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Brain, Science, Spirituality, Religious Experience

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CREATION SCIENCE & THE MYTH OF THE ORGANIC SOUP

Spontaneous Generation, Creation Science, DNA, RNA Worlds, and Viruses

by Rhawn Joseph, Ph.D.

The "question" as to The Origin of Life -of all life- is a query that at present cannot be adequately explained. By contrast, the problem as to the origin of life on Earth may be answered by the obvious. If life were to appear on a desert island, we would assume that it washed to shore, or fell from the sky. The Earth too is an "island," swirling in an ocean of space, and living tissue may have been washing to shore since the creation.

This view, however, is rejected by present-day "creation scientists" and most (but not all) mainstream Western educated scientists, the latter of which generally hold to the view that life emerged from an organic soup, or was spewed out of an undersea thermal vent. The "life from non-life" scenario has in fact been the mainstream "scientific" view as to the origin of life for over a thousand years. However, despite its ancient history, the "organic soup" hypothesis is erroneously believed by many to have been first proposed by Darwin.

THE ORGANIC SOUP

More than a century ago, Charles Darwin (1887) wrote a letter to a friend where he speculated as to the origins of life and the first living organisms. In so doing, he reintroduced to 19th century science what would become the myth of the organic soup:

"If (and oh what a big if) we could conceive in some warm little pond, with all sorts of ammonia and phosphoric salts, light, heat, electricity, etc., present, that a protein compound was chemically formed ready to undergo still more complex changes...." chemical compounds, Darwin proposed, that would have had the chance to accumulate, eventually becoming a living entity as there were no other forms of life to compete with it, or eat it up.

Hence, according to Darwin, life emerged from non-life, the residue of an organic soup. Darwin also explained that the reason life doesn't continue to emerge from non-life, is because of the presence of modern day living things. "At the present day such matter would be instantly devoured or absorbed, which would not have been the case before living creatures were formed."

Moreover, although in this letter Darwin acquiesced to the possibility that life could emerge more than once from non-life, the theory of evolution which bears his name is based on the premise that a single molecule of life had emerged only once, and that all life descended from this original single living molecule.

According to Darwin, including modern-day neo-Darwinian theory, all the branches and twigs of the tree of life trace their roots to a single seed and a single organism that emerged from the mixing of this organic soup— a notion that could best be described as the "single seed" as well as the organic soup hypothesis. The "single seed" and single tree theory is widely embraced and accepted without question by most (but not all) academics and scientists. In fact this was the official position of the 1986 "Eighth Conference on the Origins of Life" held at Berkeley, California, for they issued a press release which reflected the consensus view that "all life on Earth, from bacteria to sequoia trees to humans, evolved from a single ancestral cell" that had emerged from an organic stew.

Why a single seed? The reasoning is elementary: life must have emerged only once on Earth since all living entities are comprised of cells and DNA, and since, regardless of species, the structure of DNA is identical. If life had emerged more than once on Earth, then there would be no "universal genetic code" but innumerable genetic codes, with some life forms possibly having no genes whatsoever.

Life on Earth may well trace its roots to a single seed. However, that seed, the first living molecule, could not have emerged from an organic soup, or an undersea thermal event—at least on

Earth. The necessary ingredients for the manufacture of life did not exist on the young planet. Nor was there sufficient free oxygen, and there may have been no free oxygen at all, which is an essential ingredient that makes up the structure of DNA. In fact, almost all the essential ingredients for the construction and manufacture of DNA, were nowhere to be found—at least on Earth—thus effectively refuting any and all notions that Earthly life originated from non-life.

Rather, as the only source for DNA is DNA, and as only living cells can generate living cells, then the first DNA-equipped cells to appear on Earth have only two possible sources: They were either the product of "intelligent design" or they first originated on another planet (or both) and were subsequently hurled to Earth contained in all manner of debris that may have been sheared from other planets following cosmic collisions; or both.

SPONTANEOUS GENERATION

For thousand years it was believed that maggots appeared in garbage or rotten meat because these decaying tissues somehow became reactivated and thus "alive," i.e. resulting in the spontaneous generation of maggots from dead tissue. This remained the prevalent "scientific" view as to the origin of life in general, until 1680 when Francesco Redi performed a series of experiments that nearly laid this notion to rest. For example, if decaying tissue were placed in a bell jar and sealed, there was no evidence of spontaneous generation. The putrefying meat remained maggot free.

Nevertheless, despite repeated demonstrations that spontaneous (or gradual) generation is not plausible, many scientists have continued to cling to this view. For example, it was argued that although maggots cannot spontaneously or gradually arise from dead meat, the same is not true for bacteria. Bacteria emerge spontaneously from dead tissue and its secretions, it was argued. And, thus life arose from collections of nutrient rich organic substances, i.e. the proverbial organic soup.

Yet, these notions too were disproved 100 years ago. Louis Pasteur, for example, in the late 1800's, demonstrated conclusively that bacteria can only be generated from other bacteria. Only living bacteria can produce other living bacteria, and the same is true of all other creatures including viruses (which, by the way, must borrow the DNA of a non-viral cell in order to reproduce).

As a demonstration, Pasteur placed a nutrient rich broth into several flasks with either S-shaped necks or straight necks. Pasteur boiled both flasks, killing any and all bacteria present. Those flasks with straight necks allowed dust particles, and any adhering bacteria, to fall into the broth. Bacteria began replicating.

However, the organic soup confined within the S-shaped flasks, remained bacteria free—even after months had passed. Falling bacteria could not penetrate the film of moisture trapped within the S-shaped neck which acted as a filter. Bacteria can only reproduce from other bacteria.

It could be argued, however, that the above experiments are irrelevant as they fail to create conditions similar to those that predominated during the first billion years after the Earth was formed.

In a rather brilliant experiment, Stanley Miller and Harold Urey attempted to recreate the environmental and atmospheric conditions of the early Earth. They continuously exposed a mixture of methane, ammonia, water vapor and hydrogen gases to electric discharges and ultraviolet light for a week (Miller & Urey, 1953). The experiment and its results were viewed as a resounding success, as these experimenters were able to produce a few complex organic compounds and amino acids such as alanine and glycine; materials and elements also found in meteorites. Nevertheless, this organic soup failed to show any signs of life. No elephants, tigers, dinosaurs, single celled bacteria, or even a fragment of DNA were produced.

Melvin Calvin performed similar experiments and repeatedly irradiated a variety of substances and inorganic compounds, including solutions of water and carbon dioxide with electrical discharges. He too failed to produce life or even a fragment of DNA, as have all subsequent attempts by numerous investigators, no matter how sophisticated the experiment.

However, because some organic compounds were produced, including many of the elementary sugars and amino acids which are considered the "building blocks" of living matter, many scientists view these and similar experiments as a success! Indeed, Miller created 12 different kinds of amino acids in his flask, some of which are found in proteins. Hence, it has been argued that given similar conditions early in the Earth's history, living organic material may have been produced continually - even though these experiments completely failed to create any living matter or even a fragment of DNA.

In fact, although various scientist have produced individual elements of various "building blocks" these elements were not linked together even when mixed together so that they might combine.

These elements produce in the Miller, Urey, Calvin, et al., experiments also lacked genetic instructions or any semblance of what could be construed as RNA or DNA.

Of course, it is reasonable to assume that if provided millions of years to create life, and if provided the right elements, acids, and other necessary materials, that life may well gradually arise, beginning perhaps as a self-replicating energy extracting semi-organism, and eventually becoming a fully formed organism equipped with the necessary DNA. Nevertheless, even if provided millions of years, the creation of DNA remains a serious problem, Again, the essential precursor elements did not exist on the young Earth including oxygen—an essential element crucial for DNA integrity.

