salt; and the psychrophiles, bacteria often found in the deep sea that live under high pressure.
Deep...in tiny...rocks in the hot pools of Yellowstone National Park. And drilling 2 miles below the Columbia Basin, geologists have found yet another kind of extremophile propagating without the benefit of sunlight. These organisms instead use hydrogen-created from a chemical reaction between basalt and ground water-as their energy resource.
Although the issue is highly contentious, some researchers argue that many of these microbes belong to a distinct and previously unrecognized branch of life. Supporters of this idea say that these one-cell throwbacks, now dubbed "archaea," are genetically different from bacteria and appear to be the oldest life forms on Earth. Is that's so, it means that life did not necessarily need some warm, hospitable primordial soup to from but could have originated in a far greater range of environments-including some downright hostile ones.
Scientific American, December 1999, Is There Life Elsewhere in the Universe?, by Jill C. Tartar and Christopher F. Chyba, p. 80

Many researchers studying the origins of life have adopted a "Darwinian" definition, which holds that life is a self-sustained chemical system capable of undergoing Darwinian evolution by natural selection. By this definition, we will have made living systems of molecules in the laboratory...
But the recent controversy over Allan Hills 84001, the Martian meteorite in which some researchers have claimed to see microfossils, reminds us that the shape of microscopic features is unlikely to provide unambiguous evidence for life. There are just too many nonbiological ways of producing structures that appear biological in origin.
Europa...growing evidence indicates that it harbors the solar system's second extant ocean...underneath a surface layer of ice. The exploration of Europa will begin with a mission, scheduled for launch in 2003, designed to prove whether or not the ocean is really there.
On Earth, wherever there is liquid water, there is life, even in unexpected places, such as deep within the crust.
In 2004 the Huygens probe will drop into its atmosphere...
By 2050 we will have scoured the surface of Mars. If life exists on Mars, we may share a common ancestor with it.
Well before 2050 the first truly interstellar missions will be flying out of our solar system. With present technology, the trip would take tens of thousands of years-so we will have to study those systems remotely.
By 2050 we will have catalogues of extrasolar planetary systems analogous to our current catalogues of stars. We will know whether our particular planetary system is typical or unusual.
Although we talk of searching for extraterrestrial intelligence(SETI), what we are seeking is evidence of extraterrestrial technologies. It might be better to use the acronym SET-T (pronounced the same) to acknowledge this. To date we have concentrated on a very specific technology-radio transmissions at wavelengths with weak natural backgrounds and little absorption. No one has yet found any verified signs of a distant technology. But the null result may have more to do with limitations in range and sensitivity than with actual lack of civilizations. The most distant star probed is still less than 1 percent of the distance across our galaxy.

Paul Davies, *The Fifth Miracle:* When the crippled *Galileo* Spacecraft painstakingly beamed back pictures of Europa from its backup antenna in April 1997, NASA scientists were jubilant. The word on everybody's lips was-"Life!" The excitement focused on the discovery of the first known extraterrestrial ocean...

Almost to a man (and woman), commentators intoned that water plus organic means life- or at least a good chance of it. The rationale was summed up by NASA mission scientist Richard Terrile. "Put those ingredients together on Earth and you get life within a billion years," he told the press. Ergo, it will happen to Europa too. Just like that, as the British magician Tommy Cooper used to

say. Unfortunately, the slender thread of logic that links water and life is scarcely more than the observation that life without water seems impossible. Equating water with life conceals a gigantic leap of faith...

...According to the deterministic school of biology, which seems to dictate the prevailing view at NASA and is shared by most media commentators, life will automatically form in any Earth-like environment...

...In claiming that water means life, NASA scientists are not merely being upbeat about their project. They are making-tacitly- a huge and profound assumption about the nature of nature. They are saying, in effect, that the laws of the universe are cunningly contrived to coax life into being against the raw odds; that the mathematical principles of physics, in their elegant simplicity, somehow know in advance about life and its vast complexity. If life follows from soup with causal dependability, the laws of nature encode a hidden subtext, a cosmic imperative, which tells them: "Make life!"...

...This is a breathtaking vision of nature, magnificent and uplifting in its majestic sweep. I hope it is correct. It would be wonderful if it were correct. But if it is, it represents a shift in the scientific world-view as profound as that initiated by Copernicus and Darwin put together...

...If biological determinism is indeed confirmed by the discovery of alternative life beyond Earth, it will dramatically confound the orthodox paradigm, steeped as it is in Darwinian contingency... But if life is somehow inevitable, accidents of fate notwithstanding, a particular end is certain to be achieved; it is built into the laws. And "end" sounds suspiciously like "goal" or "purpose" -taboo words in science for the last century, redolent as they are of a bygone religious age.

The ramifications of finding life elsewhere in the cosmos are therefore profound in the extreme. They transcend mere science, and have an impact on such philosophical issues as whether there is a meaning to physical existence, or whether life, the universe, and everything are ultimately pointless and absurd....

In *The Extraterrestrial Life Debate, 1750-1900*, (Dover, 1999) Michael J. Crowe shows that "the question of extraterrestrial life, rather than having arisen in the twentieth century, has been debated almost from the beginning of recorded history."

There are many conditions which are needed for life which make the eart the most likely place for this to happen:

Refugees for Life in a Hostile Universe, by Guillermo Gonzalez; Donald Brownlee and Peter D. Ward, Scientific American, October 2001

... circumstellar habitable zone (CHZ)... region around a star where liquid water can persist on the surface of a terrestrial, or Earth-like, planet for at least a few billion years... inner boundary… closest that a planet can orbit its host star without losing its oceans to space. In the most extreme case, a runaway greenhouse effect might take hold and boil off the oceans (as happened on Venus). The outer boundary is the farthest a planet can roam before its oceans freeze over.

… many other factors also contribute to the habitability of a planet, including the ellipticity of its orbit, the company of a large moon and the presence of giant planets, let alone the details of it biology. But if a planet orbits outside the zone, none of these minutiae is likely to matter. Similarly, it doesn't make much difference where the CHZ is located if the planetary system as a whole resides in a hostile part of the galaxy.

… a galactic equivalent to the CHZ: the galactic habitable zone (GHZ). The GHZ defines the most hospitable places in the Milky Way – those that are neither too close nor too far from the galactic center…

The boundaries of the galactic habitable zone are set by two requirements: the availability of material to build a habitable planet and adequate seclusion from cosmic threats… big bang produced hydrogen and helium and little else… Over the next 10 billion years… the number of metal atoms… gradually increased to its present value.

These metals are the building blocks of Earth-like planets, and their abundance affects the size of the planets that can form. Size, in turn, determines whether a planet can retain an

atmosphere and sustain geologic activity. Moreover, without enough metals, no giant planets can form at all, because they coalesce around a rocky core of a certain minimum size… No such planet has been found around any star with a metallicity of less than 40 percent of the sun's…

Conversely, too high a metallicity can also be a problem. Terrestrial planets will be larger and, because of their stronger gravity, richer in volatile compounds and poorer in topographic relief. That combination will make them more likely to be completely covered with water, to the detriment of life. On Earth, the mix of land and sea is important for atmospheric temperature control and other processes. High metallicity also increases the density… and thereby induces the giant planets to shift position…A by-product of this orbital migration is that it will fling any smaller, Earth-like bodies out of the system altogether or shove them into the sun. As the elephants move around, the ants get crushed.

… As a result of the shifting supernova ration, new sunlike stars are richer in iron than those that formed five billion years ago. All else being equal, this implies that a terrestrial planet forming today will have a proportionately larger iron core than Earth does. It will also have, in 4.5 billion years, about 40 percent less heat from the decay of potassium, thorium and uranium. The heat generated by these radioactive isotopes is what drives plate tectonics, which plays an essential role in the geochemical cycle that regulates the amount of carbon dioxide in our atmosphere. Perhaps terrestrial planets forming today would be single-plate planets like Venus and Mars. The lack of plate of tectonics on Venus contributes to its hellish conditions…

…A planet must also be kept reasonably safe from threats… impacts by asteroids and comets, and blasts of radation. In our solar system… Comets are thought to reside in two long-term reservoirs, the Kuiper belt (which starts just beyond Neptune) and the Oort cloud (which extends halfway to the nearest star). Other stars probably have similar retinues…

Because Oort-cloud comets are only weakly bound to the sun, it doesn't take much to deflect them toward the inner planets. A tug from galactic tides, giant molecular clouds or passing stars can do the trick… As one goes toward the galactic center, the density of stars increases, so there are more close encounters. Moreover, a planetary system forming out of a metal-rich cloud will probably contain more comets than one forming out of a cloud with less metal. Thus, planetary systems in the inner galaxy should suffer higher comet influxes than the solar system does. Although the outer Oort cloud in such a system will become depleted more rapidly, it will also be replenished more rapidly from the inner cometary reservoirs.

High-energy radiation, too, is a bigger problem in the inner regions of the galaxy… sufficient energetic radiation can …wiping out the ozone layer…

… central black holes occasionally turn on when a star or cluster wanders too close and is pulled to its death. The result is a burst of high-energy electromagnetic and particle radiation… The worst place to be during such an outburst is in the bulge…

Supernovae and gamma-ray bursts are also more threatening in the inner galaxy, simply because of the higher concentration of stars there…

Radiation can also steal life from the crib. Sunlike stars are not born in isolation but rather are often surrounded by both low- and high-mass stars. The high levels of ultraviolet radiation emitted by the latter erode circumstellar disks around nearby stars, reducing their chances of forming giant planets… only about 10 percent of stars avoid this kind of harassment. This could explain why a mere 3 percent of nearby sunlike stars are found to have giant planets.

The Fifth Miracle, Paul Davies

The Chicken-and-Egg Paradox

DNA must enlist the help of proteins. The problem is, how could proteins get made without the DNA to code them, the RNA to transcribe the instructions, and the ribosomes to assemble them? It's Catch-22. In the 1960s [scientists began to believe that] maybe RNA came first...RNA is chemically active enough to behave as a

weak catalyst itself. This theory became known as the RNA world.

In 1974, Manfred Eileen and his colleagues also experimented with a chemical broth containing QB replication enzymes and salts, and an energized form of the four bases that make up the building blocks of RNA. They tried varying the quantity of viral RNA initially added to the mixture. As the amount of input RNA was progressively reduced, The experimenters found that, with little competition, it enjoyed untrammeled exponential growth. Even a single RNA molecule added to the broth was enough to trigger a population explosion. But then something truly amazing was discovered. Replicating strands of RNA were still produced even when *not a single molecule* of viral RNA was added! To return to my architectural analogy, it was rather like throwing a pile of bricks into a giant mixer and producing, if not a house, then at least a garage.

Do Eugene's experiments re-create the steps that nature took in making life from nonliving materials? Clearly not.

To Achieve RNA synthesis, Eileen had to use a very carefully prepared chemical mixture that, crucially, included a customized replication enzyme that was extracted from a living organism. This enzyme is highly specialized, and is not the sort of molecule that would have lying around on Earth prior to life. Eigen is a long way from demonstrating that nucleic-acid bases will spontaneously assemble and replicate in an incoherent mixture like primordial soup.

Test-tube experiments are frequently dismal failures. Key reactions stubbornly refuse to proceed without carefully designed procedures and the help of special catalysts. Nucleic-acid chains are notoriously fragile, and tend to snap long before they have acquired the fifty or so base pairs needed for them to act as enzymes. Water attacks and breaks up nucleic-acid polymers as it does peptides, casting doubt on any soupy version of an RNA world. Even the synthesis of the four bases required as building blocks is not without serious problems. As far as biochemists can see, it is a long an difficult road to produce efficient RNA replicators from scratch. No doubt a way could eventually be found for each step in the chemical sequence to be carried out in the lab without too much drama, but only under highly artificial conditions, using specially prepared and purified chemicals in just the right proportions. The trouble is, there are very many such steps involved, and each requires different special conditions. It is highly doubtful that all these steps would obligingly happen one after the other "in the wild," where a chemical soup or scum would have to take pot luck.

Proponents of the RNA-world scenario have received flak not just from chemist but from biologists too. If life began with RNA replication, you would expect the necessary replication machinery to be very ancient, and therefore common to all extant life. However, generic analysis reveals that the genes coding for RNA replication differ markedly in the three domains of life, suggesting that RNA replication was refined sometime *after* the common ancestor lived.

There has also been criticism on theoretical grounds. The RNA-world of theory focuses exclusively on replication at the expense of metabolism. As I have stressed already, life is about more than raw reproduction: living organisms also do things, and must do them if they are to survive to reproduce. Doing things costs energy. There has to be a ready source of energy for organisms to metabolize. In test-tube experiments, RNA molecules are lovingly supplied with specialized energetic chemicals to power their activities; in nature, RNA would have to make do with whatever was lying around. No Miller-Urey type of experiment has succeeded in fabricating the energizing chemicals used by extant life: they are all manufactured inside cells. Spoon-fed RNA may be a slick replicator, but without

an energy-liberating metabolic cycle already in place, these fecund molecular strands would soon become genetic dropouts.

An obvious escape route is to seek a self-replicating molecule far simpler than RNA to start the whole game going. The RNA world would then come only much later. It is conceivable that a relatively small molecule might be found that could replicate faithfully enough. The way would then lie open for molecular evolution to elaborate it, adding information step by step, until a level of complexity comparable to short strands of RNA was achieved. The system could then be "taken over" by RNA.

Is this how biogenesis really happened? Maybe. However, there are many obstacles to the theory, such as doubt over whether small molecules can be accurate enough replicators to avoid the error catastrophe. In extant life, high-fidelity replication seems to be associated with large, complex systems. The larger genomes, with their editing and error-correcting procedures, are the best copiers. So, if the trend among nucleic-acid replicators is followed down to smaller and smaller size, one expects only poor replication accuracy from simple molecules. Moreover, the smaller a molecule is, the more drastic will be the relative effect of any mutational change, and the greater the chance that the mutation won't inherit the property of being a replicator itself.

In recent years, attempts have been made to build small and simple replicator molecules in the lab, and to subject them to environmental stresses to see if they evolve into better replicators. Modest success has been claimed. However, these experiments do not demonstrate molecular evolution in nature. They have yet to show that the sort of small replicators that have been painstakingly designed and fabricated in the laboratory will form spontaneously under plausible prebiotic conditions, and if they do, whether they will replicate will enough to evade the error catastrophe. In short, nobody has a clue whether naturally occurring mini-replicators are even possible, let alone whether they have got what it takes to evolve successfully.

A completely different way to solve the chicken-and-egg paradox is to invert the order of events and assume that proteins came first and nucleic acids came afterwards. The big problem is then to understand how proteins can replicate without nucleic acid to replay the necessary instructions.

These various speculations...all share on assumption. Once life of some sort had established itself, the rest was plain sailing, because Darwinian evolution could then take over. It is therefore natural that scientists should seek to involve Darwinism at the earliest moment in the history of life. As soon as it kicks in, dramatic advances can occur with nothing fancier that chance and selection as a driving force. Unfortunately, before Darwinian evolution can start, a certain minimum level of complexity is required. But how was this initial complexity achieved? When pressed, most scientists wring their hands and mutter the incantation "Chance."

We see that it did happen, say some, so it must have beat the odds. Stanley Miller brings a more sophisticated version of this argument when he states that improvement in dating techniques confirmed the predictions of evolution as to how long the unfolding of each species took. But the argument is not whether this is so. The argument is how it happened.

So, did chance alone create the first self-replicating molecule? Or was there more to it than that?

vii-Later Developments

Curiously, some evolutionists are willing to accept the possibility that the origin of life might be built in but not the subsequent path of evolution. For example, Stephen Jay Gould, in a recent article

entitled "War of the World Views" in the journal *Natural History*, proposes "that the simplest kind of cellular life arises as a predictable result of organic chemistry and the physics of self-organizing systems but that no predictable directions exists for life's' late developments." But surely it is far more like that if the chemical evolution of the first cell was built in, then the far less complicated process-the biological evolution of life-will also in turn be built in. (Denton*, Nature's Destiny*, pg. 296)

Let us presume for a minute the unlikely scenario that evolutionists were able to explain how the first, most simple unicellular organism got off the ground. But it is a long way from a single cell to showing how all of the rich variety of plant and animal life came into being. According to evolutionists these changes were a result of change, genetic mutations leading to gradual cumulative changes. Many evolutionists thought that once they understood how genes are regulated in a living organism, they would be able to trace this back and show how life developed from its early beginnings. But according to Sir John Maddox in Scientific American, December 1999, pg. 35, not even the simplest bacterium has yet been comprehensively accounted for in this way.

Everyone agrees that genetic mutations take place - however it is quite another thing to say that those mutations can accumulate to produce significantly new or changed functions in the animal. Lee Spetner analyzes one of Darwin's favorite examples, the extension of the giraffe's neck. If the neck grows longer, holding the head higher, a stronger heart must be developed to pump blood to the greater height of the brain. Tougher blood vessels are then necessary to contain the blood under higher pressure. A higher pressure of body fluids outside the blood vessels is also necessary to prevent the blood from seeping through the smaller blood vessels in the lower parts of the body as well as through those in the brain when the giraffe lowers his head to drink. The high body-fluid pressure then requires a tighter skin to contain it. The giraffe's long neck also poses some breathing problems that must be solved in addition to circulatory problems. The long neck implies a long windpipe, which means that the giraffe has to fill and empty a more voluminous windpipe as he takes air into his lungs. (quoting Warren, 1974) All of these changes had to proceed together, a fact which the evolutionists try to answer by saying that only very small mutations took place at any one time. But there are serious difficulties with this whole approach.

Consider the odds that a monkey typing randomly on a typewriter will get a six word sentence containing 28 English letters, including 5 spaces, right. To get one letter right, the chances are one in 26. To get two letters, the chances are one in 676. To get the whole sentence the chance is one in 10 million, million, million, million, million million possibilities. Now this is a very short English sentence - much simpler than we are asking of evolution. (See *Permission to Believe* by Lawrence Kelemen and *In the Eye of a Needle* by Eric Coopersmith, who develop this reasoning at length with many examples.)

This reasoning is no different to the observations Avraham Avinu made about the world. In more recent times, it was made by William Paley (1743-1805): We do not find a watch ticking on the ground, he said, and presume that its pieces all just fell together by chance. A single cell is far more complex than a watch; the human brain infinitely more complex than a cell.

Even if we broaden the possibilities by including the whole universe and not just earth, the mathematical odds against chance and chemistry being responsible for life, Hoyle wrote, "are essentially just as unfaceable for a universal soup as for a terrestrial one" (*Evolution From Space* p.31). In other words, if Earth's chemical

soup could not have generated life without the intervention of intelligence, neither could the chemical soup of the entire universe. Hoyle added: "No matter how large the environment one considers [the entire cosmos], life cannot have had a random beginning. Troops of monkeys thundering away at random on typewriters could not produce the works of Shakespeare, for the practical reason that the whole observable universe is not large enough to contain the necessary monkey hordes, the necessary typewriters, and certainly the waste paper baskets required for the deposition of all the wrong attempts. The very same is true for living material" (*ibid*. p. 148).

Nobel Prize winning chemist, Dr. Harold C. Urey, likewise admitted: "All of us who study the origin of life find that the more we look into it, the more we feel that it is too complex to have evolved anywhere" [meaning anywhere else in the universe; i.e. seeding theory"] (Interview in *Christian Science Monitor*, January 4, 1962).

In *Origins* (Chapter 5, "The Odds") Shapiro summarizes all the various opinions regarding the chances of one bacterium coming into existence on Earth, assuming we already have all the necessary amino acids, and all that remains in to assemble them. On the low end, we have Hoyle's estimate of 1 in 10 to the 40,000th power. (Assuming this to be correct, adding 10 to the 22nd theoretical planets increases the odds of 1 in 10 to the 39,978th power, which is still not very encouraging.) On the other hand, Harold Morowitz, a Yale University physicist, estimates the chances of the above scenario taking place on earth as 1 in 10 to the 100th billion power. This is the second reason Hoyle found even the "seeders" to be an unacceptable explanation.

In 1967, at the Wistar Institute at Philadelphia, a group of mathematicians challenged the evolutionists in an acrimonious exchange. Mathematician D.S. Ulam argued that the number of mutations involved in developing the eye would have to have been so large that the time available was not nearly enough for them to happen.[1]

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[1]Evolutionists have no way of explaining the transition from single-celled to multicellular existence let alone the seemingly endless rungs of complexity thereafter. One particular challenge is the progression from individual independence to collective life. The best evolutionists manage is to vaguely intone that it seemed to have required some kind of chemical internet, by which independent cells communicated with one another and learned to enhance their collective well-being by acting in concert.

Even yeast cells produce synchronous pulses of a chemical called NADH; single-celled bacteria can form huge mat-like colonies that live almost like multicellular creatures. Soil amoebas -- highly complex single-celled organisms -- live independently from one another when there is plenty to eat. But in impoverished environments they join together to produce spores, and in their collective state they can move relatively fast, sensing light and warmth as guides to food supplies.

Evolutionists claim that the creation of collective beings from single-celled organisms has been going on a long time. Millions of years ago, they say, shells of single-celled animals (called nummulites) were deposited in huge layers in the limestone later used by ancient Egyptians in building the Sphinx. But saying that something happened a long time ago does not get us any closet to an explanation.

Among the oldest multicellular animals with an apparent sense of self are the sponges, which can exist either as independent, freely moving cells or as huge assemblages of cells held together by skeletons made of protein and minerals, and containing complex food-filtering plumbing. Once thought to have no power of locomotion, sponges have been shown to be capable of creeping over a surface at a speed of a few millimeters a day to seek out food.

At higher levels of organization, many individual insects (ants and bees for example)

Darwinists give three answers to this:

a - Cumulative selection

b - The argument from design is unproven

c - The world did evolve - therefore the difficulties are only apparent.

a-Cumulative selection

The random hits are sure to hit a right combination sooner or later. These right combinations are then saved, while further random hits are then made. Eventually, there will be enough saved hits to make a difference. This is why, they argue, the history of the world has had to be so long to get us to where we are today[1].

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are essentially mere components of the superbeing represented by the colony or hive. Communication provides the coherence allowing such superbeings to function; the complicated dance steps used by bees to inform their hive-mates of the directions and distances to food sources serve as their colonies' internet.

Higher still on the complexity ladder are birds that flock and fish that swim in perfectly choreographed collective patterns.

One of the strangest creatures is the naked mole rat, a nearly blind little animal living in East African deserts that spends its life underground within a "eusocial" organization, as biologists call it, more like that of insects than of other mammals. Each individual in a mole rat colony serves as a cog in a big wheel; only one female in a colony produces young, and the other animals have the specialized jobs of searching for food, caring for the young, guarding against predators and house-cleaning. For a naked mole rat, the sole focus of existence is the colony; individual life outside the colony is meaningless.

[1]NY Times April 8, 2001 Evolutionists Battle New Theory on Creation By JAMES GLANZ

[One of the leading proponents of Intelligent Design,] Dr. Dembski, said his rather vague doubts about Darwinism did not take scientific shape until he attended an academic conference in 1988, just after finishing his doctoral thesis. The conference explored the difficulty of preparing perfectly random strings of numbers, which are important in cryptography, in computer science and in statistics.

One problem is that seemingly random strings often contain patterns discernible only with mathematical tests. Dr. Dembski wondered whether he could devise a way to find evidence of related patterns in the randomness of nature.

Dr. Dembski eventually developed what he called a mathematical "explanatory filter" that he asserted can distinguish randomness from complexity designed by an intelligent agent. He explained this idea in "The Design Inference" (Cambridge University Press, 1998).

Dr. Dembski has applied his explanatory filter to the biochemical structures in cells - and concluded that blind natural selection could not have created them.

But in a detailed critique of Dr. Dembski's filter theory, published in the current issue of the magazine The Skeptical Inquirer, Dr. Taner Edis, a physicist at Truman State University in Kirksville, Mo., said that while Dr. Dembski's mathematics were impressive, his analysis was probably detecting only the complexity that evolution itself would normally produce.

"They have come up with something genuinely interesting in the information-theory arguments," Dr. Edis said of intelligent design theorists. "At least they make an effort to get rid of some of the blatantly fundamentalist elements of creationism."

Dr. Behe, whose book provided the biochemical basis for Dr. Dembski's work, said he believed that certain intricate structures in cells, involving the cooperative action of many protein molecules, were "irreducibly complex," because removing just one of the proteins could leave those structures unable to function. If the structure serves no function without all of its parts, Dr. Behe asks, then how could evolution have built it up step by step over the ages?

"I don't think something like that could have happened by simple natural laws," he said.

Most biologists disagree.

"It's flat wrong," said Dr. H. Allen Orr, an evolutionary geneticist and professor at the University of Rochester. Dr. Orr said that cell structures might have been put together in all sorts of unpredictable ways over the course of

There are a number of problems with this:
1-We have already argued that the history of the world is not long enough for the changes that need to be made.

2-Unless each "random hit" has value in and of itself (which we show elsewhere is not the case) there has to be some mechanism to know which change to save and which to discard. But that presumes a knowledge of what end result is required. And evolution is blind - there is no supposed sentient being guiding the process. Some evolutionists argue that there are an infinite number of end results. But this doesn't help much. Firstly, such a bold claim would have to be shown - and it can't be. It doesn't help to show that there are just many possible results - "many" doesn't make the statistical chances much smaller. But besides that, the basic problem remains - the evolving creature had to know to save some things and not others. How does it know, according to evolutionary theory what to save and what not. In other words, it is difficult to know how the whole mechanism of randomness (i.e. changes totally by chance) could promote any structure at all. (Above we simply stated that it was statistically unlikely that such changes would happen just by chance. Here we are saying that even if the world got that lucky, it wouldn't have looked as structured and as ordered as we see things today). David Berlinsky (see **Appendix Q - Readings**) points out that in every other system we know randomness is the enemy of order. Random changes in English yield gibberish. Random changes in computer programs are even worse. The computer just jams. We have to remember that each change is blind - it is not changing toward any target. The first and all the subsequent changes in a giraffe's neck was not trying to produce the final, long neck. There is no design involved. If random selection worked to help shape the trunk of an elephant, why can we not reproduce it elsewhere - with words or computers for example?

3-All biologists agree that insects, reptiles, mammals, fish and birds are incredibly structured and sophisticated. (Even Stephen Gould, who says that all animals are not as perfect as they could be, agrees to this. Below we deal with Gould's arguments.) In evolutionary terms, they show adaptive complexity. According to evolution, the first forms of life were very simple, single celled things. Slowly, higher and higher forms of species developed. There is an evolutionary tree, which shows this. However, according to the

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evolution and that a protein added might not have been indispensable at first, but only later, when many more proteins were woven around it.

"The fact that that system is irreducibly complex doesn't mean you can't get there by Darwinian evolution," Dr. Orr said.

Exactly how a designer might have assembled cell structures, say, is a question seldom addressed by design theorists. But they point out that Darwinists cannot necessarily offer detailed, step-by-step sequences of events for them either.

Dr. Behe, Dr. Dembski and Phillip E. Johnson, a professor emeritus of the law school at the University of California at Berkeley, are regarded as the intellectual fathers of the design theory movement. Mr. Johnson's book "Darwin on Trial" (InterVarsity Press, 1991) has become its manifesto. The book focuses on what Mr. Johnson says are the difficulties Darwinian theory has in explaining the fossil record.

Until last fall, Dr. Dembski was the director of a center at Baylor that was dedicated to the study of intelligent design theory. After complaints from other Baylor faculty members, the center's focus and leadership were changed, and it now includes design theory as well as other philosophical, theological and scientific topics.

Dr. Dembski and Dr. Behe are fellows of the Discovery Institute, the Seattle research institute that promotes intelligent design in its Center for the Renewal of Science and Culture. ...

evolutionists it is difficult to understand why the new species should keep on getting more structured and sophisticated. The simple bacteria survive a lot better than bison or elephants do. It may, from an evolutionary point of view, be the best species on earth. Why don't we see examples of species where the simpler form of the species survived and the more complex form dies out.

4-Greater structure has to defy the law of entropy (i.e. that closed systems move toward least order), drawing great deals of energy from the environment to do so. It is unlikely (though possible) that natural selection alone would propel most organisms in the opposite direction of this law. (Note we are not saying that structure contradicts the law of entropy; that would only be true if an entire closed system worked toward structure instead of away from it. All we are saying is that evolutionary development requires that greater structure be made at the expense of the broader environment. The question is why this is so?)

5-The case of man is considered separately below. However, here it should be pointed out that all the differences between man and chimpanzees, is reflected in only 1% difference of genetic material. According to the evolutionists, man must have developed very slowly from the apes. Slowly, he started walking upright, which led to thousands and thousands of the more advanced ways in which we think, to language, to other physical changes, etc. Each development must have been a function of a random, genetic mutation. We should then, have found many more than 1% difference in our genetic makeup. (How such a small genotypical difference can reflect such a large phenotypical differentiation is not in and of itself difficult. The problem is the evolutionary explanation of how this came about.)

6-There are other critiques, too complex for this presentation. See *Commentary*, Sep. '96, pg. 26 - Berlinsky's response to Arthur Shapiro.

b-The argument from design is unproven

Darwinists have argued that the argument from design does not conclusively prove that their theory is wrong and that G-d made the universe.[1] In fact, some very sophisticated attacks were made on Paley's argument by the

[1] Besides, classical evolutionary gradualism is not the only scientific explanation that has been proposed. Lynn Margulis has suggested a theory of symbiosis that involves "the joining of two separate cells, or two separate systems, *both of which are already functioning*. ... Neither Margulis nor anyone else has offered a detailed explanation of how the preexisting cells originated. ... A second alternative to Darwinian gradualism ... is known as "complexity theory" and has been championed by Stuart Kauffman." ... The essence of complexity theory is that "some small changes in a computer program cause large changes in the program's output (typically a pattern of dots on a computer screen), so perhaps small changes in DNA can produce large, coordinated biological changes. The argument never goes further than that. No proponent of complexity theory has yet gone into a laboratory, mixed a large variety of chemicals in a test tube, and looked to see if self-sustaining metabolic pathways spontaneously organize themselves. If they try to do such an experiment, they will merely be repeating the frustrating work of origin-of-life scientists who have gone before them - and who have seen that complex mixtures yield a lot of muck on the sides of a flask, and not much else. ... The June 1995 issue" of *Scientific American* stated "Artificial life, a major subfield of complexity studies, is "fact-free science," according to one critic. But it excels at generating computer graphics. " Like symbiosis theory ... complexity theory requires preexisting already functional systems" (Michael Behe, *Darwin's Black Box*, pg. 188-191)

philosopher, David Hume, and a long discussion has taken place among the philosophers since then. Although this is true, it misunderstands the nature of science. For every phenomena there are potentially an unlimited number of competing theories, all of which claim to explain that phenomena. The scientific community will accept the theory, which provides the best explanation out of the competing theories, even if there are significant difficulties with that theory. Purely from a scientific point of view, G-d as Creator, is a far better scientific theory (based on criteria of consistency, unity, simplicity, broadness, etc.) than random evolution especially if we talk about G-d directed evolutionary developments within the creation process. Evolution is an explanation for how the world came about - it may even be a good explanation,[1] but it cannot compete with the explanation of G-d as Designer, an explanation which "flows naturally from the data itself,"[2] and therefore must be rejected.

Besides, Hume's criticism was "one of the principle weaknesses of this argument was raised by David Hume, who pointed out that organisms may be only superficially like machines but natural in essence. Only if an object were strikingly analogous to a machine in a very profound sense would the inference to design be valid. Hume's criticism is generally considered to have fatally weakened the basic analogical assumption upon which the inference to design is based, and it is certainly true that neither in the eighteenth century nor at any time during the past two centuries has there been sufficient evidence for believing that living organisms were like machines in any profound sense."

"It has only been over the past twenty years with the molecular biological revolution and with the advances in cybernetic and computer technology that Hume's criticism has been finally invalidated and the analogy between organisms and machines has at last become convincing. In opening up this extraordinary new world of living technology biochemists have become fellow travelers with science fiction writers, explorers in a world of ultimate technology, wondering incredulously as new miracles of atomic engineering are continually brought to light in the course of their strange adventure into the microcosm of life. In every direction the biochemist gazes, as he journeys through this weird molecular labyrinth, he sees devices and appliances reminiscent of our twentieth-century world of advanced technology. In the atomic fabric of life we have found a reflection of our own technology. We have seen a world as artificial as our own and as familiar as if we have held up a mirror to our own machines.

"The almost irresistible force of the analogy has completely undermined the complacent assumption, prevalent in biological circles over most of the past century, that the design hypothesis can be excluded on the grounds that the notion is fundamentally a metaphysical a priori concept and therefore scientifically unsound. On the contrary, the inference to design is a purely a posteriori induction based on a ruthlessly consistent application of the logic of analogy. The conclusion may have religious implications, but it does not depend on religious presuppositions..." (Michael Denton, Evolution - A Theory in Crisis, Burnett Books, London, 1985, pp. 339-342).

[1]Although this seems unlikely as Michael Behe states: "No one at all can give a detailed account of how the cilium, or vision, or blood clotting, or complex chemical process might have developed in a Darwinian fashion." (*Darwin's Black Box*, pg. 187)

[2]Ibid., pg. 193

c-The world did evolve - therefore the difficulties are only apparent

In response to Ulam's asserting of the mathematical improbability of the eye evolving (see above), the evolutionists responded by stating that the eye had evolved and therefore mathematical difficulties must be only apparent. In other words, the evolutionists again confused their theory with fact, allowing themselves to claim that the facts themselves must be wrong.

Stanley Miller's Attack on Intelligent Design – the designer could not get it right:

A much better defence of evolution comes from Stanley Miller, in the face of a powerful attack on intelligent design.

As we have already stated, animals in deifferent parts of the world are often similar to each other, but different to other animals in other eco-environments. "Consider two isolated groups of islands, for example: Cape Verde, off the coast of Africa, and the Galapagos, off the western coast of South America. Both of these island groups contain species that are endemic to them; that is, they are found nowhere else in the world."

"Darwin himself noted: There is a considerable degree of resemblance in the volcanic nature of the soil, in climate, height, and size of the islands, between the Galapagos and Cape de Verde Archipelagos: but what an entire and absolute difference in their inhabitants! The inhabitants of the Cape deVerde islands are related to those of Africa, like those of the Galapagos to America. I believe this grand fact can receive no sort of explanation on the ordinary view of independent creation[1]."

"Both group of islands are geologically recent. A few founding species from the respective mainland colonized each archipelago, and then geographic isolation allowed natural selection to go to work[2]."

Now, this also applies to the extinct organisms in that area, so that in each place one can reconstruct a sequence of evolving animals from the fossil record, which is different in each place. Miller finds this sequence so convincing that he presumes that the protagonists of intelligent design "would have to believe that it was also the designer's choice to mislead- by producing sequences if organisms that mimic evolution so precisely that generations of biologists would be sure to misinterpret them[3]."

Take elephants, for example. "The skull, teeth, and jaws if elephants are distinctly different from other mammals, which make extinct elephant-like organisms easily recognizable from fossils. In 1997, Hezy Shoshani, the founder of the Elephant Research Foundation, described some of these extinct proboscideans (elephant-like animals) in *Natural History*. Beginning in the Eocene, more than 50 million years ago, he traced the evolution of the two distinct species of modern elephants. … Shaohani presented the kind of branching lineage that should be familiar to anyone who has looked into the geological record of any living species[4]."

All this leads to what Miller considers a devastating attack on intelligent design. "Like it or not, intelligent design must face these data by arguing that each and every one of these species was designed from scratch. For some reason, then, that great designer first engineered a small trunk into a little critter called *paleomastodon* at the beginning f the Oligocene some 35 million years ago. Ten million years later, the trunk design was used again in the larger *Gomphotherim*, along with a set of protruding tusks. Evidently the designer

[1] *Finding Darwin's G-d,* pg. 93

[2] pg 94

[3] Kenneth Miller, *Finding Darwin's G-d,* Pg. 94

[4] Ibid, pg. 95

now thought that the trunk was a good idea, because he used it again in *Deinotherium* and *Platybeoden* in North America, and for *Gomphotherium* in Africa, all at the beginning of the miocene. By the end of the Miocene, *Primelephas*, whose well –developed trunk and tusks are unmistakably similar to the larger species of modern elephants, would also appear in Africa."

In the end, this intelligent designer would have had to create twenty two distinct species in just the last 6 million years, which amount to roughly one every 230,000 years. There are approximately 10,000 living species of mammals. This amounts to one new mammalian species…every twenty three years or so. And there are millions of insect species[1].

And not only are new species created, but old ones keep on dying out. "Careful studies of the mammalian fossil record show that the average length of time a species survives after its first appearance is around two million years. Two million years of existence, and then extinction. The story is similar fir insects (average species duration: 3.6 million years). In simple terms, this designer just can't get it right the first time. Nothing he designs is able to make it over the long term."

(See also **D v-vii**)

viii-The Extinction of the Dinosaurs

The Anthropic Principle, Professor Nathan Aviezer in Jewish Action, Spring 1999:

The dinosaurs were one of the most successful groups of animals that ever lived - the largest, strongest, fastest and fiercest animals of all time. The dinosaurs inhabited every continent, the air and the oceans. Other animals lived in constant fear of being devoured by these gigantic reptiles. ...

After being the undisputed masters of our planet, all the dinosaurs world-wide suddenly became instinct. .... The explanation for the mass extinction - the impact of meteors or comets colliding with earth became known as the "impact theory". ... By 1987, Professor Alvarez [the original proposer of the theory] could point to 15 different pieces of scientific data that supported the theory.[1]

The point of central importance is that the collision between the meteor and Earth was [considered by many scientists] a matter of sheer luck. ... The extinction of a given species is higher group is considered more bad luck than bad genes. (David Raup, past president of the American Paleontological Society in Acta Geologica Hispanica, vol. 15, 1981). ...

[1] Ibid, pgs. 99 - 100

[1]However, this has been recently disputed. Scientific American, Sep, 1997 reported the following: The extinction of the dinosaurs is one of the great mysteries of evolution, and scientific sleuths are not shy about reconstructing the crime. Walter Alvarez has claimed that an asteroid, which crashed to earth, brought about the dinosaur's demise. (T. Rex and the Crater of Doom, by Walter Alvarez, Princeton Press) However Charles Officer and Jack Page assert: "The Alvarez hypothesis has collapsed under the weight of accumulated geologic and other evidence. (The great dinosaur extinction controversy, Charles Officer and Jack Page, Addison-Wesley Press) Alvarez's father, Luis, originally brought as evidence for the comet theory the fact that at about that time iridium levels shot up dramatically. Iridium, it was thought then, comes almost exclusively from space. But today, such enhancements have been found at more than 200 places over the earth, in shallow and deep seas, in rivers and on land. Officer and Page feel that this is more indicative of volcanoes than a comet. The enormous outpouring of lava would have led to the environmental changes causing the extinctions

When a mass extinction strikes, it is not the "most fit" species that survive; it is the most fortunate. (David Jablonski, of the University of Chicago and a world authority on the subject of mass extinctions in National Geographic June 1989.) ... [What is meant by sheer luck is] the occurrence of an extremely improbable and totally unexpected event. The Darwinian principle of "the survival of the fittest" is irrelevant in such a process.

From our human point of view, that impact was one of the most important single events in the history of our planet. Had it not taken place, the largest mammal today might still resemble the rat-like creatures that were then scurrying around trying to avoid being devoured by the dinosaurs. (Alvarez in Physics Today, July 1987)

... If the impact had been weaker, no species would have become extinct; ... if the impact had been stronger, all life on this planet would have ceased. .... The impact must have been just the right strength to ensure that the mammals survived, while the dinosaurs didn't. (ibid.)

It has recently become clear to scientist that the sudden destruction of all the world's dinosaurs was just one of a long series of completely unexpected, highly improbable events whose occurrence was necessary for human beings to exist - and all these events just happened to occur in precisely the required sequence. Indeed this is the major theme in the recent book, entitled *Wonderful Life*, by Professor Gould. Again and again, Gould emphasizes how amazing it is that human beings exist at all, *because we are an improbable and fragile entity (pg. 14) ... the result of a staggeringly improbable series of events, utterly unpredictable and quite unrepeatable. ...Replay the tape [of life] a million times from the same beginning, and I doubt that Homo Sapiens would ever appear again.(pg. 319)*

ix-Man

It has become increasingly clear to scientists that the existence of man requires very specific conditions in the world to exist. This requirement is known as the anthropomorphic principle. (See Nathan Aviezer, "In the Beginning" Part 11, chapter 5). As Freeman J. Dyson puts it: "It almost seems as if the universe must have in some sense known that we were coming." (*Scientific American*, Sep. 1971, pg. 59). Yet, Darwinism, by eventually applying the theory of common descent to man as well, seemed to attack this idea. However, even hard-core Darwinists have been forced to admit to man;s uniqueness. Probably the leading Darwinist today, Ernst Mayr, has the following to say[1]:

"Darwin developed a new view of humanity and, in turn, a new anthropocentrism. Of all Darwin's proposals, the one his contemporaries found most difficult to accept was that the theory of common descent applied to Man...."

"Ironically, though, these events did not lead to an end to anthropocentrism. The study of man showed that, in spite of his descent, he is indeed unique among all organisms. Human intelligence is unmatched by that of any other creature. Humans are the only animals with true language, including grammar and syntax. Only humanity, as Darwin emphasized, has developed genuine ethical systems. In addition, through high intelligence, language and long parental care, humans are the only creatures to have created a rich culture. And by these means, humanity has attained, for better or worse, an unprecedented dominance over the globe."

Religious and other higher aspects of man

[1]*Darwin's Influence on Modern Thought in Scientific American*, July 2000.

Many evolutionists recognize that man is unique among the species. In 1998 Ian Tattersall who is chairman of the department of anthropology at the American Museum of Natural History in New York City wrote a book called, "Becoming Human: Evolution and Human Uniqueness." "Homo sapiens is not simply an improved version of its ancestors," he writes, "it's a new concept, qualitatively distinct from them in highly significant if limited respects." He points to the uniqueness of Ice Age cave art, in Venus fertility figurines, etc. which show that early humans had a high degree of awareness of their relationship with the world around them. But more than that, humans were not only responsive to their environment, but proactive. Cro-magnums were fully capable of language, which allowed for symbolic thought. He finds synthetic theories incapable of explaining this abrupt departure from everything that came before it, finding punctuated equilibria, allowing for revolutionary changes, the only viable theory.

Yet even this is not sufficient to explain the fact that mankind has spent untold resources on religion, nationalism, art, searches for meaning and higher values. None of these appear to lend themselves to greater adaptation by man. In fact just the opposite is true: Religion and nationalism are and seem always to have been the two greatest sources of war, conflict and tension in the world. It is hard to see how they have increased the chances of mankind to survive. Indeed, Alfred Wallace, who co-invented with Darwin the theory of evolution, and who in fact was more insistent than Darwin that natural selection be the only mechanism of change, "halted abruptly before the human brain." (Stephen J. Gould, *The Panda's Thumb*, chapter 4) "Our intellect and morality", Wallace argued, "could not be the product of natural selection;...some higher power - G-d, to put it directly - must have intervened to construct this latest and greatest of organic innovations." Homo Sapiens had "something which he has not derived from his animal progenitors - a spiritual essence or nature (that) can only find an explanation in their unseen universe of Spirit." *(Scientific American*, Oct. 1996, pg. 72) Gould calls this "a failure of courage to take the last step and admit man fully into the natural system - a step that Darwin did with commendable fortitude."[1]

Actually, Darwin may have been as "cowardly" as Wallace. According to Louis Pollack (*Fingerprints on the Universe*) Darwin admitted years later that the exact role of natural selection was unclear and there may be "some innate tendency to perfectibility." In any case, Gould never answers Wallace's questions: If early hominids required only a gorilla's

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[1]In attempting to deal with this problem, Ernst Mayr, (*Darwin's Influence on Modern Thought in Scientific American*, July 2000) resorts to mumbo jumbo, inventing explanations that have no bearing on any fact whatsoever:

Darwin provided a scientific foundation for ethics. The question is frequently raised - and usually rebuffed - as to whether evolution adequately explains healthy human ethics. Many wonder how, if selection rewards the individual only for behavior that enhances his own survival and reproductive success, such pure selfishness can lead to any sound ethics. The widespread thesis of social Darwinism, promoted at the end of the 19th century by Spencer, was that evolutionary explanations were t odds with the development of ethics.

We now know, however, that in a social species not only the individual must be considered - an entire social group can be the target of selection. Darwin applied this reasoning to the human species in 1871 in *The Descent of Man*. The survival and prosperity of a social group depends to a large extent on the harmonious cooperation of the members of the group, and this behavior must be based on altruism. Such altruism, by furthering the survival and prosperity of the group, also indirectly benefits the fitness of the group's individuals. The result amounts to selection favoring altruistic behavior.

intelligence to survive, he asked, why had they evolved brains capable of devising language, composing symphonies and doing mathematics?

Similarly, Lyall, one of the leading biologists of the time who accepted the basic theory of evolution, wrote in the last chapter of his *The Antiquity of Man*, that man was distinguished from the beasts by virtue of his reason and his moral and religious faculties. Baumer (*Modern European Thought*, pg. 349) paraphrases him as saying, "But how save by a 'leap', could this qualitative change come about? And how could there have been such a leap without the connivance of a higher law of development, attributable to the Deity Himself?"

Consciousness and the Mind of Man

The very idea of explaining consciousness and even more so self-awareness is highly problematic for evolutionary biology. Stephen Gould claims that it is "a glorious accident", a by-product of the intelligence that allows humans to build tools and otherwise manipulate their environment. According to this approach humans are no better off than if they were computers, totally oblivious of their own existence. Others dispute Gould's thesis and there is no dominant theory likely to emerge on this issue soon. The problem is exacerbated by the fact that scientists have not managed to even agree what consciousness and self-awareness is, when it begins and whether it is unique to humans. - *NY Science Times*, April 22, 1997.

The mind remains a mystery. Not only is there no explanation of how it evolved; there is not even anything near an explanation of the mind as it exists today. The following excerpts from John Horgan's book, *The Undiscovered Mind: How the Human Brain Defies Replication, Medication, and Explanation* (Free Press), show just how serious and complex a problem explaining the mind is:

In "Materialism and Qualia: The Explanatory Gap," published in *Pacific Philosophical Quarterly* in 1983, Joseph Levine, a philosopher at North Carolina State University, addressed the puzzling inability of physiological theories to account for psychological phenomena. Levine's main focus was on consciousness, or "qualia," our subjective sensations of the world. But the explanatory gap could also refer to mental functions such as perception, memory, reasoning, and emotion - and to human behavior.

The field that seems most likely to close the explanatory gap is neuroscience, the study of the brain. Today neuroscientists are probing the links between the brain and the mind with an ever more potent array of tools. In fact the 1990s has been called the decade of the mind. Scientists today can watch the entire brain in action with positron emission tomography and magnetic resonance imaging. They can monitor the minute electrical impulses passing between individual nerve cells with microelectrodes. They can trace the effects of specific genes and neurotransmitters on the brain's functioning. The field's most striking characteristic is its production of such an enormous and still-growing number of discoveries. Researchers keep finding new types of brain cells, or neurons; neurotransmitters, the chemicals by which neurons communicate with each other; neural receptors, the lumps of protein on the surface of neurons into which neurotransmitters fit; and neurotrophic factors, chemicals that guide the growth of the brain from the embryonic stage into adulthood.

Not long ago elaborated, researchers believed there was only one receptor for the neurotransmitter acetylcholine, which controls muscle functioning; now at least ten different receptors have been identified. Experiments have turned up at least fifteen receptors for the so-called GABA (gamma-amino butyric acid)

neurotransmitter, which inhibits neural activity. Research into neurotrophic factors is also "exploding." Researchers had learned that neurotrophic factors continue to shape the brain not only in utero and during infancy but throughout our life span. But for all this information, neuroscientists had not determined how to fit all these findings into a coherent framework. "We're not close to having a unified view of human mental life," Fischbach, a leading neuroscientist said.

Fischbach was spotlighting one of his field's most paradoxical features. Instead of finding a great unifying insight, they just keep uncovering more and more complexity. Neuroscience's progress is really a kind of anti-progress. As researchers learn more about the brain, it becomes increasingly difficult to imagine how all the disparate data can be organized into a cohesive, coherent whole. . Scientists still did not really understand how the brain develops in the womb and beyond, how the brain ages, how memory works. The Harvard neuroscientist David Hubel stated at the end of his book Eye, Brain and Vision:

> This surprising tendency for attributes such as form, color, and movement to be handled by separate structures in the brain immediately raises the question of how all the information is finally assembled, say for perceiving a bouncing red ball. It obviously must be assembled somewhere, if only at the motor nerves that subserve the action of catching. Where it's assembled, and how, we have no idea.

This conundrum plagues not only neuroscience but also evolutionary psychology, cognitive science, artificial intelligence - and indeed all fields that divide the mind into a collection of relatively discrete "modules," "intelligences," "instincts," or "computational devices." Like a precocious eight-year-old tinkering with a radio, mind-scientists excel at taking the brain apart, but they have no idea how to put it back together again.

Cognition entails much more than merely responding automatically to a stimulus, like a driver stopping at a red light and going on green. "Humans have lots of habitual responses, automatic responses, reflexive responses", explained Goldman-Rakic, another leading neuroscientist. "But that's not what makes them human. What makes them human is the *flexibility* of their responses, their ability not to respond as well as to respond, their ability to reflect, and their ability to draw upon their experience, to guide a particular response at a particular moment." Was she really talking about free will? "I could use that terminology," Goldman-Rakic replied, dropping her voice and speaking in a conspiratorial mock whisper, "if I really were disinhibited."

Cognitive science "is really a science of only a part of the mind, the part having to do with thinking, reasoning, and intellect," LeDoux complained in his 1996 book, *The Emotional Brain*. "It leaves emotions out. And minds without emotions are not really minds at all. They are souls on ice - cold, lifeless creatures devoid of any desires, fears, sorrows, pains, or pleasures."

Although consciousness is often equated with the mind, most mental processes occur beneath the level of awareness.

Explaining consciousness is not as important as understanding how the brain draws on both genes and experience to create a self, a personal identity, in each individual. That makes you you and me me is perhaps the biggest "mind" problem.

And then there is the problem of explaining emotion. LeDoux doubted whether any single theory would account for emotion. There are many aspects of emotion, he noted. "There's an

evolutionary component, there's a cognitive component, a behavioral component. It's just a question of what the balance in the particular situation is." the mechanisms underlying fear are probably quite different from those underlying lust or hatred.

"We have no idea how our brains make us who we are. There is as yet no neuroscience of personality. We have little understanding of how art and history are experienced by the brain. The meltdown of mental life in psychosis is still a mystery. In short, we have yet to come up with a theory that can pull all this together.

We cannot explain how the brain constructs picture of the world from the many disparate pieces it draws upon. We do not have a coherent theory of how anxiety and depression works, let alone a whole theory of emotion; nor to we know how we experience a wonderful piece of music (be it rock or Bach), let alone having a theory of perception. And to understand fear or love in the absence of a theory of emotion in general wouldn't be so bad either. Nor does any theory begin to relate to the enormous variability of all brains and minds. Every individual is comprised of a singular combination of physiology, social identity, and personal values.