Nevertheless, a number of possible scenarios have been put forward, all of which posit that life and DNA arose gradually when various crystals, or clay particles, or enzymes, or proteins, and/or micromolecules were randomly jumbled together by chance, and that these random occurrence coincided (by chance) with some electrochemical, activating event, thereby organizing and giving these molecules life (de Duve, 1995; Lamond & Gibson, 1990; Orgel, 1994; Rebek, 1994). As the essential elements did not exist on Earth, it is believed that exobiological organic matter must have fallen to Earth, and was then washed into the seas where these life promoting substances accumulated, forming an organic sludge.

At present, 50 organic compounds and 25 nitrogen-based molecules, including molecular oxygen, carbon, carbon dioxide, methane, ammonia, benzene, formic acid, acetic acid, methanol, polycyclic aromatic hydrocarbons, and silicate grains have been detected in interstellar space. These molecules can build amino acids. There is also evidence to suggests that amino acid can be synthesized in comets and then deposited on Earth (Bada et al., 2001).

Moreover, sugar molecules, i.e., methyl formate, acetic acid, and glycolaldehyde, have been detected in giant gas and dust clouds, and glycolaldehyde (an 8-atom molecule composed of carbon, hydrogen, and oxygen) can combine with other molecules to form the more complex sugars such as ribose. Ribose is a building block of the nucleic acids, DNA and RNA.

As over 70 different amino acids have been detected in various meteorites which have fallen to Earth, and as our planet is bombarded with over 30,000 tons of extraterrestrial material yearly, it is thus believed that this accumulating extraterrestrial organic material was mixed and churned together, eventually forming an "organic soup."

Presumably this bubbling organic brew was simultaneously subjected to massive doses of ultra violet radiation from the sun, as well as radiation given off from the core of the Earth. Presumably, these primeval conditions coincided with, and thus effected the course of chance molecular associations, thereby giving life to certain activated and irradiated molecular combinations, which again, were astrobiological and extraterrestrial in origin.

Finally, these first living and behaving molecules began to engage in further "random" associations thus creating one simple life form. This first creature not only survived but was somehow provided with a complete and full fashioned macromolecule of DNA (deoxyribonucleic acid) or RNA (ribonucleic acid). The DNA and RNA were also provided with genetic instructions and then enveloped in a cellular membrane. Once the membrane was fashioned, a cell was born equipped with the capacity to extract energy and reproduce itself by producing RNA- or DNA-based duplicates.

Every creature and living thing, therefore, owe their existence to these chance occurrences where a multitude of organic molecules from outer space were randomly mixed together (by chance) and sprang to life, such that a single living molecule miraculously survived and began to reproduce.

In fact, even the cellular membrane may have been fashioned in outer-space. Dworkin and colleagues (2001) have synthesized self-assembling amphiphilic molecules that were transformed into vesicular structures in an environment designed to simulate the environments of dense interstellar molecular clouds. When exposed to ultraviolet radiation these molecules formed lipid bilayers similar to the lipid membranes that enclose living cells. According to these authors, "the delivery of such compounds by comets, meteorites, and interplanetary dust particles during the late heavy bombardment period may have played an influential role in the origin of life on Earth" as well as other planets.

Moreover, it has been argued that "proto-cells" can be generated in the upper atmosphere of a planet with an atmosphere saturated with organic material. According to Adrian Tuck of the National Oceanic and Atmospheric Administration in Boulder, Colorado, and colleagues Veronica Vaida and Barney Ellison of the University of Colorado, "proto-cells" may form when water droplets thrown up by ocean waves, drift into the upper atmosphere.

Prior to rising in the atmosphere, these aerosol particles are saturated with organic material due

to the film of oily molecules on the ocean surface, thus giving them the appearance of "protocells, with a layer of organic material on the outside." Moreover, once they enter the upper atmosphere, these lipid coated droplets can grab onto and fuse with other particles. Once the water inside evaporates, the diverse substances within become concentrated and may react to sunlight and undergo various chemical reactions, thereby increasing their weight, causing them to fall back to Earth or the ocean, where they can then pick up a second lipid layer, thus creating a lipid bilayer similar to the membrane around all living cells. However, the lipids and other organic materials these bilayers consist of are in fact the residue of other animals, including dead fish. In other words, these lipid bilayers could only be formed if other living creatures are already in existence.

Only life begets life.

These theories and the evidence presented above cannot explain the origin of DNA, the incredible complexity of a single cell, its capacity to extract and use energy, reproduce, and store and express information, etc., and so on. Indeed, a single macromolecule of DNA is so incredibly complex, the notion that it may have been randomly assembled from molecules that fell to Earth, is equivalent to finding a computer on Jupiter and then hypothesizing that it was randomly assembled in the Methane sea.

When coupled with the fact that all complex organic molecules had been twice destroyed on the new Earth, and that fully formed, complex life appeared on Earth, and possibly Mars, at the cessation of a 700 million year cosmic bombardment which had sterilized the two planets, we should conclude that these molecules which fell from space were not available for assembly in the time available so as to account for the emergence of life and its DNA. Rather, life, and its DNA, fell from the sky (or was created by intelligent design); life which may have then feasted on the later to develop "organic soup."

The cosmic cloud and organic soup scenarios are in fact incompatible with and are contradicted by cell theory and by what we know of genetics and the structure of DNA. Only DNA produces DNA. Without DNA, there is no life, and the origin of life cannot be explained without explaining the origin of DNA.

Although the heavens are swirling with some of the constituent elements necessary for life and the creation of DNA, the numerous theories and experiments that have been conducted to support the theory of spontaneous or gradual generation, cannot in any way account for the creation of DNA and its complex genetic instructions—at least on Earth.

DNA can only be produced by DNA. Living cells are produced only by other living cells (and their DNA). Since the purported "organic" alphabet "soup" was actually a thin broth missing three important letters: DNA, then the first DNA, and the first cells to appear on Earth, had to be produced by DNA equipped cells which were either astrobiological in origin, or possibly fashioned by the "hand of God," or both.

CELL THEORY AND DNA: ONLY DNA BEGETS DNA

It has been well established that DNA is produced only from other DNA and that all living cells arise from preexisting cells. That is, only life begets life and only DNA begets DNA. In this regard, it stands to reason that the first DNA equipped cells to arrive on Earth, were produced by DNA equipped cells that were astrobiological in origin, or created in the "laboratory of a living God."

The maxim, "only life begets life," and only DNA produces DNA is universal for all known Earthly creatures, including singled celled organisms, bacteria, and microbes. This well established rule of life provides the foundation for what has been referred to as "cell theory" as well as astrobiological contamination infection theory. All living things are composed of cells which contain DNA, and new cells are only formed when preexisting cells divide and replicate. Life begets life.

Another rule of cell theory is that old cells and new cells, and in fact all living cells, are fundamentally alike chemically, structurally, metabolically, and in regard to their cellular components (de Duve, 1995). Be it bacteria, animal, plant, or human, all cells are surrounded by a membrane (which may be partitioned by an internal membrane), and contain cytoplasm and DNA.

All living cells act similarly in regard to heat transduction and the liberation and conversion of photopic-chemical energy found in foodstuffs; that is, energy which is ultimately derived, via minerals and inorganic chemicals (chemolithoautotrophs), or plants and organic molecules secreted by other species (heterotrophs), or sunlight (photoautotrophs).

Hence, all cells are governed by the laws of thermodynamics (though the second law is sometimes violated). All cells are capable of breaking down simple molecular building blocks, such as

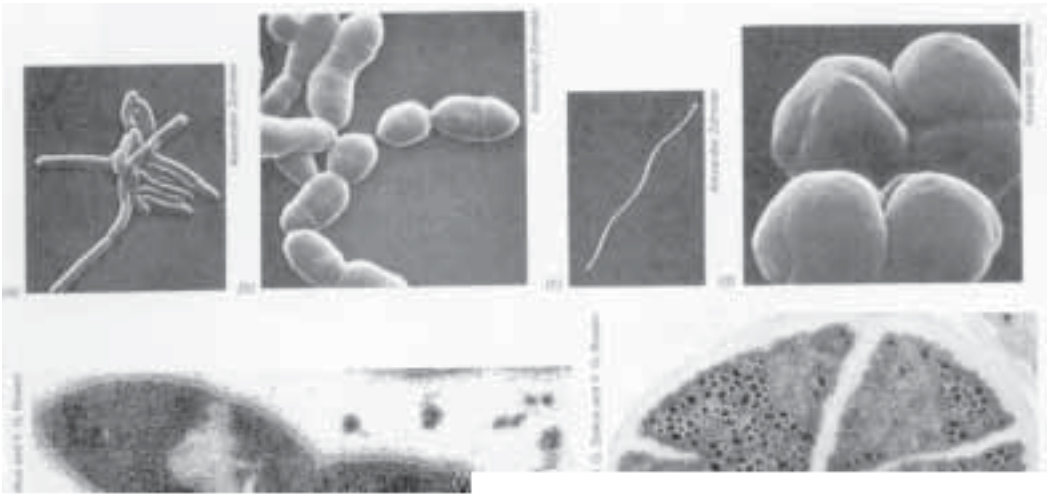


Figure 15. *The diverse morphology of Archaea. Reprinted from Brock et al., 1994. Biology of Microorganisms. Prentice Hall, New Jersey.*

minerals and glucose, or carbon dioxide, or ammonia, or nitrates, which they use to promote life and DNA replication.

All living cells are capable of converting these elements and breakdown products in order to create all the manifold and diverse proteins and carbon-containing molecules necessary for all aspects of cellular functioning. This includes regeneration of the cell wall, and the production of daughter cells, as well as the generation of proteins for maintaining the membrane, skin, skeletal system, heart, and so on. This is accomplished via instructions maintained within the macromolecules and polymeric molecules and nucleotides of DNA. These characteristics were also typical of those creatures who were among the first to take root on this planet.

Even the simplest of living cells (e.g. bacteria, archaea), maintain an inner wall which may consist of an acid-containing, fatty outer plasma membrane, within which is maintained the cell's cytoplasm and DNA. Moreover, even the simplest and most "primitive" single celled organisms are incredibly complex, and are capable of repairing their DNA as well as tears or openings in their membranes which are immediately sealed -which is accomplished via DNA induced protein synthesis.

The simplest of living organisms are mind boggling complex and the notion that they spontaneously or even gradually arose on Earth, from an undersea volcano, or an organic broth, and within just a few hundred million years, becomes completely untenable, especially when we consider DNA and cellular complexity, and the fact that the oldest life forms were equally complex and the failure to find any evidence of precursor life forms.

Single cellular microbes are comprised of over 2,500 small molecules (e.g. including amino acids consisting of 10 to 50 tightly packed atoms), macromolecules (proteins and nucleic acids) and polymeric molecules (comprised of hundreds to thousands of small molecules) all of which are precisely jigsawed together to form a single complex organism. The tiniest and most primitive of single celled creatures contain a variety of micro- macro- and polymeric molecules which fit and function together as a living mosaic of tissues.

Moreover, each of the many thousands of different molecules that make up a single cellular creature perform an incredible variety of chemical reactions -often in concert with that cell's other molecules and their protein (enzyme) products (Strachan & Read, 1996; Watson et al. 1992). When coupled with the complexity of DNA and given the fact that the essential ingredients for DNA construction were not available on this planet, it thus seems unlikely that life could have arisen gradually and merely by chance, at least on Earth.

OVERVIEW: DNA

In February of 2001, preliminary findings from two draft sequences of the human genome, generated by the Human Genome Project and Celera Genomics, were published in the journals Science and Nature. Both teams were forced to admit that they still did not know the precise number of humans genes, and could only provide gross estimates. Estimates range from 30,000-40,000 protein-coding genes in the human genome about twice as many as in worm or fly— though Venter et al. (2001) believe there may be fewer than 30,000 protein coding genes.

It is also unknown as to how many human genes exist as single copies. That is, thousands of genes may be duplicates of yet other genes. Moreover, many genes are fragmented, and the vast majority of genes (introns) are silent and suppressed.

Active genes (exons), that aspect of the gene which engages in coding and which has been expressed and activated, comprise only a tiny fraction of human DNA, about 3% of the genome and an average of about 5% of each gene. Less than 1.5% of the genome codes for proteins.

As confirmed by Celera and the Human Genome Project, and as will be detailed below, genes consist of nucleotide sequences which may be silent (introns) or coded and expressed (exons). Genes may also be active or silent. The vast majority of human DNA is silent. Activated genes and the active coding sequences comprise only a tiny fraction of the genome. Specifically, about 1.1% of the genome consists of exons, 24% consists of introns, with 75% of the genome consisting of intergenic DNA (Venter et al., 2001).

Genes consist of two strands of nucleotides, sequences of ATGC (Adenine, Thymine, Cytosine, Guanine) which are laddered together forming a double helix. However, there are almost 20% more AT nucleotides, with ATs outnumbering GCs by a ratio of 60-40, and more of the AT regions consist of silent introns.

By contrast, activated genes seem to cluster in GC rich regions. Also strings of repetitive Alu sequences cluster in the GC regions, along side active genes, which suggests that Alu sequences may play a regulatory role in gene expression.

DEOXYRIBONUCLEIC ACID (DNA): ONLY DNA BEGETS DNA

All living organisms contain DNA. DNA is composed of hundreds of thousand, and in many cases, millions of micromolecules which in turn contain all the necessary information for creating an embryo or a complex adult body (Strachan & Read, 1996; Watson et al. 1992). Hence, DNA functions as the ultimate information bearing macromolecule. As DNA also acts as a catalyst, via the synthesis of enzymes and proteins, these DNA macromolecules are capable of reproducing and synthesizing new copies of themselves, as well as generating "new" sequences of amino acids. This is accomplished through the secretion of polymerase, a characteristic of all cellular DNA. DNA gives birth to itself and to the cell.

A single macromolecule of DNA is referred to as a "gene." In all cells, the process of protein/enzyme synthesis, and related life-essential activities, are accomplished via the various genes located within and which make up the chromosomes, and in accordance with the somewhat "universal" genetic code. Each gene contains the information which determines the sequences and order of the amino acids contained in each and every cellular protein.

PROTEINS AND ENZYMES

Proteins serve as the cell's building blocks and enable it to function. All cells contain proteins and enzymes. Proteins are in fact manufactured via DNA—the substance which determines the structure of proteins, and which has generated untold life forms. The vast majority of proteins are composed of a mixture of up to 20 different amino acids, with the proportion of acids varying depending on the type of protein produced (Calladine & Drew, 1992; Strachan & Read, 1996; Watson et al. 1992). Proteins are the building blocks which comprise the organism and its manifold component parts.

The vast majority of proteins are enzymes. All enzymes are cavity scarred globules; the cavities acting to form conjunctions with other enzymes, much like a key fits into a lock. This enables them to chemically react and interact and to take specific shapes and forms.

Variations in the sequence in which these 20 amino acids are organized and fit together, therefore, can give rise to a variety of different shapes and forms, and can provide the resulting tissues and cells with specific and unique chemical and reactive properties (Calladine & Drew, 1992; Strachan &

Read, 1996; Watson et al. 1992). Moreover, the manner in which they are fashioned and fit together can serve to convey specific messages. Hence, DNA produced enzyme/proteins, contains information, and serves as information bearing micromolecules.