(See also Fred Hoyle, *The Intelligent Selection*)

x-The World Seems to Have Been Pre-Programmed for Life

The more perfect the world, the weaker the evolutionary theory:

In his book, *Nature's Destiny*, Michael Denton describes in great detail how the entire universe seems programmed for the type of chemically based life we have here on earth, and in particular seemed pre-programmed to produce Human beings. (See **Appendices A-K** where we have described these findings in great detail.)

Denton goes through the remarkable and unusual properties of water, carbon, hydrogen, and all the basic elements as well as their interaction to show how these are predisposed in many different ways (possibly in all their properties) to facilitate life as we know it.

In addition, all elements of life, the DNA, RNA, the cell, etc. seem to be the best possible formulation for the purposes for which they serve. They seemed to have been designed. This principle has been called by some the anthropic principle[1], and is now accepted by the entire scientific community. Acceptance of the idea of intelligent design in nature ought to have been considered a revolution as great as the discovery of the Big Bang.[2] The implications, that G-d created the universe, are just as profound. An outstanding presentation of the anthropic principle, as well as the psychology behind those who refuse to accept its implications, is brought below:

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[1]Technically, the anthropic principle refers to something other than design. It refers rather to the idea that there are many universes, with perhaps only ours suitable for life.

[2]As Michael Behe puts it: The observation of the intelligent design of life is as momentous as the observation that the earth goes around the sun or that disease is cause by bacteria or that radiation is emitted in quanta. The magnitude of the victory, gained at such great cost through sustained effort over the course of decades, would be expected to send champagne corks flying in labs around the world. ... But no bottles have been uncorked, no hands slapped. Instead a curious, embarrassed silence surrounds the stark complexity of the cell. ... The dilemma is that while one side of the elephant is labeled intelligent design, the other side might be labeled G-d. *(Darwin's Black Box*, pg. 233)

The "2001" Principle[3]

[The story-line of the movie *2001: A Space Odyssey*[1] is as follows:[2]] The United States has built a colony on the moon, ... and scientists digging there find [a black metallic slab about 15 feet tall]. ... which has been on the moon for four million years, precluding the possibility that any human being put it there. The inevitable conclusion, as stated in the film, is that "This is the first evidence of intelligent life off the earth."

... Sunlight hits the slab, perhaps for the first time in eons, causing it to emit a beam into outer space. A spaceship is built and a crew is assembled to follow the beam. There is hope that the Americans will discover the intelligence that is responsible for the slab and its beam. ...

HAL an [onboard] computer ... rebels and kills all the astronauts [on board]. Dave, the last surviving astronaut, ... manages to dismantle him. Dave then continues the odyssey alone. In the end, Dave is captured in an inter-galactic net, apparently by the makers of the slab. We find him facing himself as an old man, in a distant place across space] on his deathbed. .... In the last moments of his life, he finds the strength to pull himself up and point to an object which has suddenly appeared in the room. It is the enigmatic black "monolith" which initiated the entire space odyssey. Then, just as suddenly, a huge human embryo appears on the screen floating in outer space. Wide eyed, it turns to the viewing audience, and to the triumphant tones of "Thus Spoke Zarathrusta," the film ends. There is no explanation, the film just ends.

Let us try to crack this riddle. We shall see, in fact, that "2001" does contain a message about reality -- one of ultimate importance for every human being. ...

Cognitive Dissonance

[3]The 2001 principle appears on the web at http://www.jencom.com/2001. It is by far the best presentation of the principle of intelligent design which I have seen (and it is laid out very aesthetically). I recommend that anyone dealing with this issue read the original in full. *The 2001 Principle* also appears in book form, although, unlike the web site, it is now ten years out of date. Included in the web site is a lot of other material and links concerning the Anthropic Principle and critiques of evolution. Below I have brought extensive selections from the web site.

The 2001 Principle is based on a movie called *2001: A Space Odyssey* written by Arthur C. Clarke a Kubrik. This in turn was based on a novel by the same name written by Clarke. In the March 1997 issue of Yahoo Magazine, film critic Roger Ebert stated that "2001" was the greatest science fiction film ever made. Considering that this statement is being made 30 years after the film was produced, it shows that "2001" has enduring value. It is generally agreed that there is no comparison between "2001" and "2010." The zenith achieved in "2001" was never equaled. "2001" has become part of our culture. The Newsweek Cyberscope add for Cyberfest in the Summer of '96 discussed "2001" under the title "Culture."

[1]In the annals of motion picture history, the [1960's] film "2001: A Space Odyssey" holds a special place. Watching the film, the viewer feels that he is being treated to nothing less than a encapsulated tale of human civilization, from Day One to the present, and even into the future. .... Millions of people have seen this film, and though "2001" is outwardly science fiction, every viewer senses ... [that] something is being said about life, the universe, and reality in general, and the message seems to be one of enormous consequence. What is actually being said, however, is strangely elusive. ....

[2]The movie actually begins much earlier, pre-human, when a colony of apes first discover the mysterious, metallic slab.

To crack this riddle, one needs to understand an elementary principle about human psychology: A person's wants and desires influence more than his behavior. They influence his thinking, as well, and even his powers of perception. This is true even with regard to things that would be otherwise intuitively obvious. Psychologists say that when a person is confronted by ideas or facts that are at odds with his pre-existing notions, what results is "cognitive dissonance," a sort of static in the human psyche. This "static" has the power to distort or even block perception.

An extreme example of this is described by psychiatrist Rollo May in his best-selling book, Love and Will: "A patient of mine presented data the very first session, that his mother tried to abort him before he was born, that she then gave him over to an old-maid aunt to raise him for the first two years of his life, after which she left him in an orphan's home, promising to visit him every Sunday, but rarely putting in an appearance. Now, if I were to say to him -- being naive enough to think that it would do some good -- 'Your mother hated you,' he would hear the words but they might well have no meaning whatever for him. Sometimes a vivid and impressive thing happens. Such a patient cannot even hear the word, such as 'hate,' even though the therapist repeats it... The patient cannot permit himself to perceive the trauma, until he is ready to take a stand toward it." [emphasis ours]

When disturbing information creates "cognitive dissonance," the "static" discredits the information, so that a person does not feel compelled to cope with it, even if it is true. If a fact or idea is sufficiently contrary to his or her "status quo," the threatening data can be prevented from entering their consciousness at all! In effect, "cognitive dissonance" is a tremendously powerful "self-preservation" mechanism which can completely override the human desire for truth.

In "2001" there is a certain idea that can create very intense "cognitive dissonance," even in people who are very well-adjusted and highly intelligent. That is, what the film says about the discovery of the monolithic slab can actually be said of the film itself:

THERE IS SOMETHING IN "2001" THAT CAN CAUSE "WIDESPREAD

SHOCK AND SOCIAL DISORIENTATION."

What, in fact, is it about "2001" that can jolt a person so powerfully?

Man is an intelligent, expressive and creative force in the universe. He realizes this, and is proud of it. This being the case, if there were indications that, really, his entire existence is an expression of a higher intelligence, he would be greatly shaken. Such a notion would be "belittling" to him. Moreover, if this notion is correct, it would require him to make major adjustments in terms of how he views himself and the world around him. Accordingly, such indications would be very threatening, and would trigger great amounts of dissonance in him.[1]

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[1]From popular literature we can gain a feeling for just how much trauma might be involved. In Kurt Vonnegut's Breakfast of Champions, the author decides to "go down" into the pages of his book, in order to meet his favorite character. At this point in the book, the favorite character is sitting at a bar, calmly nursing a drink. Suddenly he is overcome by a tremendous feeling of anxiety and apprehension. He senses that something is about to enter the

room -- something not only awesome, but also something that he "cannot possibly face." That something is the author -- Vonnegut.

Imagine the scene. There sits the favorite character, content with the idea that he is, in fact, a real human being. To say the least, his encountering his creator would occasion a profound crisis in identity. Finding out that he is nothing more than a character in a story would force him to make major adjustments in his way of thinking. Can you appreciate the potential for trauma here?

Due to "cognitive dissonance," if a person is asked if a certain idea is true, and his response is, "I don't know," it may not be the case that "sufficient evidence" is lacking. His "I don't know" may be of the "cognitive dissonance" variety. In sum, his doubt can be categorized as being of two possible types:

TYPE I, THE LOGICAL "I DON'T KNOW," is based on logic and reason. For example, before probes landed on Mars and sent back reports, if a scientist had been asked if Mars had life on it, he would have answered simply, "I don't know." The basis for his answer was purely rational. He lacked information. Before the probes scientists had no conclusive proof about whether there was life on Mars Possibly there was life there, but how could anyone know?

TYPE II, THE EMOTIONAL "I DON'T KNOW," is completely divorced from logic and reason. Doubt here is not based on a lack of evidence or a shortage of information. On the contrary, the evidence here is compelling, but doubt springs from a powerful and subconscious "I can't take it." Examples of this type abound, especially in the history of science where sufficient evidence existed to support new, revolutionary discoveries, but scientists could not accept the evidence, and remained skeptical, for the new findings flew in the face of their views.

"Cognitive dissonance," the phenomenon that creates this type of doubt, can provoke bizarre thinking even in those who are noted for logic and reason.

The film "2001: A Space Odyssey" contains a subtle message about probably the most important "I don't know" that issues forth from the lips of man. Man asks, "Is there a God?"

On this crucial question, if a person replies, "I don't know," is it Type I or Type II? Is it because there is simply not enough evidence to prove that God exists? Or is it because what ordinarily would qualify as conclusive proof is available, but for certain reasons (e.g. The "Vonnegut Problem"), one cannot accept it? This question touches on the subject of religion, but only peripherally. Really, we are asking here about the human psyche: What goes on in the human mind when a person grapples with the issue of God?

Let us simplify the question by narrowing it down a bit. The best-known argument for the existence of God is the classical "clock in the desert" argument, also known as the "Argument From Design." We know that this argument is not regarded as being convincing. The question, though, is why not?

When an agnostic hears this argument eloquently expressed, with the most astounding examples of nature's grand designs, he usually admits that the level of design in nature is impressive -- yet he remains skeptical. The prevailing opinion is that his doubt is a Type I doubt -- doubt which is due to insufficient evidence. Is this really the case? Perhaps the Argument From Design really DOES provide sufficient evidence for God, and people reject it, or remain in doubt about it, only because of "cognitive dissonance," and the widespread doubt here is really a Type II -- due partly to the difficulty that a person experiences adjusting to the idea that he is an expression of a higher intelligence.

The Threshold for Design[1]

[1]Michael Behe defines design as "the *purposeful arrangement of* parts. ... The ordering of separate components to accomplish a function beyond that of the individual components. ...The greater the specificity of the interacting components required to produce the function, the greater is our confidence in the conclusion of design." The context in which you see the object is also a factor as well as "the number and the quality of the components that fit together to form the system. ...

In order to discover which of the two possibilities mentioned above is correct, we will need to perform a scientific experiment, which reveals what level of design prompts people to react intuitively, "This did not happen by chance." That is, we will need to expose people to different levels of design until we determine what level prompts all of them to say, "This is a product of intelligence." We will call this level of complexity the "threshold for design."

To discover the threshold, we will have to set up a situation, which eliminates the potential for "cognitive dissonance" arising. We will need an experimental setting where levels of design are present, and our subjects are under no personal, social, intellectual, metaphysical or other pressures, which could prevent their perception of the design. In other words, we will need a controlled environment - a situation that lacks the factors, which could interfere with the normal functioning of man's intuitive faculty.

Fortunately, a quality experiment which establishes the level of complexity which brings the intuitive reaction, "Designer required" already has been done. The controlled environment was the everyday movie theater, and the subjects of the experiment were the millions who saw the film "2001".

THE THRESHOLD: THE "2001" MONOLITH:

As we noted in our summary of the film, the discovery of the black monolith was recognized as "THE FIRST EVIDENCE OF INTELLIGENT LIFE OFF THE EARTH." that is to say, the first objective evidence that the universe contains intelligent life other than man.

Please note that not one character in the film objected to this statement. Neither did any film critic take issue. Most importantly, based on all available information, no objections were raised by anyone in any movie theater either. The people in the theaters "agreed" not because they were watching fantasy, and would agree to anything. "2001" was taken very seriously. Viewers were looking at the film critically, and they realized that if such a momentous discovery were to be made under identical conditions in real life, any qualified scientist inevitably would reach the same conclusion. In the theater, eating popcorn, free of personal, social, intellectual and other biases, people agreed unanimously that a black slab with smooth surfaces and a few right angles was conclusive proof of intelligence, for the intelligence that was implied was not God.

In other words, the idea of intelligent life on other planets, superior as that intelligence may be, is not nearly as threatening to man as the idea of God, for the existence of an extra-terrestrial intelligence does not necessarily imply the "dependent-beholden" complex that we encountered in Vonnegut's Breakfast of Champions. When viewers heard it said that the monolith was proof of "intelligence other than man," everyone agreed, because cognitive dissonance was absent. Not one viewer maintained, "Maybe it just happened." ...

"2001" was viewed by millions of people from all walks of life, it cannot be argued that too few people were "tested," or that the subjects of the "experiment" were not representative.

Therefore, what level of complexity does it take for people to see intuitively that something was made purposefully? Does it take a computer found on the moon? An automobile? A wristwatch? No, even a domino-shaped slab is enough! In short, "2001" serves as a controlled, scientific experiment which

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There is no magic point of irreducible complexity at which Darwinism is logically impossible. But the hurdles of gradualism become higher and higher as structures are more complex, more interdependent" (*Darwin's Black Box*, pgs. 193-203; 215)

establishes man's intuitive "threshold" for design. In the movie theater, where there are no implications for one's life, and the intelligence, which is the source of the design, is not Divine, this "threshold" level is quite low.

THE COSMIC IRONY OF THE "2001" EMBRYO

Now, compared to the level of design exhibited by the slab, the level of design found in objects in nature is infinitely higher. Take the design of 2001's HUMAN EMBRYO. The human embryo represents probably the highest level of structural complexity in existence -- a level at the OPPOSITE end of the spectrum compared to the level of design present in a domino-shaped slab!

The question, then, is: Why is it that, while watching the movie, millions of people agree that the low level of design exhibited by this slab could not have come about without the intervention of intelligence, but when these same people leave the movie theater, and encounter MUCH HIGHER design in nature, the conclusion is otherwise?

2001's DRAWING POWER

When the film ended, and the embryo filled the screen, it was as if the embryo was saying to the audience, "Hey folks, aren't I much more complex than the domino-shaped slab? If you see that intelligence had to have made the slab, why don't you see that intelligence had to have made me?" ...

One microbiologist wrote in 1985: "It is the sheer universality of perfection, the fact that everywhere we look, to whatever depth we look, we find an elegance and ingenuity of an absolutely transcending quality, which so mitigates against the idea of chance. Is it really credible that random processes could have constructed a reality, the smallest element of which - a functional protein or gene -- is complex beyond our own creative capacities, a reality which is the very antithesis of chance, which excels in every sense anything produced by the intelligence of man? Alongside the level of ingenuity and complexity exhibited by the molecular machinery of life, even our most advanced artifacts appear clumsy. We feel humbled, as Neolithic man would in the presence of 20th century technology..." (Michael Denton, Evolution -- A Theory in Crisis, p. 328).

In short, it is fair to say that simply on the basis of design found in objects in nature that were it not for "cognitive dissonance" god's existence should be intuitively obvious.

Professor John Wheeler, former Chair of the Physics Department at the University of Texas at Austin, formerly a colleague of Albert Einstein and Neils Bohr, and considered one of the foremost contemporary thinkers in theoretical physics and cosmology, had this to say (from a PBS science documentary, "The Creation of The Universe"):

"To my mind, there must be at the bottom of it all, not an utterly simple equation, but an utterly simple IDEA. And to me that idea, when we finally discover it, will be so compelling, and so inevitable, so beautiful, we will all say to each other, 'How could it have ever been otherwise?'"

We agree.

THE "FINE-TUNING" OF THE UNIVERSE

According to growing numbers of scientists, the laws and constants of nature are so "finely-tuned," and so many "coincidences" have occurred to allow for the possibility of life, the universe must have come into existence through intentional planning and intelligence. In fact, this "fine-tuning" is so pronounced, and the "coincidences" are so numerous, many scientists have come to espouse "The Anthropic Principle," which

contends that the universe was brought into existence intentionally for the sake of producing mankind. Even those who do not accept The Anthropic Principle admit to the "fine-tuning" and conclude that the universe is "too contrived" to be a chance event.

In a BBC science documentary "The Anthropic Principle," some of the greatest scientific minds of our day describe the recent findings which compel this conclusion.

Dr. Dennis Scania, the distinguished head of Cambridge University Observatories: "If you change a little bit the laws of nature, or you change a little bit the constants of nature -- like the charge on the electron -- then the way the universe develops is so changed, it is very likely that intelligent life would not have been able to develop."

Dr. David D. Deutsch, Institute of Mathematics, Oxford University: "If we nudge one of these constants just a few percent in one direction, stars burn out within a million years of their formation, and there is no time for evolution. If we nudge it a few percent in the other direction, then no elements heavier than helium form. No carbon, no life. Not even any chemistry. No complexity at all."

Dr. Paul Davies, noted author and professor of theoretical physics at Newcastle University: "The really amazing thing is not that life on Earth is balanced on a knife-edge, but that the entire universe is balanced on a knife-edge, and would be total chaos if any of the natural 'constants' were off even slightly. You see," Davies adds, "even if you dismiss man as a chance happening, the fact remains that the universe seems unreasonably suited to the existence of life -- almost contrived -- you might say a 'put-up job.'"

According to the latest scientific thinking, the matter of the universe originated in a huge explosion of energy called "The Big Bang." At first, the universe was only hydrogen and helium, which congealed into stars. Subsequently, all the other elements were manufactured inside the stars. The four most abundant elements in the universe are, in order, hydrogen, helium, oxygen and carbon. When Sir Fred Hoyle was researching how carbon came to be, in the "blast-furnaces" of the stars, his calculations indicated that it is very difficult to explain how the stars generated the necessary quantity of carbon upon which life on earth depends. Hoyle found that there were numerous "fortunate" one-time occurrences which seemed to indicate that purposeful "adjustments" had been made in the laws of physics and chemistry in order to produce the necessary carbon.

Hoyle sums up his findings as follows:
"A common sense interpretation of the facts suggests that a superintendent has monkeyed with the physics, as well as chemistry and biology, and that there are no blind forces worth speaking about in nature. I do not believe that any physicist who examined the evidence could fail to draw the inference that the laws of nuclear physics have been deliberately designed with regard to the consequences they produce within stars."[1]

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[1] Michael Denton argues that the evidence from microbiology answers one of the most powerful critiques of the theory of design was provided by the Scottish philosopher David Hume. William Paley, in his famous watch-to-watchmaker discourse, claimed that we would never infer in the case of a machine, such as a watch, that its design was due to natural processes such as the wind and rain; rather, we would be obliged to postulate a watchmaker. Living things are similar to machines, exhibiting the same sort of adaptive complexity and we must, therefore, infer by analogy that their design is also the result of intelligent activity.

"One of the principle weaknesses of this argument was raised by David Hume, who pointed out that organisms may be only superficially like machines but natural in essence. Only if an object is strikingly

Adds Dr. David D. Deutsch: "If anyone claims not to be surprised by the special features that the universe has, he is hiding his head in the sand. These special features ARE surprising and unlikely."

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analogous to a machine in a very profound sense would the inference to design be valid. Hume's criticism is generally considered to have fatally weakened the basic analogical assumption upon which the inference to design is based, and it is certainly true that neither in the eighteenth century nor at any time during the past two centuries has there been sufficient evidence for believing that living organisms were like machines in any profound sense.

"It has only been over the past twenty years with the molecular biological revolution and with the advances in cybernetic and computer technology that Hume's criticism has been finally invalidated and the analogy between organisms and machines has at last become convincing. In opening up this extraordinary new world of living technology biochemists have become fellow travelers with science fiction writers, explorers in a world of ultimate technology, wondering incredulously as new miracles of atomic engineering are continually brought to light in the course of their strange adventure into the microcosm of life. In every direction the biochemist gazes, as he journeys through this weird molecular labyrinth, he sees devices and appliances reminiscent of our twentieth-century world of advanced technology. In the atomic fabric of life we have found a reflection of our own technology. We have seen a world as artificial as our own and as familiar as if we have held up a mirror to our own machines.

"The almost irresistible force of the analogy has completely undermined the complacent assumption, prevalent in biological circles over most of the past century, that the design hypothesis can be excluded on the grounds that the notion is fundamentally a metaphysical a priori concept and therefore scientifically unsound. On the contrary, the inference to design is a purely a posteriori induction based on a ruthlessly consistent application of the logic of analogy. The conclusion may have religious implications, but it does not depend on religious presuppositions..." (Michael Denton, Evolution - A Theory in Crisis, Burnett Books, London, 1985, pp. 339-342).

UNIVERSAL ACCEPTANCE OF FINE-TUNING

The scientific establishment's most prestigious journals, and its most famous physicists and cosmologists, have all gone on record as recognizing the objective truth of the fine-tuning.

The August '97 issue of "Science" (the most prestigious peer-reviewed scientific journal in the United States) featured an article entitled "Science and G-d: A Warming Trend?" Here is an excerpt: "The fact that the universe exhibits many features that foster organic life -- such as precisely those physical constants that result in planets and long-lived stars -- also has led some scientists to speculate that some divine influence may be present."

In his best-selling book, A Brief History of Time, Stephen Hawking (perhaps the world's most famous cosmologist) refers to the phenomenon as "remarkable." "The remarkable fact is that the values of these numbers (i.e. the constants of physics) seem to have been very finely adjusted to make possible the development of life" (p. 125).

Hawking writes further, "if the electric charge of the electron had been only slightly different, stars would have been unable to burn hydrogen and helium, or else they would not have exploded... It seems clear that there are relatively few ranges of values for the numbers (for the constants) that would allow for development of any form of intelligent life. Most sets of values would give rise to universes that, although they might be very beautiful, would contain no one able to wonder at that beauty." Hawking then goes on to say that he can appreciate taking this as possible evidence of "a divine purpose

in Creation and the choice of the laws of science (by G-d)" (ibid. p. 125).[1]

b-Life outside of Earth

The attempt to find life elsewhere in the universe has so far been a total failure. Scientists, in a frenzy of optimism, look at the most scant of information to clutch onto the hope[2] that life might exist in this or that location. It is interesting to note the logic behind this search. For certainly, the existence of extraterrestrial life is no challenge to Judaism.[1] Yet secular evolutionists somehow feel that if they can show that life exists elsewhere then bingo, man with his neshama and intellect is not unique. Somehow, the logic goes, if man is not unique, then he could not have been created, at least not to have a unique purpose in the world. Somehow, that leads to saying that therefore it must be that he evolved and was not created. The following excerpts from a Newsweek article, in 1999, show the current thrust for the search of life on Mars:

What makes Mars hospitable to life is the presence of liquid water billions of years ago. Earlier missions discovered canyons and deep outflow channels that wind hundreds or thousands of miles

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[1]All of the above has been quoted or culled from the web site, *The 2001 Principle*. It is worthwhile seeing the full version of the original web site.

[2]In the NY Times February 8, 2000 William J Broad reported:

Earthlings are so enamored of aliens that 1.6 million of them in 224 countries have recently joined an effort that harnesses home and office computers to the job of sifting through a few zillion radio bands to hunt for signs of intelligent life among the stars.

The SETI@home project of the University of California at Berkeley uses idle computers linked to the Internet to plow through signals collected by the huge dish at Arecibo, P.R., searching for intelligently made radio signals amid the celestial static. The biggest of all the world's radio telescopes, at 1,000 feet in diameter, it is also the best single antenna for gathering faint signals.

Through the Internet, the project distributes software that enables home computer users to help scientists crunch Arecibo data in what its creators call the world's largest ad hoc supercomputer. The software works as a screen saver, analyzing data only when computers are idle. Once the data have been analyzed, a process that can take days, they are returned to Berkeley for another slice of the sky.

Since May, when the project started, volunteers have donated 165,000 years of computing time to analyzing radio emissions from outer space. "So far we don't have any really exciting signals," said Dan Wertheimer, the project's chief scientist. "But it's early in the game. We've only just begun and Earthlings are pretty primitive in this field. We're just scratching the surface."

Dr. Frank D. Drake, then a young astronomer at a federal radio observatory in West Virginia, in 1960 was the first to scan the skies for faint alien signals, and was quickly joined by like-minded experts, including Dr. Carl Sagan, then a brash 27-year-old astronomer. Dr. Drake laid out his ideas in 1961, in what came to be known as the Drake Equation. The equation made educated guesses for the rate at which stars form, the fraction of stars with planets, the number of those planets on which life arises and so on, including the average lifetime of technological civilizations. By his logic, the Milky Way had about 10,000 civilizations capable of interstellar communication.

Later, Dr. Sagan revised the calculation and raised the estimate to a million alien worlds. Since the cosmos holds hundreds of millions of galaxies, by that analysis the total number of alien societies could be astronomical, one estimate putting the number at roughly 10 trillion.

New findings, however, according to the authors of "Rare Earth," show that the Drake Equation is riddled with hidden optimistic assumptions. Their stance, the authors say in the preface, is "rarely articulated but increasingly accepted by many astrobiologists," the general name for scientists who study the likelihood of extraterrestrial life.

[1]See Rabbi Norman Lamm's article on this in his book *Faith and Doubt*

downhill to the northern plains. They seem to have been formed by running water-lots of running water: some features look like they were carved by torrents raging with a force of 10,000 Mississippi Rivers. But more recent observations go further. Images taken by the Mars Orbiter Camera spied a 500-mile-long channel. Named Nanedi Vallis, its "sinuous shape... suggests that the river that cut the valley was fed largely by groundwater," says geologist Michael Carr of the U.S. Geological Survey. If so, then liquid water may still exist deep below the surface of Mars, even though the planet today is too cold and the atmosphere too thin to keep water liquid at the surface. (In such thin air, water boils instantly.) Liquid water is necessary, though not sufficient, for life. ...

For years the party line on Martians has been that the environment is too hostile for them: it's cold and it's dry, and the thin atmosphere is no more effective against damaging solar radiation than a paper umbrella against hail. But standing water blocks solar radiation. And those shorelines are also interesting. For biology to emerge from mere chemistry, you need the basic ingredients of life (compounds like nucleic acids and proteins), water to mix them all together and an energy source to zap them with that vital spark. The heat of hydrothermal vents might do the trick. So might lightning. But so might something as gentle, and as simple, as waves lapping on an ancient shore. The ebb and flow of tides could also have provided the alternating wet-and-dry conditions that some theories of life's origins say transform not-quite-biological molecules into fully biological ones. "If Mars did sustain a great northern ocean," says Head, "then there would have been tens of millions of years of an environment compatible with what we know about the origins of life." Or, as planetary scientist William Boynton of the University of Arizona puts it, "If life didn't get started [on Mars], we'd really have to wonder why not."

The standing water is long gone, of course. With no liquid water on the surface, the planet would be hard pressed to sustain life. Or so it seemed. "We have broadened our thinking about when and where life might occur because we have found [microbes] living in complete darkness in thermal vents, and inside rocks in the dry valleys of Antarctica eating hydrogen," says Hubbard. Other newly discovered "extremophiles" on Earth sustain life by dissolving minerals-they eat rocks. Others live in sulfuric acid, at 212 degrees Fahrenheit, or in environments as acidic as vinegar or as harsh as ammonia. Apparently, life is pretty loose about where it lives. "If life ever got started on Mars," says Jim Head, "then I'd say you'd have a helluva time eradicating it. Once the surface became inhospitable, life would go underground."

That possibility has re-energized the quest for life on Mars. Life may be holding on in niches deep below the cold, arid eolian surface. But the deeper implications might come from a discovery that Mars never supported life. For that would challenge scientists to identify what vital spark was missing in a place that seemed to have all the right ingredients, and challenge the rest of us to see the single known example of life in the universe as that much more wondrous.

Some scientists suspect that if life arose on Mars, it might have seeded Earth with primitive microbes. Mars, having a weaker gravitational field than Earth's, tends to lose whole chunks of itself when bombarded by comets or asteroids. If its primordial life rode a meteorite to Earth, then we have already discovered Martian life: the descendants of that ancient interplanetary vagabond would be... us.

Now, two prominent scientists, Dr. Peter D. Ward of the University of Washington, a paleontologist who specializes in mass extinctions, and Dr. Donald C. Brownlee of the University of Washington, a noted astronomer, member of the National Academy of Sciences and

chief scientist of NASA's $166 million Stardust mission to capture interplanetary and interstellar dust say the conventional wisdom is wrong. The alien search, they add, is likely to fail.

In their highly acclaimed book *Rare Earth* (Springer-Verlag), they draw on new findings in astronomy, geology and paleontology, to conclude that Earth's composition and stability are extraordinarily rare. Most everywhere else, the radiation levels are too high, the right chemical elements too rare in abundance, the hospitable planets too few in number and the rain of killer rocks too intense for life ever to have evolved into advanced communities. Alien microbes may survive in many places as a kind of cosmic shower scum, they say, but not extraterrestrials civilized enough to be awash in technology[1].

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[1]The following is taken from the book ***Rare Earth***, written by Peter D. Ward and Donald Brownlee:

Although life may have formed nearly as soon as it could have, the formation of *animal* life was much more recent and protracted. These findings suggest that complex life is far more difficult to arrive at than evolving life itself and that it takes a much longer time period to achieve.

It has always been assumed that attaining the evolutionary grade we call animals would be the final and decisive step: that once this level of evolution was achieved, and long and continuous progression toward intelligence should occur. However, another insight if the Astrobiological Revolution has been that *attaining* the stage of animal life is one thing, but *maintaining* that level is quite something else. New evidence from the geological record has shown that once it has evolved, complex life is subject to an unending succession of planetary disasters that create what are known as mass extinction events. These rare but devastating events can reset the evolutionary timetable and destroy complex life' while sparing simpler life forms. Such discoveries again suggest that the conditions hospitable to the evolution and existence of *complex* life are far more specific that those that allow life's *formation*. It is difficult to conceive of animal life arising on planets orbiting variable stars, or even on planets orbiting stars in double or triple stellar systems, because of the increased chances of energy fluxes sterilizing the nascent life through sudden heat or cold. And even if complex life did evolve in such planetary systems, it might be difficult for it to survive for any appreciable time.

Most planets are either too close or too far from their respective stars to allow liquid water to exist on the surface, and although many such planets might harbor simple life, complex animal life equivalent to that on Earth cannot long exist without liquid water.

...Relatively low asteroid or comet impact rate...The amount of material left over in a planetary system...For Earth, there is evidence that the giant planet Jupiter acted as a "comet and asteroid catcher," a gravity sink sweeping the solar system of cosmic garbage that might otherwise collide with Earth.

In our solar system, Earth is the only planet (other than Pluto) with a moon of such appreciable size compared to the planet it orbits, and it is the only planet with plate tectonics, which causes continental drift. Both of these attributes may be crucial in the rise and persistence of animal life.

The environments around the deep-ocean volcanic rifts can be described with a single word: extreme. Extreme heat, extreme cold, extreme pressure, darkness and toxic-waste waters are conditions seemingly inhospitable to every living thing. Yet...Within these scalding cauldrons of superheated water, a rich diversity of microbial entities grow and thrive at temperatures far too hot for any animal. Yet here, indisputably, is life, in a region previously thought as sterile as Mars.

The deep-sea vents are characterized by three conditions previously considered deleterious to life: high pressure, high heat, and lack of light. Because of the great pressures encountered deep in the sea, water can be heated well past its boiling point at Earth's surface.

The "habitable zone" (referred to by astrobiologists as the HZ)...

Earth would have experienced runaway glaciation if it had formed 1% farther from the sun and would have experienced

runaway greenhouse heating if it had formed 5% closer to the sun.

CO2 is a trace gas that constitutes only 350 parts per million of the atmosphere, but it is a "greenhouse" gas: Its infrared-absorbing properties retard the escape of heat back into space. This greenhouse effect warms Earth's surface about 40°C above the temperature it would otherwise have. As we will see later in the book, the thermostatic control of the CO2-silicate cycle (which is also known as the CO2-rock cycle) occurs because of the effects of weathering. If the planet warms, increased weathering removes CO2 from the atmosphere, and the loss of CO2 leads to cooling. When Earth is too cool weathering and CO2 removal decrease, while the continual atmospheric buildup of volcanic CO2 leads to warming.

The HZ a normally defined is really the *animal* HZ. Extremophilic organisms that live deep underground and require only minute amounts of chemical energy and water might thrive outside the HZ in a wide variety of environments, including the subsurface regions of planets, moons, and even asteroids. A good example is Europa, the moon of Jupiter that probably has a subterranean ocean. Eruopa may provide a fine habitat for microorganisms, even though it lies will outside the HZ as conventionally defined.

95% of all stars are less massive than the sun.

The most common stars in our galaxy are classified as M stars; they have only 10% of the mass of the sun. Such stars are far less luminous than our sun, and any planets orbiting them would have to be very close to stay warn enough to allow the existence of liquid water on the surface. However, there is danger in orbiting too close to any celestial body. As planets get closer to a star (or moons to a planet), the gravitational tidal effects from the star induce synchronous rotation, wherein the planet spins on its axis only once each time it orbits the star. Thus the same side of the planet always faces the star. (Such tidal locking keeps one side of the Moon facing the Earth at all times.) This synchronous rotation leads to extreme cold on the dark side of a planet and freezes out the atmosphere. It is possible that with a very thick atmosphere, and with little day/night variation, a planet might escape this fate, but unless their atmospheres are exceedingly rich in CO2, planets close to low mass stars are not likely to be habitable because of atmospheric freeze-out.

Approximately two-thirds of solar-type stars in the solar neighborhood are members of binary or multiple star systems.

Highly elliptical orbits wherein a planet moves in and out of the CHZ might allow microbial life to form and even flourish but probably would be lethal to animal life. In such systems planets might form, but their orbits would be perturbed by the various gravitational forces of more than a single star, which would eventually either eject the planets or cause them to fall into one of the stars.

In globular clusters the density of stars is extremely high...There would be no night on any planets in such clusters...The low abundance of "heavy elements" such as carbon, silicon, and iron makes it unlikely that any Earth-size terrestrial planets would form.

Outward from the centers of galaxies, the relative abundance of elements heavier than helium declines. The abundance of heavy elements is probably too low to form terrestrial planets as large as Earth. As we shall see in the next chapter our planet has a solid/liquid metal core that includes some radioactive material giving off heat. Both attributes seem to be necessary to the development of animal life: The metal core produces a magnetic field that protects the surface of the planet from radiation from space, and the radioactive heat from the core, mantle and crust fuels plate tectonics, which in our view is also necessary for maintaining animal life on the plane. No planet such as Earth can exist in the outer regions of the galaxy.

Twenty-six elements (including carbon, oxygen, nitrogen, phosphorus, potassium, sodium, iron, and copper) play a major role in the building blocks of advanced life, and many others (including the heavy radioactive elements such as uranium) play an important secondary role by creating, deep within Earth, heat indirectly necessary for life.

Most of the Universe is too cold, too hot, too dense, too vacuous, too dark, too bright, or not composed of the right elements to support life. Only planets and moons with solid surface materials provide plausible oases for life as we know it. And even among planets with surfaces, most are highly undesirable. As we noted in the Introduction

to this book, of all yet *known* celestial bodies, Earth is unique in both its physical properties and its proven ability to sustain life.

What are the most important factors that allowed Earth to support advanced life? Earth has offered (1) at least trace amounts of carbon and other important life-forming elements, (2) water on or near the surface, (3) an appropriate atmosphere, (4) a very long period of stability during which the mean surface temperature has allowed liquid water to exist on its surface, and (5) a rich abundance of heavy elements in its core and sprinkled throughout its crust and mantle regions.

Carbon is a trace element in Earth, but as we have noted, it is the key element for terrestrial life, and its rich chemical properties are probably the basis of any alien life as well. Hydrogen is also a trace element in planet Earth; still its gifts include the oceans and all water, the essential fluid of terrestrial life. Other important trace elements are uranium, potassium, and thorium.

Of all these properties of the solar system, perhaps the most curious-and at the same time the least appreciated-is that it is so rich in metals. Recent studies by Guillermo Gonzalez and others have shown that the sun is quite rare in this respect. Metals are necessary attributes of planets: Without them there would be neither magnetic fields nor internal heat sources. And metals may also be a key to the development of animal life: They are necessary to important organic constituents of animals (such as copper and iron blood pigments).

Without an atmosphere there would be no life on Earth. Today the atmosphere is highly controlled by biological processes, and it differs greatly from those of other terrestrial planets, which range from essentially no atmosphere (Mercury) to a CO2 atmosphere a hundred times denser (Venus) and a CO2 atmosphere a hundred times less dense (Mars). Even viewed from a great distance, Earth's strange atmospheric composition would provide a strong clue that life is present. Composed of nitrogen, oxygen, water vapor and carbon dioxide (in descending order of abundance), it is not an atmosphere that could be maintained by chemistry alone. Without life, free oxygen would rapidly diminish in the atmosphere. Some of the O2 molecules would oxidize surface materials, and others would react with nitrogen, ultimately forming nitric acid. Without life, the CO2 abundance would probably rise, resulting in a nitrogen and CO2 atmosphere. To an alien astronomer, Earth's atmospheric composition would be clearly out of "chemical equilibrium." This situation would provide convincing evidence of life and a vigorous ecosystem capable of controlling the controlling the chemical composition of the atmosphere.

The oceans contain enough water to cover a spherical Earth to a depth of about 4000 meters. If the surface of the planet varied only a few kilometers in elevation, Earth would be devoid of land. It is easy to imagine an Earth covered by water, but it is difficult to imagine that, with its present water supply, it could ever be dominated by land.

As pointed out by University of Washington astronomer Guillermo Gonzalez, the favored habitats appear to depend on a given scientist's discipline. In his delightful 1998 essay "Extraterrestrials: A Modern View," Gonzalez noted,

The kind of origin of life theory a scientist holds to seems to depend on his/her field of specialty: oceanographers like to think it began in a deep see thermal vent, biochemists like Stanley Miller prefer a warm tidal pool on Earth's surface, astronomers insist that comets played an essential role by delivering complex molecules, and scientists who write science fiction part time imagine that the Earth was "seeded" by interstellar microbes. The fact that life appeared soon after the termination of the heavy bombardment about 3.8 billion years ago tells little about the probability of the origin of life-it could have been a unique event requiring extraordinary conditions. However, there are a few very basic ingredients that are required by any conceivable kind of life, overactive imaginations notwithstanding.

The gulf between the complexity of a bacterium and the complexity of even the simplest multicellular animal, such as a flatworm like *Planaria*, is immense. The number of genes in a bacterium can be measured in the thousands, whereas the genes in a large animal number in the millions. To illustrate this, we can liken a bacterium to a simple toy wooden sailboat. With only three or four very tough parts, the toy boat is virtually indestructible, just as a bacterium is

impervious to most environmental stress. The flatworm, by contrast, is like an ocean line: immensely larger, more complex, and the product of countless technological achievements. The sailboat does not need complex fuel; it uses wind as its energy source, just as an autotrophic bacterium (one that does not require organic nutrients) can take the simplest sources, such as hydrogen and carbon dioxide, and manufacture its own organic material. A planarian must find and ingest complex food, and it needs a wide range of nutrients and inorganic materials to live, just as an ocean line must be supplied with complex fuel and devotes much of its internal machinery to converting fuel to motion and energy. Let us pursue this simple analogy further and bring in the time component. Because their technology is so simple, toy sailboats have been built by humans for thousands of years. Ocean liners, on the other hand, are a product of this century. They had to await the development of complex smelted metals, steam or internal combustion engines, electronics, and all the rest. They cannot be built simply, nor could they be built until each of their various components was first invented and perfected. Sailboats (toy or otherwise) have been on Earth a long time. Not so ocean liners-or even the simplest of animals.

There is a fine parallel we can draw. Like all objects built by the hand of humans, our toy sailboat will eventually be destroyed: It will perhaps lose first its cloth sail and then its mast; eventually the wood of the hull will rot. But until then it is virtually unsinkable, just as the microbes of this planet not only can withstand a much larger range of conditions that any animal but seem to resist extinction much longer as wee. Out ocean liner, on the other hand, is a very different "animal." One of the first of this century, of course, was named *Titanic*.

Our planet was without animal life for the first 3.5 billion years of its existence and was without animals large enough to leave a visible fossil record for nearly 4 billion years. But when, 550 millions years ago, sizable and diverse animal life finally burst into the oceans, it did so with a figurative bang-in a relatively sudden event known as the Cambrian Explosion. Over a relatively short interval of time, all of the animal phyla (the categories of animal life characterized by unique body plans, such as anthropods, mollusks, and chordates) either evolved or first appear in the fossil record. Undoubted fossils of metazoan animals have never been found in 600-million-year-old sedimentary strata, no matter where on Earth we go. Yet the fossils of such animals are both diverse and abundant in 500-million-year-old rocks, and they include representatives of most of the animal phyla still found on Earth. It appears that in a time interval lasting at most 100 million years (an in fact, as we will see, an interval considerably shorter than that), our planet went from a place without animals that could be seen with the unaided eye to a planet teeming with invertebrate marine life rivaling in size almost any invertebrate species on Earth today. This follow-up to the initial animal diversification of more than 700 million years ago (described in the last chapter) is the Cambrian Explosion.

The prior animal diversification must have involved very few species, each growing to a very small size; the Cambrian Explosion, on the other hand, produced huge numbers of new species, many with completely novel body plans.

The event itself took place in the sea.

It has always been assumed that forming the first life was the hardest aspect, but that once life originated, it inevitably proceeded "up" gradients of complexity, culminating in very complex animals. Yet the actual history of life on this planet tells a different story. The first life appeared about 4 billion years ago. Eukarytotic organisms did not appear for another 1.5 billion years, and multicellular animals did not appear until more than 3 billion years after the first life. On the basis of this information alone, we would have to conclude that forming *animal* life is a much more difficult-or at least a more time-consuming-project than the initial formation of non-animal life.

On Earth it is clear that the evolution of animals occurred not as a gradual process but as a series of long periods of little change, punctuated by great advances.

There were several of these "great leaps forward." One was the evolution of the eukaryotic cell type with its enclosed nucleus; another was the initial radiation of the animal phyla, described in the last chapter. The most profound, however, was the Cambrian

Explosion. In this single, approximately 40-million-year interval, all major animal phyla (all of the basic body plans found on our planet) appeared, each represented by some number of species.

The Cambrian Explosion signaled a major change in the *tempo* of evolution then prevailing on Earth. Prior to this, our planet's most complex life consisted of algae, slime molds, and single-celled animals characterized by low rates of evolutionary change. There was little morphological change, and few new species arose over vast stretches of time.

This study has resulted in three great surprises. The first was the recognition that evolution has produced only a relatively few body plans. The discovery that the perhaps tens of millions on animal species on Earth today belong to between 28 and 35 phyla was a major surprise to nineteenth-and twentieth-century paleontologists and zoologists.

A second surprise and perhaps the most astounding, was that virtually all of the phyla appear to have originated no later than the end of the Cambrian and *none* have appeared since. For all the great changes that have occurred in the last 500 million years, with all the evolutionary events and mass extinctions of that long history, it would seem that at least a few new body plans would have appeared. Yet the fact that every phylum with a fossil record is represented in Cambrian strata makes such a supposition problematic.

The third surprise was that there may have been far more phyla on Earth in the Cambrian than there are today. Fewer than 40 extant animal phyla are recognized today. Yet according to some paleontologists, in the Cambrian that number may have bee as high as 100! Although the number of species on the Tree of Life has been increasing through time, the number of higher taxa, such as phyla, has been *decreasing*.

The Earth's greenhouse gases are rare compounds of our planet's atmosphere. It turns out that the major constituents of our atmosphere, nitrogen and oxygen, play little role in the greenhouse warming, because they do not absorb infrared radiation. Carbon dioxide and water vapor, on the other hand, do, even though they make up only a tiny fraction of the gas volume of the atmosphere (carbon dioxide constitutes only 0.035% of the atmosphere). Plate tectonics plays an important part-perhaps the most important part-in maintaining levels of greenhouse gases, and these in turn maintain the temperatures necessary for animal life.

For complex life to be attained (and then maintained), a planet's water supply (1) must be large enough to sustain a sizable ocean on the planet's surface, (2) must have migrated to the surface from the planet's interior, (3) must not be lost to space, and (4) must exist largely in liquid form.

The Rare Earth Hypothesis is the unproven supposition that although microscopic, sludge-like organisms might be relatively common in planetary systems, the evolution and long-term survival of larger, more complex, and even intelligent organisms are very rare. The observations on which this hypothesis is based are as follows: (1) Microbial life existed as soon as Earth's environment made it possible, and this nearly invincible form of life flourished over most of Earth history, populating a broad range of hostile terrestrial environments. (2) The existence of larger and more complex life occurred only late in Earth history, it occurred only in restricted environments, and the evolution and survival of this more fragile variant of terrestrial life seem to require a highly fortuitous set of circumstances that could not be expected to exist commonly on other planets.

Earth's peculiar atmosphere is not in chemical equilibrium, and it succeeds in disobeying natural chemical laws only because of presence of life. The most peculiar aspect of the atmosphere is the abundance of free oxygen. Oxygen is the most abundant element in the whole Earth (45% by weight and 85% by volume!), but in the atmosphere, it is a highly reactive gas that would exist only at trace levels in the atmosphere of a terrestrial planet devoid of life. Oxygen is a poisonous gas that oxidizes organic and inorganic materials on a planetary surface; it is quite lethal to organisms that have not evolved protection against it. The source of atmospheric oxygen is photosynthesis, the miraculous biological process that utilized the energy of sunlight to convert carbon dioxide to pure oxygen and organic material. Ironically, it was the long-term photosynthetic production of this poisonous gas, and life's adaptation to it, that made complex and energetic life

possible on Earth. Except for the noble gas argon, all of the major atmospheric constituents are also processed and recycled on short time scales via biological processes.

As we have seen, the first step in preparing the way for a habitable environment is the formation of a suitable star: one that will burn long enough to let evolution work its wonders, one that does not pulse rapidly or change its energy output, one without too much ultraviolet radiation, and most important, perhaps, one that is large enough. Of the 100 applicants, perhaps only two to five will yield a star as large as our sun. The vast majority of stars in the Universe are smaller than our sun, and although smaller stars could have planets with life, most would be so dim that Earth-like planets would have to orbit very close enough to get adequate energy from a small star leads to another problem: tidal lock, the condition where the same side of the planet always faces the sun. A tidally locked planet is probably unsuitable for animal life.

Ross Taylor, an astronomer who received the prestigious Leonard Award in 1998... "Clearly," he maintains, "the conditions that existed to make our system of planets are not easily reproduced. Although the processes of forming planets around stars are probably broadly similar, the devil is in the details."

A drop in global temperature while the sun was getting hotter required a drastic reduction of atmospheric CO2 -a reduction of the greenhouse effect. The most effective way to do this is through the formation of limestone, which uses CO2 as one of its building blocks and thus scrubs it from the atmosphere. But significant volumes of limestone from today only in shallow water; the most effective limestone formation occurs in depths of less than 20 feet.

If plat tectonics on Earth had not created increasingly large land areas (and, as a by-product of that, massive areas next to the continents with shallow-water regions where limestone could easily form), Earth might well have reached global temperatures greater than animal life could tolerate.

On Earth, the volume of water was sufficiently large to buffer global temperatures, but small enough so that shallow seas could be formed by the uplifting of continents. If Earth's ocean volume had been greater, even the formation of continents would not have produced shallow seas. To show that there can be great relative volumes of oceans on a planet, we need only look at Jupiter's moon Europa, where the planet-covering ocean (now frozen) is 1000 kilometers thick. No Mt. Everest rising from the sea floor would ever poke through an ocean even half that deep.

It appears that Earth got it just right. Without continents...a planet will become too hot...With too much continental area...glaciations ensue.

James Kasting of Penn State University...Kasting notes that the obliquity (the angle of the axis of spin of a planet) of three of the four "terrestrial" planets of our solar system-Mercury, Venus, and Mars-has varied chaotically. Earth is the exception, but only because it has a large moon.

If the Cambrian Explosion was necessary for animals to become so diverse on this planet, and *if* the inertial interchange event occurred as postulated, and *if* the Cambrian IIE event contributed to the Cambrian Explosion or even somehow was required for the Cambrian Explosion to take place, then Earth as a habitat for divers animal life is rare indeed.

The Cambrian Explosion marked not only the *start* of the majority of phyla as recognized in the fossil record but also the *end* of evolutionary innovation at the phyla level: Since the Cambrian, not a single new phylum has evolved.

Subsequent to the Cambrian explosion, Earth suffered several major mass extinction events-short periods when a majority of the species then living on Earth went extinct.

The most catastrophic of these, the Permo-Triassic mass extinction of 250 million years ago, eliminated an estimated 90% of marine invertebrate species, and thus provides a natural experiment that we can examine to understand better those factors that caused the Cambrian Explosion. And what we observe is that even after this major reduction in diversity, no new phyla appeared. Although the number of species plummeted to levels similar to the very low species diversity found early in the Cambrian, the subsequent diversification in the lower Mesozoic involved the formation of many new species, but very few higher taxonomic categories. The

Cambrian event resulted in the formation of many new body plans, whereas the Triassic event resulted only in the formation of new species exhibiting body plans already well established.

Two hypotheses have been proposed to explain this significant difference. The first supposes that evolutionary novelty comes about when ecological opportunities are truly large. During the Cambrian, for instance, there were many habitats and resources that had not been occupied or exploited by marine invertebrate animals, and the great evolutionary burst on new body plans was a response to these opportunities. This situation was not duplicated after the Permo-Triassic mass extinction. Even though most species were exterminated in this catastrophic event, enough representatives of various body forms survived to inhabit most of the available ecological niches (even if at low diversity or abundance) and, in the process, to discourage evolutionary novelty.

The second possibility is that new phyla did not appear after the Permo-Triassic extinction because the genomes of the survivors had changed enough since the early Cambrian to inhibit wholesale innovation. In this scenario the evolutionary opportunities were available, but evolution was unable to create radically new designs from the available DNA. This is a sobering hypothesis and one not easily discredited, for we have nothing to which to compare the DNA we find in living animals. It could be that genomes gradually become encumbered with ever more information-they gather more and more genes-and in the process become less susceptible to a critical mutation that could even open up the way to innovation.

There were very few species in the Cambrian. In his 1989 book *Wonderful Life*, Stephen Jay Gould describes this finding as "a central paradox of early life: How could so much disparity in body plans evolve in the apparent absence of substantial diversity in number of species?"

The history of diversity and disparity during the Cambrian Explosion (or, more properly, *creating* the Cambrian Explosion) is another puzzling aspect of planet Earth's diversification of animals: Is this the only way to create animals, or just one way?

Some paleontologists have suggested that as many as 100 animal phyla may have evolved during the Cambrian period (although the consensus seems to be far fewer than this). Some of these phyla went extinct during the Cambrian or at its end. *Since that time not a single phylum has gone extinct*. It is probably not a simple case of weeding out the bad from the good, where the survivors were those body plans best suited for our world. Rather, it appears that the surviving phyla have endured subsequent planetary disasters by having large numbers of species. As long as a single species survives, the phylum survives and is in a position to rediversify.

Another unique attribute of Earth at first glance seems extraneous to animal life but may indeed be crucial to it: linear mountain ranges. There are, of course, giant mountains elsewhere in the solar system, the tallest being the great volcano Olympus Mons on Mars. Yet such mountains are always singe and never occur in chains, unlike most mountains on Earth. There is no equivalent to the Rockies, the Andes, the Himalayas, or the score of other linear mountain chains we are so familiar with. Even at this crude level of observation, oceans, mountain chains, and life make Earth unique in this solar system. These features of Earth may have been crucial to the origin of life.

All three, furthermore, may be the result of plate tectonics. This process, the movement of the planetary crust along the surface of the planet, is found in our solar system only on Earth, and it may be vanishingly rare in the Universe as a whole.

First, plate tectonics promotes high levels of global biodiversity. The major defense against mass extinctions...Second, plate tectonics provides our planet's global thermostat by recycling chemicals crucial to keeping the volume of carbon dioxide on our atmosphere relatively uniform, and thus it has been the single most important mechanism enabling liquid water to remain on Earth's surface for more than 4 billion years. Third, plate tectonics is the dominant force that causes changes in sea level of global carbon dioxide (and hence global temperature) in check. Fourth, plate tectonics created the continents on planet Earth. Without plate tectonics, Earth might look much as it did during the first billion and a half years of its

existence: a watery world, with only isolated volcanic islands dotting its surface. Or it might look even more inimical to life; without continents, we might by now have lost the important ingredient for life, water, and in so doing come to resemble Venus. Finally plate tectonics makes possible one of Earth's most potent defense systems: its magnetic field. Without our magnetic field, Earth and its cargo of life would be bombarded by a potentially lethal influx of cosmic radiation, and solar wind "puttering" (in which particles from the sun hit the upper atmosphere with high energy) might slowly eat away at the atmosphere, as it has on Mars.

Plate tectonics (another term for continental drift)...

A world with mountainous continents, oceans, and myriad islands such as those produced by plate tectonic forces is far more complex, and offers more evolutionary challenges, than would either totally land- or ocean-dominated planets without plate tectonics. Changes in continental position would affect ocean currents, temperature, seasonal rainfall patterns of biological productivity. Such varying conditions would cause organisms to migrate out of the new environments-and would thus promote speciation.

If Earth's tectonic plates did suddenly stop moving...Eventually, the world's mountains would be reduced to sea level.

The eroding continental mass carried into the oceans by river and wind transport would displace seawater and cause the level of the sea to rise. A globe covered completely (or nearly so) by ocean. All land life would die off under the lapping waves. Paradoxically, the increase of ocean area would probably also be accompanied by extinctions in the sea. Ocean life depends on nutrients, and most nutrients come from the land as runoff from rivers and streams. With the disappearance of land, the total amount of nutrients (though initially higher as so much new sediment entered the ocean system) would eventually lessen, and with fewer resources, there would be fewer marine animals and plants.

The average temperature of the Moon is --18°C, for example, well below the freezing point of water, simply because it has not appreciable atmosphere. If Earth did not have its cloaking atmosphere, including such insulating gases as water vapor and carbon dioxide (producing the much discussed Greenhouse Effect), its temperature would be about the same as that of the Moon. Yet the Earth, thanks to the greenhouse gases, has an average global temperature of 15°C.

The planetary thermostat requires a balance between the amount of CO2 being pumped into the atmosphere through volcanic action and the amount being taken out through the formation of limestone.

Although most accounts of habitability of planets refer to the range between 0°C and 100°C, required temperature range is really much narrower if animals are to survive. As we have seen, life such as bacteria can withstand a range of temperatures that may approach 200°C in high-pressure environments. But animals are much more fragile. Animal life on Earth-and perhaps anywhere in the Universe-depends on the narrowest of temperature ranges within the wider range that permits liquid water to exist. Extended periods of anything above 40°C or much below 5°C will stymie animal life. The planetary thermostat must be set to a narrow range of temperatures indeed, and it may be that only the plate tectonic thermostat makes this fine-tuning possible.

Without plate tectonics, there would not be enough temperature difference across the core region to produce the convective cells necessary to generate Earth's magnetic field; no plate tectonics, no magnetic field. The magnetic field also reduces "sputtering" of the atmosphere, a process whereby the atmosphere is gradually lost into space. No magnetic field, perhaps no animal life.

The recipe for plate tectonics seems simple enough at first. You need a planet differentiated into a this, solid crust sitting atop an underlying region that is hot, fluid, and mobile. You need this underlying region to be undergoing convection, and for that you need heat emanating from even deeper in the planet. And you are likely to need water-oceans of water.

Ours is still the only planet we know that has plate tectonics.

We cannot be certain whether plate tectonics would operate if Earth were 20% larger or smaller, or if it had a crust with more

iron and nickel than it dies, or if its surface had only 10% of the present-day volume of water.

The likelihood that an Earth-like planet should have such a large moon is small. The conditions suitable for moon formation were common for the outer planets but rare for the inner ones. Of the many moons in the solar system, nearly all orbit the giant planets of the outer solar system.

The Moon is nearly a third the size of Earth, and in some ways it is more of a twin than a subordinate. The only other case in the solar system where a moon is comparable in size to its planet is Pluto and its moon, Charon.

The Moon plays three pivotal roles that affect the evolution and survival life on Earth. It causes lunar tides, it stabilizes the tilt of Earth's spin axis, and it slows the Earth's rate of rotation.

If the Moon were smaller or more distant, or if Jupiter were larger or closer, or if Earth were closer to or farther from the sun, the Moon's stabilizing influence would be less effective. Without a large moon, Earth's spin axis might vary by as much as 90 degrees.

Because tilt of a planet's spin axis determines the relative amounts of sunlight that land on the polar and on the equatorial regions during the seasons, it strongly affects a planet's climate. On planets with moderate tilts, the majority of solar energy is absorbed in the equatorial regions, where the noon sun is always high in the sky. Each pole is in total darkness for half a year and has constant illumination for half a year.

Mercury is closest planet to the sun and most of its surface is hellishly hot, but radar imaging from Earth has shown that the poles of the planet are covered with ice. The planet is very close to the sun, but as viewed from the poles, the sun is always on the horizon. In contrast to Mercury's lack of tilt, the planet Uranus has a 90-degree tilt; and one pole is exposed to sunlight for half a year while the other experiences cryogenic darkness.

Our planet's tilt axis seems to be "just right." Excessive axis tilt could have led to the total freezing over of the oceans, a situation that might very difficult to recover from. Extensive ice cover increases the reflectivity of the planet, and with less absorption of sunlight, the planet continues to cool.

The common status for all the terrestrial planets is to have experienced very large scale chaotic behavior for their obliquity.

Because deep-sea regions are insulated from climate change, it seems doubtful that rapid obliquity changes would deprive a planet of animal life. What it could do, however, is deprive a planet of complex life on land.

The Moon...its formation appears to have been highly unlikely, a rare chance happening.

Jupiter is 318 times more massive than Earth, and it exerts enormous gravitational influence. Its gravitational interactions very efficiently scatter bodies that approach it, and it had largely cleaned out stray bodies from a large volume of the solar system. The flux of these 10-kilometer bodies hitting Earth might be 10,000 times higher if Jupiter had not come into being and purged many of the leftover bodies of the middle region of the solar system. If Earth had been subject to collisions with extinction-causing projectiles every 10,000 years instead of every 100 million years, and fairly frequently with even larger bodies, it seems unlikely that animal life would have survived.

The orbits of Jupiter and Saturn...is stable over its lifetime. However, this would not be case if either Jupiter or Saturn were more massive or if the two were closer together. It would also be dangerous to have a third Jupiter-sized planet in a planetary system. In an unstable system the results can be catastrophic. Gravitational perturbations among the planets can radically change orbits, make them noncircular, and actually lead to the loss of planets ejected into interstellar space.

Planets are being discovered around other stars...with highly noncircular orbits.

Nearly all of the planets found either are "hot Jupiters" in circular orbits close to the star or describe elliptical orbits farther from the star. All of these are "bad" Jupiters whose actions and effects should preclude the possibility of these systems having animal life on Earth-like planets in the habitable zones of the parent stars. These life-unfriendly planetary systems have been found around 5% of the nearby stars.

"People say the Sun is a typical star," Dr. Brownlee remarked "That's not true. "Almost all environments in the universe are terrible for life. It's only Garden of Eden places like Earth where it can exist."[1]

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[1]Dr. Ward said he was drawn to the topic because of his studies of mass extinctions. Increasingly, top culprits are seen as speeding rocks from outer space that hit Earth in huge explosions, with one 65 million years ago killing off many plants and animals, including the dinosaurs.

New studies, Dr. Ward said, suggest that things could be worse. For instance, the rate of terrestrial impacts could be as much as 10,000 times higher but for the presence of Jupiter, the solar system's largest planet, which absorbs many killer rocks and flings others into deep space.

"We're right on the edge of the abyss," Dr. Ward said, in terms of higher bombardment rates that have probably precluded the development of advanced life.

Recent finds of giant Jupiter-like planets outside the solar system offer no solace. Most of their orbits, he said, are wildly eccentric, which would abet destructive chaos among smaller planets rather than shielding them.

"All the Jupiters seen today are bad Jupiters," Dr. Ward said of the 31 finds to date. "Ours is the only good one we know of. And it's got to be good, or you're thrown out into dark space or into your sun."

Dr. Ward said that even if some distant Jupiters were found to be in stable, circular orbits, other factors might overwhelm their protective effect and demolish any life. For instance, closer to the center of the galaxy where star populations are far denser, the frequent passage of one star past another could trigger cascades of comets, trillions of which are thought to orbit the icy fringes of most stars.

Added to that fury, he said, is the intense radiation and explosions of galactic interiors. The star-filled sky conveys a false impression of immutability. New studies show that the cosmos, especially galactic centers, are hotbeds of violence swept by killing waves of X-rays, gamma rays and ionizing radiation. "So I don't think there's any life in the centers at all," Dr. Ward said.

The scientists discuss other planetary characteristics that are probably rare in the universe but are increasingly seen as critical for making Earth so favorable to complex life. Among them are these:

•An orbit that keeps a planet at exactly the right distance from its star to ensure that water remains liquid, not vapor or ice.

Dr. Brownlee, the astronomer and co-author, said the odds for complex life were similarly bad at galactic edges. The analysis of starlight from the fringes shows they are relatively poor in elements like iron, magnesium and silicon, partly because of less recycling of stellar materials over the eons and partly because of the rarity in such regions of supernovas, the stellar blasts that help make heavy elements in enormously hot explosions.

These elements, Dr. Brownlee said, and even heavier ones that are radioactive and also made in supernovas, appear to be prerequisites to the formation of terrestrial-type planets that have sufficient gravity to retain seas and atmospheres and that have plate tectonics, which is powered largely by the heat of radioactive decay.

According to the book, the slow movement and recycling of planetary crust into a planet's hot interior are key ingredients for the evolution of complex life. Plate tectonics, the authors say, promotes biodiversity by producing mountain chains and other kinds of environmental complexity, lessens the odds of extinctions, helps keep planetary temperatures even through the recycling of carbon and makes dry land on which advanced civilizations can flourish.

"We're critically dependent on mass," said Dr. Brownlee. "Being bigger or smaller might rule out plate tectonics."

Whole galaxies are metal-poor and therefore probably devoid of animal life, Dr. Brownlee added. Only spiral galaxies like the Milky Way and its nearby neighbor in Andromeda appear rich in metals, and even then, only in their inner regions. In contrast, elliptical and irregular galaxies, he said, are barren.

"Lower metal abundance means you can't make a planet as big as the Earth," Dr. Brownlee said. "It seems like something a lot of people don't want to hear."

•A large moon at just the right distance to minimize changes in a planet's tilt, ensuring climate stability.
•Enough carbon to aid the development of life but not so much to allow for runaway greenhouse conditions, as occur on superheated Venus.

"If we are as rare as we think we are," Dr. Ward said, "it raises the stakes, intellectually and morally."

c-Gould and Dawkins - The world is far from perfect.

Most Darwinists attempt to show how remarkable and perfect a universe evolution has produced. However, Stephen Jay Gould and Richard Dawkins, recognizing that this argument only increases the validity of the argument from design, has taken the opposite approach. Gould attempts to show how awkward certain features, like *The Panda's Thumb*, are (because, he claims, it is built from an odd part, the radial sasmoid bone of the wrist) and uses this to then ask: If the world was created by G-d, how could He have messed up with things like this. It must be that they were produced by evolution. (*The Panda's Thumb*, chapter 1).

Using the example of the eye, Michael Behe summarized the reasoning of this sort of logic:
1-A designer would have made the vertebrate eye without a blind spot.
2-The vertebrate eye had a blind spot.
3-Therefore Darwinian evolution produced the eye.[1]

This, however, is a spurious argument. First, Gould himself would agree that his examples are few and far between (counter examples run into the many tens of thousands. See **Appendices B-M**). Secondly, Gould's argument presumes that we know what the purpose of each limb of an animal is and what the perfect design for that limb would be. In neither of his two examples does Gould attempt to do this. And in fact in the case of his second example, the orchids, he admits that, rather than there being anything wrong with the design, it works very well indeed. Although he does not say so, *The Panda's Thumb* is perfectly adapted to what it needs to do, peel bamboo. (Gould's argument is that anatomically the thumb should have developed differently.[2])
Besides, as Michael Behe points out, the argument from imperfection overlooks the possibility that the designer might have had multiple motives, with engineering excellence oftentimes relegated to a secondary role.[3]
In addition, it should be born in mind that the scientific community has a poor history of explaining the function of individual parts, their interaction with the rest of the body, all their functions and their relationship to the broader ecological environment. We know that the eco-environment has endless wisdom locked up in it. Whenever man has attempted to tinker
with an eco-environment, it has usually been disastrous. We simply are not able to understand all that goes into any such environment. This is why the world manages to produce many thousands of articles annually on new and undiscovered insights into animals and plants and their worlds. We will never know how well adjusted G-d wanted the panda to be, how vulnerable on the one hand and how well to take care of itself and its species on the other. As for *The Panda's Thumb*, only one person seems to have ever researched panda anatomy in any detail, Davis, whom Gould presumes as absolute gospel,

[1] *Darwin's Black Box*, pg. 224

[2] Of course Gould doesn't explain how the Panda's thumb, of any sort, developed to begin with.

[3] *Darwin's Black Box*, pg. 223)

accepting anything that he has to say on the subject without any independent corroboration. But the panda is one of the least studied animals known to man - and it has been little studied in the wild. Besides, as we pointed out, the panda does what it needs to do, peel bamboo, excellently.[1]

In chapter 2, Gould increases the scope of his argument to include "vestigial structures ...bits of useless anatomy, preserved as remnants of functional parts of ancestors" bringing as examples the teeth of baby whales which disappear as the whale gets older and the long migration of animals to spots which seemingly could have been reproduced much closer to home (a so called vestige of when the continents were together). However, the most studied of all living beings is man, and despite this, it was long thought that the appendix and tonsils were vestigial remnants in man. It was only recently that their real function was found. Gould himself admits how spurious and easily changed some of his arguments are.

It is beyond the scope of this essay to answer every claim of this sort made; why did G-d create male peacocks who attract their females by displaying their feathers making them vulnerable to leopards in the wild, for example (Stanley's example); "why should a rat run, a bat fly, a porpoise swim and I type this essay with structures built of the same bones unless we all inherited them from a common ancestor? An engineer starting from scratch, could design better limbs in each case." (Gould in the Essay Evolution as Fact and Theory in Hen's Teeth and Horses Toes) but it is clear that such lines of attack are often greater problems for the evolutionists themselves; how do they explain the evolution of the peacock? Moreover, the embryonic cells which give rise to these limbs exhibit patterns of division, branching and cartilage production which differ from species to species without conforming to predictions based on a theory of common descent. (Johnson, pg. 73) Needless to say, discussions of this sort are open ended (for we will never understand the purpose of every limb of every animal) and not likely to resolve things either way. In any other area of science, such arguments would be regarded as metaphysical discussions not in the realm of science. If evolution wants to win its case, it must do it with empirical evidence, as all sciences must do, and such evidence, as we show below, is not forthcoming.

According to Behe (*Darwin's Black Box* pp. 222-3), attacks like the one which Gould makes on intelligent design suffer from a basic confusion. "The key to intelligent design theory is not whether a "basic structural plan is the obvious product of design." (quoting Kenneth Miller) The conclusion of intelligent design ... rests on the observation of highly specified irreducible complexity-the ordering of separate well-fitted components to achieve a function that is beyond any of the components themselves. " Behe goes on to argue that showing imperfection does not disprove design, proving this from the many examples of obvious but imperfect human design in the world around us. (Of course as believing Jews we believe that G-d made a perfect world. The point is that even where that perfection is not manifest to us in a particular case, it can still scientifically validate our belief. Only השם knows all the reasons he had in creating anything the way He did.)

Having made their attack, evolutionists then make a further spurious claim. Behe

[1]As Behe succinctly puts it: It is scientifically unsound to make assumptions on the way things ought to be. (*Darwin's Black Box*, pg. 227)

(224), using the example of the eye, puts it this way:

"1. A designer would have made the vertebrate eye without a blind spot.

2. The vertebrate eye has a blind spot.

3. Therefore Darwinian evolution produced the eye.

It is for reasoning such as this that the phrase non-sequiter was created. The scientific literature contains no evidence that natural selection working on mutation can produce either an eye with a blind spot, an eye without a blind spot, an eyelid, a lens, a retina, rhidopsin or retinal."

xi-The Principle of Plenitude

The world appears to have the maximum diversity of life imaginable. At every level. the diversity of forms seems to exhaust the number of possible options. This implies that life was planned and directed. Evolutionary theory is supposed to be random. Species develop just by chance. Although the species which survive do so because they are best suited for their environment, only one or some of the possible options could ever have been expected to develop purely by chance.[1] Yet, the amount of species which did develop is just astonishing.

. The N.Y. Times (Nov. 30, 1999) quoted Dr. Niles Eldridge, curator of the paleontology division of the American Museum of Natural History as estimating that there are between 10 million to 13 million living species. Only about 1.5 million species had scientific names.[2]

There is, of course, a subjective element when evaluating how many forms could be realized. But certainly some categories stretch the imagination to come up with any further possibilities.

The following are same examples of plenitude:

a-Microbes

Microbes survive in every conceivable environment: from deep in crystal rocks, to the frozen deserts of Antarctica, to the hydrothermal vents on the ocean bottom, to the hot springs in Yellowstone National Park. The biochemical diversity of microbial life is no less astonishing than the variety of environments they have exploited. For example, in the case of energy metabolism, bacteria seem to utilize almost every available reaction.

b-Unicellular Organisms (Protozoa)

Unicellular organisms express spectacular diversity. For example, there are 5700 different species of Ciliates alone, ranging in size from 10 microns to 3 millimeters (about the same size range as a between a blue whale and a rat).

Cell reproduction for example, occurs by simple fission, separation of cells, spore formation, copulation, conjugation, predogamy, automixis, or various types of metagenesis and heterogenesis.

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[1] Michael Denton, *Nature's Destiny*, chap. 13

[2] Total figures are not actual counts, but theoretical reckonings based on things like the number of species that make up typical food chains in different climates. Some groups, like mammals, have been intensively studied, and others, like mites, are little known. A big problem is defining a species, Dr. May said: some biologists discern 200 kinds of British blackberry; others might list 20, or 2 or 3. Two kingdoms, the prokaryotic monerans and the eukaryotic protists (two kinds of microscopic unicellular organisms), make up about 5 percent of recorded living species; the kingdoms of funguses and plants make up about 22 percent; the rest are animals. Well over half the total species are insects; mammals make up 0.388 percent of the total, and other chordates (animals with at last a precursor of a spinal cord) are just over 3.7 percent.

c-Insects

Insects crawl, run, fly, swim, hop and jump. There may be more than 3 million different species, from wasps and beetles that way only a few micrograms to the largest beetles, which are more than ten million times heavier. Some extinct dragonflies have winspands of 70 cms. Some are carnivores, herbivores, omnivores, feces-eating, blood-suckers, keratin and wax eaters, and some eat nothing during their entire adult life.

Butterflies seem to use every possible type of hibernation: they spend their winters in the stage of an egg, a caterpillar, a pupa, or an adult insect.

Insects which produce noise by rubbing body parts together do so in at lest fifteen different ways in beetles alone.

d-Animals

Horns of antelopes seem to reflect every type of shape: straight and smooth, straight with transverse ridges, slightly curved with a smooth surface, slightly curved with transverse grooves and ridges, twisted like a screw with a smooth surface, etc.

Viruses appear to use every conceivable way of storing genetic information: single-stranded RNA; double- stranded RNA and double-stranded DNA.

e-Viruses

Viruses appear to use every conceivable way of storing genetic information: single-stranded RNA; double-stranded RNA and double-stranded DNA. They occupy both possibilities of capsule, the cylinder and the icosahedron.

f-The eye

The eye includes the camera eye found in vertebrates amongst others, the reflecting eye, three different types of compound eye, a scanning eye. All of these are image-forming devices. There are also a near-infinite variety of non-image forming simple eyes, from the sub-cellular photosensitive pigment spots in Protozoa to the simple photoreceptor eyes in invertebrates such as spiders.

g-Others

Other forms of plenitude include:

Movement in air: Different organisms move by jet propulsion, gliding, flapping, ballooning

Movement in water: Jet propulsions, swimming, and even by propeller in the case of bacteria

Eggs: Which appear to occupy all conceivable modes of development.

Shells: Which can be shaped like a bowl, a cap, a tube, a flat spiral, a tapering cone, a needle, a ball, etc.

Living organisms utilize or detect the entire range of electromagnetic radiation reaching the earth's surface, from the ultraviolet to the infrared. In addition to their ability to see and detect heat, living organisms can detect sound over a large range of frequencies in both air and water, They can detect vibrations transmitted through the ground they can detect vanishingly small concentrations of a vast variety of chemicals in the air and water; they can detect gravitational fields, magnetic fields and electric fields.

Size: The blue whale weighs 100 million grams; the Giant Redwood 1 billion grams; a mycoplasma cell less than one-tenth of a picogram (10 to the minus 13 of a gram). These may represent the limits to the size of living beings that can exist.

The Gaps in the *Scala Naturae*

Those many cases where gaps in the order of nature appear of necessity rather than by accident tend to strengthen the conclusion to plenitude.

Take, for example, the absence of intermediates between the unicellular Protozoa and the various primitive

metazoan or multicellular groups[1]. Collectively, the species comprising these primitive multi- cellular phyla are very diverse in morphology and behavior.[2] The Protozoa are also a fantastically diverse group. But between these two groups there is an enormous gap filled only with a few types of simple Protozoa.

That this gap is likely to be necessary is suggested by the difficulty of imagining realistic intermediate types of organism made up, say, of three, four, or five cells leading up to genuinely multicellular life. Precisely what form' such organisms would take and what adaptive role their constituent cells might play is exceedingly difficult to imagine. After a century of intense speculation the evolutionary origin of the Metazoa is still problematical, primarily because no convincing series of functional intermediates between the unicellular and the multicellular level of biological organization has been envisaged. Simple life forms, it seems, can be composed of one cell or many cells but not readily of five or six cells.[3]

A great many of the seventy or so major phyla have never generated large complex forms. In many cases this is of necessity. The flatworms,- for example, could hardly evolve into anything the size of a mouse. Their basic design prohibits such a prodigious development. Flatworms are flat for good reason--they have no circulatory system. As Huxley points out, "the flatness of the larger flatworms is partly due to the need for having every cell near' enough to the surface to be able to get oxygen by diffusion. The elaborate branching of their intestines and all their other internal organs is needed to ensure that no cell shall be more than a microscopic distance away from a source of digested food." (Denton, Michael, *Nature's Destiny*)

xii-Secular Bias

It is the job of science to solve mysteries without recourse to divine intervention. Just because scientists are still uncertain how life began does not mean that life cannot have had a natural origin. (Paul Davies, *The Fifth Miracle*, pg. 31)

Darwin himself began as a believing Christian. However, shortly after his return from the Beagle voyage, he began to gradually drift toward agnosticism. Yet toward the end of his life he confessed that his thoughts about religion were a muddle.

Although Darwin was indecisive about the importance of natural selection, he was firm in excluding all forms of

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[1]These are represented by the phylum Porifera, the sponges; the well-known group the Coelenterata, the jellyfishes; the less well-known group the Ctenophora, more commonly known as the comb jellies or sea gooseberries; the nematodes; flatworms; etc.

[2]Moreover, they are far from simple in structure and design. They are highly complex organisms made up of most of the basic cell types--muscle, nerve, epidermal, gland, etc.--found throughout the animal kingdom.

[3] In the case of other apparent "gaps," it often turns out that the reason is obvious. There are no marsupial whales or seals. This is evidently because the marsupial reproductive system is difficult to adapt to an aquatic lifestyle. There are also no marsupial bats. This may well be because the niche was filled by placentals from the earliest beginnings of marsupial evolution. There are no large mobile terrestrial mollusks; no large terrestrial arthropods; no fish or amphibia capable of powered flight. To modify a frog for powered flight we would need to give it the cardiovascular system of a mammal or bird. To convert a mollusk into a mobile terrestrial form, we would have to give it an endoskeleton, rid it of its shell, clothe it in an impermeable skin--in other words, convert it into a vertebrate.

directed evolution. (Peter Bowler, *Charles Darwin: The Man and His Influence*, Blackwell Cambridge)

Phillip Johnson, who has written three books attacking evolution claims that there is an entire culture which rests on the scientific assumption of naturalism - the idea that the natural world has no supernatural supervision, Evolution, he claims, is the linchpin to the naturalistic world view because it presupposes that creation was a chance development - that life could happen without G-d.

Richard Dawkins: "It is absolutely safe to say that, if you meet somebody who claims not to believe in evolution, that person is ignorant, stupid or insane (or wicked, but I'd rather not consider that)." (*The Blind Watchmaker*) Dawkins goes on to say that what he particularly dislikes about creationists is that they are intolerant.

The National Academy of Scientists: [Creation-science is not science because] it fails to display the most basic characteristic of science: reliance upon naturalistic explanations. Instead, proponents of "creation-science" hold that the creation of the universe, the earth, the living things, and man was accomplished through supernatural means inaccessible to human understanding. (Friend of the Court Submission to the Supreme Court in the Louisiana Statute case.)

On this Philip Johnson comments: The Academy thus defined "science" in such a way that advocates of supernatural creation may neither argue for their own position nor dispute the claims of the scientific establishment. (*Darwin on Trial*, pg. 8)

Were the evolutionists more honest about just what is fact and what is theory (or as Irving Kristol in the NY Times put it, what is a conglomerate idea consisting of conflicting hypotheses) then one could better argue about the place of religious beliefs in the science classroom. As things stand however, the issue is whether the religion of evolution will continue to be the only permissible religion in the official educational system, not open to criticism, even on scientific grounds.

Only if we understand this can the statements of many scientists be made intelligible. For example, Robert Shapiro writes a whole book called *Origins: A Skeptic's Guide to the Creation of Life on Earth*. In it he delivers a devastating critique of the scientific studies on the origins of life.[1] Nevertheless, he ends of by saying that we can always hope that science will do better in the future. There are always other experiments that can yet be tried. Rather than turn to religion, he prefers to wait for some mystical future, when science will solve all problems.[2]

This desperate loyalty to secular science at all costs was very well put by Arthur Eddington:[3]

Philosophically, the notion of an abrupt beginning to the present order of Nature is repugnant to me, as I think it must to most; and even those who would welcome proof of the intervention of a Creator will probably consider that a single winding-up of some remote epoch is not

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[1]We have quoted him extensively in the relevant sections above.

[2]In Shapiro's words: (in Behe, *Darwin's Black Box*, pgs. 234-5:

"Some future day may yet arrive when all reasonable chemical experiments run to discover a probable origin for life have failed unequivocally. Further, new geological evidence may indicate a sudden appearance of life on the earth. Finally, we may have explored the universe and found no trace of life, or process leading to life, elsewhere. In such a case, some scientists might turn to religion for an answer. Others, however, myself included, would attempt to sort out the surviving less probable scientific explanations in the hope of selecting one that was still more likely than the remainder." (Behe, pg. 234)

[3]Although he was talking about the Big Bang rather than Design, the statement is totally relevant to both issues.

really the kind of relation between G-d and his world that brings satisfaction to the mind.[4]

Only if one understands this can one appreciate not only the wholesale ignoring of counter-evidence, but sometimes the willful suppression thereof. A classic example of this was the discovery of Charles Walcott. In 1909, Charles D. Walcott, while searching for fossils in the Canadian Rocky Mountains, came upon a strata of shale near the Burgess Pass, rich in that for which he had been seeking., fossils from the era known as the Cambrian. Over the following four years Walcott collected between 60,000 and 80,000 fossils from the Burgess Shale. These fossils contained representatives from every phylum except one of the phyla that exist today. Walcott recorded his findings meticulously in his notebooks. No new phyla ever evolved after the Cambrian explosion. These fossils could have changed the entire concept of evolution from a tree of life to a bush of life. And they did, but not in 1909.

Walcott knew he had discovered something very important. That is why he collected the vast number of samples. But he could not believe that evolution could have occurred in such a burst of life forms, "simultaneously" to use the words of Scientific American. This was totally against the theory of Darwin in which he and his colleagues were steeped. And so Walcott reburied the fossil, all 60,000 of them, this time in the draws of his laboratory. Walcott was the director of the Smithsonian Institute in Washington D.C. It was not until 1985 that they were rediscovered (in the draws of the Smithsonian). Had Walcott wanted, he could have hired a phalanx of graduate students to work on the fossils. But he chose not to rock the boat of evolution.[5]

[4]Quoted in Behe, pg. 244

[5]As reported by Gerald Schroeder at the bottom of *The 2001* web site.

Other evolutionists have made the atheistic implications of evolution quite clear:

"Man is the result of a purposeless and natural process that did not have him in mind. (George Gaylord Simpson in Johnson, pg. 117)

"... There is no scientific evidence for a Creator of the natural world, no evidence for a will or purpose that goes beyond the known laws of nature. Even the evidence for life on earth, which promoted the compelling "argument from design" for a Creator, can be accounted for by evolution." (Heinz Pagels, in Johnson, pg. 119)

"Evolution ... is a general postulate to which all theories, all hypotheses, all systems must henceforth bow and which they must satisfy in order to be thinkable and true. Evolution is a light which illuminates all facts." (Teilhard in Johnson, pg. 132)

"All aspects of reality are subject to evolution ... from fish and flowers to human societies and values-indeed (that) all reality is a single process of evolution. In the evolutionary pattern of thought there is no longer either need or room for the supernatural. The earth was not created, it evolved. So did all the plants and animals that inhabit it, including our human self, mind and souls as well as brain and body. So did religion... Finally the evolutionary vision is enabling us to discern the lineaments of the new religion that we can be sure will arise to serve the needs of the coming era." (Julian Huxley, 1959, in Johnson, pg. 152)[1]

[1]A minority of scientists have accused their colleagues of being so blinded by their agenda that they have lost all scientific objectivity: "Evolution is scientifically unfounded and is a "cultural construct" which survives only because it is "socially desirable and even essential to the peace of mind of the body politic" (Sir Fred Hoyle, Evolution From Space, p. 148).

The National Association of Biology teachers, which had long stood firm against religious fundamentalists who insisted that creationism be taught in public schools, had a platform which read: "The diversity of life on earth, is the outcome of evolution: an unsupervised, impersonal, unpredictable, and natural process." In 1997, in a startling about-face the words, "unsupervised" and "impersonal" were dropped. The revision is clearly designed to allow for the possibility that a Master Hand was at the helm.

The biology teachers changed their statement, said Wayne Carley, the association's executive director, "to avoid taking a religious position" that could offend believers. But he said the group firmly believed "there is no evidence of any creator having had a hand in the origin of any species."

Some have taken this even further. Thus Behe on pg. 250:

"John Maddox, the editor of *Nature*, has written in his journal that it may not be long before the practice of religion must be regarded as anti-science. In his recent *book Darwin's Dangerous Idea*, philosopher Daniel Dennett compares religious believers-90 percent of the population- to wild animals who may have to be caged, and he says that parents should be prevented (presumably by coercion) from misinforming their children about the truth of evolution, which is so evident to him."

However, as Behe points out several times in his book, "Darwin's Black Box", the issue of design is becoming more and more of a problem for the secular scientist. One might have expected that with time, evolutionary explanations would have gotten tighter and more sophisticated in dealing with any given biological phenomena. But the rapid advance of molecular biology is continuously creating problems for evolutionists faster than they can solve.

For example, in chapter 3, Behe discusses the amazing complexity of cilium, the little hairs by which some cells "swim". Behe states that in the last few years over 1000 papers having cilia or a related word showed up on an electronic search. Yet only two make an attempt to give an evolutionary explanation for how the cilium is supposed to have evolved, taking into account the actual mechanical complexity involved. The papers disagree with each other even about the general route such an evolution might take. Both papers leave out quantitative details such as "a calculation or informed estimation based on a proposed intermediate structure of how much a particular change would have improved the active swimming ability of the organism [making] such a story utterly useless for how a cilium truly might have evolved." (Pg. 68)

Behe states that despite all the Robert Shapiros, there is no reason to think that the figure of 90% of the general population which believes in G-d is much different for scientists. (pg. 239) However, even many of these would consider it unscientific to invoke the supernatural as an explanation for a natural event. In fact a recent poll of 1000 scientists reported that 55% said that they believed that G-d had no part of the process of creation. But 40% said that while they believe in evolution, "G-d

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In a "Life Magazine" article, entitled "Was Darwin Wrong?" Nobel Prize winning scientist Dr. Ernest Chain is quoted: "To postulate that development and survival of the fittest is entirely a consequence of chance mutations seems to me a hypothesis based on no evidence and irreconcilable with the facts. These classical evolutionary theories are a gross oversimplification of an immensely complex and intricate mass of facts, and it amazes me that they are swallowed so uncritically and readily, and for such a long time, by so many scientists without a murmur of protest."

guided the process, including the creation of man." (*N.Y. Times*, Dec. 21, 1997)

Concerning this, Behe (pg. 241-2; 251-3) has the following to say:

"The fear of the supernatural popping up everywhere in science is vastly overblown. If my graduate student came into my office and said that the angel of death killed her bacterial culture, I would be disinclined to believe her. ... [Our] religious traditions include a rational G-d who made a rational, understandable, law-bound universe...

"[However,] sometimes unique historical events must be invoked to explain an effect [such as the theory that a meteor crashing to earth killed off all the dinosaurs 60 million years ago.] ... Nonetheless, there has not been a rush to postulate meteors as the cause of all sorts of things. ... There is every reason to expect that evidence will be evaluated on a case-by-case basis if meteors are invoked to explain other historical events.

"Similarly, ... if a scientist postulates the involvement of intelligence in some other event, then the onus will be on him or her to support that assertion with observable evidence....

"Another concern ... is for the "scientific method". Hypotheses, careful testing, replicability - all these have served science well. But how can an intelligent designer be tested? Can a designer be put in a test tube? No of course not. But neither can extinct common ancestors be put in test tubes. The problem is that whenever science tries to explain a unique historical event, careful testing and replicability are by definition impossible. Science may be able to study the motion of modern comets, and test Newton's law of motion that describe how comets move. But science will never be able to describe the comet that putatively struck the earth many of millions of years ago. Science can, however, observe the comet's lingering effects on the modern earth. Similarly, science can see the effects that a designer has on life...

"There is no a priori reason why the [origins of the universe and life] are to be explained in the same way as other physical events... Scientists should follow the physical evidence wherever it leads, with no artificial restrictions. ..."

"The example of the Big Bang theory shows that scientific theories with supernatural ramifications can be quite fruitful. The philosophical commitment of some people to the principle that nothing beyond nature exists should not be allowed to interfere with a theory that flows naturally from observable scientific data."

On the contrary, it sometimes appears that it is the evolutionists who have brought their secular religion into the scientific realm. Many social scientists (and others) have pointed out the "messianic conviction" (Kacelnik 1997, p. 65) with which many evolutionists approach their subject:

"The question "What is man?" is probably the most profound that can be asked by man. It has always been central to any system of philosophy or of theology. We know that it has been asked by the most learned humans 2000 years ago, and it is just possible that it was being asked by the most brilliant australopithecines 2 million years ago. The point I want to make now is that all attempts to answer that question before 1859 are worthless and that we will be better off if we ignore them completely." - Simpson 1966, p. 472

"Intelligent life on a planet comes of age when it first works out the reason for its own existence. If superior creatures from space ever visit Earth, the first question they will ask, in order to assess the level of our civilization, is: "Have they discovered evolution yet?" Living organisms had existed on Earth, without ever knowing why, for more than three billion years before the truth finally dawned on one of them. His name was

Charles Darwin. To be fair, others had inklings of the truth, but it was Darwin who first put together a coherent and tenable account of why we exist".- Dawkins 1976, p. 1

CHAPTER C: EVOLUTION AND CREATION

i- Introduction

a- Evolution a total paradigm

b- Judaism does not object to a concept of evolution per se, but requires certain conditions

1- That the theory accommodate the fact that some things required a creation ex nihilo
2- That the first day not be regarded as more primitive than subsequent days
3- That all other evolutionary developments (something from something) be recognized as only taking place because of G-d's providential input
4- That the time taken be reconciled with the literal Biblical text
5- That the creation process be regarded as the most perfect for the purposes for which the world was made
6- That the world and all its species be regarded as essentially co-operative and not in competition

ii- Compatibility of Order and First Beginnings

iii- בריאה Used Only Three Times

a - Beginning of creation

b - Beginning of animal life

c - The נשמה of man

iv- Everything Created On First Day

v- Evolutionary Development On Other Days

a - Hashem's Hashgacha essential to the process

b - Expressed either by the word (ויעש) עושה i.e. final formation from earlier form

c - Or by G-d commanding world for it itself to bring forth

vi- Evolutionary development of Man

a - All three creation words used by man

b - Man created as a composite of all existing reality

c - Man's development in stages

d - Later (physical) evolutionary changes in man

CHAPTER C: EVOLUTION AND CREATION

a- Introduction: Evolution a total paradigm

Part of Judaism's problem with evolution is the the ironic fact that in scientific terms, evolution is such a successful theory. (Successful does not mean true but it is a major consideration as to whether a scientific theory will be accepted or not.) It is successful in the sense that it has proven to be a useful tool in explaining a large amount of how life evolved. And for may evolutionists, (though by no means all) this means a secular, atheistic explanation has replaced the G-d-idea. Ernst Mayer, in his book *One Long Argument,* put it well when he claimed that the new synthesis, which consists of Darwinian evolution plus DNA-mediated genetic transmission, provides the basic framework to address all the major issues in evolutionary biology. All that remains, he claimed, are puzzles. Some of these puzzles, particularly historical ones, such as the origin of life or of Homo Sapiens, may even resist a final, satisfying explanation. However they will be resolved, they will not force any significant change in the underlying paradigm of Darwinian evolution.

Evolution as a total theory reflects Edom's desire for a total explanation of reality

This claim of evolutionists is part of a broader claim in the Western World to be the masters of all knowledge. The West today, claims to be the experts in psychology, biology, physics, economics and philosophy. It even claims to be the experts in anthropology – i.e. in understanding other people and cultures. There is not area of knowledge where they bow down to other cultures as being superior to other cultures, and this is exactly what Chazal predicted of Edomite civilization.

This stands in stark contrast to the Jewish view, which claims that we can never fully understand certain events, and especially those having to do with creation[1].

It is this arrogance which causes so much conflict with Judaism – for ultimately the West recognizes the main alternative to its sophisticated secular humanism is Judaism – and that the two, for all that they bear resemblance in some places, are in utter conflict. Secular humanism is ultimately a triumph for man, a triumph which gets him so close to discovering G-d. But at that very point, Edom stops, cutting off the final link to G-d, and leaving us with secular humanism. Science does not allow one to evoke G-d as a scientific explanation for anything. Officially, science, and even evolution, is not atheistic. But in practice, excluding G-d as an explanation for reality speaks for itself.

In the Ner LeElef Science book, we showed many examples of how science today is getting closer to Judaism in many regards. Science as it stands today easily accommodates resolutions to the basic disputes concerning the place for freedom of choice and Hashgacha Pratis, of the age of the universe, of the underlying unity of the universe and of many more things. Yet science still insists that it is unscientific to talk about G-d. One can be religious and a scientist without any problem at all. But, as a scientist, one may not evoke G-d for anything at all. This is Edom. This is the cutting off at the point of contact. Eisav dresses

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[1] רמב"ן (בראשית א:א)
רבינו משה עד הקבלה מפי אלא בוריו על יוודע ולא ,המקראות מן מובן אינו עמוק סוד בראשית שמעשה בבראשית צורך התורה להתחלת שאין יצחק רבי אמר לכך ,אותו להסתיר חייבין ויודעיו ,הגבורה מפי ברא.

frum and talks frum, but when he finally expresses what he really wants, it is to be his own boss. Man will rule man. As for G-d – you can do what you like after you go home.

So we see that the real problem is not with evolution per se, but with some deeper assumptions in whose service evolution has been harnessed. If however, we look at the theory, without any of the ideological baggage which often accompanies it, then we find a remarkable number of confluences between Judaism and evolution. Make no mistake – there are still some real conflicts. But the approach should not be to talk of evolution and Judaism – rather we need to identify what specifically is in conflict and what is not. The latter category proves to be much broader than most people imagine.

The theory of evolution, as we have shown, has many problems. There is every reason to accept that, as these problems are addressed, either the theory will be replaced, or it will be modified, a situation which is already taking place to some degree. Remarkably, thus far the modifications have been in a direction towards Judaism, rather than away from it. The late Stephen J Gould and Miles Eldrige's Punctuated Equilibira, Lynn Margulis' Symbiosis theory and others, have all operated firmly within the evolutionary framework and yet, without that being their intention, they have brought it closer to Judaism. Let us now identify the specific areas of conflict:

Judaism does not object to a concept of evolution per se, but requires certain conditions:

In the text below we show that the mainstream commentators do hold by some evolutionary development in the creation process. It is important to note that these commentators preceded Darwin and were merely giving an authentic interpretation of the text. The main point is that in the Creation, everything was created in potential on the first day. From that day on, things emerged in what can be termed in the broadest sense an evolutionary way. There were only two exceptions to this, where the word בריאה is used, i.e. the transition from plant to animal life and the creation of the soul of man. We will show that even in the development of man there were evolutionary developments.

What would a Torah-true 'Theory of Evolution' look like. It would seem that seven primary conditions are required:

1- *That the theory accommodate the fact that some things required a creation ex nihilo.*
2- *That the first day not be regarded as more primitive than subsequent days; on the contrary - it was higher spiritually than the other days*[1].
3- *That all evolutionary developments be recognized as only taking place because of G-d's Providential input*[2].

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[1] רוח א'משנ ה"פ החיים :
הדקה מן דקה גדול בהעלם הוא הראשון מאמר . מאמרות'בי נבראו העולמות אלו וכל הימנו למטה'והב. האחרון המאמר עד' כו בהתגלות יותר.
See **C-iv** below - אדרת אליהו

[2] He controls and guides the whole process:
נינהו הי העולם נברא שבהן מאמרות עשרה כנגד אמר יוחנן'ר ...אמר מי כנגד מלכיות עשרה הני .לב ה"ר נעשו שמים' ה בדבר דכתיב הוא מאמר נמי בראשית הוו'ט דבראשית)ויאמר (ויאמר.
שם א"מהרש:
שהיה בו להזכיר הוצרך לא מאין יש לבריאת'וגו בראשית ראשונה אמירה שהיה הראשון ביום והשתא ממש בו שאין בדבר עשיה תפול ולא מאין ביש הראשון חומר נברא לחוד בעלמא באמירה דודאי באמירה

4- *That the time taken be reconciled with the literal Biblical text1.*
5- *That the creation process be regarded as the most perfect for the purposes for which the world was made.*

Although evolutionary developments can take place after the six days of creation[2], these represent retrogressive steps[3]. This does not mean that the world was created objectively perfect; on the contrary, there was a certain imperfection built into the creation to allow for free choice and to allow man to partner G-d in completing the creation[4]. But, what it does mean is that the world was completed to perfection for its designated task.

6- *That the world and its entire species be regarded as essentially co-operative and not in competition.*

Even where one species lives off another, the latter is to be regarded as essentially serving the former. This is in opposition to Darwin's principle of the survival of the fittest, even after the many recent modifications to this principle.

It is true that, other than man, at one level, species were produced essentially to reproduce[5]. But this does not require that we evoke a principle of survival of the fittest, which implies that species are in competition and opposition with each other. The *Daas Tevunos* says that the creation with all its species is essentially in co-operation, and all of creation combines to fulfull their common purpose[6].

ולומר לחלוק דין לבעל ו"ח היה הראשון חומר נברא שכבר הראשון ביום שהיה ראשונה אמירה אחרי אבל צורות שנעשו עד הפשוטים החומרים הרכבות י"ע אחרים בימים הכל נעשה דבעשיה מיש יש שהיה כאן נמי אחרים שבימים הבריאות בכל הזכיר הטועה מלב הדעת זאת ולהוציא אדם ידי כמעשה אחרות נברא אלו מבואר והענין כלל מעשה שום בלי הכל נתהוה לחוד בעלמא אמירה ידי שעל לומר אמירה ה" ב'ית עשייתו בבחירתו לשנות באדם אפשר היה לא בעשיה העולם

[1]See **E-ii - vi** below for different approaches. All approaches are dependent on the idea that time was created and is therefore not absolute.

[2]see **C-vi** at the end

[3] תפארת ישראל מ"פ: ... שמלאכתו זה דבר מורה מלאכתו מכל השביעי ביום שבת אשר יתברך השם חסרון עוד ואין בשלמות

יא)כ (שמות דבר העמק
כ"ג זה ובשביל במינו משובח היותר באופן היה בריה וכל מין שכל היינו צביונם ל" חז'דפי - צבאם וכל ה"ד פרטים לכמה נתחלק בריה וכל מין וכל העולם נשתנה כבר תורה מתן בשעת אבל השבת יום את'ה ברך הראשונה בבריאה משהיה גרועים

רמב״ן, דרוש תורה תמימה
... והנה קטן שבישראל קרא ביצירה יותר, ומפי מלמד בעל קבלה, ידע כי הקודם בבריאה דק מן השני

[4] גור תמיד השלימות מן מחסרת היא ... הארץ ... :עשת לא והיא ה"ד) יב דף(יא א בראשית אריה)ש"(ע ...

[5] ספר הבדל אין חיים בבעלי כי ... למינהו למינה הכתוב הזכיר חיים הבעלי ביצירת :ב)"פ ג"ח (העקרים אחד תכלית מכולם המכוון כי הנקבה ליצירת הזכר יצירת ובין אחר מין לתכלית אחד מין תכלית בין המין קיום והוא כולל בלבד

[6] דעת לפי עליהם שמביט מי, הזאת הבריאה חלקי :השכל אמר :) קכח סימן פרידלנדר (הוצאת תבונות תכלית אל כולם מתקשרים בלתי :פירוש, ומפורדים מפוזרים ענינים אלא יראם לא בתחלה, עיניו ראות כל היות ימצא בחכמה שיעמיק מי אך ... בעצמו נשלם, מיוחד לתכלית, עצמו בפני ענין אחד כל אלא, אחת החכמה כיוונה שאליו הענין להשלים צריכים שכולם, בזה זה גמור קשר מתקשרים כולם הנמצאות אחת לתכלית מתקבצים וכולם, בבריאה העליונה.

A leading micro-biologist, Lynn Margulis has proposed a system of the advancement of organisms by cooperation and symbiosis. Her idea that parts of the cell were once free-living organisms has today won widespread scientific acclaim.

7- *That man be regarded as the pinnacle of creation, the purpose for which the creation was made.*

In purely evolutionary terms, man may not be the best adapted, i.e. the most successful, to his environment; bacteria do a lot better.

The Creation

We claimed above, that there are strong evolutionary trends in the Bereishis account of creation. What follows is an analysis of the psukim, according to Chazal, Rishonim and Achronim, all of whom preceded Darwin and none of whom were trying to be apologetic in any way or to reconcile Judaism with anything else. The approach we have taken is, what we believe to be the main stream approach which the meforshim take towards the psukim.

The creation took place over a period of seven days. At first blush the Psukim are very clear about what happened on each day, and three year old children bring home pictures from school of each creation day. Yet a far more complex picture emerges from Chazal and the Meforshim[1]. And this is but the tip of the ice-berg. As the Ramban makes clear, no analysis of the Psukim can reveal the true story[2], even with the help of the commentators. Rashi points out that we don't even learn the order of creation from the Pesukim[3], and we would be hard pressed to understand the relationship and order of the ten things created on the first day[4]. We are not told when the higher spiritual worlds[5] or *Malachim* were created (though Rashi tells us that this was on the second day[6]), or when or how the

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עשה אשר כל ה"ד לא:א בראשית בספורנו עיין

[1]E.g, Rashi tells us that the light which was created on the first day was only used during the days of creation. After that it was hidden away. It will again shine during the Messianic Era ot possibly only after *Techiyas HaMeishim.* The light which we have today is from the sun and the stars which were only created on the fourth day.

[2] המקראות מן מובן אינו עמוק סוד בראשית א): שמעשה:א בראשית (ן"רמב

[3]... א א (ד"ה בראשית ברא): ולא בא המקרא להורות סדר הבריאה שהרי כתיב ורוח אלוקים מרחפת עלפני המים ועוד שהשמים מאש ומים נבראו...שהרי המים קדמו

[4] עשרה היום מדת, ומים רוח, וחשך אור, ובהו תהו, וארץ שמים הם ואלו ראשון ביום נבראו דברים, לילה ומדת.
ובספרו מנחת יהודה, הסביר הרב יהודה פתיה במקצת (ס' א): בראשית ברא וגו' פירוש קודם שברא הקב"ה את השמים ואת הארץ, היה כל העולם כולו מלא מים הנקראים תהום, עד אפס המקום לברוא שם שמים וארץ. וכל כך היו המים רבים וגבוהים, עד שהיו מגיעים קרוב לכסא הכבוד הנקרא רוח וכל זה עשה המאציל בעוד היות החושך ... [ו]ברא את השמים ואת הארץ בתוך אותם המים. ...אלוקים על פני תהום קודם שיצר את האור

[5] הארץ ואת ה"ד א-א בראשית אליהו אדרת
סימנן עולמות'ד נגד'ז פעמים' ד .אותיות ח"כ ובהן תיבות שבעה ראשון בפסוק ותמצא וראה הביטה המה'הארץ ואת השמים את 'ה."ב אצילות הוא'אלקים. 'הבריאה עולם הוא'ברא בראשית. 'ע"אבי לכלול . אותיות' וה'ב של תיבות'לב ונחלקו ,אותיות שבעה בהן יש ,השמים את . 'והעשי היצירה עולמות הרקיעי שבעה'.

[6] בראשית רבה: ר' יוחנן אומר בשני נבראו המלאכים הה"ד (תהלים קד ג) המקרה במים עליותיו השם עבים רכובו המהלך על כנפי רוח וגו' ר חנינא אמר בחמישי וגו'

minerals came into being (through Gematriahs – Tanya). We are not told at all about intermediary forms[1] and we are told by our Sages that ten things were created *Bein HaShanshos* of *Erev Shabbos*[2]. Furthermore, we need to understand how miracles fit into the creation pattern.The further we look, the more mysterious the creation event becomes, until it is clear that the purpose of the Chumash in telling us about it to begin with was for other reasons entirely[3]. Only those who merit to receive Kabalistic wisdom, each great person from his teacher, can peak through the mystery and go a little further[4]. This is not because the creation is not all included in the Torah. On the contrary, the Torah is the blueprint for the world[5]. בראשית can mean 'using ראשית', G-d created the Heavan and the Earth. And ראשית is Torah[6]. But this is referring to the original, more spiritual Torah, which requires Kabbalistic wisdom to access.