For every enzyme, and for every protein, there exists specific instructions which are maintained within the various multiple strands and sequence segments of DNA (Calladine & Drew, 1992; Strachan & Read, 1996; Watson et al., 1992). Through activation of various portions of the genetic code, a bacterium, or a complex human body can be fashioned. DNA, therefore, contains the ancestral and hereditary-based instructions for creating a simple or complex organism and its protein building blocks.

DNA DUPLICATION

DNA can be found in all living cells (Calladine & Drew, 1992; Strachan & Read, 1996; Watson et al. 1992). Moreover, this DNA (and the genetic code) is replicated in all daughter cells. That is,

Figure 16. *Schematic illustration of three idealized forms of DNA. A and B, are "right handed" with 10 to 11 phosphates per helical turn, and Z is "left handed" with 12 phosphates per turn. Reprinted from Calladin & Drew, 1992, Understanding DNA. Academic Press, San Diego.*

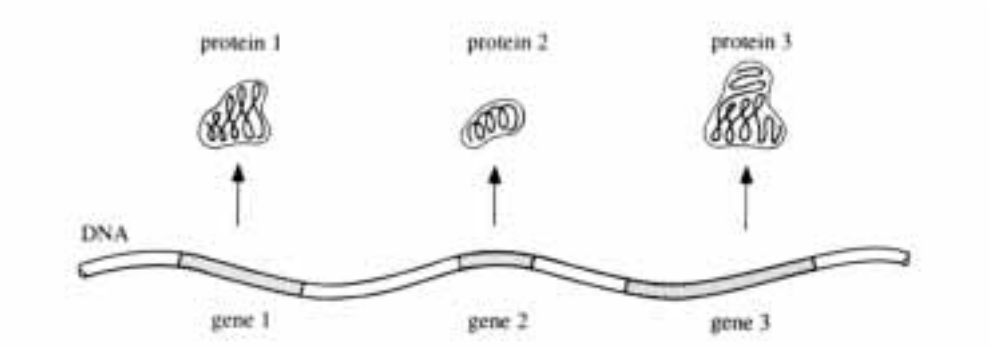
when a cell divides, each daughter cell receives an exact copy of its DNA including those intronic (non-coded) portions that are repressed, dormant, and silent (Jacob & Monod, 1993). Unlimited copies of a DNA macromolecule can be fashioned due to DNA's double helix (two chain) organization and through the secretion of polymerase.

As will be detailed below, each strand of DNA is made up of nucleotides: Adenine (A), Thymine (T), Cytosine (C), and Guanine (G), which are linked together. When these two strands unwind and polymerase is secreted, a complementary strand is produced. Just as a sculptor may use a cast in order to mold identical forms, one half of the helix acts as a mold, or template, to which is fitted its mirror image (reviewed in Calladine & Drew, 1992; Strachan & Read, 1996; Watson et al. 1992). Hence, DNA is capable of replicating itself. DNA is also capable of inducing its own metamorphosis.

CHROMOSOMAL DNA

DNA (deoxyribonucleic acid) macromolecules (genes) comprise and are located along and are entwined within the chromosomes. Chromosomes are visible under a microscope and consist of long entangled nucleotide threads. Depending on species thousand of genes may be enmeshed within a single chromosome.

Most bacteria (and other prokaryotes) have a single circular chromosome. Eukaryotic (nucle-



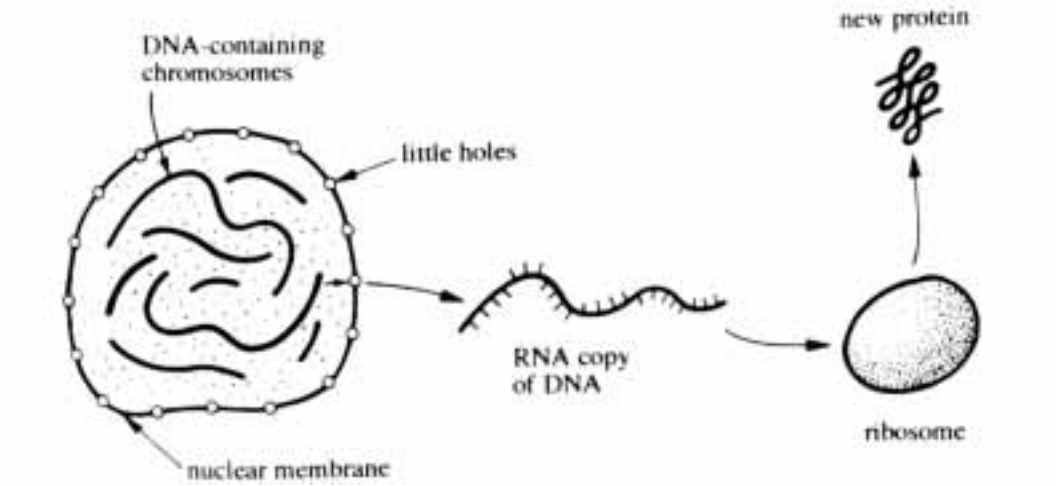


Figure 17. *DNA codes for proteins. Twenty different kinds of amino acids can make all proteins, and any series of three nucleotide base pairs can create an amino acid. Reprinted from Calladin & Drew, 1992, Understanding DNA. Academic Press, San*

Figure 18. *Any series of three nucleotide base pairs can create an amino acid which in turn codes for all necessary proteins. Reprinted from Calladin & Drew, 1992, Understanding DNA. Academic Press, San Diego.*

ated) cells usually contain several large, linear shaped chromosomes. Humans, for example, contain 23 pairs of chromosomes: 22 different autosomes and two sex chromosomes. Multicellular life forms may contain two, four, eight, or 30 or more chromosomes etc. (Strachan & Read, 1996; Watson et al. 1992). However, generally, as the complexity of the species increases so does the size of its genome, though there are exceptions (Miklos & Rubin, 1996). The cell of a lily, for example, has 30 times the DNA of a typical human cell, though the vast majority of these DNA macromolecules are repressed (Jacob & Monod, 1993) or perform functions which are as yet not apparent.

Human chromosomes vary in size and DNA content, and are numbered in ascending order as they decrease in size. Thus chromosome 1, is larger than chromosome 2.

Not all chromosomes contain the same number of genes (DNA macromolecules). Gene density differs among the chromosomes, with some chromosomes being gene rich, and others gene poor (Antequera & Bird, 1993. Craig & Bickmore, 1994). For example, the male, Y-sex chromosome is gene-poor, whereas the X-sex chromosome is gene rich. Similarly, chromosome 22 is gene rich, whereas human chromosome 21 is gene poor.

The maxim that only life produces life, and only DNA produces DNA, also holds for the various chromosomes. As noted, each human has 23 pairs of chromosomes, half of which have been passed on by the mother, the other by the father. After cell division (such as following fertilization), or when the maternal and paternal chromosomes are matched together, the genes (and their long chains of nucleotides) are paired up and compete for rival positions along and within the chromosomes. When genetic dominance is established, certain traits (e.g. brown eyes vs blue) prevail.

Every single chromosome, therefore, contains paternal and maternal genes. Via the interaction and competition of these different genes and their long chains of base pair nucleotides (the helix), billions of complex codes can be combined and differentially expressed. This is because different gene combinations will give rise to different codes within the same organism, which can be passed on to subsequent generations (Calladine & Drew, 1992; Strachan & Read, 1996; Watson et al. 1992).

These changes in genetic chromosomal organization can produce variations between and within species (including siblings). However, in part, these alterations are also responsible for inducing diversity as well as the creation of “new” species; that is, when formerly “silent” genes (introns) or “silent” gene combinations or nucleotide sequences are activated, shuffled, and so on (e.g., Finnegan, 1989; Moran et al., 1999; Rueter et al., 1999).