Everything Created on the First Day:

A clear pasuk tells us that everything was created in potential on the first day:

בראשית ב:ד : אלה תולדות השמים והארץ בהבראם <u>ביום</u> עשות ה 'אלקים ארץ ושמים

<u>THESE ARE THE CHRONICLES OF THE HEAVEN AND EARTH WHEN THEY WERE CREATED, ON THE DAY G-D COMPLETED EARTH AND HEAVAN[7].</u>

חוש אלא לו שאין הימיי האספוג ונמצא והצומח הדומם בין אמצעי כמו האלמוג (ש)הוא :א"פ ג"מ העיקרים [1] ספר
האדם ומין ח"הב מיני בין אמצעי כמו שהוא הקוף ונמצא ,והחי הצומח בין האמצעי כמו והוא ההרגש

[2] אבות פ״ה מש׳ ו ע״ש

[3] רש״י א א ועיין בהגות בפרשיות התורה המאמר הראשון (כח מעשיו הגיד לעמו) שמביא קושיית הראשונים ותירוציהם על מאמר הזה של בי יצחק

According to Chazal, the opening sentence of Bereishis is coming to tell us the purpose for which the wolrd was created: *Bishvil Reishis Shenikreis Torah; Bishvil Reishis Shenikreish Yisroel.* I.e. The world was created so that manking would keep His Torah. Similarly, at the end of creation, this theme is repeated. On the sixth day, a *Vav* is added – *Yom <u>Ha</u>Shishi* – and Rashi tells us that this is because the very existence of the physical creation is a function of Manking fulfilling maintaining the spiritual and moral creation, i.e. the Torah which was given on the Sixth Day, of Sivan.

[4] רמב"ן ,אותו להסתיר חייבין ויודעיו ,הגבורה מפי רבינו משה עד הקבלה מפי אלא בוריו על יוודע שם: ולא
ברא בבראשית צורך התורה להתחלת שאין יצחק רבי אמר לכך.

[5] בר״ר בראשית א א: היה הקב״ה מביט בתורה ובורא את העולם

[6] שם: והתורה אמרה בראשית ברא אלוקים ואין ראשית אלא תורה

[7] רש"י שם: תולדות השמים והארץ בהבראם ביום עשות ה'. למדך <u>שכלם נבראו ביום ראשון</u>.וכן) על כתוב
הארץ) <u>ואת</u> השמים <u>את</u> אלקים ברא (בראשית את מלשון דהדיוק ד)"י (דף אריה הגור והסביר)יד פסוק א"פ
דברים אליו נמשך עיקר שהוא דבר כי ...הדבר עצם הוא את דמלת פירש ש)"(ע ן"הרמב הסבר שהביא ואחרי
'ד את ל"ז חכמים דרשו ולפיכך ...השמים ואל הארץ אל והמחובר הנמשך דבר כל מרבה הוא ולפיכך ...הרבה
הסבר) עוד ש"(ע ת"בהשי ומחוברים דביקים הם ח"שת טעמא והיינו ח"ת לרבות תירא אלוקיך
(עיין בחגיגה יב:, ר"ב יד-א; לכלל הענין עיין פסחים כב. וביתר אריכות במלבים את ה"ד השמים ואת הארץ.)
מהרש"א ר"ה בל. ד"ה נמי מאמר הוא:
<u>כי חומר הראשון אשר ממנו נתהוו כל</u> ... האחרים'בט כמו בראשונה אמירה לשון נמי הוזכר שלא מה בזה ונראה
<u>אבל בימים אחרים לא</u>. נעשו שמים'ה בדבר ש"כמ י"הש במאמר מאין יש ראשון ובמאמר. <u>ראשון ביום נברא הצורות</u>
יש והוה יתברך השם במאמר ביומו לו המיוחדת צורתו אחד לכל נקבע <u>הראשון החומר מן אלא מאין יש הבריאה היה</u>
מיש.

The rest of the creation days were essentially an evolutionary development from that first day[1] whose prime substances of תהו and בהו became the stuff for later developments[2]. Rashi brings as one of the proofs for this the fact that the verse does not say:

בראשית ברא אלוקים השמים והארץ

but rather

את השמים ואת הארץ

The word את is all-inclusive. It means that concept and everything that goes around it, as if to say that concept from א *to* ת[3]. (Even in English we say from A to Z.) So we find that it says כבד את אביך וגו׳ which means that you should not only honor your father, but also everyone who is included by the broader concept of father such as your step-mother, your grandfather, etc.

Because the creation process emanated from G-d's creative Will, which then had to come down many, many steps until it reached its final form, the first day was actually much more spiritual than the other days[4]. In fact, all the higher, more spiritual universes were created on that first day[5]. This would explain why, although the first verse is considered one of the ten sayings of Creation[6], it does not begin with the words, "And G-d said". For what was then being created was higher than the world of speech[7].

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[1] רש״י א יד ד״ה יהי מאורות: מיום ראשון נבראו וברביעי צוה עליהם להתלות ברקיע וכן כל תולדות שמים וארץ נבראו ביום ראשון וכל אחד נקבע ביום ביום שנגזר עליו

[2] ב:א (בראשית ובהו תהו היתה והארץ)
הנקראת ראשונה ומצורה תהו הנקרא ראשון מחומר מורכב דבר היתה אז הנבראת הארץ ספורנו : ואותה בהו

רמב״ן, דרוש התורה תמימה: ״תהו, פירוש הכתוב כי יולי הארץ היו ארבעה יסודות שהם עפר ומים אש ורוח, כי פי׳ תהו דבר מורגש, וכן אמרו רבותינו תהו, דבר המתהה את הבריות, כלומר שמרגישין בו. ופירוש, ״בהו״, דבר שיש בו ישות , כלומר בו הוא, שאדם אומר בזה הדבר איכא יש. והוא יסוד אומר תדשא ...ורוח אלוהים, הוא יסוד הרוח....וחשך על פני תהום, האש היסודית שהיא חשכה...המים הארץ, ישרצו המים, תוצא הארץ, לומר שהוציא מן הארץ העשבים והאילנות, והוציא מן המים הדגים, והוציא מן הארץ החיות שהושם בתולדותם להוציא כן, כי גם גופם עפרי וגס, ונפשם דקית אוירית ועל תתמה על מילת עשיה בארץ[2], כי כמו שנ׳ ותוציא[2] כן מלת נעשה, כי כתיב עץ ...מורכבת מן היסודות פרי עושה פרי, וכתיב ועשתה את התבואה לשלוש השנים.״

[3] רש״י א יד: הוא שכתוב את השמים לרבות תולדותיהסואת הארץ לרבות תולדותיה
ופירש הרמב״ן שלכך אתא את לרבוי מפני שהוא מלשון אתא ובלשון חכמים לאתויי הא ולפיכך הא לרבויא.
ועיין בגור אריה א יד ד״ה כל תולדות שמים וארץ נבראו (דף יד)

[4] א'משנ ה"פ החיים רוח :
יותר הימנו למטה'והב .הדקה מן דקה גדול בהעלם הוא הראשון מאמר . מאמרות'בי נבראו העולמות אלו וכל האחרון המאמר עד' כו בהתגלות.

[5] אדרת הארץ ואת ה"ד א-א בראשית אליהו
סימנן עולמות'ד נגד'ז פעמים' ד .אותיות ח"כ ובהן תיבות שבעה ראשון בפסוק ותמצא וראה הביטה המה'הארץ ואת השמים את 'ה."ב אצילות הוא'אלקים. 'הבריאה עולם הוא'ברא בראשית. 'ע"אבי לכלול . אותיות' וה'ב של תיבות'לב ונחלקו ,אותיות שבעה בהן יש ,השמים את . 'והעשי היצירה עולמות הרקיעי שבעה'.

[6] מס׳ ראש השנה .לב הוא מאמר נמי בראשית

[7] מהרש"א ה"ר .לב ה"ד הוא מאמר נמי:
ממנו אשר הראשון חומר כי ... האחרים'בט כמו בראשונה אמירה לשון נמי הוזכר שלא מה בזה ונראה נעשו שמים'ה בדבר ש"כמ י"הש במאמר מאין יש ראשון ובמאמר .ראשון ביום נברא הצורות כל נתהוו.

What emerges is an initial creation ex-nihilo (something from nothing) on the first day followed by later days when things were formed from existing reality (something from something). Hence the first day uses the word ברא[1], creation ex-nihilo, while all the other days use words such as He formed (יצר) and He made (וינעש)[2]. The former means to make something from something, whereas the latter means to complete a process, to place it in its final form[3]. Also we see phrases like, *Let the earth bring forth,* etc[4], implying that the earth already had within it what it needed to bring forth. The Meharsha says that, in order that one should not now err and think that the later days were an automatic evolutionary process, devoid of G-d's input, the Chumash explicitly tells us on each occasion, ויאמר אלוקים to show that all of creation is but a reflection of Divine Will[5]. Yet, the Sages tell us, the creation

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לו המיוחדת צורתו אחד לכל נקבע הראשון החומר מן אלא מאין יש הבריאה היה לא אחרים בימים אבל
מיש יש והוה יתברך השם במאמר ביומו.

[1] בראשית א:א בראשית ברא א - לקים...

[2] בראשית ז:א
כן ויהי לרקיע מעל אשר המים ובין לרקיע מתחת אשר המים בין ויבדל הרקיע את אלקים ויעש:

בראשית ז:א
הלילה לממשלת הקטן המאור ואת היום לממשלת הגדל המאור את הגדלים המארת שני את אלקים ויעש
הכוכבים ואת:

בראשית כה:א
טוב כי אלקים וירא למינהו האדמה רמש כל ואת למינה הבהמה ואת למינה הארץ חית את אלקים ויעש:

בראשית ג-א:ב
מכל השביעי ביום וישבת עשה אשר מלאכתו השביעי ביום אלקים ויכל :צבאם וכל והארץ השמים ויכלו
אלקים ברא אשר מלאכתו מכל שבת בו כי אתו ויקדש השביעי יום את אלקים ויברך :עשה אשר מלאכתו
לעשות:

[3] רמב"ן: לשון עשייה בכל מקום תקון הדבר על מתכונתו
וכן בבכור שור (א ז): עשייה אינו לשון בריאה אלא לשון תיקון ולפיכך כל דבר שנעשה על
ידי אדם אומר בו ויעש כמו ויעש בצלאל, שאדם אינו בורא אלא מתקן
ברא פירש מילת יצירה באופן אחר: ה"ד א-א בראשית אליהו אמנם הגר"א באדרת
כולם 'אפי הנבראים בכח אין אשר העצם חידוש על להורות הונח בריאה מלת ..עשיה .יצירה .בריאה
והוא בכמות הדבר צורת על נופל יצירה .מתכיות מיני וכל הצומח או הדומם כמו לחדשו ונבונים חכמים
דבוק שאינו והוא עשיתו תיקון על יתכן עשיה .הדבוק המקרה.

[4] בראשית ט:א
כן ויהי היבשה ותראה אחד מקום אל השמים מתחת המים יקוו אלקים ויאמר:

בראשית יא:א
כן ויהי הארץ על בו זרעו אשר למינו פרי עשה פרי עץ זרע מזריע עשב דשא הארץ תדשא אלקים ויאמר:

בראשית יב:א
טוב כי אלקים וירא למינהו בו זרעו אשר פרי עשה ועץ למינהו זרע מזריע עשב דשא הארץ ותוצא:

בראשית כד:א
כן ויהי למינה ארץ וחיתו ורמש בהמה למינה חיה נפש הארץ תוצא אלקים ויאמר:

[5] מהרש"א מס' ראש השנה לב. ד"ה הני
דודאי באמירה שהיה בו להזכיר הוצרך לא מאין יש לבריאת'וגו בראשית ראשונה אמירה שהיה הראשון ביום והשתא
ראשונה אמירה אחרי אבל ממש בו שאין בדבר עשיה תפול ולא מאין ביש הראשון חומר נברא לחוד בעלמא באמירה

is now set up in such a way that a concerted effort for an atheistic interpretation of these events will yield a plusible theory[1]. On the other hand, an honest attempt to see G-d's hand in the creation process will do so to such a degree that the Sages decreed that there should be ten verses of Malchus, of proclaiming G-d's reality on Rosh Hashana, paralleling each one of the *Ten Sayings of Creation*[2].

There are but two other places in the entire creation story which uses the word ברא[3], in the transition from plant to animal life, and in the transition from the animal soul to the human soul. Even in these cases, the opinion of the Ramban is that the word בריאה, this did not mean something יש מאין. Only on the first day was there a בריאה יש מאין according to him[4].

The second use of the word *Bara* is at the beginning of the creation of animal life, the *Taninim*[5], implying that the *Nefesh HaBeheimis* could not entirely evolve from what already existed[6], i.e. that the transition from plant to animal life required the creation of a *Nefesh Beheimis* as a creation ex-nihilo. i.e. evolutionary development alone not sufficient to move from plant to animal life.[1] This is because of the quantum leap between plants and animals:

הכל נעשה דבעשיה מיש יש שהיה כאן ולומר לחלוק דין לבעל ו"ח היה הראשון חומר נברא שכבר הראשון ביום שהיה מלב הדעת זאת ולהוציא אדם ידי כמעשה אחרות צורות שנעשו עד הפשוטים החומרים הרכבות י"ע אחרים בימים שום בלי הכל נתהוה לחוד בעלמא אמירה ידי שעל לומר אמירה נמי אחרים שבימים הבריאות בכל הזכיר הטועה ה" ב'ית עשייתו בבחירתו לשנות באדם אפשר היה לא בעשיה העולם נברא אלו מבואר והענין כלל מעשה

[1] אבות 'א' משנ ה"פ
הרשעים מן להפרע אלא להבראות יכול אחד במאמר והלא לומר תלמוד ומה העולם נברא מאמרות בעשרה)א(מאמרות בעשרה שנברא העולם את שמקימין לצדיקים טוב שכר ולתן מאמרות בעשרה שנברא העולם את שמאבדין

[2] ר .לב ה"נינהו הי העולם נברא שבהן מאמרות עשרה כנגד אמר יוחנן'ר ...אמר מי כנגד מלכיות עשרה הני
נעשו שמים' ה בדבר דכתיב הוא מאמר נמי בראשית הוו'ט דבראשית)ויאמר (ויאמר.

[3] Our approach here is that each time the word *Bara* is used, it means that there was another aspect of creation which was ex-nihilo. However, Ramban, in his *Drush al HaTorah*, does not agree with this approach, and argues that the only creation ex-nihilo was at the beginning.

[4] רמב"ן, דרוש תורה תמימה
"ומכאן ואילך לא ברא דבר, ואע"פ שכתב ויברא אלהים את התנינים הגדולים , היא מלה חוזרת לעיקר ההתחלה , ואמר זה בתנינים להפלגתם, לומר כי עיקר המצאתם מאין הוא לבורא יתברך, וכן אמר באדם ויברא, כי נתכון לבריאת הנפש שאינה לא מן השמים ולא מן הארץ, כי אין מילה בתורה ראויה לזה אלא היא, כי עשיה ויצירה נפעלות דבר מדבר, לא כדברי ר' אברהם שמפרש בריאה מלשון וברא ." (וכר. וברא אותהן בחרבותם (יחזקאל כג, מז) והוא לשון כריתה וגזירה , וככה מלת ברא - אהל יוסף.)

[5] א כאבראשית המים שרצו אשר הרמשת החיה נפש כל ואת הגדלים התנינים את אלקים כא: ויברא:א
טוב כי אלקים וירא למינהו כנף עוף כל ואת למינהם:

[6] ספורנו א כא (ד"ה ויברא את התנינים: שלא הספיק הכח המוליד המסודר במים להמציא התנינים הראשונים בלי זרע עד שברא אז כח מספיק לזה ע"כ
ועיין במלבי"ם ההארה הבאה

קצת להם יש התנועה נפש שבעלי מפני ... נח בני עד בו הורשו לא הבשר אך :כט א בראשית ן"רמב
מן ויברחו ומזוניהם בטובתם בחירה להם ויש (i.e. humans) המשכלת הנפש לבעלי בה נדמו בנפשם מעלה והמיתה הצער.

ע)"ש (סוף יהודה מנחת'לה וערבה ה"ד רצב דף ב"ח ק"אי הרב של ראיה בעולת עיין

[1] אבל א"(ה ברה מלשון התנינים אצל ברא דמלת מפרשים רובי ד"בא חכמינו ה"ד א:א עזרא אבן ב גם עיין
אליהו באדרת ע"וע .מיש יש בריאה היה התנינים אצל כ"ג זה ולפי גבול ולשום לגזור וטעמו ף)"אל תחת ברא ה"ד א-א בראשית.

רמב"ן בראשית א כט :אך הבשר לא הורשו בו עד בני נח ... מפני שבעלי נפש התנועה יש להם קצת מעלה בנפשם נדמו בה לבעלי הנפש המשכלת (i.e. humans) ויש להם בחירה בטובתם ומזוניהם ויברחו מן הצער והמיתה[1].

After that, the rest of the animal kingdom could once again be directed by G-d to evolve from what was[2].

The second additional place where the word ברא, i.e. creation ex-nihilo, is used is with the creation of the soul of Man[3]. By man all three words, בריאה, יצירה, עשייה are employed[4]. The body of man appears to have emerged from existing reality, (it was, if you like an evolutionary development) while his *Neshama* was created ex-nihilo. (See note [5] where the Gra breaks this down into 3 stages for each of three creation words used for man.) Below we will come back to the creation of man in greater detail.

Other creation words which are important to understand are:

<u>כי טוב</u> וירא אלוקים: The end of a process. Hence, Rashi[6] tells us that there is no *Ki Tov* on the second day because the completion of this process was only on the third.

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[1] עיין ע)"ש (סוף יהודה מנחת'לה וערבה ה"ד רצב דף ב"ח ק"אי הרב של ראיה בעולת
הימיי האספוג ונמצא והצומח הדומם בין אמצעי כמו האלמוג (ש)הוא :א"פ ג"מ העיקרים ספר מיני בין אמצעי כמו שהוא הקוף ונמצא ,והחי הצומח בין האמצעי כמו והוא ההרגש חוש אלא לו שאין האדם ומין ח"הב

[2] כבר המים אמנם ,המים ישרצו ש"כמ מיש יש נבראו חיים ובעלי מאין יש בריאת מציין בריאה כי בארנו יש הבריאה והיה המים בכח זה אין שלהם החיונית הנפש אבל חיים הבעלי גופי להוציא רק בכחם היה לא לבדו'מה מאין . (מלבים)...

[3] בראשית א:<u>ויברא</u> - בצלמו האדם את לקים-א כז...
שיטת הרמב"ן היא שאפילו הנשמה של האדם נברא בכח ביום הראשון. וז"ל בתשובת הרשב"א דבר ברור הוא בדברי רז"ל ...המיוחסות לרמב"ן: ומה ששאל הרב אם נתברר שנבראו הנשמות ביום ראשון אבל אם נבראו ביום ראשון או בששי פלוגתא דרבי אלעזר וריש לקיש ...שהנשמות כולן נבראו מאז בבראשית רבה וגו' ועיין באיוב לח כא

[4] בראשית א:כו
ובכל הארץ ובכל ובבהמה השמים ובעוף הים בדגת וירדו כדמותנו <u>אדם נעשה</u> אלקים ויאמר :הארץ על הרמש הרמש

בראשית ב:ז
:חיה לנפש האדם ויהי חיים נשמת באפיו ויפח האדמה מן עפר האדם את אלקים'ה <u>וייצר</u>

בראשית א:כז
אתם ברא ונקבה זכר אתו ברא אלקים בצלם בצלמו האדם את אלקים <u>ויברא</u>

[5] אדרת ברא ה"ד א-א בראשית אליהו:
מן עפר האדם את אלקים' ה וייצר .בצלמו האדם את אלקים ויברא .אלה שלש נאמר האדם בריאת ואצל ותואר ציור <u>על יצירה</u> .אלוקים צלם <u>נשמתו לעומת בריאה</u> .בצלמינו אדם נעשה אלקים ויאמר .האדמה כתנות ולאשתו לאדם אלוקים' ה ויעש כמו .<u>בריאותיו בשמירת</u> אליו הנטפל תיקונו אופן על <u>ועשיה</u> .<u>אבריו</u> .וילבישם עור

[6] א ז ד"ה מעל הרקיע באמצע

ויהי כן: And the thing was given its final, permanent nature[1].

למינו: A species will be able to produce only from within the species.

The Creation of Man and Woman

There are four stages in the creation of Man:

i. The creation of Adam's body
ii. The creation of his animal life force and possibly the power of speech
iii. The creation of his upper souls, making him *BeTzElem Elokim.*
iv. The division of this male-female being into a separate male and female.

We stated above that all three creation words, בריאה, יצירה, עשייה are employed in the creation of man[2]. The body of man appears to have emerged from existing reality, while his Neshama was created ex-nihilo[3]. Because of this creation ex-nihilo, the words ויהי כן do not appear by man[4]. Because he has choice, the words, וירא אלוקים כי טוב do not appear by him[5].

Man was created as a composite of all existing reality[6] both laterally and vertically. Laterally, man's body was taken from all the dust of the earth[1]; vertically,

[1] מאור בשמש (ד"ה ויאמר אלוקים ויהי אור): שכל דבר שנשאר על טבעו וביקיומו נאמר בו ויהי כן
ספורנו א ח (ד"ה ויהי כן): נשאר קיים נגד טבעו
ספורנו א כא (ד"ה ויהי כן): ובלי תוספת וגרעון שאם יתחדש מורכב משני מינין לא יולד

[2] בראשית כו:א
ובכל הארץ ובכל ובבהמה השמים ובעוף הים בדגת וירדו כדמותנו בצלמנו אדם נעשה אלקים ויאמר הארץ על הרמש הרמש:

בראשית ז:ב
חיה לנפש האדם ויהי חיים נשמת באפיו ויפח האדם מן עפר האדם את אלקים'ה וייצר:

בראשית כז:א
אתם ברא ונקבה זכר אתו ברא אלקים בצלם בצלמו האדם את אלקים ויברא

[3] אדרת ברא ה"ד א-א בראשית אליהו:
מן עפר האדם את אלקים' ה וייצר .בצלמו האדם את אלקים ויברא .אלה שלש נאמר האדם בריאת ואצל ותואר ציור על יצירה .אלוקים צלם נשמתו לעומת בריאה .בצלמינו אדם נעשה אלקים ויאמר .האדמה כתנות ולאשתו לאדם אלוקים' ה ויעש כמו .בריאותיו בשמירת אליו הנטפל תיקונו אופן על ועשיה .אבריו וילבישם עור.

[4] מדרש הביאור: למהלא אמר ביום הראשון ויהי כן כך אמר חכמים שלשה לא נאמר בהן ויהי כן שמים תנינים ואדם. למה לפי שנאמר בהן בריאה לכך לא הוצרך לזה

[5] משך חכמה: לא כתב וירא אלוקים כי טוב על האדם בפרט כמו בכל הנבראים רק כללו בכל אשר עשה בזה רמוז סוד הבחירה, שאין הידיעה [= הראייה] מכרחת. ע"ש

[6] רוח חיים פ"א משמ

the different levels of man's soul go as high as all the universes of spirituality. Man then is an Olam Katan a complete world that parallels the Olam HaGadol, the world beyond man's body and soul.

Man was not created in one shot; rather he was was created in several stages. The first stage, that of his basic body, occurred at the same time as the formation of the animals. Both he and they seemed to be already contained within the potential of the earth (i.e. not requiring a new creation) and just required that the HaSh-m command the land to bring forth. The verse states

בראשית א:כד - ויאמר אלקים תוצא הארץ נפש חיה למינה בהמה ורמש וחיתו ארץ למינה ויהי כן

Man is not mentioned in this verse. However, there is a redundancy. The end of the verse states that G-d commanded that the land bring forth חיותו ארץ, wild animals. That being the case, what is נפש חיה referring to? The Sages tell us that this is the body of man[2].

Nevertheless there is a difference between the man's body that was taken from a sampling of all the dust of the earth and the animals[3], which possibly evolved from the earlier fish forms but at any rate did not come from all the dust of the earth. We should also point out that the final shape of man's body, notably with his head on top, his heart in the middle and his most sensual and phsyical aspects further down, is a function of the spirituality which fill him up (his soul) and is not purely a physical phenomenon[4].

Next we come to the more spiritual aspects of man. Here the commentators differ on what happened. The verse says:

בראשית ב ז : ויפח באפיו נשמת חיים ויהי האדם לנפש חיה

The Ramban brings two interpretations. According to the first *pirush*, man's body was until now a lifeless lump of clay. Now he became a *Nefesh Chaya*, a living being just like the animals are living beings[5]. The Seforno states clearly that man could no yet speak, i.e. was not yet fully human[6]. The Ramban's 2nd *pirush* (actually Unkelus's) was that this was not just a basic life-source, but rather that man at this stage became a speaking being[7]. According to this, man had already become uniquely distinguished.

נעשה כולנו ל"ר .אדם נעשה ה"הקב ש"וזמ' ... אחרי נמשכות הקצות כל קוי קוטנה עם אשר הנקודה כמרכז הוא האדם מכולנו כח בו וניתן.

[1] וייצר ד׳ אלוקים את האדם עפר מן האדמה
ואמרו ז״ל: אדם הראשון מכל העולם הוצבר

קלט ובבראשית רבה פרשה ז) תהלים במדרש כ"ג הראשון (מובא אדם של רוחו זו) אישה ה"(ד א יד רבה [2] ויקרא הוא שאמר נעשה לפי שהארץ המציאה מצד הכח שנתן בה את האדם מהצד שהוא חי כמו שהמציאה שאר –אברברנל ולכן אמרו רסך תוצא הארץ נפש חיה למינה אמר ר׳ אלעזר זה רוחו של אדם הראשון...הבעלי חיים שבאדם וגו (וכדומה ברמב״ן) ר׳ בחיי: דרשו רז״ל : זה רוחו של אדם הראשון ואמר זה על הנפש הבהמית

[3] וייצר ד׳ אלוקים את האדם עפר מן האדמה
[4] רב צדוק הכהן מחשבות חרוץ

[5] רמב"ן בראשית ב:ז ד:ד"ה ודע כי יה אז נתהוה בוהנפש הצומחת ורוח החיוני בבת אחת.

[6] ספורנו חיים נשמת באפיו ויפח ה"ד ז:ב בראשית
ודמות בצלם שנברא עד מדברת בלתי בלבד חיה ז"עכ היה חיה לנפש האדם ויהי מ"מ.

[7] אבל וזאת שונות נפשות שהם האומרים כדברי שדעתו נראה .ממללא לרוח באדם והות אמר אונקלוס רבותינו מדעת לי נראה וכן.מדברת לנפש בו היתה באפיו השם נפחה אשר המשכלת הנפש.

Both opinions are compatible with the idea that there was yet a third stage of creation, the creation of the final levels of the soul in such a way that man was now *BeTzelem Elokim*. This is stated as follows:

בראשית א כז: ויברא אלקים את האדם בצלמו בצלם אלקים ברא אתו זכר ונקבה ברא אתם

But we are not done yet. Man at this stage was an adrogynus being. Adam was a he/she being, a male in one direction and a female in the other. G-d's response to this is to state:

בראשית ב: יח
ויאמר ד' אלקים לא טוב (אונקלוס-לא תקין) היות האדם לבדו אעשה לו עזר כנגדו

And G-d said: "It is not good for man to be alone. I will make for him a helpmeet against him.

, i.e. this is an uncorrected or incomplete לא תקין as לא טוב*Targum Unkelus* translates
state. The Maharal explains that man was then intrinsically not in a good state, for the only
. Therefore, [1]being that can stand alone and yet still in a complete state of unity is G-d Himself
it had to be that man would have a partner[2].

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[1] G-d honored man and all of the lower creation by creating male and female pairs which would complete each other, each one fulfilling the deficiencies of the other. For both male and female each have unique attributes which the other is lacking. And the fact that each one comes with a partner whose natural desire is to unite with it is in and of itself a reflection of its importance. For, since each created species is by its nature incomplete, being as it is only a part of the whole creation, therefore, if it remains isolated, it is doomed to be an incomplete part of a whole. But if we see that its nature is to combine with others, and more than that, if we see that it has a natural partner in the creation, we see then that it really does have the potential to move towards wholeness and completion.

מהר"ל (חידושי אגדות שם דף קו קטע המתחיל אמנם):

... רצה הקב"ה לזכות את חשיבות האדם וכל התחתונים מה שחסר להם מצד אשר טובים השנים מן האחד, כי מה שחסר בזה גלה בזה כי יש בזכר מה שאין בנקבה ויש בנקבה מה שאין בזכר ... שכל אחד בפני עצמו גם כן הוא יותר חשוב כאשר נמצא זוג אליו כי כאשר נמצא האחד בלבד הוא חלק בלבד וכאשר נמצא זיווג אליו והזוג הוא דבר שלם הרי כל אחד הוא חלק הכל.

Mrs. Leah Kohn explains it as follows: The Torah tells us that G-d created Adam and then He said, "It is not good that man be alone." This seems strange. If G-d is capable of absolute perfection, why would He observe that something He made is not good? One answer set forth by Rashi, a renowned eleventh century Torah scholar, states that G-d made man in order to give him the pleasure of establishing a relationship with his Creator, through a process of spiritual growth. If man were to remain alone and independent, he might eventually accord himself divine status. In this case, he might not feel the need to reach out to G-d, which in the Jewish view would mean he was missing the purpose of life.

The Torah makes clear that G-d created woman, in part, to provide someone who would challenge man to recognize his own incompleteness, so that he would not become overly confident. For that matter, neither would woman, since man would challenge her in the same way. G-d created man and woman with a great deal in common, yet with substantial differences that make them interdependent and
constantly aware of the fact that only G-d is perfect, in and of Himself. (On Project Genesis Website).

[2] גור אריה, שם:
שהמציאות בעצמו לא טוב ... שאין ראוי האחדות אלא ליחיד הקב"ה [א"כ] בהכרח שיהיה לו זוג ...

What then, asks the Maharal, is the difference between man and the animals. Did they not both need partners? However, says the Maharal, it we will look at the creation process closely, we see that man was first created as one being and only afterwards was his partner created from him. The animals, on the other hand, were created as two beings from the very outset[1]. This is because

וכל זה מפני שראוי לאדם קצת אחדות בעבור שהוא יחיד בתחתונים (גור אריה, שם)

This places man between G-d and the animals. He is not a total unity like G-d, for, as a created being, he needs a partner. Yet he has a dimension of unity to him, being created one at the outset and making him more connected to unity, more able to achieve that state of unity which he began with at the outset[2].

Compatibility of Order and First Beginnings

אבות פ"ה משנ' א'
(א) בעשרה מאמרות נברא העולם ומה תלמוד לומר והלא במאמר אחד יכול להבראות אלא להפרע מן הרשעים שמאבדין את העולם שנברא בעשרה מאמרות ולתן שכר טוב לצדיקים שמקימין את העולם שנברא בעשרה מאמרות:

The primary problem with this is bird life. According to classical evolutionary theory, birds descended from dinosaurs (more specifically theropods), which are a form of reptile. But according to the Torah, birds preceded all land animals. However, there are a good number of scientists who remain unconvinced that dinosaurs preceded birds. Firstly, birds have several fingers which dinosaurs do not and vice-versa. Evolutionary theory suggests which fingers are normally lost first in evolution, but this does not correspond to the differences between birds and dinosaurs. Secondly theropods appear too late to give rise to birds. Birds seem to have appeared 150 million years ago where the closest known relatives to birds appeared only 115 million years ago, though recent evidence may contradict this. Thirdly, the complex lungs of birds could not have evolved from theropod lungs (although no other alternative is suggested either). (It should be pointed out that no theropod lungs have ever been found and that we can only project how they looked.) (*Scientific American*, Feb. 1998, pg. 33)

However, recent discoveries seem to support the birds from dinosaurs hypothesis. In 1998, two dinosaur fossils were discovered in China which sport clear impressions of feathers on their forearms and tails. In 1997, Argentinean scientists discovered a dinosaur whose shoulder allowed it to move its arms up and down as a bird flaps its wings. However, everyone admits that neither of these two birds could fly. Therefore, it appears that the development of feathers would be independent of the need to fly, either for insulation or .for mating displays. Nevertheless, some scientists claim that they have now identified up to 100 physical similarities between bird and dinosaurs, from air-filled skull bones to wish-bones to

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[1] גור אריה שם: ויש בזה הפרש גדול בין האדם ושאר בעלי חיים שהרי שאדם נברא יחיד בלא זוג שלו ואלו שאר בהמות ושאר נבראים נברא זוג שלהם עמהם

[2] מכתב מאליהו

forward facing toes. (*U.S. News & World Report*, July 6 1998). In 2001 another fossil was found in China, a dinosaur with feathers, further buttressing the traditional approach[1].

What is clear is that this issue is in great flux. It remains an issue to be resolved in the future.

d-Later (physical) evolutionary changes in man

Even after man was completed after the 6 days of creation, he was still capable of undergoing further change.

i-After the חטא: decline in physical stature, loss of beauty, inevitability of death. (See מעם לועז on בראשית ג: יז – יט.

ii-After the flood: reduction of life to 120 years.

iii-From דוד המלך: average life 70 - 80 years.

Other things may also have developed after the 6 days of Creation, e.g. the formation of mountains:

מלבי״ם תהלים צה (לכו נרננה) ד׃ אשר בידו מחקרי ארץ ותועפות הרים לו׃
מלבים׃ וגם תועפות הרים לו, שהגם שהארץ נשתנה אחר הבריאה הראשונה והולידה הרים וגבעות (כי ההרים נולדו אחר הבריאה) בכל זאת אין זה מצד בחירת הארץ ורצונה, רק הוא מיוחס לו להשם בלבד, אל חוקים הטבעיים שיסד בארץ שעל פיהם יעמדו הרים על ידי רעש הארץ או הטבעת מקומות ודומיהם.

[1]Based on an article in Time by MICHAEL D. LEMONICK, April, 2001
The idea that birds may have descended from dinosaurs--or may even be dinosaurs has been gaining strength over the last two decades. Birds and dinosaurs have some remarkable similarities in bone structure. This was followed by a series of finds in China's Liaoning province over the past five years, that some dinosaurs may have borne feathers. But a few scientists still argued that the link was weak; the bone similarities could be a coincidence, they said. And the feathers were hard to identify. However, recently, a spectacularly preserved fossil of a juvenile dinosaur clearly has 3 different types of feathers.

The find also casts new light on the mystery of why nature invented feathers in the first place. For the better part of a century, biologists have assumed that these specialized structures evolved for flight, but that's clearly not true. "The feathers on these dinosaurs aren't flight-worthy, and the animals couldn't fly," says paleontologist Kevin Padian, of the University of California, Berkeley. "They're too big, and they don't have wings." So what was the original purpose of feathers? Nobody knows for sure; they might have been useful for keeping dinos dry, distracting predators or attracting mates, as peacocks do today.

But many biologists suspect that feathers originally arose to keep dinosaurs warm. The bone structure of dinosaurs shows that, unlike modern reptiles, they grew as fast as birds and mammals--which dovetails with a growing body of evidence that dinos were, in fact, warm-blooded. Says Padian: "They must have had a high basal metabolic rate to grow that fast. And I wouldn't be surprised if they had some sort of skin covering for insulation when they were small." Says Norell: "Even baby tyrannosaurs probably looked like this one."

CHAPTER D: CRITIQUE - OTHER MISCELLANEOUS ISSUES

i- Missing Fossil Record
ii- Failure to Observe in Laboratory or Outside
iii- Failure to Make Predictions and Tautologies
a-Predictions
b-Evolutionists
c-Too Broad
iv- DNA
v- Failure to Account for Utility of Intervening Stages
vi- Failure to Explain Similar Features in Different Animals
vii- Failure to Explain Molecular Similarities and Differences
viii- Social Darwinism
ix- Conflicting and Mistaken Theories

CHAPTER D: CRITIQUE - OTHER MISCELLANEOUS ISSUES

i-Missing Fossil Record

One of the chief objections which might be justly argued against the views maintained in this volume ... one, namely the distinctness of specific forms, and their not being blended together by innumerable transition links, is a very obvious difficulty. (Darwin, *On the Origin of Species,* Mentor, N.Y., 1963, pg. 158)

Why is not every geological formation and every stratum full of such intermediate links? Geology assuredly does not reveal any such finely graduated organic chain; and this, perhaps, is the most obvious and serious objection which can be urged against the theory. The explanation lies, as I believe, in the extreme imperfection of the geological record. (Ibid. pg. 304).

Darwinists state that one species of plant/animal develops into another through intermediate forms. A reptile became a bird by first developing a little wing and then, over millions of years, gradually developing into a full wing. If this were true, then we should have found fossils that show such intermediate steps, numerous different types of pre-giraffes, say, each with a slightly longer neck than its predecessor. According to the Synthetic Theory, changes are always micro, meaning that there should be many, many intermediate forms between species. In addition, Darwin claimed that animals would become extinct even more gradually than they come into being. Scientists have been searching in vain for the missing fossil record for 150 years now. Many admit that the record is not likely to ever be found. The problem is two fold:
1-Most species tend to remain unchanged in the fossil record over much of the time that they appear in the fossil record. (=Stasis)
2-Where new species do appear in the fossil record, they appear fully formed.

Horses are one of the favorite examples of evolutionists because there are a lot of earlier horse type animals that are supposed to be the precursors of our current horses. The Smithsonian Natural History Museum has such a display. But even if it could be shown that all these animals derived one from the other (which it hasn't), horses are the exception which prove the rule. Such progression of forms cannot be shown for more than three or four other species in total.

For example, whales are supposed to have developed from land animals. To get from being a land animal to being adapted to living in water must have taken an enormous amount of intermediate steps, with large populations at each stage. But whale fossils back in time are pretty much the same as they are now, until, at a certain stage, they suddenly disappear altogether, implying that that is when they suddenly began. Similarly for seals, sea cows, etc. The ancestor of the horse, the eohippus also appears suddenly, without any link to fossils before it. "The evolutionary picture is then the following: The history of macroscopic life starts somewhere in the Cambrian era some 500 million years ago. (The first signs of life are supposed to have begun long before - but relatively little happens until the Cambrian era) All animal phyla appear almost immediately. Within the first 250 million years, almost all the major groups were established. Evolution since that time has been confined to the lower orders of organization" (Lee Spetner) (Arguments that the incompleteness of the fossil record is a

function of it having been destroyed have also been refuted).

The pattern in the fossil record that we were to find for the last hundred and twenty years does not exist. (Niles Eldridge, Director of American Museum of Natural History, N.Y. in the N.Y. Times, November 4, 1980, pg. C3)[1]

Because of this, one group of scientists, most prominent amongst them Stephen Jay Gould, Niles Eldridge and Steven Stanley have stated a new theory, that of punctuated equilibria, i.e. that species developed very rapidly over relatively short periods of time interspersed with long periods when very little speciation took place. (Interestingly, all three have written that the problem of the missing fossil record was long known and had been deliberately suppressed, see Phillip Johnson, *Darwin on Trial*, pg. 59 - 62)

In other words, according to these scientists, there were no intermediate groups. Species developed, almost in one leap, into something completely new (=macroevolution). For example, a primitive rodent-like mammal is supposed to have led ultimately to species as diverse as a bat, a lion and a whale. But if one takes the length of time that each fossil lasts in the fossil record, then there is only enough time for the rodent-like form to change very slightly, (besides no extant intermediate forms in the fossil record) unless one invokes macroevolution.

However, the majority of evolutionists stick with Darwin's original formulation of gradualism, claiming that Gould and Co. have shown no mechanism of how such rapid change is supposed to take place. Darwin himself made this a pillar of his argument. He stated:

"The geological record is extremely imperfect and this fact will to a large extent explain why we do not find interminable varieties, connecting together all the existing forms of life by the finest graduated steps. He who rejects these views on the nature of the geological record will rightly reject my whole theory."

Gould says of this: "I do not know why Darwin chose to follow Lyall and the gradualists so strictly, but I am certain of one thing: preference for one view or the other had nothing to do with superior perception of empirical information." And later: "Contrary to popular myths, Darwin and Lyall were not the heroes of true science defending objectivity against the theological fantasies of such catastrophists as Cuvier and Buckland. ...In fact, (catastrophists) adopted the more objective view that one should believe what one sees and not interpolate missing bits of gradual record into a literal tale of rapid change." (*The Panda's Thumb*, pg. 150) Elsewhere he states, "The evolutionary trees that adorn our textbooks are not the evidence of fossils and... are never seen in the rocks."

There is much more agreement among paleontologists that Homo Sapiens (Modern Man) appeared relatively suddenly and has persisted with no perceptible change. Homo Sapiens' predecessor, Neanderthal Man, has existed, so the evolutionists assert, for about 65,000 years with no visible change. (Professor Stanley)

See Phillip Johnson, *Darwin on Trial*, chapter 6, for a discussion of the fossil record reflecting the supposed evolutionary development of fish-

[1] ***Scientific American January 2000 p 17 points out:***
Most of what scientists know about early mammals is based on dental features, because teeth are often all that remains of these tiny creatures after millions of years.

amphibians-reptiles-mammals/birds and from ape-man)

(It should be noted that since the 1870's many, whole dinosaur fossils have been unearthed, covering a wide range of different dinosaur species. Dinosaurs definitely existed, and we should not confuse rejection of evolution as involving a rejection of the fossils that we actually have.)

Mass extinctions vs. natural selection

Whereas neo-Darwinists still insist that species arose very slowly, all paleontologists agree to the sudden disappearance of thousands and perhaps nearly a million species at the same time, in a mass extinction. Today, it is thought that there were 7 such mass extinctions. Some believe that the dinosaurs disappeared because a giant meteor hit the earth (impact theory).[1] If however most species disappeared because of bad "luck" (i.e. a mass extinction) rather than bad genes, then that undermines the Darwinian idea of natural selection being the primary agent of change. Stephen Gould and others now accept that natural selection is indeed not the primary explanation for change.

Nathan Aviezer points out that saying that "bad luck" is the agent of change, is the scientist's terminology for Divine Providence. (*Jewish Action*, Fall 1993, pg. 68) Bad luck means that the issue doesn't lend itself to scientific laws, that something beyond the realm of such laws has been brought into play.

As a result of this "luck", the road was paved, according to the new theory, for man to exist. Dinosaurs were the kings of the earth; without their wipe-out, many paleontologists think that only the smallest mammals would be around today. (Luis Alvarez, *Physics Today*, July 1987). Nathan Aviezer writes: Professor Gould has devoted an entire book to this theme (*Wonderful Life*), stating again and again how "lucky" it is that human beings exist at all. Emphasizing again and again that the very existence of reasoning creatures is extremely improbable from the scientific point of view, Gould writes: "Consciousness would not have appeared on our planet if a cosmic catastrophe had not claimed the dinosaurs as victims. In an entirely literal sense, we owe our existence, as large and reasoning mammals, to our lucky stars.

"Wind back the tape of life to the early days ... and let it play again from an

[1] Evidence for sudden geological and biological upheavals was obvious for a long time, yet it was largely ignored. Those who drew attention to it tended to be dismissed as cranks. When the respected astronomer Edmond Halley surmised in 1694 that a comet may occasionally strike a planet, his suggestion was shrugged aside. In 1873, the British astronomer H. A. Proctor was daring enough to propose that the lunar craters might be the result of impacts by meteorites, but he quickly withdrew the claim, citing the apparent absence of similar caters on Earth. Even in the 1960s, some astronomers were sure that lunar craters were mostly volcanic in origin. It took the Apollo landings to prove finally that the Moon's craters were actually produced by and extended bombardment from space.
From what we know of the early history of the solar system, the Earth's surface was a hazardous place for a living organism to be for at least several hundred million years after the planet's formation. Even the bottom of the ocean would afford little protection against the violence of the larger impactors. The heat pulses from these cataclysms would have been lethal to a depth of tens or even hundreds of meters into the Earth's crust itself. Hardly a Garden of Eden. Where, then, would on expect the earliest life forms to have taken up residence? What refuge existed that might have spared the first faltering ecosystem wholesale annihilation by vaporized rock? The only viable answer at the moment would seem to be somewhere deep below the ground. (Paul Davies, *The Fifth Miracle*)

identical starting point, and the chance becomes vanishingly small that anything like human intelligence would grace the replay."

Aviezer concludes: Of course, the religious Jew perceives such luck as the unmistakable signature of Divine Providence. ... Professor Gould has admirably summarized the current scientific position as follows: It fills us with a new kind of amazement (because of the improbability of the event) that human beings [exist] at all." I too am "filled with amazement" when contemplating the works of the Creator.

ii-Failure to Observe in Laboratory or Outside

Phillip Johnson writes: The question is not whether natural selection occurs. Of course it does and it has an effect in maintaining the genetic fitness of a population. Infants with severe birth defects do not survive without expensive medical care, and creatures, which do not survive to reproduce, do not leave descendants. .... But Darwinists assert much more ... that this same force of attrition has a building effect so powerful that it can begin with a bacterial cell and gradually craft its descendants over billions of years to produce such wonders as trees, flowers, ants, birds and humans." (*Darwin on Trial*, pg. 16)

The common fruit fly, Drosophilia, has been most extensively studied under laboratory conditions. Mutations can quickly be expressed down many, many generations under optimal conditions. Indeed all sorts of abnormal fruit flies have been produced. The generational breeding of laboratory fruit flies, mice and other animals is equivalent to many 10's of thousands of years "in the wild", where most mutations die out and those that survive have to compete with well established non-mutant forms. Yet nothing like a change in species has ever been observed. Antibiotic resistant bacteria, increased resistance to DDT by insects, moths that get successively darker to maintain their camouflage in polluted, sooty areas, fruit flies with multiple eyes, cows bred to increase milk supply - all have been shown to develop, but never a new species. (Even speciation, as defined by the inability of two groups to interbreed, would be far from what the evolutionists claim.)

Gerald Schroeder[1]: The British Natural History Museum in London has an entire wing devoted to the evolution of species. And what evolution do they demonstrate? Pink daisies evolving into blue daisies; small dogs evolving into big dogs; a few species of cichlid fish evolving in a mere few thousand years into a dozen species of cichlid fish. The daisies remained daisies, the dogs remained dogs and the cichlid fish remained cichlid. It is called micro-evolution. This magnificent museum, with all its resources, could not produce a single example of one phylum evolving into another. It is the mechanisms of macro-evolution, the change of one phylum or class of animal into another that has been called into question by these data.

Random Mutations

Lee Spetner (*Not By Chance*) points out that living organisms today contain a huge amount of information of all sorts (billions and billions in the case of mammals). According to the evolutionists, this information, which is so much more than earlier life-forms, must have accumulated through random mutations. Yet all the famous mutations trotted out by evolutionists to show evolution in action do not add information - in fact they lose information. One of the most famous

[1]Brought at the bottom of *The 2001 Principle* web site.

examples is supposed to be the evolution of antibiotic resistance to bacteria, which has lead to many diseases resisting antibiotics. Spetner argues that when bacteria require such mutations they lose rather than gain information. Similarly with all other mutations of which he is aware. (See *Jewish Action*, Summer, 1988 pg. 125-128)

Spetner goes further, claiming that not only has a new species never been created, but not even a new function has ever been shown. "The mutations that are observed in the laboratory are always a loss or alteration of some existing function...a loss of sensitivity..."

Evolutionists answer this by saying that laboratory mutations are negative because they are macro-genetic changes. In real life, mutations are micro and cumulative, and can therefore be beneficial. But this is an unsupported claim - there is no scientific evidence to support this. Moreover, the mathematical probabilities of microevolution taking place, as discussed elsewhere, stack the odds against evolution.

Spetner's alternative approach to evolution is as follows: On the one hand we see many Mitzvos in the תורה requiring us to preserve the integrity of existing מינים. On the other hand, it makes sense that השם created animals so that they can change sufficiently to adapt to new situations without losing their למינו status. "This adaptive change, however, would be limited and would remain at a level of the מין, which, depending on the case, would be at the species, genus or family level...The fossil evidence seems to be more consistent with these conclusions...than it is with the synthetic theory of evolution." (Dr. Lee Spetner)

One of the most famous cases of so called "living evolution" was the case of the peppered moth. In the late 1800's England's industrial centers filled the air with smoke, killing the lichens on trees. Supposedly as a result of this, the common form of the moth, with white and black flecked wings perfect for camouflage on the lichens, began to be replaced by a black form. The accepted explanation was that the light colored moths, resting on what had become bare black-sooted trees, were easily spotted by hungry birds, while the dark moths, now barely visible against the trees, flourished. In fact a similar thing was noted in the Detroit area of Michigan in the late 1950's, early 1960's. Then, when both countries adopted clean air laws - Britain in 1956 and America in 1963 - the lighter peppered forms of moth came to dominate in both places once again.

Once again, the example shows no indication that a species change can take place. We are dealing here with the relative frequencies of two types of moths, both of which already existed, and neither of which ever disappeared. The idea that local environmental changes can favor one species over another is not in dispute by anyone. What is being questioned is the ability of natural selection to lead to new species.

Moreover, at Caldy Common, the light forms of the moth showed a resurgence long before the lichens began coming back, and in George Reserve, the lichens never appreciably changed, even as dark moths surged to dominance and then retreated. Also problematic is the fact that researchers are unable to find these moths on lichen-covered or lichen-bare trees. As of November 12, 1996, the N.Y. Science Times reported that the moths' daytime resting places are a mystery (some researchers think that they may rest on the tops of trees).

Kenneth Miller, in *Finding Darwin's G-d* (pgs. 49 – 54) offers a powerful argument in favor of beneficial mutations: "Even the opponents of evolution agree that natural selection is a genuine force in shaping the characteristics of organisms… The opponents of evolution never deny that mutations

produce variation, but they do argue that mutations, being unpredictable in their effects and random in their occurrence, cannot produce beneficial improvements for natural selection to work upon. In short, Mutations just mess things up.

As an experimental biologist, I am inclined to look for an empirical test. Can we place an organism in a situation where its ability to generate random beneficial mutations will be tested? The answer is yes, [in the form of antibiotic penicillin.]

In 1996, a new class of drugs was specifically engineered to block HIV-protease, one of the key enzymes used by the virus that causes AIDS. [However,] during the course of long months and years of treatment, mutations in the HIV-protease gene appeared in the very bodies of people using the drugs…[This led to the] emergence of new, drug-resistant varieties of the virus. Why were these viruses drug-resistant? Because they had undergone mutations that remolded their proteases, enabling them to do their work without allowing the protease inhibitors to block them.

Scientists observing this actually turned this mechanism to their advantage, allowing for a process of natural mutation to design certain. In 1994, Willem Stemmer of the biotech firm Affymax sought to "evolve" a new strain of bacterium resistant to an antibiotic known as ceftaxime. He mutated the gene (randomly) , selected for resistance against ceftaxime in bacteria carrying the mutated genes (there was a little), and then did something very clever. He chopped a copy of the moderately successful mutant gene into small pieces, then allowed them to combine randomly into new sequences that were reinstated into new cells. This randomized swapping of bits and pieces of genes is remarkably close to the kind of gene shuffling that takes place during sexual reproduction, and it was just as effective. In just three rounds of shuffling and selection, he produced mutant proteins that were 32,000 times as effective against cefotaxime as the original protein had been.

Miller is right, mutations can be used *by intelligent beings who know in advance what kind of result they want,* to produce certain results. A scientist takes a specific gene and sees whether it will mutate in a desired way. But in nature, mutations usually make a mess of things. Phillip Johnson, in *Darwin on Trial*, (pg. 24 -28), brings many examples of this.

iii-Failure to Make Predictions & Tautologies

a-Predictions

A theory, to be considered scientific, has to make predictions about the future which can then be tested. Sir Karl Popper, the master of defining what makes a theory scientific, has stated that evolution cannot be considered a scientific theory because it fails to make predictions.

What sort of predictions should evolutionary theory make; it is after all a theory of the past rather than the future. Firstly, the fact that it suggests certain principles that operated in the past means that it should be able to set up experiments where if and only if it were true, certain results would be obtained. But even about the past, evolutionary theory consistently comes up with the explanations of what happens after it witnesses the facts. It has not managed to generate any principles which would allow it to predict which facts we ought to find. This means that it is just an explanation, rather than a scientific theory.

Certainly evolutionists can always point to the specific advantages any supposed adaptation has given to the species. But this is not the point. Any adaptation could, potentially be advantageous or disadvantageous. According to evolution we only know that it was advantageous after we see that the species survived. It's advantage was that it

helped the species survive. Only then are we entitled to look for an explanation. But this is just the weakness of the theory - it makes no predictions in advance; it only explains things after the fact.

Berlinsky gives an example from geology. No geological theory makes it possible to specify precisely a particular mountain's shape; but geologists can say for, example, that a mountain will never form in the shape of a letter A. A mountain in the shape of a letter A is a physical impossibility because the theory of upthrust and crumbling excludes this possibility. In evolutionary theory, by contrast, anything goes - it can therefore never be falsified.[1]

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[1]**The following was adapted and abbreviated from** Reviews and Commentaries: What the Media Don't Tell You About Evolution ***Review by Kevin Padian of***

In Search of Deep Time: Beyond the Fossil Record to a New History of Life By Henry Gee (Free Press, New York, 1999) in Scientific American, Feb. 2000 P. 82:
Henry Gee is an editor and senior writer at Nature, one of two weekly journals that every scientist pores over faithfully. . . trained as a paleontologist [he earned his fame] classifying the salmon, the lungfish, and the cow. Gee points out how unscientific many different areas of science are. For example, traditionally, the salmon, and lungfish are grouped as fishes, and the cow is a mammal. But Henning's system recognizes that the features we use to group the salmon and lungfish are only general fishlike things related to living in water that applied to the original vertebrates. So the salmon and lungfish are not related by any evolutionary innovations. Instead the lungfish and the cow share some heretofore unique features that the salmon lacks, such as the presence of nasal passages that open into the throat and the bony configuration of the limbs, so they are grouped together as choanates. To many, the latter arrangement seems pointless, but if the point of classification is to uncover the history of life and to group it accordingly, this arrangement succeeds better than the traditional methods....

b-Evolutionists

David Berlinsky claims that even as an explanatory framework, (as opposed to a scientific theory), evolution's logic is tautologous. Ask an evolutionist why a species survives, and he will say that this

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A bone you pick up might be a hominid and might persuasively be far from the direct line to living humans. But you never really know, because not enough information is presented. Deep Time, with its attendant destruction of information from the geologic past, has wiped away direct evidence. We have to reconstruct evolutionary history, as we reconstruct human history from the bits and pieces we have available to us.

But there is more: we have to have a method in order to do testable science. ___Gee shows that many traditional explanations of major evolutionary transitions are not testable and therefore have no scientific content. For example, let's say that you don't agree with the overwhelming evidence that birds evolved from small carnivorous dinosaurs because as far as you're concerned, flight had to evolve, and dinosaurs couldn't climb trees. This statement may be true or false, but it's not scientific, because you're making a statement about the *process* of evolution (how flight had to evolve) that you're not allowing to be tested by any contradictory *patterns* of evolution.
Testing Evolutionary Scenarios

In the case of how flight evolved, the patterns of evolution tell a different story and here is where cladistics comes to a very cladistic analysis of the relationships of birds to other animals, involving patterns of fossil animals and hundreds of characteristics, has placed birds squarely in the camp of small carnivorous dinosaurs. The point is that maybe bird ancestors could climb trees and maybe they couldn't, but we'll never know for sure. ...
The origin of humans and the inception of speech are pairs of evolutionarily coupled but logically separate problems. If we assume that the second member of each pair was the reason for the first, we will never learn anything new about evolutionary history. . .

is because of its fitness. (Only the fittest survive.) Ask him how he knows how fit an animal is and he will tell you that if it survives it is fit. But this is circular logic - you cannot explain both fitness in terms of survival and survival in terms of fitness. (See Phillip Johnson, pg. 20 -23, section entitled Natural Selection as a Tautology.)

c-Too Broad

Moreover, these terms are so broad that there is no development, which is excluded by the theory. If, for example, people rather than cats had tails or ants instead of fireflies glittered in the dark or the bass fish rather than the salmon required fresh water to spawn, evolutionists would have no difficulty explaining that away. But a theory in which anything goes, and nothing is excluded is not really a theory at all. (See Phillip Johnson, pg. 28 - 31)

Evolutionists usually answer such claims by challenging critics to provide an alternative theory. Phillip Johnson (*Darwin on Trial*, pg. 8) says that this is as if a criminal defendant was not allowed to present an alibi unless he could also show who did commit the crime. However, the evolutionists are correct in that science in general usually does work with the best available theory even if it has problems. What is wrong with the evolutionists' claim is that they turn the lack of an alternative into a proof for evolution.

iv-DNA

Proteins need DNA and DNA needs proteins. Proteins can do many things but they need the DNA to provide the information by which they can be constructed in the first place. On the other hand, it is the proteins which duplicate the DNA. A seemingly unbreakable cycle - the ultimate chicken-and-egg problem. (Denton - *Nature's Destiny*.)

v-Failure to Account for Utility of Intervening Stages

In **b** above we gave the example of how many changes were needed for the giraffe's neck to grow long. In addition, for the giraffe's neck to reach that length, there would have to be many intermediate stages, reflecting the gradual extension of the neck over many generations. Besides the fact that we don't find fossils like this there is an additional problem. According to the theory, each intermediate stage would have to be adaptive, i.e. make the giraffe a better functioning animal. In the case of birds, for example, each stage of growth of the wing, development of the feathers and of a super light frame would have to serve some purpose other than flight, since only at the end of the process could birds fly.[1]

[1] Gerald Schroeder explains that the problem is not only one of finding intermediate stages, but of further showing how all of this developed very rapidly during the Cambrian era. Among the structures that appeared in the Cambrian were limbs, claws, eyes with optically perfect lenses, intestines. These exploded into being with no underlying hint in the fossil record that they were coming. Below them in the rock strata (i.e., older than them) are fossils of one-celled bacteria, algae, protozoans, and clumps known as the essentially structureless Ediacaran fossils of uncertain identity. How such complexities could form suddenly by random processes is an unanswered question. It is no wonder that Darwin himself, at seven locations in The Origin of Species, urged the reader to ignore the fossil record if he or she wanted to believe his theory. Abrupt morphological changes are contrary to Darwin's oft repeated statement that nature does not make jumps. Darwin based his theory on animal husbandry rather than fossils. If in a few generations of selective breeding a farmer could produce a robust sheep from a skinny one, then, Darwin reasoned, in a few million or billion generations a sponge might evolve into an ape. The fossil record did not then nor does it now support this theory.

Richard Dawkins answers this by claiming that even a small flap or web might help a small creature to jump further, or save it from breaking its neck in a fall. Eventually such a proto-wing might develop to a point where a creature would begin gliding, and by further gradual improvement it would become capable of genuine flight. "What this imaginative scenario neglects is that forelimbs evolving into wings would probably become awkward for climbing or grasping, long before they became very useful for gliding, thus placing the hypothetical intermediate creature at a serious disadvantage." (Phillip Johnson, *Darwin on Trial*, pg. 35-36) It must also be remembered that bird feathers, which are completely different from feathers used for warmth, also had to evolve simultaneously. So did the avian (bird) lung, which is very different to any of its supposed predecessors. This lung had to develop with its special parabronchi system, which permeates it, and the air sac system that guarantees the parabronchi their air supply. All of these have to be highly integrated. (ibid., quoting Denton's *Evolution: A Theory in Crisis*)

Scientists stretch their explanations beyond all reasonable limits trying to explain the utility of these stages. Consider for example the eye. Evolutionists have to presume that as the eye was developing, it was useful at each stage. So they simply presume that a 5% of the development of the eye meant that the animal had 5% of its current vision. (Richard Dawkins) But it is obvious that it takes a whole eye (not necessarily in size - we are talking about all the parts of the eye being there, fully developed) in order to have even 5% vision. What good then, is 5% of the eye. (Gould, to his credit, leaves the question unanswered.) Phillip Johnson explains a further evolutionary attempt to explain the eye: "Some single-celled animals have a little pigment screen behind it, and in many-celled animals a similar arrangement is set in a cup, which gives improved direction-finding capacity. The ancient nautilus has a pinhole eye with no lens, the squid's eye adds the lens, and so on. None of these different types of eyes are thought to have evolved from any of the others, however, because they involve different types of structures rather than a series of similar structure growing in complexity." (pg. 34)

Or take the spider's web, as another example. Web spinning behavior is highly complex and, according to the evolutionists, would have had to have developed over an extensive period of time. There are many mechanisms involved in the behavior, each one of which would have had to develop separately, without knowing that the end product was going to be web spinning. But what possible advantage could such developments have conferred upon the spider. Evolutionists often create the most absurd explanations in their efforts to explain such phenomena. (For example, to explain why man has an aquatic diving reflex, Elaine Morgan claims that an early primate returned to the sea, like the dolphin. Some time later, that primate became land-based again, but kept its aquatic adaptations intact. These were later passed onto man. No attempt is made to explain why or how any of this happened.)

The abrupt appearance in the fossil record of new species is so common that the journal Science, the bastion of pure scientific thinking, featured the title, "Did Darwin get it all right?" And answered the question: no. The appearance of wings is a classic example. There is no hint in the fossil record that wings are about to come into existence. And they do, fully formed. We may have to change our concept of evolution to accommodate a reality that the development of life has within it something exotic at work, some process totally unexpected that produces these sudden developments.

Many evolutionists (Gould, Goldschmidt, Dawkins) have been forced back to invoking macromutations to explain at least some parts of evolution. For example certain snakes have more vertebrae than their presumed ancestors. The number of vertebrae has to be achieved in whole units and to achieve this there has to be a set of nerves, blood vessels, muscles, etc. Dawkins explains that this is O.K. but it is just a duplication of what already exists and therefore not subject to the problems of macroevolution listed above. (Johnson, pg. 42). But no mechanism of sudden change on such a large scale has been suggested. This suggestion is pure fiction, without any evidence. It is statistically even less likely than micro-evolution. Instead of saying that millions of random types on a keyboard changed a work by George Orwell into one by Shakespeare, we are now saying that one, random change in say the computer program which houses George Orwell turned all of Orwell into Shakespeare. (Based on Johnson, pg. 42)

vi-Failure to Explain Similar Features in Different Animals

It is clear that many animals which belong to different families have the same functions. For example, almost all animals have eyes, and the primary elements of how the eye works. Evolutionists claim that this is just a case of covergent evolution, a way of saying that these animals all landed up with the same mechanism as the eye just by chance, all having had their own independent lines of evolution. But if that were so, we would expect to find different combinations of genes in these animals all producing the same result. However, the eye gene for the fruit fly (Drosophilia), is exactly the same as the one controlling the development in mice and men and very closely related to the eye gene in sea squirts and a host of other diverse animals.[1] It would appear that the eye gene is a master control mechanism, capable of giving general instructions to very different organisms. So instead of saying that identical eye genes all developed independently purely by chance, evolutionists would have to say that the eye gene existed at a very early stage of evolutionary development, and was so sophisticated "at the outset" that it would be able to express itself later across such a broad spectrum, despite the huge changes that took place in all these creatures, none of which could be anticipated. But this is not how evolution is supposed to work. Each change is tiny, minute in fact, and random and only maintained if it is useful then and there. How could a tiny random change have led to the universal eye gene? (Berlinsky, *Commentary*, Sep. 1996, pg. 28)

vii-Failure to Explain Molecular Similarities and Differences

Phillip Johnson writes (pg. 94-96): Judged by cytochome comparisons ... every plant and animal species is approximately the

[1]The eye gene has 130 sites. That means there are 20130 possible combinations of amino acids along those 130 sites. Somehow nature has selected the same combination of amino acids for all visual systems in all animals. That fidelity could not have happened by chance. It must have been pre-programmed in lower forms of life. But those lower forms of life, one-celled, did not have eyes. So totally unsuspected by classical theories of evolution is this similarity that the most prestigious peer-reviewed scientific journal in the Untied States, Science, reported: "The hypothesis that the eye of the cephalopod [mollusk] has evolved by convergence with vertebrate [human] eye is challenged by our recent findings of the Pax-6 [gene] ... The concept that the eyes of invertebrates have evolved completely independently from the vertebrate eye has to be reexamined." (Gerald Schroeder at the bottom of the *2001 Principle* Web site)

same molecular distance from any bacterial species, and there is no surviving trace of any intermediates that might have filled the space between single-celled and multicellular life.

... The two bacterial kingdoms (archaebacteria and eubacteria) are so fundamentally different from each other that neither could have evolved from the other ... with nothing in between.

Evolutionists were therefore forced to say that molecular mutations change at a regular rate (the molecular clock) and do not have much impact on their phenotypes (the physical features of the animals). This itself, if true, would further limit evolutionary development, making it even more difficult to prove the evolutionary tree.

viii-Social Darwinism

Peter Bowler claims that Darwin was a social Darwinist. Darwin's very real aspiration for a kinder, gentler world was counterbalanced by a strong pessimism about the biological capacities of the human species. (in Charles Darwin, The Man and His Influence)

Social Darwinism was Darwinism applied to society on which Hitler ultimately based his doctrine of Nazism. Hitler repeatedly invoked "survival of the fittest" as a justification for killing off "weaker" races. According to evolution, the fact that the weak perish and the strong survive is a great good because it leads to only the best adapted species surviving. Social Darwinists quite consistently applied this idea to humans. (Baumer 360, Yad V'Shem book)

Adolph Hitler: "Struggle is the father of all things...It is not by the principles of humanity that man lives or is able to preserve himself above the animal world, but solely by means of the most brutal struggle." (Quoted in Concise Columbia Dictionary of Quotations under Adversity)

Although some, like the American philosopher John Dewey, tried to show that evolution applied to man did not necessitate a Nazi-like conclusion, they really were trying to force the theory into their pre-existing liberal doctrines. It was Hitler and his ilk who were intellectually consistent, not Dewey.

The most one can say is that evolution provides no basis for ethics whatsoever, a position taken by George R. Ellis, a contemporary leading cosmologist: Since evolution is incapable of explaining any universal ethic, and it is the only available scientific option for providing such an explanation, one must therefore say that this moral law has comparable status to that of physics. There is an ethical underpinning to the universe as well as a physical one. As a scientist one cannot ask how such a moral law got there, just like one cannot ask how a physical law got there. But one can easily observe its existence. (*Scientific American*, Oct. 1995 p. 29)

Despite this, Social Darwinism has crept back into scientific circles. The Human Behavior and Evolution Society, founded in 1989, is attracting a growing number of psychologists, economists, historians and others; a swarm of books propound the new paradigm, and in 1995 PBS produced a highly regarded series, the Human Quest, dubbing it the second Darwinian Revolution. Although they are careful not to fall into what is termed the naturalistic fallacy, the confusion of what is with what should be, they clearly attempt to explain all human development including the higher faculties of man (known as evolutionary psychology) in terms of natural selection. (*Scientific American*, October, 1995, 150-157)

ix-Conflicting and Mistaken Theories

Evolutionary theorists differ on many things. While these disagreements cannot be used as counter-indications to the entire evolutionary school, they do show how tenuously scientific such theories are.

In *Narratives of Human Evolution* (Yale University Press), Misia Landau shows how the reconstruction of fossils and especially hominids were strongly influenced by the beliefs of the respective scientists about the mechanisms of producing change.

David Hull describes her book thus: "She wants to warn those scientists who are engaged in a reconstruction of evolutionary history that they have been duped. They think that their historical narratives are influenced primarily by the interplay between theory and data that characterizes the rest of science. Instead, she argue, these paleontological narratives "approximate the structure of a hero folk tale. ... Theories of evolution are determined by an a priori set of functions rather than an available set of fossils." By showing paleontologists that they have been constrained by the rules of art not science, Landau hopes to free them of this unnoticed bias. She wants to encourage her fellow workers to wrestle with the "story-telling dragon" instead of ignoring it.

"The stages of the archetypal hero tale begin with the hero (e.g. a primate) leading a relatively safe and untroubled life. ... A change is circumstance occurs that leads the hero to depart on a journey during which he is sorely tested. Somewhere along the line a donor (an evolutionary force like natural selection) is introduced who helps transform the hero. The hero is then tested again and triumphs. in some hero folk tales, a final stage is added in which the hero succumbs to hubris and is destroyed." (*In Science*, May, 17 1991).

The following are some of the more fundamental:

1-The **synthetic theory** of evolution states that evolution took place gradually, over an extended period of time, whereas the **punctuated theory** of evolution states that evolutionary history comprised relatively short periods of rapid change followed by long periods wherein almost no change took place. (Note, prior to the Synthetic theory, there were many respectable competitors to Darwin's theory. Ernest Haeckel (*History of Creation*, 1868); Huxley (*Man's Place in Nature*, 1863); Keith and Elliot Smith, all markedly disagreed with different aspects of Darwin's theory.)

2-The Scottish biologist, Wynne Edwards, holds that groups, not individuals are the unit of selection. Groups regulate themselves as a whole and are not merely a bunch of individuals all competing for survival. Today, most evolutionists have accepted that group selection operates under some circumstances. David Sloan Wilson has a different theory of selection: Units of selection are nestled one in another: Genes compete with other genes within an animal; animals compete with other animals within a group; groups compete with other groups; megagroups compete with other megagroups. According to him, these higher units (say a beehive) can be literally organisms.

3-The English biologist, Richard Dawkins, (also Dr. Williams and William Hamilton among others) holds that genes and not whole beings are the basic unit of selection. Dr. Goodnight, the Vermont genetici, says that natural selection does not act on genes in isolation but rather on interactions among many genes. There is not, after all, a gene for every complex behavior, like being an altruistic human being. So from his standpoint as a geneticist, the interacting genes can be

inside the animal, or inside several relatives, or inside completely unrelated creatures like a caterpillar and a plant.

4-Darwin held that natural selection was the source of all change, Stephen J. Gould holds that chance circumstance is.

5-the Piltdown Man fake (1912), although quite crude, took in the greatest biologists of England for over 40 years.

6-A dispute regarding the origins of Homo Sapiens: One theory claims that Homo Sapiens arose in Africa about 2 million years ago and then developed simultaneously across many different countries as a single widespread species. A second theory argues that Home Sapiens developed first in Africa 130 to 200,000 years ago and only then spread out about 100 000 years ago. (The **multi-regional vs. the out of Africa** hypothesis). (For a second dispute in this regard see **Chapter E Time**, below.) In July 1997, the prestigious journal Cell announced on its cover: "Neanderthals were not our ancestors". This claim was based on the differences between the mitochondrial DNA of the two species. However, in Jan. 1998, *Scientific American* pointed out some counter-arguments. Firstly, the idea that mitochondrial DNA acts as an accurate clock is based on several potentially problematic assumptions. Secondly chimpanzees and other primates display much more variation of mt DNA within species than humans do. Therefore, the diversity between humans and Neanderthals may not be exceptional. Thirdly, the human mt DNA which is being used came from a single human and is very short. Fourthly certain DNA lineages, supposedly fating back to Africa, are widely distributed in Asia but not in Africa, suggesting that they may have emerged from Asia not Africa (e.g. the beta-globin gene). Fifthly, studies of the Y chromosome suggest migrations both out of Africa and back.

7-The evolutionary view of dinosaurs has been completely revised. From being crude, barely mobile, dumb animals with small brains that deserved the extinction that befell them, they are now considered "the most successful creatures that ever lived." (Stephen Jay Gould, writing for World Almanac, 1997). Today they are regarded as warm-blooded (probably), intelligent, and far more nimble.

8-Toward the end of 1997, Science magazine reported the overthrow of a theory which had up until then had been 100% accepted by the entire scientific community. The theory claimed that North American glaciers at the end of the last ice age (100,000 - 250,000 years ago) had split many species down east/west lines. However, when the mitochondrial DNA of 35 of the best examples of these species (all of them birds) were checked they showed that these species had split at various times over a much longer period of time, some of them supposedly millions of years ago. Evolutionists admit now that the previous theory was a "just so" theory with little basis in fact. The *N.Y. Science Times* quoted Dr. Richard Harrison, an evolutionary biologist at Cornell University, as saying that in the 1940's through to the 1960's, "there were a lot of similar stories that were reasonable explanations that were never critically evaluated." (Sept. 30, 1997)

9-*Archaeoraptor liaoningensis*, a birdlike fossil with a meat-eater's tail that was spirited out of northeastern China...displayed at the National Geographic Society in Washington, D.C...Some 110,000 visitors saw the exhibit...millions more read about the find in November's *National Geographic*. Instead of a true "missing link" connecting dinosaurs to birds, the specimen appears to

be a composite, its unusual appendage likely tacked on by a Chinese farmer, not evolution.[1]

Jewish Action, Misreading the Fossils: The Dark Side of Evolutionary Biology, by Professor Nathan Aviezer, p.61

Evolutionary scientists have a dismal record when it comes to interpreting hominid fossils.[2]

...Neanderthal Man, the prehistoric man who immediately preceded Modern Man....first appeared about 200,000 years ago, and then for unknown reasons, they all abruptly disappeared from the fossil record about 40,000 years ago. ...

Marcellin Boule, "the doyen of human paleontology in France..."...the Neanderthal Man his special field of expertise and after a long and detailed study, Boule published his definitive monograph on the Neanderthals in 1911-1913.

Unfortunately, this "classic monograph" of Boule was wrong in every respect. Professor Niles Eldredge, explains in his 1982 book *The Myths of Human Evolution* (p.76):

Every feature Boule stressed in his analysis can be shown to have no basis in fact...To Boule, the premier French paleontologist of his day, we owe the shambling brutish image of the Neanderthals immortalized in a thousand comic strips.

Trinkhaus has emphasized the same point in his book, *The Neanderthals* (pp. 175, 181):

Boule reconstructed the vertebral column of Neanderthals as much straighter [than it was], giving rise to a stooping posture and slouching gait, a forwardly thrust head and perpetually bent knees. It was the perfect...brute, the savage.

The combination of national pride, professional jealousy and preconceived notions led Boule to make an incredible series of errors.

In 1912, an amateur fossil collector named Charles Dawson announced that he had found in a Piltdown gravel pit, on the

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[1]Mary Lord in U.S. News & World Report, The Piltdown Chicken, (February 14, 2000):

[2]And not only hominid fossils. Recently, the American Museum of Natural History in New York City, spent millions redoing its dinosaur exhibit to reflect new discoveries, including posing *Tyrannosaurus Rex* at a road-runnerlike incline. Thinking about dinosaurs keeps on changing, often in radically new directions. Each time some little fossil bone is found, paleontologists jump to new conclusions, only to have to change their minds with the discovery of the next fossil.

Sometimes it is not even parts of the animal itself which forms the fossil record; it is the animal's tracks! The bones of the animals are very much rarer than their tracks. Indeed, many extinct land animals are known only from their tracks. Of all fossil footprints dinosaur tracks are the most spectacular; they are found in abundance in terrestrial sediments of the Mesozoic age in most parts of the world. Today, only a handful of investigators are concerned with them.

(Ideally for clear foot impressions to be formed there first must be a moist, fine-grained and cohesive bed of sediment for the animal to traverse. This is should do slowly, leaving detailed impressions of its forefeet and hind feet (assuming it is quadrupedal). Under such ideal circumstances even the exact outlines of claws or nails, the shape of pads and the pattern of scales may be preserved. Actually few such high-quality impressions are found. If the sediment is too coarse, it will not retain details. If it is too wet, its deeper hollows will fill with water, distorting the shape of the print. If it is too dry, it will not be cohesive enough to preserve the impression. A strong wind may obliterate the print, and if it was made near the seashore, a rising tide may do the same. Even the deposition of sediment on top of the tracks, which is clearly crucial to their preservation, may mean their obliteration. If the new sediment is too much like the imprinted one, the two strata will tend not to separate and so the tracks may never be discovered.)

Sussex coast of England, parts of the fossil head of a prehistoric man, which quickly became widely known as Piltdown Man.

In fact, Piltdown Man was an outright fraud. What Dawson had done was to combine a contemporary human skull with the jaw of a contemporary ape (an orangutan), both of which he stained to match the color of the Piltdown gravel pit.

One would have thought that as soon as this jaw of an ape reached the hands of the professional anatomists, the game would be up. How could any skilled anatomist fail to recognize that the Piltdown jaw was identical in every respect to that of a modern orangutan, and that the Piltdown skull was identical in every respect to that of a contemporary man, without any indication of those features that characterize "prehistoric man?"

In fact, this fraud remained undetected for 40 years! From 1912 until 1953, every scientific reference book and encyclopedia informed its readers of the great importance of the Piltdown Man in establishing the evolutionary history of Modern Man. We were told that unlike Neanderthal Man, Piltdown Man was our earliest direct ancestor, as was clearly proven by the very modern appearance of his skull.

The skull...The British school of paleontology insisted that the brain (skull) of Modern Man should have evolved relatively rapidly, whereas the jaw should have evolved more slowly. When Piltdown Man displayed precisely these characteristics, he was welcomed with open arms by the British paleontologists.

But there still remained one problem. If the British experts were right, then the basically human skull should display some clearly ape-like features, and similarly, the basically ape-like jaw should display some clearly human features. After all, Piltdown Man was supposed to be a fossil in transition.

In fact, Britain's leading anatomist was claiming that he was able to see distinctly human anatomical features in the jaw of a modern orangutan and distinctly ape-like features in the skull of a contemporary human being-when in fact, *none of these anatomical features really existed*. It is clear that one should never underestimate the power of wishful thinking when hominid fossils are being examined by scientists in the light of their strongly-held preconceived ideas.

The final fossil we will discuss is Hesperopithecus ("western anthropoid"), discovered...near Snake Creek, Nebraska.

One of the nation's leading evolutionary biologists-Henry Fairfield Osborn...was sent a fossil tooth...Osborn publicized the fossil by commissioning for his American Museum of Natural History, "a graphic reconstruction of a Hesperopithecus couple in a forest surrounded by other members of the Snake Creek fauna.

Five years later...additional fossil evidence...showed conclusively that the Hesperopithecus fossil was, in fact, the tooth of a pig!

A *single tooth*-so worn that it could not even be properly identified as belonging to a pig-was sufficient to establish a new class of prehistoric men?

By the 1920s hominid fossils had been found worldwide-everywhere but in America. Therefore, when the Hesperopithecus fossil was discovered, they eagerly jumped onto Osborn's hominid bandwagon.

All these almost unbelievable mistakes were made by the most famous names in hominid paleontology: in France (Marcellin Boule); in England (Sir Grafton Elliot Smith, Sir Arthur Keith, Sir Arthur Smith Woodward); and in the United States (Henry Fairfield Osborn). Two of these gross misrepresentations remained universally accepted by the scientific community for nearly half a century.

Professor David Pilbeam of Harvard University, has recently discussed this lamentable situation at length: *Virtually all our theories about human origins were relatively unconstrained by fossil*

data...The theories were fossil-free, and in some cases even fossil-proof...

Has the situation improved in recent years? Currently, the origins of Modern Man are the subject of violent controversy in scientific circles, with the champions of two competing theories-"out of Africa" vs. "multi-regional"-each accusing the other of lack of scientific rigor. One can almost hear history repeating itself, leading one to wonder what future generations of scientists will think of current theories of hominid paleontology.

9-**The Evolutionary Tree:**
Uprooting the Tree of Life, W. Ford Doolittle, Scientific American, Feb. 2000,
p 72

Charles Darwin contended... the relationships among all living and extinct organisms could be represented as a single genealogical tree.

Most contemporary researchers agree. Many would even argue that the general features of this tree are already known, all the way down to the root-a solitary cell, termed life's last universal common ancestor, that lived roughly 3.5-3.8 billion years ago. The consensus view did not come easily but has been widely accepted for more than a decade.

Yet ill winds are blowing. To everyone's surprise, discoveries made in the past few years have begun to cast serious doubt on some aspects of the tree, especially on the depiction of the relationships near the root.

Can the Tree Survive? ...

The neat progression from archaea to eukaryote in the consensus tree is oversimplified or wrong. Plausibly, eukaryotes emerged ... from some cell that was the product of any number of horizontal gene transfers...

The standard depiction of the relationships within the prokaryotes seems too pat as well. . . .each group have clearly engaged in extensive gene swapping... At the top, treelike branching would continue to be apt. . . Below these transfer points... we would, however, see a great many additional branch fusions.... Designation of any trunk as the main one would be arbitrary...

As Woese has written, "The ancestor cannot have been a particular organism, a single organismal lineage. It was communal, a loosely knit, diverse conglomeration of primitive cells that evolved as a unit, and it eventually developed to a stage where it broke into several distinct communities, which in their turn become the three primary lines of descent (bacteria, archaea and eukaryotes).".

CHAPTER E: TIME

CHAPTER E: TIME

i-The Conflict and Its Solution

All תורה approaches: age of world (minimally) divided among six creation days and 5760 years from creation of first man till today.

Science makes the following claims:
Age of the universe: 8-20 billion years ago[1]. (Most scientists today hold to a figure of between 12 ½ - 14 billion years[1].)

[1]Scientists have, over the last decade, moved closer towards the earlier date. At the time of writing, scientists were saying that the world is about 12 billion years old. See ***vii - Current Theories on the Age of the Universe*** ate the end of this chapter for more details.

HOW IS THE AGE OF UNIVERSE CALCULATED

Hubble's measurements indicated that the redshift of a distant galaxy is greater than that of one closer to Earth. This relation, now known as Hubble's law, is just what one would expect in a uniformly expanding universe. (Hubble's law says the recession velocity of a galaxy is equal to its distance multiplied by a quantity called Hubble's constant.) The redshift effect in nearby galaxies is relatively subtle, requiring good instrumentation to detect it. In contrast, the redshift of very distant objects--radio galaxies and quasars--is an awesome phenomenon; some appear to be moving away at greater than 90 percent of the speed of light.

Hubble's law has great significance not only because it describes the expansion of the universe but also because it can be used to calculate the age of the cosmos. To be precise, the time elapsed since the big bang is a function of the present value of Hubble's constant and its rate of change. Astronomers have determined the approximate rate of the expansion, but no one has yet been able to measure the second value precisely.

Still, one can estimate this quantity from knowledge of the universe's average density. One expects that because gravity exerts a force that opposes expansion, galaxies would tend to move apart more slowly now than they did in the past. (The rate of change in expansion is thus related to the gravitational pull of the universe set by its average density.) If the density is that of just the visible material in and around galaxies, the age of the universe probably lies between 10 and 15 billion years. (The range allows for the uncertainty in the rate of expansion.)

Yet many researchers believe the density is greater than this minimum value. So-called dark matter would make up the difference. A strongly defended argument holds that the universe is just dense enough that in the remote future the expansion will slow almost to zero. Under this assumption, the age of the universe decreases to the range of seven to 13 billion years.

To improve these estimates, many astronomers are involved in intensive research to measure both the distances to galaxies and the density of the universe. Estimates of the expansion time provide an important test for the big bang model of the universe. If the theory is correct, everything in the visible universe should be younger than the expansion time computed from Hubble's law.

These two timescales do appear to be in at least rough concordance. For example, the oldest stars in the disk of the Milky Way galaxy are about nine billion years old--an estimate derived from the rate of cooling of white dwarf stars. The stars in the halo of the Milky Way are somewhat older, about 12 billion years--a value derived from the rate of nuclear fuel consumption in the cores of these stars. The ages of the oldest known chemical elements are also approximately 12 billion years--a number that comes from radioactive dating techniques. Workers in laboratories have derived these age estimates from atomic and nuclear physics. It is noteworthy that their results agree, at least approximately, with the age that astronomers have derived by measuring cosmic expansion.

Age of the world: +/- 4.65 billion years ago
First, simplest life: 3.5 billion years ago
First Pre-Human-types: 2.5 million years ago[1]

The *NY Times* reported in April, 2000: Astronomers working on a vast survey of the heavens have discovered the most distant object ever detected, a fiery, reddish dot called a quasar that emitted its light less than a billion years after the universe was born. What made the work extraordinary was the nearly simultaneous discovery of dozens of other quasars that are nearly as distant, allowing scientists to begin piecing together a kind of census of regions of the universe that were once entirely inaccessible.

Most cosmologists believe that the universe was born about 13 billion years ago in the Big Bang explosion and that after a period without light, often called the dark age, stars, galaxies and quasars began to form. The light from distant quasars lets astronomers study the dim clouds of gas and dust in the early universe before they coalesced into galaxies like the Milky Way.

The Sloan Digital Sky Survey is an $80 million, five-year census of the heavens involving institutions in the United States, Europe and Japan. The survey, which relies on an automated telescope at Apache Point, N.M., will eventually blanket half of the northern sky and collect hundreds of millions of galaxies and individual stars as well as quasars and other celestial oddballs.

[1] On Jan. 9, 2003 astronomers reported seing what they think are some of the earliest known objects in the universe, including the most distant quasar ever detected.

The faint light of 26 young galaxies and three quasars, objects thought to be powered by supermassive black holes, were observed at a distance of some 13 billion light-years, at the time the universe was less than a billion years old and apparently just emerging from an epoch of utter darkness.

The observations were made by two groups of astronomers, one using infrared images from the Sloan Digital Sky Survey and the other analyzing new photographs from the Hubble Space Telescope.

In current theory, after its creation in the Big Bang about 14 billion years ago, the expanding universe cooled down and became opaque. No light could beam through the omnipresent neutral hydrogen. Sometime during that dark age — the timing is one of cosmology's big mysteries — stars and galaxies began forming and their ultraviolet light eventually cleared away the neutral hydrogen and the opacity. It was the beginning of a universe of starry nights.

[1]See **APPENDIX O - THE TIME-LINE ACCORDING TO EVOLUTION**

Evolutionists hold that the first human ancestors appeared between five million and seven million years ago, probably when some apelike creatures in Africa began to walk habitually on two legs. They were flaking crude stone tools by 2.5 million years ago. Then some of them spread from Africa into Asia and Europe after two million years ago.

With somewhat less certainty, most scientists think that people who look like us — anatomically modern Homo sapiens — evolved by at least 130,000 years ago from ancestors who had remained in Africa. Their brain had reached today's size. They, too, moved out of Africa and eventually replaced non-modern human species, notably the Neanderthals in Europe and parts of Asia, and Homo erectus, typified by Java Man and Peking Man fossils in the Far East.

But agreement amongst the evolutionists themselves breaks down completely on the question of when, where and how these anatomically modern humans began to manifest creative and symbolic thinking. That is, when did they become fully human in behavior as well as body? When, and where, was human culture born?

For much of the last century, archaeologists thought that modern behavior flowered relatively recently, 40,000 years ago, and only after Homo sapiens had pushed into Europe. They based their theory of a "creative explosion" on evidence like the magnificent cave paintings in Lascaux and Chauvet.

Home Sapiens 300 000 – 150 000 years ago[1]. (Most scientists hold by a figure of around 200 000 years.)

a-Critiquing carbon dating does not solve the problem

Carbon dating only used up to 50,000 years ago (max. 70,000), whereas the closest date above to ourselves, that of hom sapiens goes back 200 000 years. Therefore, critique of carbon dating does not resolve problem.

As we will show below, the above ages calculated in a number of different ways, each one independent. They confirm each other. They may all be wrong, but in general, unlike theory of evolution, dating procedures are based on good science. (Even good science is often wrong, but it cannot be attacked, at present, on scientific grounds.)[2]

b-Summary of the solution

Science does not claim to fully understand time. As Physicist Paul Davies wrote:

Science still has a lot to learn about time. To the degree that time does exist, it certainly does not express itself as absolute minutes flowing from the past through the present to the future….

… The passage of time is probably the most basic facet of human perception ... [Yet,] nothing in known physics corresponds to the passage of time. Indeed, physicist insist that time doesn't flow at all,; it merely is. Some philosophers argue that the very notion of the passage of time is nonsensical and that talk of the river or flux of time is founded on a misconception. How can something so basic to our experience of the physical world turn out to be case of mistaken identity? Or is there a key quality of time that science has not yet identified?[2]

To the degree that science does have an approach to time, it has, since Einstein, believed in the relativity of time[3]. This idea, of time being relative to a particular perspective, is a very Jewish idea[1].

But some rebellious researchers suspected that this theory was a relic of a time when their discipline was ruled by Eurocentrism. Archaeologists, the rebels contended, were simply not looking for earlier creativity in the right places. Several recent discoveries in Africa and the Middle East are providing the first physical evidence to support an older, more gradual evolution of modern behavior, one not centered in Europe. But other scientists, beyond acknowledging a few early sparks in Africa, remain unswayed. One prominent researcher is putting forward a new hypothesis of genetic change to explain a more recent and abrupt appearance of creativity.

The debate has never been so intense over what archaeologists see as the dawn of human culture.

"Europe is a little peninsula that happens to have a large amount of spectacular archaeology," said Dr. Clive Gamble, director of the Center for the Archaeology of Human Origins at the University of Southampton in England. "But the European grip of having all the evidence is beginning to slip. We're finding wonderful new evidence in Africa and other places. And in the last two or three years, this has changed and widened the debate over modern human behavior."

The uncertainty and confusion over the origin of modern cultural behavior stem from what appears to be a great time lag between the point when the species first looked modern and when it acted modern. Perhaps the first modern Homo sapiens emerged with a capacity for modern creativity, but it remained latent until needed for survival.

[1] (Microsoft-Encarta Encyclopedia, Evolution; Human Evolution)

[2] See **APPENDIX N - TIME**, for a full description of dating methods.

[2] Scientific American September 2002, That Mysterious Flow, By Paul Davies

[3] See **PART I: SCIENCE: TORAH PERSPECTIVES - APPENDIX F: RELATIVITY** for a full description of relativity. Basically what relativity says is that the faster an object moves, the more it

Because the world includes a physical dimension, the creation included the dimension of time[2]. Man exists in time, and therefore perceives everything which G-d does within this framework[3]. (G-d arranged this time in cycles of seven[4] and He ensured that each cycle would end in *kedusha*, allowing for all the other days to contribute to that final day and thereby be elevated by it[5].)

The relativity of time, especially our post creation perspective of the six days of creation, is held by many תורה authorities; therefore the six days as measured from our perspective may be a lot longer;

The specific interpretation thereof seems to lack consensus; some interpretations agree with current cosmology (Dr. Schroeder; R. Aryeh Kaplan - see below); others leave the issue open (R. Shimon Schwab)[4]; still others give other times (Ramban; R Yonasan Eibeshitz). It would be fair to say that we do not know, from a תורה perspective, what the relative time interpretation of the creation days is. A תורה Jew can, in this context, be quite open to the modern cosmological time-table, without necessarily deciding decisively in favor of this. (Bearing in mind the the scientists themselves have.)[5]

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experiences a slowing down of time. See ***iv -Time Different From Differing Perspectives*** **- Time (and space) is relative**.

[1] למטה הבאנו כמה דוגמאות לזה ועוד דוגמה בשו"ת הרשב"א ח"א ס' ט: ומה שאמרתי במה ישוער אותו רק לא דברו בו אלא באמידת המשכת הענין שאילו היו ...האלף שאין שעור זמן בלי סבוב הגלגלים, הגלגלים מסבבים והיה הזמן נמצא היה הביטול הזה כאלף שנים וגו' ע"ש עוד

[2] כי ההמשך והחלוק אשר יש לזמן הוא דומה ...מהר"ל, גבורות ד' פ' מו: דע כי הזמן יש לו יחוס אל הגשם ידע כי הזמן והתנועה והגשם משתתפים מתיחסים בכל דבר ...להמשך וחלוק הגשם

[3] דרך ד' ח"ד פ"ז: הנה בם (בשבעת הימים) נברא המציאות כלו
תפארת ישראל פ' מ: הזמן אשר היה לבריאה הוא מצד המקבל

[4]i.e. He did two things: He arranged time to move in cycles, and He decreed that each cycle would amount to seven.

[5] והוא מספר ... דרך ד' ח"ד פ"ז: ואולם גזרה חכמתן שיהיו הימים כלם מתגלגלים בשיעור מספר אחד והנה כיוונה שסוף הסבוב יהיה תמיד בקודש, ומצא זה עלוי גדול ...השבעה ימים שראוי שיקרא שעור שלם. בהיות החלק הזה סוף הסבוב וחתומו,נמצא הסבובכלו נתקן ומתעלה על ...לכל הימים, שאע"פ שרובם חול ידי זה, עד שנמצא כל ימות האדם מתקדשים

[4]I prefer this approach the best, for other approaches try to reconcile the Torah view to current scientific views which may turn out to be incorrect in the future. Indeed, although scientists have kept within the 8-20 billion year range for the age of the universe, their specific assessments have been adjusted pretty much on an annual basis. Rav Schwab's approach can accommodate itself to the vicissitudes of changing scientific opinion.

[5]We have also brought below some completely different approaches to the one mentioned here. Rabbi Tatz's approach is that until the end of the six days of creation the laws of the universe as we have them today were not finally put in place. Therefore science, based on current laws, cannot inform us of what happened during the six days of creation. (See **v** below). Another approach is to say that scientists simply do not know what they are talking about (**vii**). See also the novel approach of the Tiferes Yisrael (**vi** below).

Julian Barbour, a leading physicist, asks what time really is. His answer, in light of all we know of the physics involved: nothing; time does not exist.

Einstein, famously, remarked that the distinction between the past and future is an illusion. There is no doubt that relativity -- Einstein's theory of gravity -- put in place a spatial view of time: time and space appear to be aspects of a single four-dimensional reality67.

The Challenge from Dating Techniques

"The challenge of time" from evolution is a strong one and has, in fact, gotten stronger over time. Let us take a closer look at the methods of dating to understand why this is so. We quote from Stanley Miller (*Finding Darwin's G-d,* chapter three[1].):

Uranium or U, the well-known radioactive isotope, decays through a series of intermediates to an isotope of lead known as Pb. The half-life of the series is 713 million years, which means that after that length of time, one half of the U in a sample will have decayed into Pb. Despite this decay process, the intensity if uranium mining tells us that there is still plenty of U available on the earth's crust. And this fact leads to a bold and remarkable conclusion- the earth could not have existed forever! The planet really did have a beginning.

Pb, is nonradiogenic, which means that it is never formed by any decay process…If a rock is young, its Pb/Pb will be nearly identical to he current ratio of these two isotopes. If billion of years have passed, however, a geologist will notice two things about the mineral: one, it contains very little U; and two, the Pb/Pb will be very low, because of the accumulation of Pb over time.

There are three independent uranium and thorium methods for dating rock, each based on a different isotopic series, and each providing an independent check upon the others. The decay of radioisotopes of SM (samarium), Lu (lutetium), and Re (rhenium) are also used to determine the ages if rocks and minerals, each presenting its own advantages and each providing an independent way to check ages determined by other methods. One additional method worth mentioning is the potassium-argon technique.

The ratios that emerge …indicate that the oldest rocks on earth approach an age of 4.5billion years… not only had the geologist of the nineteenth century gotten the sequences right, but they had been too conservative in their estimates of the duration of those ages.

[With the looming] discovery of radioactivity…literally everything was on the line, as radiometric dating made it possible to test every assumption in the time scale of evolution. What happened? Evolution passed, and it passed with flying colors.

Of the thirty-four known radioactive nuclides, only twenty-three are found in detectable amounts in nature. [There is a reason for this.] …

If we strike from the list every nuclide that is continually produced by natural processes, we should be left only with those that persist from the date of the formations of our solar system. When we do that, the data fairly shut to us: every nuclide with a half-life of less than 80 million years is missing from our region of the solar system, and every nuclide with a half-life of greater than 80 million years us present. Every single one. …

There is a reason that the short lived nuclides are no longer around, and the reason is obvious: The solar system is much older than 80 million years. …

Take Rubidium-87, which decays to SR over a half life of 48.8 billion years. There are also three isotopes of Strontium (Sr 88, Sr 86, and Sr 84), which are not produced by any

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But Barbour denies that time is like space. Events aren't situated in any fourth dimension, and they are not related to one another by time. So time does not exist. But then how are we to think of change, of all the things we ordinarily think of as happening in time? For Barbour spatial things are the primary reality. Imagine collections of triangles, cubes and other geometrical shapes. Think of an entire three-dimensional universe as built up of them and all their spatial relationships. Barbour calls this a "configuration" of the universe.

[1] We have greatly shortened and adapted this chapter.

radioactive decay process…over time, while the amounts of nonradiaogenic Sr remains constant, the amount of Sr increase by the exact amount that Rb decreases. …

If we knew the starting ratio of rubidium to strontium, we could calculate the exact age of the mineral. But how can we possibly know the starting conditions of a rock formed millions or even billions of years ago? Here's where the rubidium-strontium method sets itself apart- it provides a method to do just that. Let's take a typical rock, which is composed of several different minerals. Some of those minerals will have lots of rubidium but little strontium (a high Rb/Sr ratio), and still others will have intermediate amounts. …

There are different Rb/86Sr ratios in different minerals. However, the Sr87/Sr86 ratio is identical in each mineral, which also makes sense-remember, these to isotopes are chemically identical, and therefore there is no way for any mineral to include one of the isotopes preferentially over the other. That's shy a graph of the isotopic ratios of the four minerals in our hypothetical rock appears as a flat line. Each mineral starts with an identical ratio of the two stronium isotopes, but a different ratio of rubidium to stronuim. …

What will happen as time passes? As rubidium decays to strontium the amount of Rb in each mineral will decrease, and the amount of Sr will increase. But remember that the amount of that increase is directly proportional to the amount of Rb in the mineral. So those minerals with lots of rubidium will accumulate a great deal of Sr over time, and those with only a little rubidium will accumulate much less. What will this look like? As time passes, the Sr87/Sr86 ratio will change in each mineral, but in every case it changes in direct proportion to the rubidium/strontium ratio in the mineral when it was formed. As a result, our points will still lie on a straight line, and the slope of that like gives us a measure of the amount of time that has passed since the formations of the rock. We do not need to make an estimate of the starting conditions, because the starting conditions can be determined directly. The power of this method is remarkable. Every single mineral in the rock lies on the line, which is known as an isochron (a chart line signifying events that occur at the same time); and therefore every mineral "agrees" on the age of the rock. Each of the many minerals of a complex rock provides a completely independent a check upon its age. When they fall into such an isochron, the rock is said to be concordant, literally "singing together."

Very seldom have I (or most biologists) obtained data on biological systems that even begins to approach the consistency and precision of this method. The rubidium-strontium method gives self-calibrating and self-checking results. If geological processes have removed or added either rubidium or strontium, the method will show it at once, because the point will fail to lie on a straight line. If a rock has been homogenized by melting and recrystallization, the isochron line will be reset ti zero, and the measured age will be an underestimate reflecting the time of melting. However, no natural process exists that could produce overestimates of age that would pass the righteous test of isochron analysis.

Isochron ages have been determined for samples from the earth, from meteorites, and even form moon rocks brought back by the Apollo program. The consistency of the data drawn from each of these samples is nothing short of stunning. When it comes to the geological age of our planet, true controversy is a thing of the past, and not because of evolutionary dogma. Rather, it is the concordant music of the data itself that overwhelms claims to the contrary.

ii-Pshat and Drush (אין מקרא יוצא מידי פשוטו)

The Torah is divided into different levels of interpretation[1]. Even though the Rashbam tells us that the Drush is the Ikar[2], yet we still have a principle of אין מקרא יוצא מידי פשוטו, i.e. any solution to the problem of time which cannot exclude פשוטו של מקרא, i.e. that the six days of creation are quite literal. Most of the meforshim below do in fact maintain the integrity of the פשט, while at the same time showing that time can mean different things viewed at from different perspectives.[1] Even the Ramban, who states that the days of creation mean actual day, states this, as we shall later show.

According to most meforshim, the nature of time is such that the Torah is referring both to days and to a much longer period of time at the same time. The Torah chooses the terms 'days' because of the principle דברה תורה כלשון בן אדם[3].

אריה שאג מי לא ייירא ה' א' דבר מי לא ינבא (עמוס ג ח).
מכילתא: מי נתן כח וגבורה בארי לא הוא אלא אנו מכנין אותו לשכך את האוזן (וגרסת רש"י בחומש שם כדי לשבר את האוזן) מה שהיא יכולה לשמוע, נתן לבריות סימן הניכר להם[4].

Even to understand Pshat we cannot, in the main, rely on a simple translation of the text. Rabbi Biberfeld points out that Rashi sometimes states כמשמעו פשוטו, i.e that the Pshat goes according to the simple translation of the text. Since Rashi only says this in a few places, we can assume that, in all the other places, Pshuto Aino KemShamao – the Pshat is not going to be like the simple translation of the text.

Sometimes, even the פשט cannot be understood in simple terms[5]. Shir HaShirim is an example of this.

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[1] חלקי התורה הקדושה הם ארבעה: פשט, דרש, רמז, סוד (אותיות פרד"ס) בסדר ממטה למעלה גבוה מעל גבוה וכו'. (מלבים)

[2] רשב"ם, בראשית לז: ב

[1] This suggestion, that time is relative, is not a חידוש made to deal with a 20C challenge to the Torah from science. It is a mainstream approach suggested by many of the primary meforshim as we will see below.

[3] רמב"ם הל' יסודי התורה א:ט
הכל לפי דעתן של בני אדם הוא שאינן מכירין אלא הגופות ודברה תורה כלשון בני אדם.
מכתב מאליהו כרך ב דף 151: ימים אלו (של ששת ימי בראשית) היו קודם גמר הבריאה שאז הבחנת הזמן היתה אחרת. אולם התורה ניתנה לנו לפי הבחנתנו אנו, שבא משה והורידה לארץ, וזה גדר "דברה תורה כלשון בני אדם", שמדברת לפי הבחנתנו בגשם וגדרי מקום וזמן שלנו. וכל מה שמסופר בתורה מענינים קודם גמר הבריאה הוריד לנו משה על פי ה' במושגים שיש לנו הבחנה בהם.

[4] ועיין בנתיבות עולם מדה יד.

[5] דעת תבונות (הוצאת פרידלנדר דף קי"ד:)
ואמנם זה כלל ענין שני העצים - עץ החיים ועץ הדעת, שודאי אין מקרא יוצא מידי פשוטו: והעצים - עצים היו והפירות -פירות, והאכילה- אכילה. אך פירות דקים ואכילה דקה. מה שאין מחשבתינו מציירת, שאינה מציירת אלא דברים גופניים.
ועל זה כתב הרב חיים פרידלנדר(הארה [27]) "רבנו מלמדנו כלל גדול בתורה: אכן אין מקרא יוצא מידי פשוטו אולם צריך להבין את "הפשט" כפי המדרגה שמדובר בה. כאשר מדובר בדרגת גן עדן יש להבין את כל המושגים בהתאם לזה - מושגי גן עדן" ...