Chromosomes are constantly shuffled as they are passed from parent to child, thereby giving rise to different gene combinations each generation (thereby producing variability and individual differences between brothers and sisters). Hence, parents and children, and brothers and sisters share genes - which are faithfully reproduced during cell division (and leap from body to body via sexual intercourse and fertilization). And yet, although siblings, for example, share genes, they do not share the same

Figure 19. *(A) Depiction of the double-stranded antiparallel helix structure of DNA. (B) Depiction of the double helix with base pairs. Reprinted from Strachan & Read, 1996, Human Molecular Genetics. Wiley, New York.*

Figure 20. *Molecular organization of A,T,G,C, base pairs. A-T base pairs have two connecting hydrogen bonds and G-C have three connecting hydrogen bonds. All bonds require oxygen. Reprinted from Calladin & Drew, 1992, Understanding DNA. Academic Press, San Diego.*

identical chromosomes. Inherited chromosomes contain different gene combinations and thus slight variations in the genetic code.

Chromosomes, therefore, have a short, individual lifetime. By contrast, an individual gene (DNA macromolecule) may live forever -that is, if it is faithfully reproduced and successfully passed on to subsequent generations. Most modern genes may have a history that may extend interminably into the long ago (e.g., D'Souza et al. 1995; Garcia-Fernandex & Holland, 1994; Miklos & Rubin, 1996; Ruddle, et al. 1994; Strachan & Read, 1996; Tautz, 1998; Watson et al., 1992).

DNA NUCLEOTIDES: INFORMATION BEARING MOLECULES

The simplest cells, that is, single celled organisms, may contain as many as 6000 genes (which may be located along and within a single chromosome). By contrast, the more complex human nuclear genome consists of anywhere from 30,000 to 40,000 genes—97% of which are "silent" and have not been expressed (IHGSC, 2001), and/or which come to be expressed only in reaction to changing environmental conditions (de Jong & Scharloo, 1976; Dykhuizen & Hart, 1980; Gibson & Hogness, 1996; Polaczyk et al., 1998; Rutherford & Lindquist, 1998; Wade et al., 1997).

As noted, each DNA macromolecule (i.e. the gene) is comprised of two long strands of micromolecules, the nucleotides, the organization of which provides the instructions for creating a living organism. All DNA molecules consist of four nitrogenous bases, two pyrimidines and two purines; i.e., Adenine (A), Thymine (T), Cytosine (C), and Guanine (G). These micromolecules are linked in a linear, sequential fashion, and the sequences of nucleotides on one strand are complimentary to those of the other strand thereby forming two double stranded chains (the double helix).

For example, one strand may consist of the nucleotides CTGA... and the other GACT.... These two strands of nucleotides are linked and held together by weak electrostatic hydrogen bonds, thereby forming two complementary strands of "base pairs" (e.g. C-G, T-A, G-C, A-T, etc.). These strands are laddered together (via two sugar-phosphate backbones) thereby creating a long twisting spiral, the double helix— a double helix whose "backbone" includes oxygen and phosphorus which were not available for DNA assembly on the young Earth, as these elements were tightly bound in minerals.

The double helix, therefore consists of two nucleotide chains consisting of base pairs. These chains of micromolecules could be likened to tiny billiard balls attached, in sequence, to a long thread. Each gene, therefore, contains two spiraling "threads" of "billiard balls" which are laddered together thereby forming long sequences of base pairs.

The human genome, containing approximately 30,000 genes, consists of around 3 billion (or more) nucleotide base pairs. However, even the genomes of the simplest of single celled creatures are incredibly complex (Miklos & Rubin, 1996). A single DNA molecule with over 4 million base pairs has been identified in Escherichia coli (E. coli), and the total DNA of a simple, single celled creature

Figure 66. *Schematic illustration of cell and nucleus containing chromosomes. Chromosomes come in homologous pairs. Reprinted from Calladin & Drew, 1992, Understanding DNA. Academic Press, San Diego.*

Figure 21. *Chromosomes from the salivary gland of a fruit fly. Courtesy of Ron Hill an dMargaret Mott. Reprinted from Calladin & Drew, 1992, Understanding DNA. Academic Press, San Diego. (Bottom) Human ovum. 2-human chromosomes.*

may contain over 30 million base pairs.

Given the incredible complexity of a single DNA molecule, and the obvious chemical complexity of those creatures who appeared on Earth 3.8 billion years ago, it is thus rather incredible to posit that these creatures and their DNA, or for that matter, any strand of DNA, may have been spontaneously generated. Again, there is no other source for DNA other than DNA (Strachan & Read, 1996; Watson et al. 1992), and that holds true for the first DNA to arise on this planet. The maxim that "only life begets life" also applies to DNA. Only DNA begets DNA.

INTRONS AND RNA SPLICING

RNA is usually single stranded and employs uracil rather than thymine. The RNA backbone also differs significantly from that of DNA as it lacks oxygen and employs ribose (rather than deoxyribose). RNA is also constructed by DNA but never constructs DNA. There are different types of RNA which differ depending on their function (e.g. Rueter et al., 1999). Broadly considered these include messenger RNA (mRNA), transfer RNA (tRNA), and ribosomal RNA (rRNA), which act in sequence to code and express the information contained in specific DNA sequence segments.

Each double strand of DNA is divided up into specific information-bearing sequence segments of base pairs (exons) which are separated by non-coding sequence segments, i.e. protein coated

introns. mRNA acts to code and make copies of specific DNA nucleotide (exonic) sequence segments which in turn specify what type of protein should be produced (Rueter et al., 1999).

There are tens of millions of coded (exonic) and repressed (non-coding/intronic) nucleotide sequence segments (reviewed in Strachan & Read, 1996; Watson et al. 1992). However, a single sequence segment may consists of only three adjacent nucleotides, e.g. CCG (referred to as a "codon"), or it may consist of thousands of nucleotides (CCGGTCGATT...). Moreover, each sequence which is to be coded may be separated from the next coding sequence by sequences of non-coding intronic base pairs.

Considered broadly, introns as well as exons act to signal the exact sequence and segment length of exonic nucleotides which are to be copied and transcribed by RNA (Breathnach et al. 1978; Watson et al., 1996). Because introns are protein coated, and as proteins are not easily accessed or recognized by RNA, due to the depth and configurational organization of its nucleotide framework (Draper, 1995), introns, therefore indicate where each particular segment sequence and its code begins and ends, and thus informs mRNA where coding sequences end and begin, thereby indicating which portions of each segment it should copy (Belfort, 1991, 1993; Breathnach et al. 1978; Watson et al. 1992; Witkowski, 1988). RNA, therefore, plays a major role in copying, editing, and then splicing together coded segments (Rueter et al., 1999).

Initially, however, mRNA acts to copy both exonic and intronic base pairs. Nevertheless, after transcription, copies of the introns, for the most part, tend to be snipped out of the RNA template (Rueter et al., 1999). Once snipped out, they are seemingly discarded, leaving only disjointed segments of exons in the grasp of the RNA molecule. In some cases, however, these snipped out intronic portions may become incorporated into new genomic locations by retrotransposition (Finnegan, 1989; Moran et al., 1999) or they transfer out of the nucleus into the cytoplasm, becoming a plasmid in the process—a plasmid which may become incorporated into the genome of another organism.

In any case, the remaining exonic sequential fragments are then spliced and joined together; referred to as RNA splicing (Rueter et al., 1999). The tRNA then transports these spliced segments outside the nucleus, into the cytoplasm, where they combine with the ribosomes and rRNA in order to begin producing proteins and enzymes.