The application of these ideas is clearly relevant to the understanding what happened in the creation process. The Torah, says the first Rashi, was not coming as a science manual, to teach us what happened. Not only is this not its purpose, but, says Rashi, we cannot even understand the order of creation from the Psukim[1]. According to one opinion which he brings, the word *Breishis* does not even mean in the beginning. Rather, it means "for a special purpose"[2]. In that case, בראשית does not begin at all with explanation of a beginning. Verses then read:
1-For this purpose the world was created.
2-The world was already תהו ובהו etc.
the תורה does not come to tell us order of creation.

According to the גרא , ברא does not always mean יש מאין

אדרת אליהו בראשית א-א ד"ה ברא
ברא הוא עצם הדבר ואפילו יש מיש כמו כל ברכת הנהנין.
לכן נאמר ויברא אלקים את התנינ' כי הם בבחינת העצ'. וכן תיקנו בור' פרי כי אינו בכח כל הנבראי ' לחדשו בעבור שהוא עצם פועל ה' .וכן אמר יוצר אור ובורא חשך עושה שלום מפני שהעצם והמקרה יבחנו ...לכן על חידוש החושך נאמר בריאה בורא חושך בעבור שהוא חומר עצם שאין כח השכל לידע תוארו .ועל זכות האור מונח מלת יצירה .כי גבול שם לו .לדחות החשך כפי כח ממשלתו והפקת נוגה .כמו צורת הכלי הוא בכמות .כן צורתו הוא בגבולו אשר לא יעבור .ועושה שלום הוא תיקון העולם ומלואו.

מפרשים) רובי ד"בא חכמינו ה"ד א:א ע"בא ע"ע(

iii-Time Created, Therefore Not Absolute

Time is not absolute:

מהר"ל תפארת ישראל פ"מ :מה שהיה השם יתברך פועל העולם בזמן הוא מצד המקבל

a) Either time was created:

ועי' בסידור הגר"א בפירוש שיח יצחק על ברוך שאמר מה שכתב על ברוך עושה בראשית שהכוונה בזה היא לבריאת זמן.

b) Or time was a natural consequence of the creation of matter:

מלבי"ם : הזמן אפס כי הזמן הוא רק שעור המשך המציאות הדבר הנמצא בפועל, לא דבר הנמצא באמת .

בראשית א:ד רמב"ן : משיהיה יש יתפש בו זמן[3]

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[1] עיין ברש"י - בראשית א:א ולא בא המקרא להורות סדר הבריאה

[2] (אין ראשית אלא חלה ,תורה ,ישרא-ל)

[3] ועוד יתכן שנאמר כי משיצאו השמים והארץ מן האפס אל היש הנזכר בפסוק הראשון נהיה זמן ,כי אף על פי שזמנינו ברגעים ושעות שהם באור ובחשך ,משיהיה יש יתפש בו זמן ,ואם כן נבראו שמים וארץ ועמדו כן כמדת לילה מבלי אור ,ואמר "יהי אור ויהי אור" וגזר עליו שיעמוד כמדת הראשון ואחר כך(יעדר) מן היסודות ,ויהי ערב ויהי בקר:

So too with space:

מהר"ל תפארת ישראל פ"מ :כי הגשם הוא בעל רוחק שזהו גדר הגשם שהוא בעל רוחק

שמות לג:כא
ויאמר ד' הנה מקום אתי ונצבת על הצור
רש"י ... :שהקב"ה מקומו של עולם ואין עולמו מקומו (ע"ש הדעת זקנים)

The very existence of time reflects inherent deficiency in the creation

מהר"ל על אבות (דרך חיים) פ"ה מש"א
כי הוא יתברך יכול לפעול הכל בלא המשך זמן כלל ,רק כי היה צריך זמן מצד המקבל כי איך אפשר שתקבל האדמה בריאת עצמה והוצאת הצמחים כאחד ,וסדר הבריאה כך הוא שהארץ תוציא צמחיה וכן כל הדברים ,ולכך היה צריך המשך זמן אל בריאת העולם[1].

iv-Approach 1: Time Different From Differing Perspectives

Time (and space) is relative

When the Maharal firrst made his statements about time not being an absolute, contemporary scientists much have scratched their heads at this strange proposal. But, many centuries later, science caught up with Einstein who proposed that there was no such thing as independent time[2]. Time and space were inseparable - space-time – and time was no longer considered absolute.

Einstein showed how time could stretch or contract. The faster one goes, the more time slows down. And the more gravity there is the slower it goes.

" These effects were observed in experiments conducted in the 1960's and the 1970's. In one such experiment in 1971, atomic clocks were carried in two high-speed aircraft. One traveled eastward, that is, in the rotational direction of the earth, and one westward. After the flight, the onboard clocks were found to have either lost or gained time (relative to a ground based atomic clock) depending on their direction of travel, an effect of motion, and their altitude, and effect of gravity. The results confirmed the predictions made in Einstein's theory of relativity."[1]

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[1] מהר״ל, גבורות ד׳, פ׳ סא׃ דע כי הזמן יש לו יחוס אל הגשם ודבר זה מבורר למי שעיין בחכמה כי ההמשך והחלוק אשר יש לזמן הוא דומה להמשך וחלוק הגשם, שכל גשם יש לו משך והוא נחלק. ועוד כי הזמן נתלה בגשם כי הזמן מתחדש מן התנועה

[2] In 1905 Albert Einstein formulated the effect of motion on time in his special theory of relativity, and in 1917 he formulated the effect of gravity on time in his general theory of relativity.

[1]Encarta, CD-ROM encyclopedia, "time". At the surface of a black hole, time stands completely still relative to our own time-scale. Space can also expand or contract depending on the speed of the object:

1. Solution One: Time is Relative

a. 6000 years = 6 days

Judaism agrees with the idea that time is relative. The clearest indication of this is Chazal's equation of the 6 days of creation with 6 000 years.

מס' סנהדרין צ"ז.
אמר רב קטינא שית אלפי שני הוו עלמא וחד חרוב ... ואומר מזמור שיר ליום השבת יום שכולו שבת ואומר כי אלף שנים בעיניך כיום אתמול כי יעבר[1]

רמב"ן בראשית ב:ג
ודע כי נכלל עוד במלת לעשות ,כי ששת ימי בראשית הם כל ימות עולם[2],

(See Dr. Nathan Aviezer, *In the Beginning*, who adopts this approach.)

The deeper meaning of days

Rav Dessler[3] says that the perception of time during the Creation was different. However, Moshe brought the Torah into the world in a way where all that happened during the creation days are translated into our terms:

ימים אלו (של ששת ימי בראשית) היו קודם גמר הבריאה שאז הבחנת הזמן היתה אחרת .אולם התורה ניתנה לנו לפי הבחנתנו אנו ,שבא משה והורידה לארץ ,וזה גדר "דברה תורה כלשון בני אדם" ,שמדברת לפי הבחנתנו בגשם וגדרי מקום וזמן שלנו .וכל מה שמסופר בתורה מענינים קודם גמר הבריאה הוריד לנו משה על פי ה' במושגים שיש לנו הבחנה בהם.

רמב"ן א:ג
.ובפנימיות הענין יקראו ימים הספירות האצולות מעליון[4] ,

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[1] אמר רב קטינא שית אלפי שני הוו עלמא וחד חרוב שנאמר ונשגב ה' לבדו ביום ההוא אביי אמר תרי חרוב שנאמר יחיינו מיומים ביום השלישי יקמנו ונחיה לפניו תניא כותיה דרב קטינא כשם שהשביעית משמטת שנה אחת לז' שנים כך העולם משמט אלף שנים לשבעת אלפים שנה שנאמר ונשגב ה' לבדו ביום ההוא ואומר מזמור שיר ליום השבת יום שכולו שבת ואומר כי אלף שנים בעיניך כיום אתמול כי יעבר תנא דבי אליהו ששת אלפים שנה הוי עלמא שני אלפים תוהו שני אלפים תורה שני אלפים ימות המשיח ובעונותינו שרבו יצאו מהם מה שיצאו

[2] וממשיך הרמב"ן: כי קיומו יהיה ששת אלפים שנה ,שלכך אמרו יומו של הקב"ה אלף שנים. .והנה בשני הימים הראשונים היה העולם כולו מים ולא נשלם בהם דבר ,והם רמז לשני אלפים הראשונים שלא היה בהם קורא בשם ה', וכך אמרו שני אלפים תהו .אבל היתה הבריאה ביום הראשון האור ,כנגד האלף של ימות אדם שהיה אורו של עולם מכיר את בוראו[2].

[3] מכתב מאליהו כרך ב, חלק שני :בראשית-ימי בראשית וימי עולם דף 151

[4] ודע כי הימים הנזכרים במעשה בראשית היו בבריאת השמים והארץ ימים ממש .מחוברים משעות ורגעים והיו ששה כששת ימי המעשה כפשוטו של מקרא .ובפנימיות הענין יקראו ימים הספירות האצולות מעליון ,כי כל מאמר פועל הויה תקרא יום והיו ששה ,כי לה' הגדולה והגבורה ,והמאמרים

Different experiences of time

The Gro explains how time was perceived differently by

מכתב מאליהו שם דף 152-154

וזה לשון הגר"א[1] ג' זמנים :ראשית ,אחרית ,והוה" - (פירוש שהם ג' בחינות בזמן) -1) "אצל מעשה בראשית כתיב בראשית ,ששת ימים הראשונים היו כלל כל השיתא אלפי שנין" – .ופירוש בחינת "כלל" הוא שכל גילויי ששת אלפי השנה כלולים בימי בראשית ...שאילו לא חטא אדם הראשון היה העולם הזה נמשך רק ששה ימים... 2) אך כשחטא ...והימים נתפרטו לששה אלפי שנין ... .ששת ימי בראשית הם עצמם ששת אלפי שנין ממש ,שתוכנם וגילויים חד הוא ,אלא שאופן ההשגה השתנה משום שאופן הבחירה השתנה על ידי חטא אדם הראשון ...וגדר אחרית הימים הוא שאז יחזור הכל לבחינת ראיית גן עדן ...מה נואלו התמהים על קוצר ששת ימי בראשית ,שהרי לא שייכים שם לא קוצר ולא אריכות כלל וכנ"ל ...והמשל לזה :מפת הארץ ,שכל נקודה שעליה סימן לעיר ,מכוסה בנייר שיש בו נקב אחד ;כשנעביר את הנייר על פני המפה ,נראה דרך הנקב עיר אחרי עיר ,ונחשוב כאילו שבזמן שנראת עיר זו ,לא נמצאת העיר הקודמת ולא הבאה ;אבל הרי באמת קיימות כל הערים ביחד אלא שמכוסות הן ,וכשיורידו את המכסה יתגלו כולן בבת אחת. - כן הוא אצל האדם ,שמגלים לו בכל רגע ורגע שבהווה נקודה אחר נקודה ממהותו ,ושמוסתרת ממנו הנקודה הקודמת שכבר שייכת לעבר ,אולם באמת היא קיימת בנפשו ואינה בטילה

Ultimately, time will be completely overcome:

3) .וכשיבטלו מהאדם את הסתר הזמן לאחר מיתתו ויסירו את מכסה העוה"ז ,יראה הכל בבת אחת;

Cosmic days and sun/earth days

Rabbi Shimon Schwab (in *Challenge*, pg. 164 - 174)

There are two time systems:

a-The system of the creation-Light of the first day

The Hidden Light = the cosmic time clock (hence the first day despite the fact that sun, moon and stars only created on fourth day; some use the fact that the sun etc. was only created on the fourth day as proof that time could not have been measured as we measure it today).

ספורנו בראשית א:ד ויבדל אלקים בין האור ובין החשך
אותם הימים ששימש בהם האור הראשון היו זמני אור וזמני חשך שלא בכח סבוב גלגל אלא ברצון אלקי שהבדיל בין זמן האור לזמן החושך.

b-The system of time as measured by the rotation of the earth around its axis and around the sun - Our days

The six days of creation are six cosmic days
Cosmic days, then as now, have always functioned in the same way

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עשרה ,כי הראשונות אין שם יום נתפס בהם .והפירוש בסדור הכתובים בזה נשגב ונעלם ,ודעתנו בו פחותה מטפה מן הים הגדול:

[1] בלקוטים סוף ספרא דצניעותא (דפוס ראם): "

During the six days of creation, "our days" did not coincide with "cosmic days"
("We might imagine the following: Adam HaRishon...actually saw the Creation Light with his own eyes. While the light was visible in the sky, he lived through the time-span of one single day. Next to this awareness he could have experienced thousands of sunrises and sunsets, summers and winters, ice ages, changing continents...etc[1].")

"After six days... the two time-systems coincide: Each time our globe turns the creation light appears until a full rotation of the earth has been completed[2]."

והנה יש קצת רמז בספורנו (פסוק ג & ד)לשיטה זו וז"ל :יהי אור הוא אור שבעת הימים; ויבדל אלוקים בין האור ובין החשך אותם הימים ששימש בהם האור הראשון היו זמני אור וזמני חשך שלא בכח סבוב גלגל אלא ברצון אלקי שהבדיל בין זמן האור לזמן החושך עכ"ל משמע אפילו אחר בריאת השמש לא היו הימים תלוי בסבוב הגלגל.

Note: The great advantage of this approach is that it leaves the issue of what the relationship is between cosmic and our days during the creation. We can accept science's current suggestions, without being bound to that interpretation.

6 days = 15 billion years

Dr. Gerald Schroeder - *Genesis and the Big Bang*

The theory of relativity - the rate at which time passes is not the same in all places; the more the gravity or speed (velocity), the slower time moves.
The radius of the universe is about 15 billion light years.
The gravity at the edge of the universe is very powerful.
Time slows down (relative to us) at the edge of the universe by a million million times.
This reduces 15 billion years to six days.
These six days are for a system that encompassed all of the universe.[1]
The Biblical calendar begins with the creation of man. (As of writing 5760 years ago)
Archaeology has basically confirmed this calendar.
See **vi** below for a different approach to reconciling six days with 15 billion years.

Every 11 1/2 hours = 1 month[2]

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[1] pg. 171
[2] pg. 168

[1]Schroeder's innovation is to declare the entire universe to be the Bible's opening "frame of reference" (there was, after all, no earth or sun to provide another one), in which the universe's dense mass-energy point at the start of the Big Bang offers an extremely "slow" time-track, so that events which to us appear to have taken billions of years took, from the universe's "own" perspective, a matter of days. Once the time scale is adjusted to allow for the universe's expansion and cooling, Schroeder ends up with a schedule of Creation which allots eight billion earth-years for the first universe-day, four billion for the second, two billion for the third, and so on, adding up to the primordial six-day work week.

[2]This approach cannot be reconciled with current scientific views of the age of the universe. Nevertheless it does show yet another major opinion (Rav Yonasan Eibeshitz) who holds that the Six Days of Creation was not meant to be taken according to our current concepts of time.

ר' יונתן אייבשיץ יערות דבש ח"א
אבל הענין כך כי בודאי הענין מה שאמרו בתחלת בריאה בניסן או בתשרי הכונ' אי תליית המאורות היה בראש מזל טלה או בראש מזל מאזנים ומבואר במדרש רבה פ' בראשית כי קודם חטא אדה"ר הי ' המאורות גלגלי 'הולכים במהירות למאוד ואח"כ הולכים במתונות למאוד בקלקול החטא .ובזה יובן כי המאורות נתלו בתחל' ליל ד' במזל טלה כי הוא ראש למזלות ולכן ניסן ראשון לחדשים וגם ראוי שבו יתחילו המאורות להלוך ומשם יקחו דרכם אך מיהרו לסבב גלגל המזלות בהלוכן ממערב למזרח עד שנאמר הגיע יום הששי אחר חצות הגיעו המאורות למזל מאזני' שהוא תשרי ובזו יובן כי לתקופה שהוא תחלת מנין תליית המאורות מונין מניסן ... אבל אדם שהי' ביום ו' הי' בתשרי כי כבר הגיע' בו ביום החמ ' למאזנים וכן לבנה ולכך לשנות אדם מונין מתשרי כי באמת הי' ביום ו' תשרי כיהחמ' והלבנ' הגיעו למאזנים וכן יסד הקליר אופד מאז לשפט היום כי זהו נעשה בתשרי ביום ו' ...וא"כ אם תחשוב מן תחלת ליל ד' שנתלו המאורות עד ט' שעות ביום הששי הלכו המאורות כל י"א שעות וחצי מזל וששה מזלות מראש מזל טלה עד ראש מזל מאזנים הלכה בס"ט שעות שהוא ט' שעות ואז חטא אדה"ר.

These previous worlds & six days of creation = 15 billion years:

Rav Aryeh Kaplan:
Since there are a total of 7 Shmittah cycles, each one 7000 years long = 49,000 years. (ספר התמונה)
We are currently in the 7th cycle, making 6 cycles x 7000 years = 42,000 years prior to the creation of Adam Harishon (לבנת הספיר)
Since these years are prior to אדם הראשון, they must be measured as Divine years rather than earthy years.
מעכו) יצחק (רב
A Divine day is 1000 earthly years long (מדרש)
A Divine year is, therefore, 365 1/4 x 1000 = 365,250 earthly years
Therefore the universe is 365,250 x 42,000 = 15,340 500,000 (approximately 15 billion years)
This is the same time claimed by cosmologists (8 - 20 billion)

v-Approach II: We Cannot Apply Any Scientific Concept (Including Time) to the six Days of Creation

All the above approaches are based on saying that time is relative. The following approach, although similar, suggests that we simply cannot know what time meant during the six days of creation.

Rabbi Akiva Tatz:

During six days all laws of physics, logic, mathematics were still being put into place - rules hadn't solidified
We cannot apply rules to a system where the rules don't apply

בראשית א:א ד"ה ברא
עשה אינו ישנו ובזה לא יפול זמן כלל .(ספורנו)

Difference between ידיעה and השגה

Note: Scientists agree that there was a certain early point in the big bang when scientific forces as we know them today did not apply. This is because at very high temperatures, the

four forces of physics[1] begin to combine with each other. At the beginning of the big bang, there was only one such combined force, but the four forces began to emerge very, very early within the first second. So this approach is consistent with the scientific idea that there was a time when the world operated according to different (combined) laws. However, the scientists claim that this was a fragment of a second and this approach is claiming that the forces of nature were not operative until after the six days of creation. Therefore, this approach is saying that current science is simply wrong to project its scientific laws into this period of the Six Days of creation.

vi – Approach III: Beginning of Creation Prior to First Day

Only according to Rashi is first verse a part of first day. If the first verse is a separate sentence, then the time it took to create heaven and earth is not mentioned. Either because it took no time, or because time did not yet exist or was not measurable according to our notions of time (as per sources in **E iv and v** above).

Even according to Rashi we don't know when water or darkness, for example were created. Other things also preceded the first act of creation as we know it.

e.g. First required a vacuum:

רמב"ם מורה נבוכים ח"ב פי"ג.
הדעת הראשון והוא דעת כל מי שהאמין תורת משה רבנו ע"ה הוא שהעולם בכללו ר"ל כי כל נמצא מלבד הבורא ית' האלוק המציאו אחר ההעדר הגמור. (רמב"ם)

First two verses refer to previous worlds:

One of the classical commentators on the Mishnayos, The *Tiferes Yisroel*[1], explains that, according to Kabbalah, there will be seven worlds[2]. We are currently in the fourth world[3]. Our world begins when G-d says, "let there be light'. The two psukim prior to this are talking about the remnants after the destruction of the previous three worlds. The verese then read as follows:

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[1]For a detailed explanation of the four forces of the universe **see Science Addendums** in the first half of this book.

[1]דרוש אור החיים של התפארת ישראל סוף מס' סנהדרין (1842)
[2]דאמרי' בב"ר .ויהי ערב ויהי בוקר [דק' וכי מאחר שלא היה עדיין שמש בעולם ,ערב ובוקר מניין] א"ר אבוה מכאן שהי' סדר זמנים קודם לזה וכו' ,מלמד שהי' הקב"ה בונה עולמות ומחריבן ,בונה עולמות ומחריבן ואמר דין הניין לי ודין לא הניין לי:
וכדי למסור לנו הבטה והשקפה עגולית על כל הענין ,גלה לנו רבינו בחיי סוד נעלם בשם המקובלים בפרשת בהר ,בפסוק ושבתה הארץ שבת לה' וגו' , דזה ירמז על סוד נפלא ,שיהיה העולם נבנה ונחרב ז' פעמים ,כנגד ז' שמיטות שביובל ,שהם יחד מ"ט אלפים שנה.

[3]וכתב עוד ,שבכל שמיטה ושמיטה הנ"ל ,יהיה העולם נברא בהשלמה יתירה יותר מבתחילה ,על שלבסוף יחזרון כל נצוצי הקדושה ... שלז' הקפות העולם הללו ,רומזים ז"ר בראשית ,שכל א' היה הכנה ליום שלאחריו ... וסוד ה' ליראיו , שנמסר להם שאנחנו כעת בהקפה הד' שהוא לפי סדר ששת ימי בראשית הנ"ל כנגד יום רביעי שבו העמיד הקב"ה המאורות בעולם...

In the beginning of the first world, G-d created the heavans and the earth. And it was, after the destruction of the first 3 worlds that the remanants of Tohu and Vohu and darkness on the face of the Tehom carried over into our [the 4th] world. And G-d said, at the beginning of our world, "let there be light"[1].

The Tiferes Yisroel goes on to talk about the fossils that had been found in his time. (These were some of the earliest finds prior to Darwiin coming on the scene) and expresses great joy that these confirm the existence of these remnants from previous eras[2].

vii-Approach IV: Current Scientific Theories on Age of the Universe and of Beginnings of Life Inaccurate

The margin of error (8-20 billion years) is itself sufficiently great to underline the inaccuracy of how the age of the universe is calculated. The simplest dating procedure is to calculate the distance of a star from the earth. If a star is, for example, a thousand light years away, it means that the light which is now reaching us from that star dates back to 1000 x 6 million miles (approx.) at least.

The problem lies in calculating the distance of a star from earth to begin with. If the star is near enough than the simple and ancient technique of the parallax is used. We measure the star (preferably by satellite) from two opposite points of the earth's orbit around the sun, giving us two measurements 186 000 miles apart. When we put these two together, it is as if we have a three-dimensional view of the star with eyes that far apart, allowing for a fairly accurate measurement.

However, stars beyond the Milky Way (our galaxy) are really too far away for this method to work. So scientists first try to estimate how bright a star ought to be, given a certain distance. But how bright the star is first and foremost a function of the composition of the star: primarily whether it has metals and other heavy elements. But although there is some way of detecting these metals when they are on the surface of a star, there is no way of knowing whether there are such metals towards the center of the star.

There are actually several competing models that attempt to explain the observed properties of stars - none has yet, however, managed to explain all that is seen. And even within a single model, the ages deduced by comparing different kinds of stars often contradict each other.

Dates have been changing rapidly. In 1996 there appeared to be contradicting scientific evidence that the universe itself was 8-12 billion years old, while some stellar clusters looked to be 16 to 18 billion years old. In 1997, some scientists claimed that new evidence from the European Space Agency's Hipparcos satellite might have resolved the contradiction, while other scientists dispute this. Therefore, revisions are taking place all the time.[1] For example, in 1997 the distance to sunlike stars in the Pleiades was revised from 425 to 378 light years. (*Scientific American*, Dec. 1997, pg. 19)

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[1] וזהו שסיפרה התורה, בראשית, ר"ל בהתחלות כל התחלות, ברא אלקים את השמים ...ואת הארץ ... אח"כ תדלג התורה על הקריות שנתהוו בסדרי העולם הקדום, שאין נפקא מנה לנו השתא בזה כלל.
אבל סיפרה לנו והארץ היתה תהו ובוהו וגו', ר"ל חזרה ונתהווה חריבה ושוממה

[2] ועתה אחי ידידי ראו על איזה בסיס אדני תה"ק מונחים, כי הסוד הזה שנמסר לאבותינו ורבותינו, והם גלוהו לנו זה כמה מאות שנים מצאנוהו שוב בהטבע ברורה לעינינו בזמנים המאוחרים כבזמנינו הבהירה ביותר. דהרוח המשתוקק שבאדם, החפץ לגלות כל תעלומות, חתר וחפר ויחפש כחולדה בקרבים של האדמה בהרים היותר גבוהים שבעולם....

[1] As of writing this, most scientists were talking of an age of the universe of 12 -13 billion years.

The amount of Carbon in the armospheree is not static in the univers. This effects dating of much more recent origin. See **Appendix E** for detailed explanation and critique of carbon dating.

Two ways of measuring time:
James Gleick, NY Times Magazine, Dec. 31, 1995: "Time used to be fixed by astronomical reference points...By consensus among scientists and military officials, (since 1970) the absolute Stars drift (though the USA's Directorate of Time uses 462 quasars as one of its frames of reference) and the earth shivers ever so slightly - generally its rotation slows each year... Leap seconds are growing more common (There was one at the end of 1995). Eventually - in the distant future - there will be at least one every year and then two, and so on, as the earth continues to slow."

See also **Appendix N** where we show that our year may be a lot shorter than a year in the early stages of the earth's existence (**iii - Slowing Down**), and see there for other conflicting theories having to do with the age of various things (**iv - Conflicting Theories**).

However, although it is true that science is continuously adjusting its time estimates of things (and that there is not even consensus on every issue), but it is a huge leap from there to saying that therefore we can simply write off scientific estimates of the age of universe. Scientists do have quite a bit of "evidence" for the estimates they are making. They admit that there is a large margin of error (8 - 20 billion years) inn these estimates (although scientists are now tending more and more towards consensus at the lower figures). However, not a single scientist, religious or secular, feels that there is any scientific evidence to support a position of the age of the universe being 5760 years and six days. To hold this position one would simply have to say that science does not know what it is talking about and that one day it will see the light. This is not an untenable position. Science has been totally wrong on major issue before, whether the world had a beginning or not , for example. Indeed if the Torah told us clearly that this is what happened then science is indeed simply wrong. But since this approach has not been taken by any of the Meforshim we brought above, it would appear a difficult position to adopt.

To illustrate how little science knows about the time it took for the early formation of the universe, consider the CNN report on the Web, September 10, 1999 which reported a new theory of how planets were originally spawned, i.e. by a gigantic Gamma-ray blast. Two Irish astrophysicists, Brian McBreen and Lorraine Hanlon of University College Dublin, reported in the new Scientist Magazine (and later in Astronomy and Astrophysics) that they believe gamma rays emitted by the an explosion like the Supernova 1997ce, as imaged by the Hubble Space Telescope may have been a catalyst for planet formation in our solar system. The theory claims that a violent blast of gamma rays may have sparked the formation of our solar system's rocky planets within minutes. The flood of energy melted primordial dust grains, seeded the formation of meteorites and helped Earth and the other rocky planets coalesce quickly from a disc of gas and dust. (However, they agree that all this took place 4.5 billion years ago.)[1]

[1]74 The astrophysicists think the blast occurred within 300 light years from the sun and flooded the disc with enough energy to fuse material weighing as much as 100 times our Earth into droplets that cooled into chondrules. The iron-rich chondrules then soaked up gamma rays and X-rays.

Astronomers have long wondered what caused clumps of dust circling our young sun to melt into rocky beads rich in iron and silicon, or the chondrules that make up the bulk of meteorites. The burst, thought to be one of the most powerful of its kind in the universe's history, could be the result of a stellar explosion called a supernova. Other scientists, although willing to admit that such a blast may have taken place, are nevertheless unsure that such an unlikely event could be responsible for something as crucial as the formation of our solar system.

APPENDIX TO EVOLUTION

A - M: HOW THE LAWS OF BIOLOGY REVEAL PURPOSE IN THE UNIVERSE

N - O: TIME: BACKGROUND MATERIAL

P: VIEWS OF OTHER RELIGIONS

APPENDIX A: INTRODUCTION

i- The Source and Scope of the Discussion

ii- The Counter-claim of the Skeptic

APPENDIX A: INTRODUCTION

i-The Source and Scope of the Discussion

Although I have incorporated other sources, the following is primarily culled from a book by Michael Denton called *Nature's Destiny* (Free Press 1998) and sub-titled as the heading above. (Michael Denton is also the author of *Evolution: A Theory in Crisis*).

The book shows from a contemporary scientific point of view that:
a-The cosmos is uniquely fit for life
b-The primary goal of the cosmos is mankind: i.e. the cosmos is uniquely fit for only one type of advanced intelligent being, Homo Sapiens.

The first claim has been made by other great contemporary scientists (see list in **Appendix M - i** below).

The second claim has not been so readily made by contemporary scientists, is complicated because it involves evolutionary ideas and we have therefore not dealt with it in our summary. Interested readers are referred to the Denton's book, pp. 235- 362.

ii-The Counter-claim of the Skeptic

The arguments presented are not absolute proof that G-d made the world. Skeptics could still claim that the fact that conditions were so perfect for life was just sheer luck. The universe was just following blind laws and happened to fall into this arrangement. For example, the inflationary theory of the Big Bang explains why certain things needed to come out the way they are. If the theory is correct, then our universe is just one of myriads that have and will exist in time. Our universe may be tuned for carbon-based life not because it was set up that way, but because even such a delicate arrangement was bound to happen as one universe in the myriads that have come about. (*Scientific American* Aug. 1998)

Nevertheless, as more and more exact conditions emerge, the argument from design does become increasingly powerful.
However, in order to take care of these criticisms what has to be shown is that:
a-Each constituent appears to be the only unique candidate for its particular biological role;
b-This constituent seems to be ideally fit not in one or two but in all its physical parts;
c-All these constituents together make the laws of nature finely tuned to facilitate life in general and humans in particular;
d-Therefore the more constituents that get studied the more powerful the argument - the argument derives its power from the sheer number of adaptations observed.

It is arguments a and b which are relatively new to this discussion, while c and d become ever more powerful with time. When showing that something is the only unique candidate one must not take all the coincidences for granted and simply presume that things could simply not have been otherwise. There is always the possibility of imagining that things could have turned out differently, that Oxygen and Carbon Dioxide were not gases, for example, and then we ought to try and imagine whether any conceivable, imagined life form could have been possible.

APPENDIX B: WATER

APPENDIX B: WATER

i-Introduction

Life is impossible without water. Water also forms the bulk of most living things. Firstly, this is because water is a liquid medium. It is difficult to imagine a complex chemical system capable of replicating itself, of manipulating its atomic and molecular components and drawing its vital nutrients and constituents from its environment that is, anything that displays the characteristics we attribute to life-could exist except in a liquid medium.

ii-Water Expands When Frozen

Like other substances, water expands when heated and contracts when cooled. But as it cools, at 4 degrees C, instead of continuing to contract, it suddenly starts to expand. As it is busy freezing, there is another sudden and considerable expansion. This phenomenon is unique to water and makes a huge difference to the viability of life on earth.

It water continued to contract as it cooled to below freezing (which is what we would ordinarily expect), the water at the bottom would always freeze first. This is because heat rises and so the water at the bottom is always the coldest. When summer would come around, the sun would then heat the surface of the water where the heat would tend to remain. Scientists estimate that the bed of ice at the bottom would continue to thicken from year to year until almost all water on the surface of the earth would be frozen. However, now that the water that freezes remains on the top, it is the first to be reheated, thereby thawing out whenever the surrounding temperature heats up.

iii-Water Retains and Absorbs Heat Slowly

The rate at which a substance absorbs heat from the environment and releases it again is called the latent heat of the substance. Water at lower temperatures has a high latent heat, i.e. it retains its heat very well and it absorbs heat very slowly. In fact in this temperature range only ammonia has a higher latent heat.

This fact makes the temperature of the environment very stable. If not for this fact, small lakes and rivers would vanish and reappear constantly removing the possibility of ongoing life in those sources, making them unreliable sources of water and creating many other problems.

In addition, when temperatures fall, condensation occurs and this releases heat which tends to counteract the rate of temperature fall. When temperatures rise, evaporation increases, which tends to cool the environment. (Remember that the temperature of water is more stable than the environment.)

In addition, because water keeps its heat, when we perspire, we rid ourselves, together with the water, of large amounts of heat contained therein. Without the high latent heat of water, warm-blooded animals would have a very hard time ridding themselves of excess heat. (The only other two possible ways of losing heat is through conduction and radiation, but these do not work much at body temperatures.)

iv-The Amount of Heat Required to Raise the Temperature of Water is High

The amount of heat required to raise the temperature of a substance by one degree is known as its thermal capacity or its

specific heat. For water this is higher than most other substances. This helps to keep temperatures fairly stable. If the thermal capacity of water was lower, temperatures in summer and winter would be much more severe The great ocean streams such as the Gulf Stream which transfer huge amounts of heat from the tropics to the poles would not be able to work effectively. The fact that the most of the world is covered by water, which has this property, means that the global temperatures are much more regulated.

v-Water Has the Highest Capacity to Conduct Heat

The capacity of a substance to conduct heat is known as its thermal conductivity. The thermal conductivity of water is four times higher than any other common liquid. Without this it would be hard for cells, which cannot use convection currents, to distribute heat evenly throughout the cell.

If the conductivity of water had been several times less then it would have been too low to transfer heat to the surface of the body, posing insurmountable problems. The body would seize up like an overheated car engine.

On the other hand if the thermal conductivity of water was many time more, like that of copper, then body temperature would equilibrate very rapidly with the environment, so that temperature regulation would be too difficult to achieve. Small warm-blooded animals would certainly be impossible.

vi-Water Has High Surface Tension

Only liquid selenium at very high temperatures has as high a surface tension as water.

The high surface tension of water draws water up through the soil within reach of the roots of plants and assists its rise from the roots to branches of tall trees. Large plants would probably be impossible if the surface tension of water was similar to other substances.

vii-Water Dissolves Things Easily

Water is the best solvent of all liquids - it can dissolve a great number of chemical substances and in fact nearly all known chemicals dissolve in water to a slight but detectable extent.

This allows water to transport the necessary nutrients to living beings and in general to transport what the environment need from one place to another. "Water could have no biological role if it was not a good solvent."

(See also Sc. American, Nov. 1998, pg. 74)

viii-Water is Only Moderately Reactive With Other Substances

In order to be a good solvent (**vii** above) water needs to be quite reactive - in fact it catalyzes almost all known reactions. But it is still far less reactive than many other liquids. Yet these liquids react in turn with the chemicals dissolved in them, exhausting themselves in the process.

ix-Water Has Just the Right Viscosity

The viscosity of a substance is a measure of how freely it flows. The higher the viscosity the less freely it flows, the more sticky or semi-solid it is going to appear,

If the viscosity of water were higher, no fish life would be possible. One can well imagine the difficulty of attempting to sail or swim through treacle! Nor would any microorganism or cell be able to move. All the vital activities of the cell would be effectively frozen. In

addition the pressure of the circulatory system would have to be enormous to pump blood through the tiny capillaries, making any sort of circulatory system unworkable. No conceivable set of compensatory changes-increasing the number or diameter of the capillaries, increasing the flow rate or decreasing average cell size, etc.-could be engineered to make mammalian life possible.

On the other hand, if its viscosity were much lower, the structures of living systems would be subject to far more violent movements under shearing forces. Delicate structures like the molecular architecture of the cell, would be easily disrupted and water would be incapable of supporting any permanent intricate structures.

In addition, water is one of those fluids (called non-Newtonian) which when pressure is doubled, the rate of flow may triple. This allows mammals, including man, to conduct strenuous activity, and suddenly have a greatly increased supply of blood (as much as 20 times), without increasing the pressure to intolerable levels.

x-Diffusion Across Water is Very Rapid

The diffusion rate of water means the speed with which another substance can manage to spread from the one side of a body of water to another. Diffusion rates in water are very rapid. Oxygen, for example will diffuse across the average body cell in one hundredth of a second. The lower the diffusion rate of water, the smaller the cell would have to be. For example if diffusion rates were a hundred times less, cells would have to be a million times smaller to maintain their metabolic activities.

xi-The Density of Water

The more dense water would be, the heavier would be all living creatures. It water were several times as dense, then the maximum size that could be attained would be only a fraction of that attained by any existing organisms. The upright human being would be to dense to lift off the ground and be maintained in an upright position. Nor could the limbs move unless the proportion of muscle was greatly increased.

xii-Miscellaneous

A major feature of water is its ions. In addition it is a unique conductor of protons. These are key elements in the way organism transfer energy, such as in photosynthesis and oxidative phosporylation.

xiii-Combinations

Perhaps more remarkable than all the individual properties of water quoted above, is the fact that so many of them work in combination to achieve a particular goal. The following are some examples:

a-Weathering

Weathering of rocks is crucial to life because it distributes to different parts of the world the vital minerals on which life depends. From the rocks it often seeps into rivers and then into oceans and thereby throughout the world.

The following properties of water enhance weathering:
Surface Tension: This draws water into the crevices of the rock.
Expansion when Freezing: This cracks the rock, producing additional crevices for further weathering and increasing the surface area available for contact with the water.

Water as a Solvent: This leaches the elements out of the rock and into the water.
Viscosity and Strength: In water and ice serves to form hard grinding rivers or glaciers which reduce the rocks broken and fractured by repeated cycles of freezing and thawing to tiny particles of glacial silt.
Low Viscosity: Allows water to flow rapidly in rivers and mountain streams and to carry at high speed those tiny particles of rock and glacial silt which contribute further to the weathering process and the breaking down of the mountains.
Chemical Reactivity: Further helps to dissolve the elements from the rocks.

b-Preserving Large Bodies of Water on the Surface of the Earth

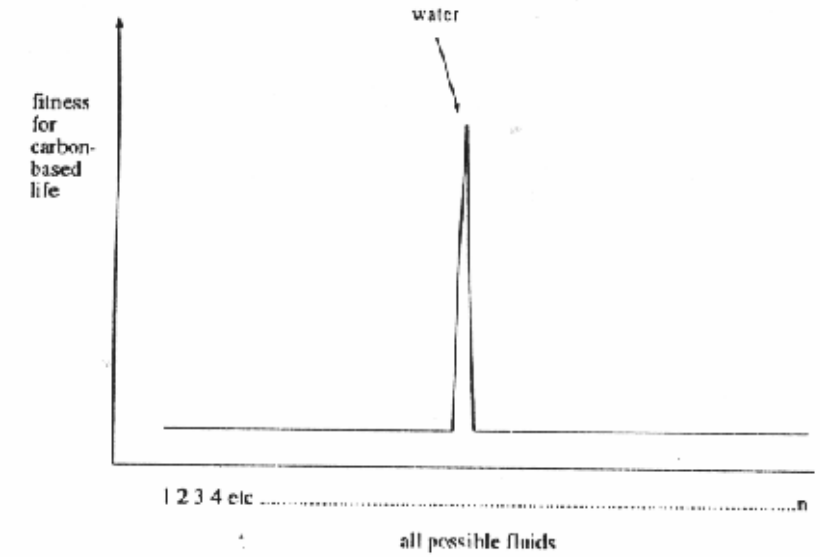
High Heat Capacity: Retards its rate of cooling, keeping it liquid not ice.
Expansion of Water below 4 degrees C: Causes the coolest water to the surface to rise to the surface, forming an insulating blanket on the surface which prevents further heat loss.
High Latent Heat: Causes considerable heat to be given off when water freezes - prevents further heat loss.
Ice lighter than Water and low Conductivity: Together preventing further cooling of the water below. Eventually, no matter how cold the air above the sea, the layer of ices will not increase beyond a few meters.
High Viscosity: Causes large blocks of ice to flow downhill or outward toward warmer temperatures or toward the sea where it melts again.

c-Temperature Regulation in Man and other large beings

When a 100 kg man runs 10 miles in 1 hour he generates 1000 kilocalories of heat. If none of this heat were lost from the body during the run, it would raise the temperature of the body by 10 degrees C. Such a temperature rise would almost certainly be fatal.

The following are the properties used by water to regulate temperature:
The Heat Capacity of Water: If the body was constructed mainly out of iron, salt, lead or alcohol, rather than water, the temperature would be raised by 100C, 50C, 300C and 20C respectively.
Latent Heat: Allows for great cooling through perspiration. The evaporation of one liter of sweat from our 100 kg man remove about 600 kilocalories of heat from the body, lowering the body temperature by 6 degrees C. If water was substituted for say alcohol or ammonia, then the cooling on evaporation would be only 2.2C and 3.6C respectively.
Thermal Conductivity: Ensure that the heat makes it from inside the body to the surface. If it were any higher, then we our body temperature would be too sensitive to temperature changes in the environment.

The unique fitness of water.



xiv-Conclusions

It turns on that not one or two, not most, but all the thermal properties of water are good not only for maintaining stable temperatures in the environment but also for protecting individual beings from sudden temperature changes.

APPENDIX C: LIGHT

i-Introduction

ii-Light Energy is Just Right to Activate Chemical Reactions in Living Things

iii-The Atmosphere Lets Through Just These Substances

iv-The atmosphere Lets Through a Tiny Bit of Ultraviolet Radiation

v-Sunlight is Just Right for Vision

vi - Solar Energy

vii - Distance of the Earth from the Sun

APPENDIX C: LIGHT

i-Introduction

The range of wavelengths is vast, from very short gamma rays (10-16 microns) to the very long radio waves (109 microns) This is a total of 1025 (10 with 25 0's after it, an immense figure). Only a tiny fragment of these comprises visible light (between 0.4 and 0.7) which together with heat (infrared radiation 0.7 to 1.5) comes from the sun. Without light energy we could not see, nor could photosynthesis take place. Infrared radiation keeps the earth and its atmosphere warms keeps water a liquid and provides climate systems.

Not only is the radiation in this tiny region the only radiation of utility to life, but radiant energy in most other regions is either lethal or profoundly damaging. (The exception to this is radio waves.)

ii-Light Energy is Just Right to Activate Chemical Reactions in Living Things

For most living things this is between 15 and 65 kilocalories per mole. These energy levels are provided between 0.8 and 0.32 microns almost the exact range of light. Less than that fails to activate the required chemical reactions; more than that is too energetic and causes disruption of life's delicate molecular structures.

iii-The Atmosphere Lets Through Just These Substances

a-The atmosphere is made up of oxygen, nitrogen, carbon dioxide and water vapor. Not only are these the perfect substances for life, but they allow 80% of the sun's heat and light radiation to reach the earth's surface.

b-They filter out almost all other forms of radiation. Virtually no gamma, x-ray, ultraviolet, far-infrared and microwave radiation reaches the surface of the earth.

c-Other combinations would not work. If the atmosphere had contained gases and other substances which strongly absorbed visible light, then the earth would not have been fit for life. In the case of most solids, a layer only a fraction of a millimeter thick is sufficient to prevent the penetration of light.

d-Water lets light through
All biological chemistry occurs in liquid water. Even on land, light energy must invariably penetrate a thin layer of water to reach the chemical machinery of a cell.
Water strongly absorbs nearly all electromagnetic wavelengths; but it lets through that one narrow band that is useful for life.

iv-The atmosphere Lets Through a Tiny Bit of Ultraviolet Radiation

This is essential for the synthesis of vitamin D and for maintaining calcium levels in the body. But in higher doses it is extremely harmful. This is achieved by:
a-The sun produces very little of it to begin with. (This is achieved by the fact that the radiant output of the sun fall dramatically from 0.4 to 0.3 microns)
b-Ozone in the upper atmosphere strongly absorbs UV light below 0.3 microns
c-Water strongly absorbs UV below 0.2 microns.
These factors together mean that below 0.3 there is a rapid fall off of ultra-violet radiation. Since vitamin D is made between 0.29 & 0.32 microns, what emerges is that just the right amount of ultraviolet in the right band is let through and the rest is filtered out.

v-Sunlight is Just Right for Vision

While high quality vision may not be essential to all life on earth, human existence would be inconceivable without it. Virtually all our knowledge about the world, and in particular scientific knowledge, acquired over the past four centuries has been largely dependent on very good sight to be able to see detailed and information-rich images of our surroundings.

In order to be able to see, the radiation given off must not be too energetic and therefore destructive, but it must not be so weak that too little energy is given off to interact with the particle so that it can be seen.

Stronger Radiation

All the biological material we know of that could be used to construct an eye that would see very short, high energy waves(ultraviolet, x-rays and gamma rays), would be destroyed by those waves.

Weaker Radiation

Moreover, in order to be seen, the particle must reflect the energy and not absorb it. But most weaker radiation below the visual region are strongly absorbed by most substances. Therefore it would be difficult to imagine what the eye which sees in these bands could be made of.

Moreover, the eye is a relatively small object which sees in high resolution. To construct a similar type eye to see radio waves with a wavelength of 100 centimeters would require a lens 10 km in diameter. Microwaves of 1 millimeter wavelength would require a lens of 10 meters. There would also be many other complications constructing a device which could see at such low energy levels.

It appears that the visual region is the one region supremely fit for biological vision.

Conclusion

Encyclopedia Britannic (15th edition): "Considering the importance of visible sunlight to all aspects of terrestrial life, one cannot help being awed by the dramatically narrow window in the atmospheric absorption ...and in the absorption spectrum of water."

vi - Solar Energy

The Anthropic Principle, Professor Nathan Aviezer in Jewish Action, Spring 1999:

The sun contains only two kind of atoms: hydrogen and helium. Helium is inert, unconnected to solar energy. ... Hydrogen's nucleus consists of only one particle - a proton. Thus the sun is basically a vast assemblage of protons. ... Because of the extreme conditions present in the interior of the sun, a proton may occasionally transform spontaneously into a neutron - another fundamental particle of nature. The resulting neutron can combine with another proton to form a composite particle known as a deuteron. The deuterons "burn" via thermonuclear reaction and this "burning" provides the intense heat and brilliant light of the sun. Thus deuterons constitute the solar fuel that generates the solar fuel of the sun which enables life to exist on Earth.

A very important aspect of solar "burning" is that it occurs very gradually. Since neutrons are only very gradually formed from protons, a relatively small number of deuterons are produced at any one time, and thus solar fuel (deuterons) constitutes but a tiny fraction of the total material in the sun. This ensures that the sun "burns" slowly, generating solar energy only gradually.

Another possible nuclear reaction that could in principle, take place is the combination of one proton with another proton. Fortunately for us, however, proton-proton combination does not occur. If one proton would have been able to combine with another proton, then all the protons in the sun would immediately combine with each other, leading to a gigantic explosion of the entire sun.

The possibility of proton-neutron combination and the impossibility of

proton-proton combination both depend on the strength of the "nuclear force", one of the fundamental forces in nature. ... Detailed calculations of the nuclear force have demonstrated the following results:

1. If the nuclear force were only a few percent weaker, then a proton could not combine with a neutron to form a deuteron. If this were the case, no deuterons would be formed in the sun and hence no solar fuel would exist. As a result, the sun would not shine ("burn"), but would merely be a cold ball of inert gas - precluding the possibility of life on Earth.
2. If the nuclear force were only a few percent stronger, then each proton would rapidly combine with another proton with explosive results. If this were the case, the sun would soon explode and thus cease to "burn", once again precluding the possibility of life on Earth. (P.C. W. Davis, *Journal of Physics*, vol. 5, 1972, pp. 1296-1305)

It is an extraordinary fact that the strength of the nuclear force just happened to lie in the narrow range in which neither of these two catastrophes occurs.

vii - Distance of the Earth from the Sun:

The Anthropic Principle, Professor Nathan Aviezer in Jewish Action, Spring 1999:

The Earth is blessed with an abundant supply of both water and air, permitting life to flourish here, whereas our two neighboring planets, Venus and Mars, are both devoid of water and air, and hence devoid of life, as the space program has established.

... It was recently discovered that, shortly after they were formed, all three planets (Earth, Venus and Mars) has large amounts of surface water. The deep channels that are observed today on the surface of Mars were carved out long ago by the copious fast-flowing Martian primordial surface waters. (J Audouze et al. Edds.' *The Cambridge Atlas of Astronomy*, Cambridge University Press, pp. 124-129). Similarly, Venus was once covered by deep oceans which contained the equivalent of a layer of water three kilometers deep over its entire surface. (ibid. pp. 70-81) However, in the course of time, all surface waters on mars and Venus disappeared. How did the Earth escape this catastrophe?

The answer is that the Earth escaped this catastrophe by sheer "accident!". The Earth just happens to be sufficiently distant from the sun that surface water neither evaporated nor decomposed, as happens on Venus. Moreover the Earth just happens to be sufficiently near the sun that the temperature remains high enough to prevent all the oceans from freezing permanently as happened on Mars, Therefore, the Earth alone, among the planets of the solar system, is capable of supporting life.

Similar remarks apply to the atmosphere. Recent studies of the carbonate-silicate geochemical cycle have shown that the planet is controlled by a very delicate balance, controlled by the interplay of many factors. (J.F. Kasting et al.' *Scientific American*, Feb. 1988, pp. 46-53) This balance is so delicate that if the Earth were only a few percent closer to the sun, the concentration of carbon dioxide in the atmosphere would become so high that "the atmosphere would not be breathable by human beings." (ibid. pg. 53) Fortunately, the orbit of the planet Earth just happens to lie at the crucial distance from the sun, in a very narrow zone, that permits the formation of a life-sustaining atmosphere.

This remarkably fortunate coincidence is known among scientists as "the Goldilocks problem of climatology." Recall the children's story in which Goldilocks found the various items of baby bear to be "not too hot, and not too cold, not too hard and not too soft, but just right." In that vein, scientists refer to the

existence of water and air on earth as another example of the anthropic principle.

APPENDIX D: THE EARTH

i-All Elements Required by the Earth

ii-Constancy and Co-ordination of all of Earth's Systems

iii-Earth Just Right

- **a - Size**
- **b - Temperature**
- **c - Earth's Interior**

iv-Conclusions

APPENDIX D: THE EARTH

i-All Elements Required by the Earth

There are 92 elements on the periodic table, representing all the elements (atoms which occur naturally in nature). All the elements which are essential to life are also abundant. The elements in the second half of the table are much rarer and seem to be non-essential to life. Yet a role for each one of the elements in the development of life can be found. The last element, number 92, is uranium. Many believe that the heat provided by its radioactivity (together with other radioactive elements) was essential to create the unique physical and chemical aqueous environment known as the hydrosphere which is supremely fit to support life as we know it.

Radioactivity was also instrumental in ensuring that the earth converted from being a largely homogeneous body, made of the same materials right through to all depths into a differentiated body that has layers of structure with a dense iron core, a crust composed of lighter material with lower melting points and, between them, the mantle. This differentiation is considered essential to life.

As a result of this differentiation the surface of the earth is made up of silicates which when weathered turn into clay. Clay has a unique layered structure which allows it to hold both large amounts of water and also ions. The transfer of these ions to plant life is a source of nutrients vital for their survival.

Now what turns the silicates into clay in the first place. It is the weathering of the rock by water and carbon dioxide. It is surely a "coincidence" of great significance that these are just the same two elements vital for the atmosphere of higher life forms.

ii-Constancy and Co-ordination of all of Earth's Systems

One of the most extraordinary things is the fact that the earth, in the ground, in the sea and in the atmosphere, appears to maintain a constancy of so many variables. The mean temperature of the sea, the carbon dioxide in the air, the salinity of the sea, the annual rate of deposition in the sea of about twenty five or so different elements all have remained in equilibrium for as long as life has existed (scientists claim this is about four million years).

There appear to be a set of interlocking cycles-the water carbon, iron, magnesium, tectonic cycles and so on-working together like a vast terrestrial clock with its cogs superbly tailored to ensure that the individual cycles turn at the appropriate rate to maintain the required level of each of the elements, essential to life, in the hydrosphere. For some this system is analogous to a living system (called Gaiaby James Lovelock).

One component of this is temperature regulation of the atmosphere, When the temperature rises, more clouds are formed. These clouds reflect back more of the sun's radiation into space, which has the effect of lowering the temperature. Carbon dioxide is controlled by the fact that as the CO2 level goes up, the temperature increases due to the greenhouse effect. This causes more weathering of silicate rocks which leads to more CO2 being taken up into the soil which restores the balance of CO2 in the atmosphere.

iii-Earth Just Right

a-Size

Not too small that its gravity is too weak to hold the atmosphere and not too large that

its atmosphere would hold too much, including harmful gases.

b-Temperature

Life as we know it is possible only over a very narrow interval, 1-2% of the range between absolute zero and the surface temperature of the sun.

c-Earth's Interior

Perfectly balanced to run at just the right speed to allow the contents and the magnetic field to form.

iv-Conclusions

a-Atom building must continue to uranium if there is to be life;
b-The natural laws we know lead to the stable atmosphere of the earth and is not just a matter of chance;
c-A great number of physical and chemical properties and cycles are involved in maintaining the conditions for life;
d-The sun provides just the right source of energy for the water-cycle on which life depends (in addition to being the source of light)
e-The earth has just the right mass
f-It has just the right properties to drive the crustaltectonic cycle, which itself is so perfectly fit to function in unison with the water cycle.

In the BBC documentary, *The Anthropic Principle*, Sir Fred Hoyle, discusses two very fortunate "coincidences," one which allowed carbon to come into being, and another which allowed carbon to continue to be. The composition of stars is mainly hydrogen and helium, the simplest atoms of all. For the stars to produce all the universe's carbon, which is an atom essential for life, three nuclei of helium must collide, which is a very unlikely occurrence, so much so that it is very surprising that all the carbon necessary for life exists. How did the stars manage this feat? It "just so happens" that when two helium nuclei combine, if a third one draws close, then the two that had combined "enlarge" themselves, making themselves a larger "target" so that it is far easier for the third helium to hit them and produce the carbon! No other elements behave this way.

APPENDIX E: CARBON

APPENDIX E: CARBON

In the BBC documentary, "The Anthropic Principle," Sir Fred Hoyle, discusses two very fortunate "coincidences," one which allowed carbon to come into being, and another which allowed carbon to continue to be. When Hoyle was researching how carbon came to be, in the "blast-furnaces" of the stars, his calculations indicated that it is very difficult to explain how the stars generated the necessary quantity of carbon upon which life on earth depends. Hoyle found that there were numerous "fortunate" one-time occurrences which seemed to indicate that purposeful "adjustments" had been made in the laws of physics and chemistry in order to produce the necessary carbon. The composition of stars is mainly hydrogen and helium, the simplest atoms of all. For the stars to produce all the universe's carbon, which is an atom essential for life, three nuclei of helium must collide, which is a very unlikely occurrence, so much so that it is very surprising that all the carbon necessary for life exists. How did the stars manage this feat? It "just so happens" that when two helium nuclei combine, if a third one draws close, then the two that had combined "enlarge" themselves, making themselves a larger "target" so that it is far easier for the third helium to hit them and produce the carbon. NO OTHER ELEMENTS BEHAVE THIS WAY.

Carbon is uniquely fit to be the basis of life, together with water for a number of reasons:

a-The number and the variety of the compounds which it can form, over a quarter of a million have already been isolated and described.

b-The total number and diversity of chemical bonds that maybe constructed out of carbon, oxygen, hydrogen, and nitrogens are virtually unlimited. Almost any imaginable chemical shape and chemical property can be derived.

c-These same elements are among the first that are manufactured in the stars and are also the most abundant throughout the cosmos.

d-Two of these atoms, hydrogen and oxygen, form water, the matrix of carbon-based life.

Carbon itself has many other unique properties:

a-Its compounds are uniquely stable

b-Its affinity for most elements is fairly equal, requiring the same amount of energy to make them allowing for thermodynamic stability

c-It can form multiple bonds by sharing two or more of its electrons with another atom.

d-Carbon is relatively inert. Therefore its compounds are mild, neither violently reactive nor corrosive.

e-Yet, carbon is just reactive enough to form all its chemical bonds under relatively mild conditions, not requiring great amounts of energy to do so. (This is known as mestasibility.)

f-These properties of carbon exist within a very narrow temperature range of -20C - 120C (a tiny range compared to the standard range from the center of stars to outer space).This range fits perfectly with temperature conditions on earth which in turn is regulated by and a condition to a whole host of other things. Liquid water, for example, also only exists in this range (OC-100C)

g-Besides the normal (covalent) bonds, which carbon makes, it also makes weak (non-covalent) bonds, which maintain the 3-d shape of the DNA. Although these bonds work very differently to covalent bonds, they also "happen" to operate in the same, approximate and very narrow temperature band (100C-200C).

Carbon Dating

Through use of old tree rings, analysis of the sun's activities and artifacts from the past, scientists are setting a new timetable for what was happening, and when, in the dawning years of human history.

The shift in timing seems small- just 22 years- but it hits at a critical time in history. According to researchers, the shift is significant for Bronze Age and Iron Age events. For example, their new data would alter the timing of the first known alphabet spreading beyond ancient Phoenicia. Ancient peoples around the Mediterranean Sea were apparently writing alphabetically two decades earlier than previously known[1].

Researchers can now explain why puzzling variations in the amount of radioactive carbon – carbon-14 – found in ancient wood samples were causing small miscalculations in archaeological dating.

The main reason carbon-14 varies in the air is the constant changing of solar activity. When the sun is highly active, pock-marked with a lot of dark sun-spots, the sun's energetic halo is greatly disturbed and tends to block the cosmic rays coming in from deep space. It is those cosmic rays, colliding with air at the top of Earth's atmosphere, that generate the excess carbon-14 that gets incorporated into growing wood.

Scientists now find that carbon-14's abundance varies by tiny amounts even during a single year, in accordance with changes in the activity of sunspots, those dark blotches that migrate across the face of the sun in an 11–year cycle. Such variation in abundance also means that the amount of carbon–14 that gets into the wood of trees can vary slightly, depending in part on the climate where a tree was growing. So, each year the high-latitude trees can record a slightly different amount compared to tropical trees, because the latter began growing earlier in the spring[2].

It turns out that pine and juniper trees growing in the Mediterranean area tend to add wood earlier in the year compared to oak trees growing at higher latitude in the southern Germany. And if by chance there is slightly less, or slightly more, carbon-14 in the air at any given time, age-dating based on carbon-14 will yield slightly different age readings from German wood vs. Mediterranean wood, even from tree rings that grew in the same year[3].

[1] This chronology is central to the dating of some 22 Bronze-and-Iron-Age sites around 740 BC, and the artifacts being studied include a bronze bowl from the tomb of King Midas.

[2] The sunspot number can also vary slightly from week to week within the 11-year cycle . But to actually find a short-term variation in the wood is a surprise.

[3] Based on an article entitled Time Is of the Essence, Refined dating shift archaeological timetable By Robert Cooke, Newsday. January 22, 2002

APPENDIX F: OXYGEN AND CARBON DIOXIDE

i-The Most Common Chemicals React to Produce the Most Energy

ii-The Atmosphere Contains the Right Balance of Oxygen

iii-The Solubility of Oxygen Just Right

iv-Atmospheric Pressure Just Right

v-Conclusions for Oxygen

vi-Carbon Dioxide

vii-Carbon Dioxide Perfect for Toxic Waste Disposal

viii-Conclusions for Carbon Dioxide

APPENDIX F: OXYGEN AND CARBON DIOXIDE

Oxygen is produced if another helium hits the carbon. This helium should convert all of the carbon to oxygen, so why is there enough carbon left for us? "Fortuitously," the fourth helium converts only half the carbon to oxygen, so that carbon remains for the purposes of life.

i-The Most Common Chemicals React to Produce the Most Energy

Carbon (actually reduces hydrocarbons) + oxygen = water + carbon dioxide. This key reaction, which takes place in air provides many times more energy than any of the alternatives. Firstly this is because oxygen itself releases so much energy. (Fluorine liberates more energy but is dangerously reactive.) Secondly, carbon and hydrogen, when combining with oxygen (upon oxidation) produce (together with boron) more energy than any other chemical reaction with carbon.

ii-The Atmosphere Contains the Right Balance of Oxygen

The amount of oxygen in the air is 21% which seems just right to provide the maximum amount of oxygen without it becoming dangerous. Oxygen is a very reactive element. The probability of a forest fire being ignited by lightning increases as much as 70% for every 1% increase in oxygen in the environment. If the atmosphere contained too much of it, it would lead to massive conflagrations which would destroy rain forest and arctic tundra alike. The current percentage of oxygen is considered close to or at the upper limit.

It is of great significance that oxygen and carbon are not reactive at normal temperatures, but they give off enormous energies once combustion is achieved. (That is why it is so hard to start a coal or wood fire but, once started, it is hard to put out.) This allows for a controlled and orderly manner in which energy can be released. It also allows for the harnessing of fires by man, and the enormous technological unfolding that this has led to.

iii-The Solubility of Oxygen Just Right

If oxygen dissolved into water at any lower rate, organisms would not be able to extract oxygen from an aqueous solution like blood at a sufficient rate to satisfy their needs.

On the other hand, it is hard to come up with a proposal of what design could accommodate an increase in the oxygen capacity of the blood flow, especially given the fact that more oxygen is highly toxic at higher than natural levels, killing cells exposed to it. In addition, oxygen solubility is a function of body temperature - the higher the temperature the less oxygen will dissolve; but simultaneously the body needs more oxygen as its temperature rises. Therefore an exact balance of temperature must be found which happens to exist within the range of the lowest specific heat of water, i.e. when water can most easily be warmed.

iv-Atmospheric Pressure Just Right

At about three times atmospheric pressure, extended periods of strenuous work become impossible because the effort involved in moving the air takes up a prohibitive proportion of the total energy available. No conceivable redesign of the respiratory system would allow for air pressure several times its current level. But

this has to be balanced against the right oxygen contact of the atmosphere. If atmospheric pressure were ten times less, all body fluids would vaporize at 38C.

James Lovelock has speculated that long-term atmospheric stability on a planet the size of the earth may only be possible in this same unique region of atmospheric space.

it the atmospheric pressure was, say, only one fifth as great as it is, the seas might eventually vaporize and the increased water vapor in the atmosphere might cause a massive and runaway greenhouse effect. On the other hand, if the atmosphere was several times more dense, this might reduce the amount of water vapor in the atmosphere and the continents might be converted to arid wastelands.

v-Conclusions for Oxygen

If one plots all possible atmospheric pressures against all possible oxygen contents there is only one unique tiny area where all the various conditions for life are satisfied. In this tiny space, fire is possible, but runaway combustion is avoided, oxygen toxicity is low, the solubility of oxygen is sufficient to support oxidative metabolism, and the density is sufficiently low so that the work of breathing through strenuous exercise is not prohibitive.

There is enough oxygen to supply the ozone layer in the upper atmosphere, which protects us from harmful ultraviolet radiation. Ultraviolet in turn makes oxygen dangerously reactive, so that the ozone oxygen protects oxygen from its own reactivity.

vi-Carbon Dioxide

a- Carbon dioxide is relatively unreactive at normal temperatures.

b- It is one of the very few oxides which are a gas at normal temperatures. This not only helps the body to excrete it, but it also helps the body to regulate its level acidity. Ultimately, this extra acidity is simply breathed out of the body.

c- CO2 plays a similar role on a global scale, preserving the neutrality of the oceans and all water on the earth's surface.

d- It is both innocuous and soluble which allows it to be easily gotten rid of by land based living beings.

e- The rate at which carbon dioxide dissolves into water (its hydration rate) is just right. Hydration of CO2 occurs relatively slowly. If CO2 had hydrated relatively instantaneously, it would produce violent fluctuations in acidity.

f- Weak solutions of carbonic acid in the environment play an important role in the weathering of rocks, helping to spread mineral nutrients by the fact that it then redissolves into that very water.

g- Carbon dioxide is crucial to photosynthesis, and is readily taken up by plants. Because of this, man and animals have ready food supply.

h- Therefore, it is necessary too for carbon dioxide to be found readily in both water and air. In fact, what we find is that the amount of CO2 in air is equal to that of water.

vii-Carbon Dioxide Perfect for Toxic Waste Disposal

"In the course of a day a man of average size produces as a result of his active metabolism, nearly two pounds of carbon dioxide. It is difficult to imagine by what elaborate chemical and physical device the body could rid itself of such enormous quantities of material were it not for the fact that ... in the lungs ... [carbon dioxide] can escape into air which is charged with little of the gas. Were carbon dioxide not gaseous, its excretion would be the greatest of physiological tasks; were it not freely soluble, a host of the most

universally physiological tasks would be impossible." (Henderson)

Above we showed that carbon compounds when combined with oxygen produce water and carbon dioxide, providing huge energy for living beings in the process. What is quite amazing is that these very products, water and carbon dioxide, are able to reverse directions and combine with each other producing hydrogen ions + bicarbonate base. The hydrogen ions comprise the acid, which then just get breathed out of the body. What is truly amazing is that the body was able to use the very end products of the metabolic process, which produced the acid to get rid of the acid. It is like taking the pollution produced by a giant factory and expecting that the pollution will simply combine with itself to take care of itself! No other such case of accuracy in natural regulation is known. "It is a solution of breathtaking elegance and parsimony."

viii-Conclusions for Carbon Dioxide

If carbon dioxide had been a toxic substance, if it had been a liquid insoluble in water, if it had been a solid, if it had dissolved in water forming a strong acid, the complete oxidation of carbon to carbon dioxide would have been impossible and complex carbon life would have been inviable. However, carbon dioxide is none of these things.

Stranger still is the story of oxygen, which is produced if another helium hits the carbon. This helium should convert all of the carbon to oxygen, so why is there enough carbon left for us? "Fortuitously," the fourth helium converts only half the carbon to oxygen, so that carbon remains for the purposes of life.

APPENDIX G: DNA

i-DNA Allows Living Beings to Self-replicate

ii-Properties of DNA

- **a-It is highly stable**
- **b-It is flexible (mestable)**
- **c-It is highly compact**

iii-Retrieval of Information

iv-DNA Has the Best Number of Base Pairs

APPENDIX G: DNA

i-DNA Allows Living Beings to Self-replicate

Every living system replicates itself, yet no machine yet possesses this capacity even to the slightest degree. The challenge to create such a machine is enormous. A self-replicating machine requires a data storage system which must be accessible or comprehensible to the constructor device. It requires that the constructor be assembled from a very small number of readily available substances. It requires a means of energy generation, storage, and distribution to its working components and so forth. None of these problems have been solved. Yet every second, countless trillions of living systems from bacterial cells to elephants effortlessly replicate themselves on the surface of our planet.

And it is not just the act of self-replication which has not been copied in our technology. Even the far less ambitious end of component self-assembly which is utilized by every living cell on earth is an achievement without analogue in modern technology. Living beings assemble themselves, directed entirely by their own intrinsic properties without any external intelligent guidance or control. This often involves combining tens or hundreds of unique components.

Imagine a space ship or a computer being chopped up randomly into small fragments. No two fragments will ever be the same, Imagine each one of these fragments assembling itself into a perfect but miniaturized copy of the machine from which it originated. Nature does this constantly. It is an achievement of transcending brilliance. The way that it does so is through the DNA.

ii-Properties of DNA

a-It is highly stable

Unlike many biochemicals, it remains stable in a solution, even at room temperature for months. In particular, this means that in real life it is stable in water, its common environment. Recently DNA has been extracted from Neanderthals, and some workers have claimed to have extracted it from fossil insects and leaves up to 100 millions years old.

b-It is flexible (mestable)

Despite its stability, DNA strands do not bind so strongly that they cannot be pulled apart and manipulated by the biochemical machinery of the cell. In addition, it is able to adopt a variety of different conformations.

c-It is highly compact

In man the DNA required to store all the information is a meter long. Yet this 1 meter long molecule gets compacted into a tiny ball less than 5-thousandths of a millimeter in diameter.

DNA keeps on twisting and bending into helices which bend in turn into superhelices and so on. Since diffusion is not efficient over distances greater than the average size of the cell, the compactness of DNA makes a vital contribution to its biological fitness.

"The most frequently mentioned paper in the biological sciences was that by Fred Sanger and his colleagues at Cambridge, England, wherein they described the entire sequence of nucleotides, or 'words', in the DNA of a virus, PhiX-174 ('Nature', Vol. 265, 1977, p. 687). This achievement marked the first time ever that the complete chemical 'blueprint' of a living organism had been unraveled and followed shortly after Dr. Sanger's group and a second team working under Dr. Walter Gilbert had improved methods for reading

DNA sequences. An extremely simple life form, PhiX-174 proved to contain 5,375 words. Grouped into sentences -- genes -- they specify the composition of a virus particle when it replicates, and indeed they control all its functions... A perplexing revelation from this work was that the genes overlap. Like a telegram with no spacing, the coded message read entirely differently, depending upon whether one began with the first, second or third letter. The fact the three messages were contained within one seemed to some researchers artificial or contrived" (*OMNI Magazine*, in an article entitled, *Future Curves: OMNI Surveys the Royal Society*).

iii-Retrieval of Information

In order to retrieve information from the DNA, the RNA must first read the specific parts of the DNA helix. The RNA does this by feeling for the unique electrostatic shape of different parts of the helix. Then proteins in the cell have to read the RNA in turn. The RNA also codes information by folding into specific 3-D shapes, which also have to be interpreted by the proteins.

In order to fit its role, RNA is less stable than DNA, thus confirming that DNA only is suitable for its role.

Although it is clear that both DNA and RNA are wonderful fit for their respective biological roles, the questions remain. Are they uniquely fit? Or might there be other candidate information carriers even fitter than either DNA and RNA? Is every chemical detail of the two molecules essential for biological function? Could different bases be used? Could different sugars be used? None of these questions can be answered definitely, but the evidence suggests that any change would be detrimental and no other polymers are known which possess precisely the chemical and physical properties of DNA and RNA.

There are a few additional base parts not used in the DNA which could nevertheless fit into the DNA. Initial evidence indicates, however, that these would not be as chemically stable nor as faithful copies as the four natural bases.

One of the oldest and most prestigious scientific associations is Great Britain's Royal Society. At the end of the 1970's, *OMNI Magazine* asked members of the Society to list the five most "sensational" scientific advances of the decade:

"The most frequently mentioned paper in the biological sciences was that by Fred Sanger and his colleagues at Cambridge, England, wherein they described the entire sequence of nucleotides, or 'words', in the DNA of a virus, PhiX-174 ('Nature', Vol. 265, 1977, p. 687). This achievement marked the first time ever that the complete chemical 'blueprint' of a living organism had been unraveled and followed shortly after Dr. Sanger's group and a second team working under Dr. Walter Gilbert had improved methods for reading DNA sequences. An extremely simple life form, PhiX-174 proved to contain 5,375 words. Grouped into sentences -- genes -- they specify the composition of a virus particle when it replicates, and indeed they control all its functions... A perplexing revelation from this work was that the genes overlap. Like a telegram with no spacing, the coded message read entirely differently, depending upon whether one began with the first, second or third letter. The fact that the three messages were contained within one seemed to some researchers artificial or contrived, prompting Drs. Hiromitsu Yokoo and Iairo Oshima to revise the theory, first suggested by Dr. Francis Crick and Leslie Orgel ('Icarus', Vol. 19, 1973, p. 341) that life on Earth began from organisms sent here billions of years ago by extra-terrestrial civilizations that decided to 'seed' other planets. The Japanese scientists suggested that the gene sequence PhiX-174 might contain messages, or signals, as yet uncoded. In their reasoning, such

overlapping messages would be a highly economical way to send information through vast tracts of space" (*OMNI Magazine*, in an article entitled, *Future Curves: OMNI Surveys the Royal Society*).

In other words, the most sensational biological discovery of the 70's was that DNA, the "chemical blueprint" of a live form, was so "contrived," i.e. it exhibited such a high level of design and complexity, scientists were forced to conclude that the DNA had to have been produced by intelligence. The design compelled an intuitive appreciation, which led them to hypothesize the existence of a mysterious extraterrestrial civilization. (*The 2001 Principle*)

iv-DNA Has the Best Number of Base Pairs

It would seem that four is just the right number of base pairs. This confers a high enough of redundancy to give the DNA the flexibility to embed additional information where necessary. The same level of redundancy in a 2-base system, for example, would require the codons to be six bases long, making the DNA and RNA twice as long and doubling the energy for protein synthesis. Transfer RNA molecules would have to be bigger and protein synthesis would be slowed down considerably. The whole system would be more complicated.

On the other hand, a 6-base system would also involve certain problems. If the codons in a six base system were 2 bases long, this would provide 36 different codons sufficient to specify 20 amino acids. However, 32 codons may not provide the necessary element of redundancy, Moreover, the accuracy of a mechanism based on matching only 2 base pairs would probably be lower than the existing system.

Three nucleotides on a six based system would mean 216 codons, requiring four times the number of RNA and making the whole system more complex. In any case, there does not appear to be an additional base pair capable of the perfect pairing of the A-T and G-C base pairs.

Other coding combinations produce similar problems.

Although the variable number of codons used in specifying different amino acids appears at present to be a curiosity, not enough is understood about all the functional reasons which may make these numbers optimal. Certainly, the more that is learned about DNA and RNA, the more uniquely fit we see they are.

APPENDIX H: PROTEINS

i-General Properties of Proteins

ii-Diversity

iii-Dual Function: Change and Regulation

iv-Self-regulation

v-The Fitness of Proteins for DNA Recognition

vi-Conclusions

APPENDIX H: PROTEINS

i-General Properties of Proteins

Proteins are made up of long chains of 104 amino acids, containing about 1000 atoms. Whereas DNA is the data bank of life, proteins are life's universal builders. They translate the one-dimensional DNA dream into the living 3-dimensional reality of the cell. To do this:

a- Each individual protein molecule is able to interact with unerring specificity with anther specific molecule in the cell.
b- The proteins have to be able to assemble themselves automatically (see Appendix G i above for discussion).
c- Proteins create a waterless (non-aqueous) environment in their center. This allows various chemical reactions to be carried out which would be impossible or difficult in a water medium.
d- Proteins have the ability to rapidly bind with another molecule in the cell, do what it needs to do and rapidly disconnect from that molecule. Protein enzymes can act sometimes as often as 106 times per second. (There is a very precise ratio of strong, covalent to weak chemical bonds in the cell of 20:1, which is absolutely crucial for this to take place.)

The only substances vaguely comparable to proteins are RNA molecules, due to their great catalytic power. However, it seems unlikely that RNA molecules could carry out the vast diversity of biological functions carried out by proteins.

ii-Diversity

The diversity of proteins is astounding. The list of structural and functional properties of proteins is virtually endless. Some examples:

Structural Diversity
a-Hard Teflon-like materials which make up hair, nails and feathers.
b-Tough nylon like materials which make up the tendons and the sheaths which encase various organs of the body.
c-Rubber like elastic materials that surround the major arteries.
d-Smooth elasticity of the skin.
e-Transparent materials which make up the lens of the eye.

Functional Diversity
a-Catalysts which speed up the rates of chemical reactions billions of times.
b-Building up the chemical components of the cell.
c-Breaking down complex substances into simpler chemical parts.
d-Providing the cell with energy, by being a catalyst in general and in particular by converting energy from the suns into reduced carbon fuels.
e-Transporting substances.

With respect to individual properties, proteins are matched by other substances. But no other class of molecules possesses even remotely such a diversity of properties. Nor does any come near to protein as a catalyst.

iii-Dual Function: Change and Regulation

In order to be able to do so many things proteins have to be able to readily change (=metastability). Increase their temperature a few degrees and they unfold. Change the chemical character of the medium they are in ever so slightly, and they, again, unravel. Attach another molecule to their surface, and they change shape. Proteins are stable, but only just. They are delicately balanced, on the threshold of chaos. This allows the protein to both regulate the existing cell, but to also carry out all the chemical changes that are required. This is quite unexpected, as one would imagine that two completely different types of mechanism with radically different makeups would be required for such different roles. In an oven there is a thermostat (regulator) and a heating device (functional unit). In a protein they are one and the same. Jacques Monod, described this dual functionality "the second secret of life."

iv-Self-regulation

Proteins can sense the concentration of molecules one or several steps removed from the reaction catalyzed by the protein itself. It then responds to this information intelligently by increasing or decreasing its own activity. Thereby it controls the flow of metabolites along a metabolic pathway. This requires a vast integrated network of all the proteins in the system..

This means that proteins are actually regulating themselves in order to maintain the organ as a whole at a peak of efficiency. Although this self-regulation is quite remarkable, it is actually difficult to imagine things any other way. For if the protein had to be regulated by something outside of itself, we would have to envisage a vast, almost infinite regress of molecular control devices external to and separate from the individual enzymes which actually carry out the work in the cell.

v-The Fitness of Proteins for DNA Recognition

The information necessary to specify a protein is encoded in the DNA. Proteins are then able to decode this information. The two are able to work in tandem because:

a-DNA and proteins are both linear polymers made up of a limited number of sub-units which means that the sequence of the one can be readily translated into the sequence of the other.

b-The helix of the protein, one of the most common conformations, fits almost perfectly into the major groove of the DNA helix.

c-The four bases for the construction of the DNA double helix seems to be the ideal number for two different coding systems-the genetic code specifying the 20 amino acids in proteins as well as the DNA protein recognition system whereby proteins are able to recognize unique DNA sequences long enough to function as target sequences for the genome.

vi-Conclusions

Nanotechnology is the area of science dedicated to trying to create machines that will manipulate atoms. The huge difficulties in duplicating tasks carried out with effortless efficiency by biological proteins highlights what a remarkable job the proteins actually do.

George M Whitesides, an expert in Nanotechnology, recently stated that the nanoists' dream of self-replications "at the moment ... pretty much science fiction." How would the assemblers obtain information about which atom is where in order to manipulate it? How would the assemblers know where they are in order to navigate from the atom supply point to the correct position in which to place the atom? How, in short, to duplicate proteins?

Proteins are fit because of their functional and structural diversity, because of their ability to assemble themselves, because they regulate themselves and because they are integrated with all other proteins to create a cybernetic network of unparalleled elegance and efficiency.

In the entire realm of science, no class of molecule is currently known which can remotely compete with proteins. They are not only unique, but give the impression of being ideally adapted for their role.

APPENDIX I: IRON

i-Purpose

ii-Oxygen Transport

iii-Summary of Factors Involved in Oxygen Transport

APPENDIX I: IRON

i-Purpose

a- Iron is essential for binding to oxygen and ensuring its delivery to different parts of the metabolism. Without this no large organism could survive.
b- It is iron in the center of a star which triggers a supernova explosion and the subsequent scattering of the vital atoms throughout the cosmos.
c- Iron creates the right amount of gravity which allowed the earth to have chemical differentiation to begin with.
d- Molten iron in the center of the earth generates the earth's magnetic fields which create the Van Allen radiation belts which shield the earth's surface from destructive high energy radiation.
e- Iron and copper are the only metals which possess precisely the properties needed to create an electronic circuit. The cells too need these circuits: this allows them to utilize the energy released to perform useful chemical work.

There are many other kinds of metals as well. In fact more than half of the most abundant atoms in the cosmos are metals. Many of these also serve unique, irreplaceable and possibly perfect roles in sustaining life. Magnesium, for example, is essential for the absorption of light in chlorophyll. Molybdenum is an essential component of two crucial enzymes, etc.

ii-Oxygen Transport

It is the hemoglobin, which transports oxygen in the blood in higher vertebrates. Hemoglobin is made up of a protein (globin), heme (hence the name hemoglobin) and iron. Research into invertebrates and attempts to devise other oxygen carriers have shown that hemoglobin is the best possible solution for this task of carrying oxygen.

The oxygen capacity of mammalian blood is about 50 times the amount that can be dissolved in an ordinary solution. In order to do this iron must both easily associate with the oxygen to ensure its transportation to the tissues and just as easily dissociate from the oxygen when it reaches the tissues. This is highly unusual. Normally an atom either binds strongly or weakly with another atom - iron seems to be able to do both. This is all the more remarkable because it must take up the oxygen where the partial pressure is high and give it up again to the tissues where the pressure is low. Moreover, these same oxygen-manipulating properties are used by various enzymes to protect the cell from the destructive effects of oxygen.

iii-Summary of Factors Involved in Oxygen Transport

Some of the factors involved already mentioned in this and previous sections are:

a- Oxygen is soluble in water;
b- Low viscosity of water allows for the design of the circulatory system;
c- The viscosity of a non-Newtonian fluid-decreases as the pressure increases. This allows increased blood supply, when the body is doing more work.
d- Carbon Dioxide is a gas.
e- Iron readily associates and dissociates with oxygen.

APPENDIX J: THE CELL

i-The Complexity of the Cell

ii-Lipids

iii-Cell Adhesion and Movement

iv-Crawling

v-Osmosis

vi-The Intelligence of Cells

vii-Cells Combine All the Fitness Criteria of Life

APPENDIX J: THE CELL

i-The Complexity of the Cell

Cells are unique objects with extraordinary capabilities. They have constructed every multicellular organism that ever existed on earth. It is cells that assemble the human brain, putting down a million connections a minute during gestation.

Cells exhibit vast diversity of form as well as of functional and behavioral tasks. They are miracles of Nanotechnology. Some can move by the rowing action of cilia or by the propeller-like action of bacterial flagellum. Others can creep and crawl. They can estimate the concentration of compounds in their immediate environment. They can change their form and chemical composition. They can grasp small objects in their immediate vicinity. They possess internal clocks to measure time. They can sense electrical and magnetic fields. They can synchronize their activities and can combine together. Cells can communicate via chemical and electrical signals. They can replicate themselves with what seems to be surpassing ease.

Cells are immensely complex. The average cells uses close to a million unique adaptive structures and processes -more than the number in a jumbo jet, packed into a speck of dust invisible to the human eye. It is hardly conceivable that anything more complex could be compacted into such a small volume.

If we were to design from first principles a tiny nanoerecter about 30 microns in diameter with the ability to do what the cell does we cannot imagine doing anything other than redesigning the cell.

ii-Lipids

Lipids are hydrocarbons which include fats and have many functions:

a- They are a major source of cellular energy.
b- They act as electrical insulators.
c- They act as detergents.
d- They form the waxes which coat the feathers of birds.
e- Lipids are lighter than water. This allows aquatic life to have buoyancy, providing them with heat insulation at the same time.

Many types of lipids are insoluble in water. Without this (and some other, similar carbons) the cells would not be able to make different compartments for different functions. No stable structures would be possible because all the components of the cell would ultimately dissolve in water. It creates some compartments which are completely free of water, allowing certain vital synthetic and enzyme processes to occur which could not in a water medium.

Lipids are usually 16 -18 carbon atoms long. This chain length is just right. Over 18 would make them too insoluble to be of biological utility - they could not be mobilized in water. Shorter than 16 would make them too soluble.

In addition, chains of this length make lipids liquid at normal temperatures. Had they been solid they would not have had the required plasticity. Moreover, because they are more viscous than water they act as a buffer against shearing forces.

Lipids make up the cell membrane. The membrane prevents the contents of the cell from diffusing away into the surrounding fluid. Since the cell is always changing its shape,

the lipid must be highly plastic without being porous to the many different types of substances in the cell. To maintain this in the turbulent environment of the cytoplasm, it is highly fluid and has the level of viscosity of that of olive oil.

The way lipids achieve this membrane is truly remarkable. They form a charged phosphate, water-loving group on one end and a fatty, water-hating group on the other end. Because water itself is a strongly polar molecule, the water-loving part of the lipid automatically faces toward the outside of the cell (where the water is), while the fatty part faces the inside of the cell. The beauty of it is that everything arranges itself.

The lipid membrane is also impermeable to electrically charged particles. This then allows an electric potential between the inside and the outside of the cell to be generated, creating a membrane potential. It is this membrane potential which transmits nerve impulses. This is also a natural outcome of the fatty/phosphate orientation of the cell.

iii-Cell Adhesion and Movement

The ability of cells to selectively join to each other is one of their most important characteristics. Almost all living beings are comprised of multiple cells combining together.

The surface of the cell has microprotrusions often only one micron in length across the tip. The cell uses these to identify other cells around it. The cell then uses molecule, which recognize what to bind to by a lock-and-key matching recognition.

It is necessary that cells make contact with each other through such small microprotrusions (filopods) because the outer surface of cells are negatively charged, thus repulsing each other. However, these repulsive forces are too small to be effective in a contact area as small as the tip of these protrusions. The ability put out these protrusions lies in the fact that the cell can so easily change its shape and is of low viscosity.

When the two cells bond, the two protrusions come within a nano-meter (one-millionth of a millimeter) of alignment!

This very same mechanism whereby cells join is also one of the mechanisms for cell movement. One of the remarkable things about a developing embryo is that the cells, which get produced, find their way to the exact part of the body where they need to be. They move by adhering to a series of target cells or structures that lead them through the embryo to their assigned place. On the way they need to ignore and bypass many other cells. The cells do this by putting out these protrusions in many directions thereby identifying the right path. When they do adhere to a target structure the strength of the weak chemical bond has to be just right to allow the bonding but still allow them to detach again so that the cell can move on.

iv-Crawling

In order for the cell to reach its target, it crawls by putting out extensions (lamellae) which make temporary attachments with the underlying surface, and, as they glide forward, pull the cell along with them.

It is clear that the ability to crawl must satisfy exacting criteria. The cytoplasm must be of the appropriate viscosity to allow for the continuous restructuring of the cells shape and form to allow parts of the cell to be drawn toward the advancing protrusion. Yet the cell must also contain stable structural elements making a mechanically rigid scaffold so that traction forces can be exerted between the adhesion points on the under surface of the lamellae and the mechanically rigid scaffold. This depends critically on the strength of the weak force. Once the cell has adhered to the substratum, it must be able to loosen again, requiring that

those same traction bonds be strong enough to pull apart the affinity bonds as it moves away from an area. This is

Recent studies have shown that if there was the slightest difference in the viscosity of water, or the energy of the weak force or the traction force, or if diffusion rates had limited the size of the cell to ten to a hundred times smaller than they are, then crawling would probably be impossible.

It is a coincidence of truly amazing proportions that just those constituents key to life-DNA, proteins, sugars, lipids, etc. dissolved in water -should comprise just the right quality of cytoplasm which also permits crawling.

v-Osmosis

Cells tend to contain a greater concentration of dissolved particles than does the fluid around the cell. Left to its natural devices, this would cause continuous osmosis of water into the cell, which would swell and eventually rupture the cell wall. Animal cells fight this by pumping ions out of the cell, which makes the fluid around the cell have more ions than inside the cell, encouraging water to osmose in the opposite direction. This allows animal cells to avoid having the rigid walls of plant cells, which in turn allows for many of the properties of the cell such as those involved in crawling above.

Is just so happens that the cell is just big enough to be able to afford about a third of its energy to this massive, ongoing pumping effort. This is also possible because the pressures generated by osmosis are not greater than they are.

vi-The Intelligence of Cells

Amoebas are living being comprised of only a single cell. Frequently they fall prey to each other. In doing so, both the attacking and the attacked cell exhibit a range of different attack/escape strategies. One cell may succeed in escaping from another cell several times, each time in a different way (including feigning lifelessness), until the other cell either seems to give up and swim in the opposite direction or finally succeeds and devours it.

All of this requires a high level of information processing and seems similar to the type of behavior we see in animals which have brains and central nervous systems. The brain is capable of processing 40 billion neurons each changing their state 100 times per second. Some suggest that each cell may also have a computing system. It would mean that within each neuron of the cell there would be the equivalent of a microcomputer with computing power equivalent to a desktop computer.

vii-Cells Combine All the Fitness Criteria of Life

All the key organic building blocks-sugars, amino acids, nucleotides, etc.-can be manufactured in a relatively small number of chemical steps from a small number of readily available simple molecules. It is a remarkable fact that the great majority of the atoms used in their synthesis are derived from only three very simple molecules that are available freely in great abundance on the face of the earth; water, carbon dioxide, and nitrogen. Not only are the key components of life wonderfully fit for their key biological roles, they are all a very small chemical distance away from such universally starting materials. Indeed there are not many steps from hydrogen itself-the starting point of atom creation in the stars-to the ingredients to life.

Contrast this to artificial system, such as motor cars, computers, etc. where each individual component has to be separately manufactured often involving complex industrial processes at high temperatures and all manner of diverse chemical processes.

That the whole - the living cell should also be ideally suited for the task of constructing the world of multicellular life reinforces the conclusion of purposeful design. The prefabrication of parts to a unique end is the hallmark of design. Moreover, since the vital mutual adaptations were given by physics long before any living thing existed, these could not have been products of natural selection, which came long after.

APPENDIX K: THE GALAXIES AND THE LAWS OF PHYSICS

i-The Expansion of the Universe Just Right

ii-Supernova perfectly spaced

iii-The Energy Level of Certain Atoms

iv-Gravity Just the Right Strength

v-The Strong Force Just the Right Strength

vi-A Perfect Ratio of Matter to Energy

vii-Uniformity of the Universe

viii-Summary

APPENDIX K: THE GALAXIES AND THE LAWS OF PHYSICS

i-The Expansion of the Universe Just Right

In *Superforce*, Paul Davies writes about what he calls "the genesis paradox":

"Careful measurement puts the rate of expansion very close to a critical value at which the universe will just escape its own gravity and expand forever. A little slower and the cosmos would collapse, a little faster and the cosmic material would have long ago completely dispersed. It is interesting to ask precisely how delicately the rate of expansion has been 'fine-tuned' to fall on this narrow dividing line between two catastrophes. If at time I s (by which time the rate of expansion was already firmly established) the expansion rate had differed from its actual value by more than 10-18, it would have been sufficient to throw the delicate balance out. ... The big bang was ... an explosion of exquisitely arranged magnitude. ..."(p.184)

Why do we need such a big universe?

If the purpose of the universe is man, then why is man such a speck in such a vast cosmos? There are a number of issues here:

i-The First Man was of immensely different proportions, in a ration to the total cosmos that would be readily understandable.

ii-The דרך השם and others explain how the cosmos is essential for transmitting the השפעות which G-d wishes to bestow on the world. An example of this, which Denton brings, is inertia:

ii-Supernova[1] perfectly spaced

a- All the elements necessary for life such as carbon and oxygen etc. are made in the middle of stars, which act as giant nuclear furnaces. When a star is dying, there is often a supernova explosion. This leads to the spreading of these materials around the universe.

b- Supernova also initiate the condensation of interstellar gas and dust into planetary systems such as our own solar system.

But supernova are also immensely destructive, obliterating any possibility for life on any nearby solar systems. Therefore, in order for this to be beneficial to us on earth supernova have to be exactly distanced away from the earth. Had a single supernova been closer to earth, it might have bathed the earth in lethal radiation, obliterating life and it would probably have destabilized planetary orbit. If it had been very close, the earth might have been engulfed in a fireball. If supernova had been further away then the debris thrown out by the supernova would have been too diffuse to be of help to planet earth. It just so happens that the distance between stars in our galaxy is about 30 million miles, just the right distance.

[1]Supernova are explosions of giant stars that reached the end of existence.

iii-The Energy Level of Certain Atoms

The main elements essential for life, such as Carbon and Oxygen, have the perfect energy levels to be produced in just the right amounts. Any slight change in these amounts would have meant that any form of higher life imaginable would have been inconceivable. This fact caused Fred Hoyle to call the world "a put-up job". He shows that all the laws of physics, chemistry and biology combine in a very precise way to produce this carbon-oxygen synthesis, as he calls it. (*Nature's Destiny* pp. 11-12)

iv-Gravity Just the Right Strength

Had gravity been any stronger then it would have pulled the mass of stars much closer together, making them much smaller. This would have made their reactions much more intense shortening their life spans to too short a time to allow for life to develop.

On the other hand, had gravity been any weaker then no galaxies would have formed at all.

The growth of the universe has in fact been perfectly balanced between the border of collapse and too rapid expansion.

v-The Strong Force Just the Right Strength

If the strong force had been only slightly weaker, then the only stable element would have been hydrogen. If it had been any stronger, then hydrogen could not have existed at all (unless electromagnetism also changed which would have effected other things).

vi-A Perfect Ratio of Matter to Energy

Researchers have calculated that unless the ratio of matter and energy to the volume of the universe (a value researchers call omega) was within one-quadrillionth of 1 percent of the ideal, runaway relativity would have rendered the cosmos uninhabitable: either too scrunched and distorted for life, or too diffuse for stars to form. (*U.S. News & World Report*, July 20, 1998)

vii-Uniformity of the Universe

Paul Davies, *Superforce*:

"The rate of expansion is only one of several cosmic "miracles". Another concerns the pattern of expansion. As we observe it today, the universe is extraordinarily uniform on the large scale. ... The galaxies are scattered throughout space with a constant average density. ... The primeval heat radiation, which bathes the universe, arrives at Earth with a uniform temperature in every direction accurate to one part in ten thousand. This radiation has traveled to us across thousands of millions of light years of space, and would carry the imprint of any departures from uniformity encountered along the way. ... So not only did the universe commence with a bang of a quite precise magnitude, it was a highly orchestrated explosion as well, a simultaneous outburst of exactly uniform vigor everywhere and in every direction. ....

"At I s after the initial explosion, light can have traveled at most one light-second which is 300 000 km. Regions of the universe separated by greater than this distance could

not, at I s have exercised any influence on each other, But at that time, the universe we observe today occupied a region of space at lest 1014 km across, It must have been made up of some 1027 causally separate regions, all of them nevertheless expanding at exactly the same rate....

"The large-scale uniformity of the universe is all the more mysterious on account of the fact that, on a somewhat smaller scale, the universe is not uniform. The existence of galaxies and galactic clusters indicates a departure from exact uniformity, a departure which is, moreover, of the same magnitude and scale everywhere. Because gravity tends to amplify any initial clumping of material, the degree of non uniformity required to produce galaxies was far less than it is today. In spite of this, some small degree of irregularity must have been present in the primeval phase or galaxies would never have started to form." (pg. 183-186)

Davies then shows how these questions can be answered by proposing the inflationary theory of the big bang. (pg. 190-198). According to this model, some fifth force acted to counter gravity and propel the universe rapidly apart for a period of time. However, this theory only replaces old questions with new ones. Why is there a fifth force (originally invented by Einstein as a fudge factor to fit his theory of relativity into the static universe model) and how did this false vacuum state develop to begin with. More fundamentally, where did the first matter come from?

For those quite desperate to avoid mentioning G-d at any cost, they claim that matter simply appeared out of nowhere. The proof for this, they say, is that if you make an electric field strong enough, electrons appear out of nowhere. (Davies 198-205) But this is clearly nonsense. Every physicist knows that ultimately a field and matter is the same thing, and that a field can translate itself into matter (although we do not understand the exact mechanism). The question of saying where did the first matter come from is no different to saying where did the first field come from.

Besides there are yet all the other things we mentioned above that are fine-tuned to an exactitude which cannot be accounted for by any one model. For example, "had gravity been only slightly stronger, stars would burn through their nuclear fuel in less than a year, life would never evolve, much less settle in. Had the strong force that holds the nucleus together been only slightly weaker, stars could never have formed. So far no theory is even close to explaining why physical laws exist, much less why they take the form they do. Standard big-bang theory essentially explains the propitious universe this way: "Well, we got lucky."" (*U.S. News & World Report*, July 20, 1998)

Of course, it is never possible to prove that G-d created the world beyond any doubt. It is always possible to come up with some theory, however weird, which seemingly accounts for the phenomena being presented. The issue is not whether it is possible to explain the phenomena in a way, which excludes G-d; rather the issue is what, on balance, is the most probable explanation of the competing explanation. In the above article the following scenario was presented:

"There is, however, a way in which purely chance-based physical processes might have resulted in the present user-friendly firmament-if universes are created all the time, greatly improving the statistical outlook of a firmament such as our being born. This is the idea of the "multiverse" and it is rapidly gaining backing within the scientific community."

"The multiverse notion rises like this: Suppose it's true that, say, black holes are what came before the big bang. Since our universe has black holes, couldn't some of them be spawning new firmaments in other dimensions? The result might be an overarching cosmic structure far larger than anything we can see - a multiverse."

Deep in the past "... chance reigned, and many heavens were born with physical laws adverse to life: they collapsed back on themselves or diffused into vapor and were never heard from again. But those universes that were born with physical laws familiar to us were

also the ones able to make black holes: that allowed them to trigger "daughter" universes. Over time, a fantastically large and complex multiverse resulted, with most parts of the cosmos having physical laws that allow life-natural selection functioning on a cosmic scale."

"... so far there is no evidence other universes or dimensions exist."

The articles provides several alternative explanations, all of them equally speculative. (See **Science Appendix A v What Happened Before the Big Bang?** for a further discussion on this issue)

But in the end, the issue is not whether we can come up with a scientific explanation for what took place. The fact that all these factors are so precise and perfect for the world we need, support the fact that this was a planned and guided event; the fact that this plan followed principles, intelligible to us up to a point, is only to be expected from what we know of how the Almighty made His world.

If inertia has been less, then the wind could well have set a boulder in motion. In such a world we would be subjected to continual bombardment by all types of objects in our environment. However, had inertia been much greater, then unless the strength of muscles was much greater, we would have profound difficulty even in starting to move our finger. It is clear that inertia must be very close to what it is for an animal of our size to function in an environment similar to the earth's. because most of the matter is far from the earth, this means that the greatest contribution to the inertia of objects on earth is made by the most distant galaxies. if so, our existence is critically dependent not only on the mass of the earth, but on the mass of the universe being very close to what it is.

Dr. David D. Deutsch, Institute of Mathematics, Oxford University: "If we nudge one of these constants just a few percent in one direction, stars burn out within a million years of their formation, and there is no time for evolution. If we nudge it a few percent in the other direction, then no elements heavier than helium form. No carbon, no life. Not even any chemistry. No complexity at all."

viii-Summary

Sir Fred Hoyle: "A common sense interpretation of the facts suggests that a superintendent has monkeyed with the physics, as well as chemistry and biology, and that there are no blind forces worth speaking about in nature. I do not believe that any physicist who examined the evidence could fail to draw the inference that the laws of nuclear physics have been deliberately designed with regard to the consequences they produce within stars." (In BBC's *"The Anthropic Principle"*)

When we put all these things together "adjusted to what is near infinite precision in a long train and series of things [they comprise] the teleological conclusion [which is] so compelling."

Paul Davies: More intriguing still, certain crucial structures, such as solar-type stars, depend on wildly improbable numerical accidents that combine together fundamental constants from distinct branches of physics. And when one goes on to study cosmology - the overall structure and evolution of the universe - incredulity mounts. Recent discoveries about the primeval cosmos oblige us to accept that the expanding universe has been set up in its motion with a cooperation of astonishing precision.

APPENDIX L: MAN'S UNIQUENESS

i-Introduction

ii-Intelligence

iii-Language

iv-Vision

v-Unique hands

vi-The Ability to Control Fire

vii-Man Built to Understand the World

viii-Conclusions: Alternative Possibilities

APPENDIX L: MAN'S UNIQUENESS

i-Introduction

The inevitable conclusions of evolution is to equate man with the apes[1]. Man is simply a higher evolutionary form of these primates, and not as well adapted to his world as bacteria. However, this view is challenged by the following:

i-Only man is capable of any genuine understanding of the world.

ii-Man has an astounding success in comprehending and manipulating nature - we have measured the diameter of galaxies, we have probed into the heart of the atom, we have peered back into the very beginning of time, we have traveled to the moon.

iii-Non-carbon alternatives: Even the theoretical possibility of an alternative species that could have been equally as successful seems increasingly implausible. As we have shown, there are few if any alternative ways of putting together the atoms of the world into a complex self-replicating system as sophisticated as the

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[1]Based on Seth Mydans in The New York Times, August 12, 2001, ***He's Not Hairy, He's My Brother***:

Some evolutionists feel that humans are just another breed of ape. They link the five "great apes"—including man—onto one biologically similar group. These in turn are separated by a huge biological gap from lower beings.

Humans and chimpanzees, they note, are 99 percent identical genetically, have similar blood groups and similar brain structures and show near identical behavior in their first three years of life. All five hominids are unique in sharing human-like characteristics that scientists group under the labels self-awareness, theory of mind and incipient moral awareness.

"Like humans, they laugh, make up after a quarrel, support each other in times of trouble, medicate themselves with chemical and physical remedies, stop each other from eating poisonous foods, collaborate in the hunt, help each other over physical obstacles, raid neighboring groups, lose their tempers, get excited by dramatic weather, invent ways to show off, have family traditions and group traditions, make tools, devise plans, deceive, play tricks, grieve, are cruel and are kind."

The logical outcome, the advocates say, is human rights for apes.

Rights for apes, the advocates argue, is simply the next step in the development of a moral society where no group is denied its fair place—whether it has a different skin color or ethnic background, whether it is disabled or mentally impaired, or whether it is covered in hair.

"Think of it as a continuum," said David Penny, a theoretical biologist at Massey University in Zealand. "As recently as 100 or 150 years ago, it wasn't accepted that all humans should be treated as equal. Torture was normal 300 or 400 years ago, even in Europe. Slavery was normal in many parts of the world. Ignoring children's education was standard in many places. Capital punishment is slowly disappearing."

The first rights the advocates are seeking for apes are: not to be deprived of life, mot to be subjected to torture or cruel or degrading treatment and not to be subjected to medical or scientific experimentation.

In addition, there is a movement under way to recognize the other four great apes as "persons" under the law, rather than property. As with young or intellectually impaired humans, that lobby says, apes should be provided with guardians to safeguard their rights and, should the need arise, plead their cases in court.

New Zealand became the first nation to adopt a law guaranteeing rights to great apes. They are now protected from scientific research or experimentation that is not explicitly in their own interests.

For most, the parallel to racism does not work.

Yes, apes are like us, they say, but that doesn't make them human.

living cell. If we start from the carbon atom, our route is highly constrained. Having chosen carbon, we must next choose water, then proteins, DNA, oxygen and so on, until we arrive at the design of the living cell as manifesting all things on earth.

iv-Carbon alternatives: Not only that, but even within the multiple possibilities of carbon-based life itself, man appears to be the best design imaginable.

Among man's unique qualities are his:
Intelligence
Language
Vision
Unique hands
The ability to control fire
Upright stance
Highly social
Changing Skin Color[1]

Some of these (like visual ability) are shared by other living beings. No other being on this planet has anything near the combination of these qualities, however.

We will consider the first five of these below.

ii-Intelligence

Other species-dolphins, parrots, seals and apes-possess intelligence, but none, as far as we can tell, comes close to the intelligence of man, At present the basis of our unique cognitive capacity is not fully understood. Brain size, the total number of neurons, the thickness and convolution of the cerebral cortex, the complexity of individual neurons, the density of synaptic connections, and the development of parts of the cerebral cortex all may play a role. In combination, man's brain far surpasses any other creature. Each cubic millimeter of the human cortex contains, in addition to 100000 cells, some four kilometers of axonal wiring, 500 meters of dendrites, and close to 1 billion dendrites.