Hence, in summary, tRNA translates (or reads) the exonic information coded by mRNA. Ribosomes and rRNA are then employed for the purposes of constructing those proteins specified by the

Figure 22. *Mitosis. Reprinted from Strachan & Read, 1996, Human Molecular Genetics. Wiley, New York. Salmonella undergoing division.*

DNA sequence segment coded by mRNA. It is important to note, as will become evident below, that ribosomes and rRNA are not synonymous. Ribosomes are composed of protein products specified by DNA.

A MULTIPLICITY OF CODES

Each DNA macromolecule consists of two complementary chains of base pairs (C-G-T-A-G-C-//G-C-A-T-C-G- etc...) which are joined together to form a double helix. However, it is the sequence in which these nucleotides are organized and thus the manner in which the base pairs are arranged, which contains the instructions for creating specific proteins and conveying specific messages. This includes the plans for creating, building and maintaining a complex body and/or its component parts.

As each chain of nucleotides is divided into numerous sequence segments, and as these nucleotides, and in fact entire genes, have the capacity to shift position, a variety of codes are possible (Drake, 1991; John & Miklos, 1988; Moran et al., 1999; Symmonds, 1991). That is, just as moving the numeral "3" from its position in a sequence of numbers, from 123 to 312 results in the creation of a completely new product, and just as increasing a sequence from 123 to 1234 results in a different product (due to a "frame shift). Therefore, if one base pair moves to a different position, or if an intron or exon moves to a different position thus lengthening or shortening the coding sequence, this results in the creation of a new code and can give rise to the creation of a new gene (Finnegan, 1989; Moran et al., 1999).

Hence, genetic information, instructions, plans and memories are coded, stored in, and represented by the complex micro-molecular patterns and linear sequences in which the individual base pairs are arranged and separated (Drake, 1991; John & Miklos, 1988; Symmonds, 1991). As this organization is not static, a variety of codes and a variety of products may be produced (Moran et al., 1999).

Moreover, as the majority of sequence segments are silent, and as they may become activated, each gene retains the potential capacity to generate an incredible variety of products including those which may be triggered by changes in climatic, atmospheric, and thus environmental conditions (de Jong & Scharloo, 1976; Dykhuizen & Hart, 1980; Gibson & Hogness, 1996; Polaczyk et al., 1998; Rutherford & Lindquist, 1998; Wade et al., 1997), —as the environment acts on gene selection (Drake, 1991; Symmonds, 1991).

For example, although protein coated and seemingly silenced (Jacob & Monod, 1993), introns not only assist in the regulation of exonic activation, but may well serve as possible depositories of ancestral genetic memories which in turn may be reproduced and reactivated through the intronic generation of genes within genes (Joseph, 1997). Moreover, introns strive to break free of their protein prison. Once free of these repressive restraints, non-coding "silent" genes and intronic nucleotides may be activated by RNA and coded, and/or they can suddenly leap to a different position and undergo transformation into an exon and come to be expressed (Finnegan, 1989; Dibb & Newman, 1989; Drake, 1991; John & Miklos, 1988; Kuhsel, et al. 1990; Symmonds, 1991).

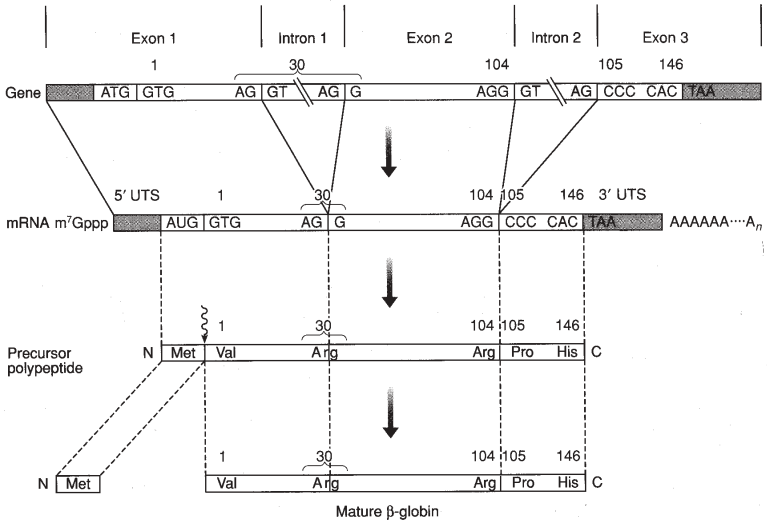


Figure 23 *Introns and RNA splicing. From Strachan & Read, 1996. Human Molecular Genetics, Wiley.*

Summary

In summary, each gene contains hundreds to thousands to millions of individual base pair nucleotide sequences which differ from that of other genes (though duplicates abound) and the vast majority of these segments are "silent" and are not coded or expressed. Each and every individual gene (including those within the same chromosomes), contain identical as well as different sequence segments of nucleotides, and thus different codes for performing a variety of different activities and duplicate (albeit silent) codes which can generate the same products. They also consist of intronic sequences which code for products which have yet to be produced, or which are produced in reaction to changing environment conditions, (e.g., de Jong & Scharloo, 1976; Dykhuizen & Hart, 1980;

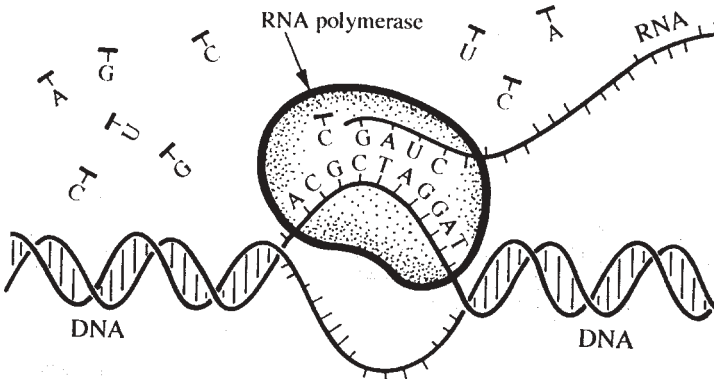


Figure 24. *Schematic depiction of a single strand of RNA being created along one of the strands of DNA which acts as a template creating its mirror image in accordance with Watson-Crick pairing rules; e.g. G=C, C=G, T=A, etc. Reprinted from Calladin & Drew, 1992, Understanding DNA. Academic Press, San Diego.*

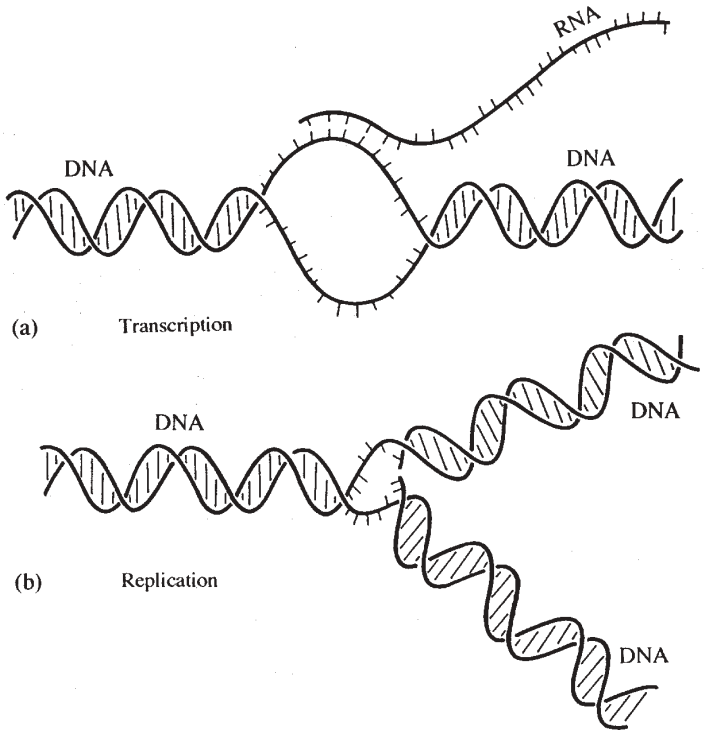


Figure 25. *Schematic depiction of transcription and replication of DNA. The DNA must untwist to allow one strand of DNA to serve as a template for the creation of RNA (A) or for the synthesis of a new strand of DNA (B). Reprinted from Calladin & Drew, 1992, Understanding DNA. Academic Press, San Diego.*

Gibson & Hogness, 1996; Polaczyk et al., 1998; Rutherford & Lindquist, 1998; Wade et al., 1997), and/or which are no longer produced having served their purpose in previous generations of species.