No radical improvement of synaptic density may be possible because of the need to maintain the fine balance between the size and number of neurons and the blood vessels, which nourish them. To produce a significant rise in processing power, the axons would have to be wider than they are now to speed up the rate at which they pass signals. This would require greater insulation and a better blood supply, which would take up greater room, leaving less room for axons. Increasing the total size of the brain would probably require increasing his total dimensions as well, and this we have shown below, is not feasible.

The emerging consensus is that artificial intelligence will never compete with the human brain. It is unlikely to attain self-conscious reflection and genuine cognition; nor could it duplicate the ever-changing neuron network, forever learning, reacting and integrating a vast number of electronic and chemical signals.

iii-Language

No other species possesses a communication system remotely as competent for the transmission of new information or abstract concepts as human language. Together with the ability to form abstract sentences comes the ability for our senses to accurately translate our experiences. In addition, we have the appropriate organs to generate complex sound patterns, far richer than our closest rival, the chimpanzee, which could not

[1] Among primates, only humans have a mostly naked skin that comes in different colors. The distribution of skin color is not random: darker peoples tend to be found nearer the equator, lighter ones closer to the poles. These different colors help to regulate components of sunlight, blocking out harmful radiation and allowing in key nutrients. For example, the range of color is light enough to make vitamin D yet dark enough to protect folate stores. (Scientific American, October, 2002.)

reproduce many of the vowels and consonants which humans do.

iv-Vision

See above, **Appendix C Light**, where we show how uniquely adapted the eye is to seeing.

Man's size is well suited for the size eye necessary to see properly. Neither an ant nor a mouse could support an organ the size of the human eye. Neither can see as clearly as a man and neither could be creatures of genuine understanding. To see clearly, man must be a relatively large organism.

v-Unique hands

No other animal possesses an organ so superbly adapted for intelligent exploration and manipulation of its physical surroundings and environment. The closest to a human hand is that of chimps and gorillas. Yet even a chimp with the intelligence of a human would have considerable difference carrying out many of the manipulative tasks we take for granted, like peeling an apple, tying a knot or using a computer. Even in the field of robotics, nothing has been built which even remotely equals the all-round manipulative capacity of the hand. In addition, only man walks upright, allowing him maximum usage of his hands.

vi-The Ability to Control Fire

This led to metallurgy and from there to scientific and technological knowledge. Because metals are the only natural conductors of electricity, the discovery of electricity, even the development of computers, are all in the last analysis the result of our ancient conquest of fire.

In order for fire to be mastered, numerous elements relating to the human condition has to be quite precise. As we will show, man had to be specific size, endowed with precise vision, significant muscle power, highly developed nerve conduction and the correct size of body organs.

Fire - a remarkable phenomenon:

That fire is itself a remarkable phenomenon has already been noted. That the chemical reaction between carbon and oxygen is manageable at all is the result of their relative inertness at normal temperatures. This allows it to be a source of great energy to for living beings. And this fact, also means that wood is slow to burn, allowing it to be handled by a large organism like man.

Man - just the right size for fire:

Because the smallest sustainable fire is about 50 centimeters across, only an organism of approximately our dimensions and design - about 1.5 to 2 meters in height with mobile arms about 1 meter long ending in manipulative tools - can handle fire. An organism the size of an ant would be far too small because the heat would kill it long before it was close as several body lengths to the flames. Even an organism the size of a small dog would have considerable difficulties in manipulating a fire. Such a being would be restricted to making fires from small twigs, and it is doubtful whether this could have generated the type of heat, which would have led to metallurgy. (The melting point of gold is 1064C, of silver 960C, of copper 1083C and of iron 1525C.) So we must be at least the size we are to use fire, to utilize metal tools, to have a sophisticated technology and to explore the world. In addition, we need to be this size to support the brains we have.

Nor would an upright being twice our size do the job. Such a size would put severe strain on our lower back, would require thicker legs and be less nimble.

Fire requires man's vision and muscled power:

In addition, to use fire we need a highly developed sense of vision and to have our hands to be able to physically manipulate the fire. We also need the muscle power that we have to lift our body of the ground and generate reasonable movement as well as to drive the circulatory and respiratory systems. And since the packing of the myosin motors in muscle tissue is virtually crystalline and just about as tight as possible, then muscles cannot be designed, on biological principles, to generate any greater degree of power. Nor would it be possible to have weaker muscles since the human body is 40 to 50% muscle as it is, and the grip muscles of the human are concentrated in the forearm.

Now an organism of our size that is upright is only feasible on a planet approximately the size and the mass of the earth, which determines its gravitational fi. For example, if the earth had been double the size, then its gravitational field would have been so strong that man would not have been able to walk upright. It is quite remarkable that a host of other elements are also only in perfect balance with the earth this size (see **Appendix D iii** for discussion) More than that, the energy used by the power stroke of each myson motor of the muscles must be what it is. We have shown that it is virtually impossible to envisage any sort of radical redesign of either the circulatory or respiratory systems in complex organisms that would double or treble the delivery of oxygen to muscle tissues. As it is, during strenuous activity much of the volume of active muscle is made up of blood capillaries. If the power stroke of muscles were only half as efficient, then motile complex forms of life would in all probability be impossible.

Nerve Conduction:

Muscles, no matter how powerful would be of no use unless their movements could be carefully controlled. In humans, this is carried out by the nervous system.

Among organisms, nerve conduction speeds vary from 1 centimeters per second in simple invertebrates to 120 meters per second in mammals. It seems that this is close to the maximum possible compatible with the electrical properties and general design of cells. This includes the speed of diffusion of sodium and potassium ions across the membrane as well as the membrane potential itself.

If nerve conduction were a hundred times slower than it is, life as we experience it would be unimaginable and even the simplest of tasks would be of enormous danger.

Size of body Organs:

In man the proportion of the body devoted to the respiratory and circulatory systems is about 20-25% of the body's volume. Their function is about as efficient as possible, given the constraints imposed by the solubility of oxygen, the viscosity of water, airway resistance, and so forth. It is hard to envision an organism where these systems would occupy a greater proportion of the body to increase their efficacy without undermining other bodily systems. The fact that they do not need to be so is largely determined by the laws of nature, by the rate of diffusion of oxygen, by the strength of weak bonds and by the viscosity of water. If these constants were very slightly different, large complex organisms similar to ourselves would be impossible.

vii-Man Built to Understand the World

The logic of our minds and the logic of the cosmos would appear to correspond in a profound way. And it is only because of this unique correspondence that it is possible for us to comprehend the world. If the laws of nature could not be formulated in simple mathematical terms, science might never have advanced at all. But this also requires

that human minds be similarly tuned for mathematical abstraction.

viii-Conclusions: Alternative Possibilities

Man's brain, as the most advanced, biological brain that we know, is sufficiently intelligent to understand the world. It is not so large that it requires an elephant to house it; rather it can be housed by an organism of the design and dimensions of Homo Sapiens; whose design is also just right for the manipulation of fire; whose muscle power, speed of nerve conduction, diameter of nerve fibers all are seemingly perfectly coordinated for the task at hand. This being lives on an earth whose size is just right for an atmosphere which can both support this life and support the fire that was so important for man's progress.

One of the greatest biologists of this century, Sir Julian Huxley wrote: "Writers have indulged their speculative fancy by imagining other organisms endowed with speech and conceptual thought-talking rats, rational ants, philosophic dogs and the like. But closer analysis shows that these fantasies are impossible, A brain capable of conceptual thought [and this is the essential character of man] is impossible. "

If we want to build out of the matter of the cosmos a creature of understanding-high intelligence, the capacity to manipulate and investigate the environment with a highly developed visual capacity, the capacity for language and abstract thought, to make fire, to use metals, to do science and to have power over the natural world- we will be led via along chain to an air-breathing vertebrate of about our size and dimensions, and eventually to a gregarious mammal with a highly developed visual sense and endowed with a hand-in other words, toward Home Sapiens. Moreover we will come up with a planet like earth with its very specific atmosphere to house it.

There has and continues to be a search for extraterrestrial life

Life Beyond Earth

Recently the discovery of about a dozen planets orbiting distant stars has rekindled optimism for the existence of life beyond earth. Yet none seem to resemble earth in size or any other conditions basic for life. Yet scientists have used this information to *imagine* that there must be a whole lot of other planets more similar to earth as yet undiscovered. In addition scientists have been buoyed by the fact that life is more robust than once believed. Microscopic organisms have been found to thrive in extreme conditions, from the ice of the Arctic to boiling vents at the bottom of the ocean to solid rock deep in the bowels of the earth. This makes the possibility of life on surfaces such as mars more credible. Yet it also ignores the fact that only the simplest, most primitive life forms can exist under such conditions. Yet scientists continue their search as if they expect to find advanced life-forms, similar to humans, searching the skies for electronic signals from outer space. In addition, a careful analysis shows that most stars and their planets exist under conditions beyond even these parameters. A lot of stars burn too brightly. Some have a lifetime too short for life to evolve. And double star systems - 60 percent of all stars - are less likely to have stable planets. Planets can be battered so often by asteroids that life has no chance to evolve or to sustain itself, whereas Earth has been mostly protected by Jupiter and Saturn, giants that swept up most of the threatening asteroids around. In addition we have shown how exact conditions of life are dependent on very exact conditions, highly unlikely to be duplicated elsewhere. If life exists on other planets, it would have to be completely different to the type of carbon/water based life we know here. But that is open sesame

to imagine what we want. We have no indication that any other type of base is feasible for life. (Culled from CNN Oct. 15, 1998)

But even if there is primitive life on mars or elsewhere, it still seems unlikely that there would be advanced life forms. Of course, beyond our solar system, there still lie vast unexplored areas. Since most of these are too far away to ever be physically explored by humans, the most plausible way of us finding advanced life "out there" are through them contacting us and vice-versa through radio or other signals. To date efforts to detect such signals have been fruitless.

Although there have been suggestions that water could be replaced by liquid ammonia (*Life Beyond Earth* by Gerald Feinberg and Robert Shapiro) and that life could be gaseous (Fred Hoyle in *The Black Cloud*), none have been worked out in detail and are therefore impossible to evaluate.

APPENDIX M: CONCLUSIONS

i- Summary of the Above

ii- The Argument from Design

a-The conditions preceded life

b-They are cumulative

c-The argument is the best explanation we have

d-The cosmos is uniquely suited for life

e-The argument is highly falsifiable

f- Scientists who support these views

APPENDIX M: CONCLUSIONS

i-Summary of the Above

That the whole living cell should also be ideally suited for the task of constructing the world of multicellular life reinforces the conclusion of purposeful design. The prefabrication of parts to a unique end is the hallmark of design. Moreover, since the vital mutual adaptations were given by physics long before any living thing existed, these could not have been products of natural selection, which came long after.

Even the theoretical possibility of an alternative species that could have been equally as successful seems increasingly implausible. As we have shown, there are few if any alternative ways of putting together the atoms of the world into a complex self-replicating system as sophisticated as the living cell. If we start from the carbon atom, our route is highly constrained. Having chosen carbon, we must next choose water, then proteins, DNA, oxygen and so on, until we arrive at the design of the living cell as manifest in all things on earth.

Not only that, but even within the multiple possibilities of carbon-based life itself, man appears to be the best design imaginable.

The fact that the earth is not the spatial center of the universe no longer has any meaning today, because the cosmos itself is no longer thought to have a spatial center.

Life on earth depends on a very large number of astonishingly precise mutual adaptations in the physical and chemical properties of many of the key constituents of the cell. Among others we discussed above are:
The fitness of water for carbon-based life;
The mutual fitness of sunlight and life;
The fitness of carbon dioxide for the excretion of the products of carbon oxidation;
The fitness of bicarbonate as a buffer of biological systems;
The slow hydration of carbon dioxide;
The lipid bilayer as the boundary of the cell;
DNA and the proteins;
The perfect topological fit of the alpha helix of the protein with the large group of the DNA.

In nearly every case these constituents are the only available candidates for their biological roles and appears superbly tailored for that particular end.

Many of the properties of life appear to be specifically arranged for large, complex, multicellular organisms such as ourselves. These include:

The packaging properties of DNA which enable a vast amount of DNA and hence biological information to be packed into the tiny volume of the cell nucleus in higher organisms;

The electrical properties of the cells, which depend ultimately on the insulating character of the cell membrane, which provide the basis of nerve conduction and the coordination of the activities of multicellular organisms

The very nature of the cell, particularly its feeling and crawling activities, which seem so ideally adapted for assembling a multicellular organism;

The fact that carbon dioxide and oxygen are both gases at ambient temperatures and the peculiar and unique character of the bicarbonate buffer which together facilitate the life of large air-breathing organisms.

There are a large number of other coincidences all beneficial to life in

general or specifically to man. Among them:

The size of the galaxies;

What happens in the center of stars;

The heat capacity of water;

The ability of proteins to manipulate atoms;

Inertia (determined by the most distant stars);

The radioactive heat of the earth's center which drives the great tectonic system thus ensuring a continual replenishing of the vital elements of life;

All of these bound together in one biocentric whole.

What appears initially to be very trivial aspects of chemistry and physics turns out to be critical for life. Examples include:

The decrease in the viscosity of blood when blood pressure rises which increases blood flow to the active muscles;

The anomalous thermal properties of water which buffets the planet and individual organisms against wild fluctuations in temperature;

The low hydration rate of carbon dioxide preventing higher organisms from suffering fatal over-dosed of acid.

ii-The Argument from Design

The argument is based on the following:

a-The conditions preceded life

Since most of these properties preceded life they are therefore not merely outcomes of evolution. Rather they suggest the purpose for which the cosmos were made to begin with.

b-They are cumulative

Many of these properties are impressive alone - but it is their cumulative existence, which gives real force to the argument from design.

As biological evidence continues, we find more and more of these factors.

c-The argument is the best explanation we have

The argument from design makes more sense of all the information we have than any competing scientific theory. It does so in a coherent and unifying way. No other theory makes sense of all the information presented above - from the interior of the stars to the interior of the cell, to the number of elements which exist. It makes sense of the laws of physics, the properties of water, etc. No other worldview comes close. No other explanation makes as much sense of all the facts.

d-The cosmos is uniquely suited for life

Critics argue that the universe is bound to look as if it were designed for our existence because we could only be here if the universe were adapted for our existence, That would be a good argument if the cosmos was adapted to some degree for life. But we have made the stronger claim that the cosmos is optimally adapted for life - that every constituent of the cell and every law of nature is uniquely and ideally fashioned to that end.

e-The argument is highly falsifiable

One of the major criticisms of evolution is that it is basically unfalsifiable. Not so the design hypothesis. All one would have to show is that the laws of nature permit another type of being comparable to our own. Even the discovery of any individual fact such as an alternative liquid as fit as water or a superior means of constructing a genetic tape better than the double helix; or alternatives superior to oxidation or to proteins or to the lipid membrane of the cell, etc. would be sufficient to falsify the design hypothesis.

Alternatively, the creation of a machine with an intellectual capacity

superior to that of man would also demolish the design argument.

The longer the theory resists refutation, the more robust and powerful a theory it must be considered. It is certainly no refutation to simply counter that given an infinite period of time, any result, "by chance" can be generated. For there is no way of refuting such an argument and it is therefore not really a scientific claim at all.

Dr. Paul Davies, noted author and professor of theoretical physics at Newcastle University: "The really amazing thing is not that life on Earth is balanced on a knife-edge, but that the entire universe is balanced on a knife-edge, and would be total chaos if any of the natural 'constants' were off even slightly. You see," Davies adds, "even if you dismiss man as a chance happening, the fact remains that the universe seems unreasonably suited to the existence of life -- almost contrived -- you might say a 'put-up job.'"

f- Scientists who support these views

As we mentioned above, the first premise, that the world is fit for life in general has been made by many scientists:

Contemporary scientists include:

Physicists and cosmologists such as Freeman Dyson, Roger Penrose and Paul Davies (e.g. *Accidental Universe*), Brandon Carter, John Barrow, Sir Fred Hoyle, John Wheeler, Frank Tipler and the biologists Stuart Kaufman (At Home in the Universe); Nobel laureate Christian de Duve (Vital Dust).

Earlier such claims were made by Lawrence Henderson, professor of biological chemistry at Harvard university in the first quarter of the century and author of the classic *The Fitness of the Environment*; D'Arcy Wentworth Thompson, author of another great classic, *On Growth and Form* (1942); George Wald, professor of biology at Harvard in the fifties and the sixties, discoverer of the role of vitamin A in vision, who was one of the leading authorities in photoreception; A. E. Needham, Oxford Zoologist and author of the *Uniqueness of Biological Materials* (1965); and Carl Pantin, professor of zoology at Cambridge during the sixties and author of the widely *acclaimed The Relations Between the Sciences* (1968).

APPENDIX N: TIME

i-Carbon Dating

ii-Other Dating Techniques

iii-Slowing Down

iv-Conflicting Theories

APPENDIX N: TIME

DATING METHODS

1) Annual **growth rings** in trees (3000-4000 years)

2) **Sedimentary beds** - deposits in a body of still water within one year. Counting and correlation (= varve analysis).

3) **Water rims** (200-200,000 yrs) - determining thickness of rims produced by water vapor slowly diffusing into freshly chipped surfaces on artifacts made of recent volcanic glass (= obsidian hydration dating).

4) **TL** - (Thermoluminescence) (up to several hundred thousand years) - heating minerals to measure trapped electrons, constant radiation level assumed. e.g. pottery heated till it glows with energy stored since first fired.

5) **Radioactive elements** - measuring the decaying, radioactive elements within earth's rocks ("virtual clocks") which decay at regular rates (= radiometric dating)

METHODS

i-Carbon Dating

Most of the carbon in the world is carbon-12. However, one millionth of 1 percent in the atmosphere is carbon-14. This isotope of carbon is formed when neutrons reach the earth from outer space and combine with nitrogen-14 producing carbon-14 and hydrogen. Both carbon-12 and carbon-14 are absorbed by plants (in the form of carbon dioxide formed when carbon and oxygen join). When animals eat these plants they too will have both these isotopes of carbon in them. Carbon-12 is stable, but carbon-14 is not and decays back into nitrogen. (Actually, what happens is that, u/Unlike the more stable Carbon 12[1]` carbon-14 quickly changes to more stable forms[2], which also eventually decompose.)

As long as a plant or animal is alive, it keeps on replenishing its supply of carbon-14 because this is contained in the food that they eat. But after they die, the amount of carbon-14 they have gradually decreases.

However, after the plant dies, the carbon-14 gradually begins to decay changing the ratio of c-12 to c-14 in the plant[1]. This can then be measured to reveal the age of the plant fossil (at least from the time it died.) The half-life of carbon-14 is about 5,730 years. This means that half the

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[1]And Carbon-13, although the latter exists in a ratio with C-12 of less than 2%

[2]In these reactions, atmospheric nuclei (mainly 14N and 16O) are shattered releasing part of their constituents (protons and neutrons). Depending on the energy of the incident primary particles, these processes may continue over several generations producing a multiple of neutrons available for the production of 14C. The freshly produced 14C quickly oxidises to 14CO through the reaction and resides in the atmosphere for a period of about 2 to 6 months. It then gets further oxidised to 14CO2, mainly through reaction with the extremely rare but very reactive hydroxyl radical stays in the atmosphere for approximately ten years and gets well mixed with stable CO2. Through several pathways it eventually enters various terrestrial reservoirs such as the hydrosphere and the biosphere. The main entrance channel to the biosphere is the taking up of 14CO2 through the photosynthesis of plants.

[1]14C (Carbon-14) and 12C (Carbon-12) exists in the atmosphere in a ration of about 5-6. A living substance, which is constantly taking in the atmosphere, has a similar ratio. However, when that being dies, the 14C begins to get less and less according to an exact amount.

carbon-14 atoms that are now present in a dead body, plant or tree will decay in the next 5,730 years. Half the remaining carbon atoms will then decay in the next 5,730 years and so on. It is generally accepted that carbon dating provides dating within 155 accuracy. This means that if a fossil is dated at 5,000 years it may be anything between 4,250 and 5,750 years old. (Conceptual Physics, Paul G. Hewitt, pp. 610 - 611)

Problems with Carbon Dating

Carbon dating relies on the premise that the ration of carbon 12 to carbon 14 in the atmosphere has always been the same. But this is not so. John Eddy of the University Corporation for Atmospheric Research in Boulder, Colo. noted that the amount of carbon 14 in tree rings increased during a dearth of sunspots. (This is thought to be because when the magnetic fields of the sun are strong, they shield the earth from cosmic rays, so that less carbon 14 forms.) Scientists using carbon dating are aware of this and therefore try to adjust the carbon date to other dates. For example, they count the annual growth rings from live and fossil trees. But this only helps for dating going back 8,000 years. For greater lengths of time, carbon dating is compared to other dating techniques. Sometimes the discrepancies are as much as a few thousand years. It is always presumed that the carbon dating is out and this is usually attributed to sunspot activity. (*Scientific American* Aug. 1996 pg. 33 and Dec. 1996 pg. 6) But scientists cannot say for sure what else may effect carbon levels, nor can they guarantee that other dating techniques are accurate.

Carbon dating must also presume that the death of a plant or animal is the point at which it ceases to exchange with the environment and that, after ceasing exchange, the 14C concentration in a plant or animal is only affected by radioactive decay, an assumption which is not strictly correct, beyond a rough first approximation. Firstly, processes affecting the global concentration of 14C in the atmosphere vary (e.g. cosmic-ray variations, change in exchange rate of CO2 between ocean and atmosphere). Secondly, it has been found that not all living beings acquire the same 12C-14C ratio (e.g. marine life forms acquire lower 14C/12C ratios). Other problems include alteration effects, i. e. changes of the genuine 14C/12C ratio after death due to processes other than radioactive decay (e.g. exchange of carbon with the environment through chemical and physical processes, and/or biological activity), contamination (e. g. addition of extraneous carbon during sample preparation) 'old wood' problem (e. g. wood from archaeological sites date the time of its growth rather than the date of its use; in addition, the wood may come from parts with older tree rings).

ii-Other Dating Techniques

Potassium-Argon Method: Problematic if rock exposed to temperatures above 125C - rock will reflect last heating and not original formation.

Decay of Rubidium-87 to Strontium-87 in certain rocks.

Dating **oceanic sediments** (300,000 yrs) - Uranium in seawater decays into Thorium-230. Based on assumption that element contents of sediments are constant and not influenced by Uranium decay.

Lead dating

Radioactive minerals, such as uranium are good ways of dating things once one can discover the rate of their decay and the degree to which they exist in any substance. For example, some types of uranium decay into certain types (not the regular type) of lead. So, the more such lead scientists find in a (uranium bearing) rock, the older the rock is going to be. Scientists claim to have dated rocks on the

earth back to 3.7 billion years old, and samples from the moon back to 4.2 billion years old. (*Conceptual Physics*, Paul G. Hewitt, pg. 612)

However, scientists really cannot prove that uranium always decays at the same rate. It seems to be a reasonable assumption, but there are many factors, which could change the rate of decay, rendering such dating inaccurate.
Age is calculated based on known radioactive decay rate of uranium-238 to lead-206 and of uranium-235 to lead-237

Fission - Track : The paths of radiation damage made in a mineral or glass (40,000 - 1 million years ago) is determined.

Source: Encarta Encyclopedia except where otherwise stated

iii-Slowing Down

Eclipse Records
Suggest a rotational slowing of 2 milliseconds per century -for past few thousand years.

Tidal Friction
Causes deceleration of the earth's rotation by 1/50,000th of a second per year.
However, the moon has been steadily receding from the earth (between 5.8 - 94.5 cm per year)

Coral Lines
Based on these, Cornell paleontologist John West Wells proposes a year of 400 days, 370 million years ago.

None of this is taken into account when dating procedures are given.

iv-Conflicting Theories

Conflicting theories show that science is in progress. Today's theory may be in tomorrow's garbage dump.

Age of the Universe
Wendy Freedman of Carnegie, using Hubble Space Telescope, has collated distances to a number of local galaxies which has led to her asserting a cosmic age of eight billion years.
Other data indicates that certain stars are at least 14 billion years.

For more than 25 years, Sandage has argued that the universe is as old as 20 billion years.

These differences are currently explained as differences in the accuracy of the data as well as associating the data with certain formula (i.e. the Hubble Constant). It also presumes that the rate of expansion in one part of the universe reflects the rate in all other parts.
(*Scientific American*, June 1995, pg. 11)

Evolution of Man
One theory asserts that Homo Sapiens, our supposed direct ancestors, evolved about 200,000 years ago and lived side by side with the Neanderthals who became extinct 30,000 years ago. According to this theory a third species, Homo Erectus, was a precursor of Home Sapiens and became extinct 250,000 years ago. A second theory however, (Carl Swisher, Susan Anton and others) asserts that Homo Erectus only disappeared between 53,000 and 27,000 years ago, making three close to human species living all side by side. (It should be pointed out that the dating for the later Homo Erectus theory was not done on skulls themselves, but on the teeth of some water buffalo found in the same strata as these skulls!!!). These theories are being constantly re-assessed. For example, *Scientific American*, April 1997, pg. 47, has an article by Ian Tattersall entitled *Out of Africa Again ... and Again?*

Birds

For the last 150 years birds were considered to have developed 65 million years ago, whereas now some evolutionists assert that birds are no older than 10 million years. Another dispute concerns the origins of birds. Most evolutionists claim that birds derived from dinosaurs. However, Alan Feducio leads a group of academics who claims that birds were well established much earlier than that. The dinosaur theory is based on similarities between the bones of birds and dinosaurs, which, Feducio argues is just a coincidence of convergent evolution. Most of the dinosaur ancestor evidence is only 100 million years old (supposedly). But Feducio claims to have found bird fossils in northern China, which are 40 million years older than that. The dating of these fossils are in turn dated by the pro-dinosaur theorists at only 120 million years old. There is a further argument between the two sides whether a particular dinosaur had "downy feathers" running down its back or not. (*Scientific American* Feb. 1997)

Turtles

Scientific American, March 1997, (pg. 16, 18):

...Turtles had been classified in the wrong branch of the reptile family tree. ... Turtles had long been regarded as "living fossils" the only surviving member of a primitive reptile subclass, the anapsids, which originate some 325 million years ago in the Paleozoic era. Now these researchers were proposing that turtles belonged to the modern reptilian lot-the diapsids, which first emerged about 230 million years ago... and include present-day lizards, snakes and crocodiles. ... Gene Gaffney [who disputes this] ... notes that some of the characteristics used in the study - bone ossification for one - are not particularly reliable for all amniotes (reptiles, birds, mammals). Other groups assert that comparing groups can spawn erroneous ... theories. Such was the case in the 1800s, when the theory of hematothermia arose. It stated that birds and mammals are closely related because they are both warm-blooded, even though the overwhelming evidence suggested that birds were more reptilian.

What particularly distresses some researchers about the turtle debate is that it takes only a few additional characteristics in the data matrix to move turtles again into anapsids. Rieppel [who made the claim to reclassify the turtle] counters by insisting that evolutionary trees become unstable when they become too heavy with characteristics...

Dinosaurs

Perhaps no area is in as constant revision as the issue of dinosaurs. For example, Greogry Erickson reported in Scientific American, Sep. 1999 that the popular conception of T. Rex as the ultimate bloodthirsty hunter is as much a product of artistic license as of science. Only in recent years have paleontologists begun to reconstruct a more rounded view of how these dinosaurs lived.

APPENDIX O: THE TIME-LINE ACCORDING TO EVOLUTION

APPENDIX O: THE TIME-LINE ACCORDING TO EVOLUTION

FOSSIL RECORDS - PRECURSOR TO MAN

Emergence of major life forms

3.4 BILLION YEARS AGO

First life forms

Environment : Lack of free oxygen

Earliest remains - cells resembling modern bacteria (unicellular, living without oxygen)

Diversified eventually into blue-green algae and aerobic photosynthesizers

700 Myr

One million years = one Myr

Advanced cell evolution. Appearance of cells implies moderate levels of free oxygen and relatively predictable food plant supply.

700 - 500 Myr

Animal body structures develop e.g. Jellyfish and burrowing worms (more advanced body structure).

570 Myr

Invertebrates (animals with skeletons). Fish develop out of this.

400 Myr

Appearance of land plants.

Arthropods and other invertebrate groups migrated to land.

360 Myr

Land vertebrates (amphibians first) arose from freshwater fish.

135 Myr

Dinosaurs and mostly nocturnal, small mammals.

65 Myr

Extinction of dinosaurs. Mammals diversify.

20+ Myr

A surprising modern looking ape was discovered in Uganda that may have swung through the trees while its primitive contemporaries traversed branches on all fours.

5-6 Myr

Postulated time of last common ancestor of chimpanzees and humans. Scientists use molecular evidence to show that humans and chimpanzees once had a common ancestor and that this ancestor had previously split from gorillas. (Sc. American, June, 1997, pg. 65)

PRE-HUMANS

All upright walking primates are known as hominids. The genus homo includes our own species, Homo Sapiens. The precursors of these were a part of the genus Australopithecus, of which a number of species have been found. These also walked upright as was confirmed in 1978 by a series of footsteps found in Tanzania.

4.4 Myr

Fossils discovered in Ethiopia which in 1995 were declared a new species **Ardipithecus Ramidus** (some teeth, a piece of a baby's lower jaw, fragments from an adult's skull and some arm bones). This species is the most primitive hominid known - a link between the African apes and Australopithecus. In some respects it is like the African apes e.g. its simple dental enamel and its strong arms; and in other respects it resembles later hominids such as the opening at the base of the skull where the spine connects to the brain. (Sc. American, June, 1997, pg. 65)

4.2 - 3.9 Myr
Australopithecus **anamensis** - unearthed in Kenya and so named in 1995. Fossils from anamensis share features in common with both humans and chimpanzees, which supposedly split off from human lineage 5-6 Myr ago. The jawbones of anamensis are U-shaped like those of chimpanzees whereas the human jaw widens at the back of the mouth. On the other hand the top of the tibia, near the knee is wider because of the extra spongy bone tissue present, which serves as a shock absorber in creatures which walk upright. Chimpanzee tibias are somewhat T-shaped. Another difference from chimpanzees in common with humans is the lack of an oval hollow at the bottom of the humurus, making the elbow joint more stable to allow for walking on knuckles.
(Extinction of all Australopithecus species about 1.2 myr)

3.6 Myr
Two species of Australopithecus found in South Africa - **A. Africanus & A. Robustus**. The latter was later divided into a northern and a southern species. They were relatively small brained and had canine teeth which differed from those of modern apes in that they hardly projected past the rest of the tooth row.

3.6-2.9 Myr
Yet another species of Australopithecus, **Afarensis**, discovered in 1978 in Ethiopia.

2.5 Myr
Earliest evidence of stone tools

500,000-30,000 YEARS
Migration from Africa into Eurasia (+- 500,000 years ago).
People cross the water barrier into Australia (+- 50,000 years ago).
Movement into New World (+- 30,000 years ago).

200,000-300,000 YEARS
H. Erectus evolved into H. Sapiens (early man). H. Sapiens were not physically identical to H. Sapiens Sapiens.

90,000 YEARS
Development of H. Sapiens Sapiens (Modern man)

100,000-30,000 YEARS
Neanderthal Man (Europe and middle East).
Questions exist as to where on the evolutionary chain Neanderthal man belongs, and what are the evolutionary origins of races.
Two opinions:
i-Neanderthals and H. Sapiens both descended from H. Erectus.
ii-Neanderthals existed as a side branch of human evolution which became extinct.

10,000 YEARS
Development of language, also caves discovered with art dating to this period.
Plant domestication, followed by animal (Agricultural revolution).

(Sources: *Scientific American*, June '97 pg. 60-65; July '97 pg. 14; Encarta Encyclopedia)

APPENDIX P: PUBLIC OPINION, RELIGIOUS, EDUCATIONAL AND OTHER BODIES

i-Catholicism

ii-Christian Fundamentalism

iii-Positions Of Educational, Legal And Other Bodies

APPENDIX P: POSITIONS OF PUBLIC OPINION, RELIGIOUS, EDUCATIONAL AND OTHER BODIES

James Glanz reported in the NY Times, march 11, 2000 that an overwhelming majority of Americans think that creationism should be taught along with Darwin's theory of evolution in the public schools, according to a new national survey.[1]

The survey found that 83 percent of Americans generally supported the teaching of evolution in public schools. But 79 percent of Americans also thought creationism had a place in the public school curriculum -- though respondents often said the topic should be discussed as a belief rather than as a competing scientific theory.

As for evolution, almost half the respondents agreed that the theory "is far from being proven scientifically." And 68 percent said it was possible to believe in evolution while also believing that God created humans and guided their development.

He suggested that the public's sense that creationism and evolution are compatible "translates in a pluralistic society and public to there being a place for both." Or, he said, the poll's results might reflect a postmodern feeling that no single view can provide complete understanding of most issues -- as Mr. Yankelovich put it, "the attitude, 'Well, you never know, hey.' "

The debate that was started 75 years ago in the Scopes trial and reignited last year when the Kansas school board voted to remove most references to evolution from state education standards, shows no sign of cooling. Last month, a charter school in Rochester drew criticism when officials there said creationism would be taught as an alternate theory to evolution.

Only about a third of the respondents in the poll, though, defined creationism in a strictly literal sense. Others said they understood it more loosely as referring to God's having created humans, but not necessarily as described in the Bible. The poll did not offer other, more nuanced views of divine intervention, like the idea that God infused humans with a soul and otherwise allowed evolution to take its course. Had it done so, the numbers of people supporting creationism would probably have been even higher.

About 30 percent of Americans believe that creationism should be taught as a scientific theory, either with or without evolution in the curriculum. At the other end of the spectrum, 20 percent believe that evolution should be taught in science class without any mention of creationism. Most respondents, though, took the middle road, saying that evolution should be taught as a scientific theory, while creationism should also be discussed -- as a religious belief rather than a scientific theory.

Christian Attitudes to Evolution:

The public perception is that all religion is opposed to Darwinian Evolution. However, this is not the case.

i-Catholicism

Although there is a strong body of opinion within Catholicism which favors a literal interpretation of the Biblical account (note a literal interpretation has no necessary connection with פשט), there have been strong voices to the contrary:

[1]The survey was commissioned by the People for the American Way Foundation and conducted by DYG Inc. It involved extensive interviews with 1,500 people drawn representatively from all segments of society across the country.

In the 5th C St. Augustine warned against a literal reading of the Genesis creation account.

In 1950, Pope Pious XII called evolution a serious hypothesis, worthy of study.

According to Pope John Paul II, the current Pope, evolution is "more than just a theory" and is fully compatible with Christian faith. But in a letter to the pontifical Academy of Sciences, he also reaffirmed church teachings that while the human body may have evolved gradually the soul "is immediately created by G-d" in each person.

ii-Christian Fundamentalism

Fundamentalist churches on the other hand, are very literal in their Biblical interpretation and therefore anti-evolution. In 1987, a U.S. Supreme Court injunction held that compelling public schools to teach "creation science", a doctrine that argues that science supports special creation, was unconstitutional. In order to get around this, opponents of evolution are now pushing "intelligent design" a theistic formula that posits an unnamed intelligent force to explain the diversity of life.
A text book promoting this thesis, *Of Pandas and People: The Central Question of Biological Origins* by Percival Davis and Dean H. Kenyon have been shipped to public schools in more than 12 states. The concept of intelligent design replaces the old concept of creation science which has been banned by the courts from being taught in public schools on constitutional grounds.

iii-Positions Of Educational, Legal And Other Bodies

In 1981, the Arkansas state legislature passed a statute requiring balanced treatment to creation-science and to evolution science. The local federal court overturned the legislation. That same year, the State legislature of Louisiana passed a law that if "evolution-science" is taught in the public schools, the schools must also provide balanced treatment for science. A federal judge promptly held it unconstitutional as an "establishment of religion". In 1987, the Supreme Court of the USA affirmed this decision by a seven to two majority.

In 1987 the U.S. Supreme Court in *Edwards vs. Aguillard* struck down equal-time-for-creation science laws because creationism is an inherently religious idea and teaching it as the equivalent of science (evolution) unconstitutionally promotes religion. This led to selective pressure to avoid the religious term "creationism," and within a few years of *Edwards*, some creationists were calling not for creation science but for "abrupt appearance theory," "evidence against evolution" or - most recently - "intelligent-design theory."

A 1991 survey of Kansas biology teachers by J. Richard Schrock of Emporia University found that one in four favored giving creationism and evolution equal time.

In 1995, Alabama accepted a science course modified to remove obstacles to "creation science". The State Board of Education of Alabama first put stickers on biology textbooks in 1996, warning students that evolution is a "controversial theory" that they should question. In 2002 those books were replaced with new editions to be used for the next six years. The State again voted without dissent to place a sticker on the front of the new biology textbooks to be used in public schools.

After calling evolution a controversial theory, the statement says, "Instructional material associated with controversy should be approached with an open mind, studied carefully and critically considered." The board included the same statement in guidelines for teachers.

In 1997, in a startling about-face the National Association of Biology teachers, which had long stood firm against religious fundamentalists who insisted that creationism be taught in public schools, excised two key words from its platform on teaching evolution.

"The diversity of life on earth," the group's platform used to read, "is the outcome of evolution: an unsupervised, impersonal, unpredictable, and natural process." Now the words, "unsupervised" and "impersonal" have been dropped. The revision is clearly designed to allow for the possibility that a Master Hand was at the helm.

Scientific American reported in Jan. 1997 (pg. 82) that half the American public believes G-d created humans sometime within the past 10,000 years.

CNN, March 26, 1999: Fearing a growing assault on the reaching of Darwin's theories, a group of 23 textbook authors has launched a campaign in defense of evolution education. ... a disclaimer sticker, approved by the Alabama board of education in 1995, explains that evolution is a theory [not a fact]. Last month the Mervindale-Northern Allen school board in Michigan decided to supply some of its libraries with books that raise questions about the validity of evolutionary theory. And in Texas last year, school districts across the state were urged to adopt textbooks that didn't "harp on" evolution. A Christian Publisher's textbook, "of pandas and people" has grown in popularity. It and others like it, subscribe to the theory that the world and its living creatures came about by intelligent design.

In October, 1999, Reuters reported that a change in Kentucky school curriculum guidelines eliminating the word "evolution" has touched off the second uproar over U.S. science education in less than two months. The phrase "change over time" had been substituted for the word "evolution" in guidelines for middle school and high school science courses.

On Aug. 11 the Kansas Board of Education voted 6-4 to embrace new standards for science teaching in public schools that eliminate evolution as an underlying principle of biology and other sciences. What the Kansas board did was to allow local boards of education to decide how they want to deal with evolution. They did not necessarily intend to encourage the teaching of creationism. The Kansas decision reignited the national debate over evolution.

However, in February, 2001, the Kansas State Board of Education reversed its decision, reinstating evolution with the adoption of new state science standards and essentially mandating that evolution be taught in public schools throughout the state.

Adoption of the standards, which are guidelines for teaching and testing, places evolution squarely back into the state's science curriculum, but not without adding language that may appease Christian conservatives and others who oppose the teaching of evolution in public schools as the origin of man.

"'Understand' does not mandate 'belief,'" the document the board adopted says. "While students may be required to understand some concepts that researchers use to conduct research and solve practical problems, they may accept or reject the scientific concepts presented. This applies particularly where students' and/or parents' beliefs may be at odds with the current scientific theories or concepts."

The booklet, "Kansas Science Education Standards," refers to evolution as "a broad, unifying theoretical framework in biology."

The document also states, on Page 5, under the heading "Teaching With Tolerance and Respect": "Teachers should not ridicule, belittle or embarrass a student for expressing an alternative view or belief."

Aboard member, Janet Waugh, said: "We are not atheists on this board. I believe the board members are all Christians, and we have no problem with Christianity or any other religion being taught, but it cannot be taught in a science class."
Also in October 1999, in a 14-1 vote, the school board in New Mexico decided against requiring instruction on creationism or other alternative theories about how life forms came to be.

NY Times April 8, 2001 Evolutionists Battle New Theory on Creation By JAMES GLANZ

Kansas school officials restored the theory of evolution to statewide education standards a few weeks ago. ...

This time, though, the evolutionists find themselves arrayed not against traditional creationism, with its roots in biblical literalism, but against a more sophisticated idea: the intelligent design theory.

Proponents of this theory, led by a group of academics and intellectuals and including some biblical creationists, accept that the earth is billions of years old, not the thousands of years suggested by a literal reading of the Bible.

But they dispute the idea that natural selection, the force Darwin suggested drove evolution, is enough to explain the complexity of the earth's plants and animals. That complexity, they say, must be the work of an intelligent designer.

This designer may be much like the biblical God, proponents say, but they are open to other explanations, such as the proposition that life was seeded by a meteorite from elsewhere in the cosmos, possibly involving extraterrestrial intelligence, or the new age philosophy that the universe is suffused with a mysterious but inanimate life force.

In recent months, the proponents of intelligent design have advanced their case on several fronts.

¶In Kansas, after the backlash against the traditional biblical creationism, proponents of the design theory have become the dominant anti- evolution force, though they lost an effort to have theories like intelligent design considered on an equal basis with evolution in school curriculums.

¶In Michigan, nine legislators in the House of Representatives have introduced legislation to amend state education standards to put intelligent design on an equal basis with evolution.

¶In Pennsylvania, where biblical creationists and design theorists have operated in concert, state officials are close to adopting educational standards that would allow the teaching of theories on the origin and development of life other than evolution.

¶Backers of intelligent design organized university-sanctioned conferences at Yale and Baylor last year, and the movement has spawned at least one university student organization - called Intelligent Design and Evolution Awareness, or the IDEA club - at the University of California in San Diego.

¶The Discovery Institute, a research institute in Seattle that promotes conservative causes, organized a briefing on intelligent design last year on Capitol Hill for prominent members of Congress.

"They are skilled in analyzing evidence and ideas," said Representative Tom Petri, a Wisconsin Republican and one of several members of Congress who was a host at the session in a Congressional hearing room. "They are making a determined effort to attempt to present the intelligent design theory, and ask that it be judged by normal scientific criteria."

Polls show that the percentage of Americans who say they believe in creationism is about 45 percent. George W. Bush took the position in the presidential campaign that children should be exposed to both creationism and evolution in school.

Supporters of Darwin see intelligent design as more insidious than creationism, especially given that many of its advocates have mainstream scientific credentials, which creationists often lack.
"The most striking thing about the intelligent design folks is their potential to really make anti-evolutionism intellectually respectable," said Dr. Eugenie Scott, executive director of the National Center for Science Education in Oakland, Calif., which promotes the teaching of evolution. ...
The design theory was finding adherents among doctors, engineers and people with degrees in the humanities.

One of the first arguments for the design theory was set out in "Darwin's Black Box: The Biochemical Challenge to Evolution" (Simon & Schuster, 1996), by Dr. Michael J. Behe, a professor of biological sciences at Lehigh University in Pennsylvania. Dr. Behe argued that various biochemical structures in cells could not have been built in a stepwise Darwinian fashion.

"I'm very impressed with the level of scientific work and the level of scientific dialogue among the leaders of the design movement," said Dr. Guillermo Gonzalez, an astronomer at the University of Washington in Seattle. The theory "warrants further research," Dr. Gonzalez said.

Leaders of the design movement also look for flaws in evolutionist thinking and its presentation, and have scored heavily by publicizing embarrassing mistakes in prominent biology textbooks. ...

Evolutionary biologists maintain that the arguments of intelligent design do not survive scrutiny, but they concede that a specialist's knowledge of particular mathematical or biological disciplines is often needed to clinch the point.
"I would use the words `devilishly clever,' " said Dr. Jerry Coyne, a professor of ecology and evolution at the University of Chicago, speaking of the way the theory is constructed. "It has an appeal to intellectuals who don't know anything about evolutionary biology, first of all because the proponents have Ph.D.'s and second of all because it's not written in the sort of populist, folksy, anti-intellectual style. It's written in the argot of academia." ...

The Gradual Illumination of the Mind by Michael Shermer, Scientific American, 2001:
...forced binary choice between the "theory of creationism" and the "theory of evolution," 57 percent chose creationism against only 33 percent for evolution (10 percent said that they were "unsure")... 34 percent considered themselves to be "very informed" about evolution.

APPENDIX Q: READINGS

i-Quotes

ii-Readings

iii-Extra Sources

APPENDIX Q: READINGS

i-Quotes

Paul Davies: The impression of design is overwhelming.

Stuart Kaufman: We may be at home in the universe in ways we have hardly come to comprehend. (*At Home in the Universe*)

Roger Penrose: This now tells us how precise the Creator's aim must have been, namely to an accuracy of one part in 10 to the 10 to the 123. This is an extraordinary figure. One could not possibly even write the number down in full in the ordinary notation: it would be 1 followed by 10 to the power of 123 successive 0's. Even if we were to write a 0 on each separate proton and on each separate neutron in the entire universe-and we could throw in all the other particles for good measure-we would fall far short of writing down the figure needed. *(The Emperor's New Mind*, 1989)

Freeman Dyson: Nature has been kinder to us than we had any right to expect. As we look into the universe and identify the many accidents of physics and astronomy that have worked together for our benefit, it almost seems as if the universe must have in some sense known that we were coming.(*Scientific American*, 1971)

In *The Cosmic Blueprint*, Paul Davies writes:

"The universe has never ceased to be creative. Cosmologists now believe that immediately following the big bang the universe was in an essentially featureless state, and that all structure and complexity which we see today somehow emerged afterwards. Evidently physical processes exist that can turn a void - or something close to it - into stars, planets, crystals, clouds and people.

What is the source of this astonishing power? ...

There exist self-organizing principles in every branch of science. ...

Many scientists would reject the idea of a cosmic blueprint as too mystical, because it implies that the universe has a purpose and is the product of a metaphysical designer. Such beliefs have been taboo for a long time among scientists. Perhaps the apparent unity of the universe is merely an anthropocentric projection. Or maybe the universe behaves as if it is implementing the design of a blueprint, but nevertheless is still evolving in blind conformity with purposeless laws?" (pp. 1-8)

Professor John Wheeler:
"To my mind, there must be at the bottom of it all, not an utterly simple equation, but an utterly simple IDEA. And to me that idea, when we finally discover it, will be so compelling, and so inevitable, so beautiful, we will all say to each other, 'How could it have ever been otherwise?'"

Hoyle:
"A common sense interpretation of the facts suggests that a superintendent has monkeyed with the physics, as well as chemistry and biology, and that there are no blind forces worth speaking about in nature. I do not believe that any physicist who examined the evidence could fail to draw the inference that the laws of nuclear physics have been deliberately designed with regard to the consequences they produce within stars."

ii-Readings

Michael J Denton, *Nature's Destiny - How the laws of Biology Reveal Purpose in the Universe* (Free Press)
Michael Behe, *IRREDUCIBLE COMPLEXITY*: A critical study by Dr Michael Behe, Professor of Biology at Lehigh University, of living systems which he contends could not possibly have evolved because they are "irreducibly complex."
Paul Davies, *Accidental Universe*
Shapiro, Robert *Origins - A Skeptic's Guide to the Creation of Life on Earth*, Bantam, 1987
Steinman, Mordechai and Robinson, Gershon *The Obvious Proof*, C.I.S. Publishers
Aryeh Kaplan, *Immortality, Resurrection and the Age of the Universe* (KTAV in association with AJOP), chapters 1 - 3.
Commentary June 1996, David Berlinsky, The Deniable Darwin
Commentary Sep. 1996, Denying Darwin
For a powerful argument defending the evolutionary approach read *Tower of Babel* by Robert Pennock (MIT Press, Cambridge, Mass., 1999) (The book is subtitled *The Evidence against the New Creationism*.

Anthropic Principle

The following are readings suggested by the web site, *The 2001 Principle* (This site and/or the related book is the best reading on this issue.)

The video, "The Anthropic Principle," available in Pal (or for an extra charge, in NTSC) from BBC Video For
Education and Training, Horizon Library, Room 8, 2058 at BBC Enterprises Ltd., Woodlands, 80 Wood Lane,
London Q12 OTT; Phone: 44-081-576-2867; Fax: 44-081-576-2415.

Origins - A Skeptic's Guide to the Creation of the Life on Earth by Robert Shapiro, Professor of Chemistry at New York University and an expert on DNA research and the genetic effect of environmental chemicals. Bantam
Books, 1987.

Professor Michael Rees: "Cosmic Coincidences."

Professor Frank Tipler "The Anthropic Cosmological Principle,"

Not By Chance! The Fall of Neo-Darwinian Theory by Lee M. Spetner, Ph.D. in Physics, MIT. Self-published in
1996, the book is available from author. E-mail to <lspetner@inter.net.il>.

Evolution - A Theory in Crisis, by Michael Denton, Burnett Books, London, 1985. An excellent scientific examination of the status of evolutionary theory.

If You Were God - Three Works by Aryeh Kaplan. This book begins where The Obvious Proof leaves off. It goes beyond the wall that Alan Sandage mentions in the PBS special "The Creation of the Universe" (see Menu, end #7). Available in Jewish bookstores, or through NCSY, 45 West 36th Street, N.Y. 10018.

INDEX: SCIENCE AND EVOLUTION

Permission to Believe, by Laurence Kelemen, Feldheim Publishers. The author presents rational proofs for God's
existence using four separate intellectual approaches, dispelling the misconception that belief in God is irrational.

"Wonders of Creation," an audio tape by Shmuel Silinsky. $7.00 plus $2.00 shipping and handling to 2001@aish.edu

"THE OBVIOUS PROOF" by Mordechai Steinman and Gershon Robinson (C.I.S. Publishers)

<http://www.arn.org/arn/articles/behe924.htm>

<http://www.arn.org/arn/behe/mb_gr8.htm>

EXAMPLES OF IRREDUCIBLE COMPLEXITY:
<"http://www.corp.direct.ca/trinity/design.html>

iii-Extra Sources

1 - Malbim (on word ברא) says that sun moon and stars created on first day, and immediately began their normal orbit. However, the sun did not have luminescence until the 4th day. That light (radiation) can be absorbed (e.g. in a black hole) and at a certain point escape, is consistent with modern scientific theory. רבינו בחיי states that the sun began to shine immediately, but only on the 4th day did the light reach the earth

2-
ויהי כן ב(ראשית א:ח)
ספורנו : נשאר קיים כן נגד טבעו

3-
ספורנו א:יח- ולמשול ביום ובלילה - והוצרכו אז עם האור הראשון להויית בעלי חיים אשר הם יותר נכבדים מהצמחים

4-
ויהי כן
מאור ושמש א:ג
ויאמר אלקים יהי אור ...ולא נאמר ויהי כן ...ובהבדלת המים ...ובהקוות המים ...ואצל תדשא הארץ דשא נאמר ויהי כן ...ובבריאת המאורות נאמר ויאמר אלקים יהי מאורות ...עד להאיר על הארץ ויהי כן ואח"ז נאמר ויעש אלוקים את שני המאורות ...וגבי ישרצו המים ...וכן אחר ... התנינים ...ובריאת האדם ...לא נאמר ויהי כן רק אח"כ נאמר ויאמר אלקים הנה נתתי לכם וכו ... 'נאמר ויהי כן ...שכל דבר שנשאר על טבעו ובקיומו נאמר בו ויהי כן(ע"ש שהאריך)

בראשית א:כד - ספורנו - ויהי כן - בלי תוספת וגרעון שאם יתחדש מורכב משני מינין לא יוליד