Each individual sequence of nucleotides, once activated, transcribed, and transferred by RNA to the ribosomes, results in the production of certain proteins, cell types, and so on. Therefore, activation of different sequence segments within a single gene, or activation of a shorter or longer version of the same sequence (i.e. such that additional nucleotides are expressed), or a shift in the position and location of even a single pair of nucleotides, can result in the production of wholly new genes (e.g., Moran et al., 1999) or different structures (John & Miklos, 1988); e.g. a muscle cell versus a motor neuron.

Again, although containing a truly mind boggling combination of codes and potential codes, only a fraction of DNA is actually coded and expressed. In fact, only 3% to 10% of all genes (exons) are activated on average (depending on species), as the vast majority of each gene, and the vast majority of genes remain "silent" and seemingly suppressed (Miklos & Rubin, 1996; Strachan & Read, 1996; Watson et al. 1992). Of the 40,000 to 30,000 genes found in human cells, only about 3% of the genome is actually coded and expressed, the rest remaining seemingly "silent," the information they contain unknown.

OF CLAY AND DNA

The incredible complexity of a single macromolecule of DNA, and the fact that only living cells beget living cells, and only DNA produces DNA, poses a dilemma for those advocating spontaneous or gradual generation theories of life. How could an incredibly complex DNA-macromolecule be created and produced on Earth, in the absence of DNA or its essential elements, including oxygen and phosphorus?

Several scenarios have been proposed, including the possibility that due to the missing DNA-ingredients, RNA-precursors or even clay may have become transformed over eons of time, thus producing this ultimate information bearing self-replicating macromolecule. For example, like God's first man, it has been proposed that the first DNA macromolecule was created from the clay of the earth (Desmond, 1993).

It has been determined that clay has two incredible capabilities. Clay is capable of storing information and engaging in energy transfer. Moreover, certain clay-crystals (like many crystals, including "DNA crystals," Winfree et al., 1998) can reproduce themselves. Microcrystalline clays

Figure 26. *Schematic depiction of RNA-splicing. RNA-splicing involves removal of non-coding intronic segments and splicing exonic segments back together. Reprinted from Strachan & Read, 1996, Human Molecular Genetics. Wiley, New York.*

(montomorillonite) when manipulated by an experimenter, can facilitate the assembly of RNA fragments if first provided with all the necessary and suitably prepared nucleotides. Hence, clay can store and generate information as well as act as a catalyst.

Given these life-like attributes, it has been argued that during primordial times, clays may have stored up radioactive and photopic energy, including energy from lightning strikes. Later, under moist conditions, this activated-clay acquired the ability to process inorganic compounds in order to create complex molecules, including RNA and DNA and its storehouse of information bearing micromolecules. However, there is no evidence that RNA or DNA can be generated from clay.

THE RNA WORLD

The genetic instructions for the creation of any and all living creatures is contained within DNA. For these instructions to be acted upon, however, generally requires an RNA intermediary. Specifically, RNA consists of a single thread of thousands of nucleotides and is manufactured as a single strand which is formed by only one half of the DNA helix. One of the two DNA strands forms a complementary chain of RNA. RNA, therefore, is derived from DNA and serves as a copy of the activated (coded) DNA which contain the genetic instructions for manufacturing various proteins. However, RNA differs from DNA as it is single stranded, employs uracil rather than thymine, and its "backbone" consists of ribose rather than deoxyribose.

Once this information is copied, thus creating mRNA (messenger RNA), tRNA (transfer RNA) molecules detach from their DNA template and are dispatched on a cytoplasmic, intracellular journey where they search out, and bind with tiny micro-molecular enzyme manufacturing proteins referred to as ribosomes. Like greedy lovers the ribosomes and tRNA molecules embrace, thus forming rRNA (ribosomal RNA) which acts to code and express the information contained in copied DNA sequence segments.

Once these instructions are decoded, specific proteins and enzymes are produced in accordance with the original DNA derived sources of genetic information. RNA, therefore, transfers these DNA-based instructions to the ribosomes so that they may be acted on thus producing the proteins necessary for building any and every body part, including multiple body parts or extensions of body parts thus inducing growth or change.

As there is absolutely no evidence to support the notion that DNA spontaneously or gradually arose from the muck of the Earth, some of those who embrace spontaneous/gradual generation have instead theorized that RNA may have been the first information bearing molecule to arise on this planet (Gilbert, 1986; Gesteland, 1993; Woodward et al., 1998). That is, life first arose in an RNA World.

In the hypothesized RNA-world, RNA creates DNA. In the real world, however, rather than RNA producing DNA, DNA serves as the template for RNA construction, and secretes and manufactures a variety of compounds (e.g. ATP, UTP, GTP, CTP) as RNA precursors. DNA specifies and provides the instructions for the synthesis of RNA and no RNA molecule can arise without these DNA-derived protein enzymes.

Some of those who believe in an RNA-world, however, reverse this process, and in so doing have had to reverse Crick's "Central Dogma," i.e. that information flows only in one direction, from nucleic acids to proteins (reviewed in Gesteland, 1993). In some RNA-world scenarios, DNA is dispensed with altogether and information changes course and flows from proteins to nucleic acids; a hypothesized function of the unusual chemical conditions that presumably characterized the early Earth. This latter scenario, however, is unable to account for the existence of these initial proteins.

In yet other "RNA-world" scenarios, DNA is also dispensed with (at least initially) and this initial, hypothetical RNA molecule fashions the proteins which are responsible for the creation of RNA. More specifically, in an "RNA world" rather than RNA being a product of DNA, this process is reversed, and a particular kind of ribosomal RNA acquires catalytic properties and begins producing proteins, and in so doing, eventually creates the first DNA (Gilbert, 1986; reviewed in Gesteland, 1993). Because DNA is a superior catalyst, these special ribosomal RNA then became subservient to these DNA molecules, and forever after have acted to code and transcribe DNA messages. Thus all subsequent life forms owe their existence to this primeval ribosomal-like RNA molecule.

As summarized by Robertson and Ellington (1998, p. 223), "Looking backwards from a contemporary vantage point, it seems that the RNA components of modern ribosomes, the cell's protein-synthesizing machinery, may itself be a ribozyme and thus a remnant of an RNA world. Looking forwards from origins, it is plausible that chemically simple, nucleic-acid or non-nucleic acid replicators gave rise to the raw material that became the RNA world."

This interesting scenario, however, does not appear to be tenable. RNA molecules are not alive, are exceedingly unstable, and cannot catalyze their own replication. Unlike DNA which can reproduce and give birth to itself -thereby creating genetic offspring- this is not a trait associated with RNA. Viruses, whose genomes consist of RNA are completely incapable of self-replication but instead must invade the genome of a host and literally hijack its DNA in order to reproduce.

In addition, although Bartel and Unrau report that they created "artificial ribozymes" capable of manufacturing one of the RNA bases, they in fact mixed trillions of organic molecules in a chemical solution, chose promising specimens, and then repeated the process again and again before creating an "artificial" ribozyme. What this means is that although an experimenter can experimentally mix and combine and chose certain organic substances so as to arrive at a carefully planned result, that the resulting, artificial molecule, nevertheless failed to create an RNA molecule.

Moreover, RNA is not easily accessed or recognized by proteins due to the depth and configurational organization of its nucleotide framework (Draper, 1995). Hence, it does not seem likely that even in an RNA-world that RNA would be able to generate the proteins and enzymes responsible for the creation of RNA or DNA.

It is noteworthy, however, that a specific type of RNA, ribozymes of which there are several subtypes (Herschlag, 1998) can be experimentally manipulated in a test tube or petri dish in order to engage in catalytic activities (Cech, 1986; Lamond & Gibson, 1990; Unrau & Bartel, 1998), including, with a little technical assistance, self-reproduction (Joyce & Wright, 1999). Moreover, Joyce and Wright (1999) reported that following several experimentally induced replications, "mutations" began to accumulate, which improved the likelihood of additional replications.

Since ribozymes can be experimentally manipulated in a test tube in order to promote their own replication, and as they can act as a catalyst and can bind other molecules, these findings have been viewed as supporting the possibility of an RNA-world (Robertson & Ellington, 1998). Hence, via the assistance of ribozymes, it is theorized that RNA fashioned the proteins which gave rise to the first molecules of RNA, even though, on the early Earth, there was a scarcity of the necessary nucleotides that constitute RNA.

In order to solve the problem of the missing RNA nucleotides, Unrau and Bartel (1998), have presented evidence to support the argument that "RNA-based life must therefore have acquired the ability to synthesize RNA nucleotides from simpler and more readily available precursors, such as sugars and bases." Specifically, Unrau and Bartel (1998) found that if RNA molecules are extracted and isolated, that they can be experimentally manipulated to catalyze the synthesis of a pyramidine nucleotide. According to Unrau and Bartel (1998, p. 260), "the finding that RNA can catalyze this type of reaction... supports the idea of an RNA world that included nucleotide synthesis and other metabolic pathways mediated by ribozymes."

Of course, pyramidine is only one of the building blocks of RNA, and the RNA they employed to induce these reactions was experimentally manipulated and modified. If similar events occurred early in the history of the Earth, one might have to postulate the helpful assistance of the hand of god—or perhaps a well funded and equipped experimenter with a test tube. Moreover, these and similar arguments rests upon the notion that a ribo-organism and thus RNA-based life existed on the early Earth; a proposition for which there is absolutely no evidence (Robertson & Ellington 1998). Moreover, even assuming that there existed RNA-based life, it not only had to have acquired catalytic abilities, but had to couple the nucleotides it created with sugars and sugar-phosphates so as to create a stable RNA-molecule. Moreover, as there were apparently no free-phosphates available, this RNA-based life had to either create phosphate where there was none, or extract it from minerals. And, most importantly, the theory of an RNA-world is rather circular in its reasoning, as it presumes the existence of an RNA-based life form that creates, with the assistance of ribozymes, RNA nucleotides, which RNA with the assistance of ribozymes, catalyzes to create RNA.

On the other hand, since the Miller-Urey-Calvin (and like-minded) experiments have generated some isolated RNA elements, this has led to the argument that early in the history of the Earth, the building blocks of RNA could have been fashioned, and these may have been randomly combined with fragments of RNA which rained down from the sky, thus creating the first step toward a ribo/RNA organism which spontaneously self-assembled.

For example, it has been demonstrated that if RNA-viral proteins are experimentally separated and then placed in a organic and chemical bath, these individual viral protein components and elements will spontaneously aggregate, recombine and will form a complete viral organism with wholly intact infective properties (Fraenkel-Conrat & Williams, 1955). However, these viral-RNAs still re-

quire the DNA of a host organism in order to replicate, as well as the active hand of an experimenter in order to extract, isolate, and then bathe them together in a controlled chemical environment which has been purposefully manipulated.

Hence, even if a single RNA molecule did appear on Earth, for example, if it fell from the sky after being manufactured in a cosmic molecular cloud, it could not have engaged in self-replication as the necessary ingredients were nowhere to be found and as it would still require the DNA of a host organism in order to replicate.

As per the problems of self-replication and protein creation, some have argued that the first RNA molecule to appear on Earth (secondary to spontaneous/gradual generation) miraculously reproduced itself by somehow folding together in such a manner that identical base pairs became matched together (e.g. de Duve, 1995). This encircled RNA molecule then broke in half, or chopped itself into two identical copies. This self-mutilating RNA then began to replicate the severed segments thereby creating copies of itself. Of course, a process such as this requires a catalyst, a guiding hand, and DNA-based genetic instructions. In fact, most types of RNA actually resist and are not amenable to becoming folded, the exceptions being Micro-RNAs and small interfering RNAs which consist of flexible structural parts. Because small RNA molecules can be folded, their existence has been argued as supporting the RNA-world hypothesis for the origin of life. However, micro-RNAs and small interfering RNAs do not perform catalytic reactions, but instead act on other types of RNA, including messenger RNA.

Micro-RNAs and small interfering RNAs, are a major controller of cellular function and also influence gene "expression." For example, these two classes of small genes have been shown to serve as molecular mechanisms controlling genes that are required for cells to turn into a lung, liver,brain or other structure. In plants, micro RNA acts on messenger RNA by literally cutting it in half, whereas in animals micro RNAs attach to target messenger RNAs and prevent translation into proteins. Small RNAs control how whole chromosomes, or regions of chromosomes, are activated or deactivated. Micro-RNAs and small interfering RNAs maywell play a significant role in evolutionary metamorphosis.

In summary, the theory of an RNA world, and the meager evidence which has been marshaled in support, fails to explain the origins of RNA, or ribozymes, or DNA, except through circular reasoning and through the creation of a theoretical chemical world—a theoretical world for which no evidence exists. Although numerous laboratories have attempted to prove otherwise, and although there has been some success in experimentally manipulating RNA and ribozymes so as to engage in catalytic and synthesizing activity, RNA cannot generate or make copies of itself (that is, without experimental assistance) and it cannot generate DNA. Only DNA produces DNA, and those cells (such as RNA equipped viruses) which are devoid of DNA are incapable of reproducing except via a DNA intermediary.

RNA-VIRAL WORLDS

VIRUSES

Although the possibility of a life-creating RNA-world seems rather unlikely, some of the scenarios briefly mentioned above may well account for the creation of the first viral "organisms" (Joseph, 1997, 2000). Viral "organisms"are not truly organisms as they are not alive.

Viruses generally differ greatly in size (from 10 to 300 nanometers), but are much smaller than single celled organisms including bacteria, approximating, in girth, a single protein or macromolecule (reviewed in Kuby, 1994). Viruses generally consist of a core of nucleic acid which is surrounded by cytoplasm containing lipids and carbohydrates, which are stabilized by a thick protein coat or lipid membrane. Almost all viruses store their genetic information in either a single or double strand of RNA with only a relatively few viral strains having acquired a single strand of DNA.

The viral genome is incredibly complex. In some cases, up to four genes are involved in regulating viral gene expression and protein synthesis. Nevertheless, although viruses have an RNA- and sometimes a DNA-genome, they share few of the metabolic and reproductive properties characteristic of animals, plants, or bacteria. Viruses behave more like a crystalline, or protein compound than a true living creature. That is, viruses are not really alive but instead consist of metabolically inert nucleoprotein particles that are in all respects lifeless. Viruses remain inert and lifeless until they come into contact with living cellular tissue, at which point they become mobile and invade and infect the host cell, sometimes inserting their own unique genetic messages into the DNA of their host (reviewed in Kuby, 1994).

Given the structure and organization of viral particles and their RNA-genome it is not incon-

deed, these globe trotting viral organisms may have contributed to the exchange and sharing of genetic/DNA memories not only between different host organisms, but between creatures living on wholly different planets thus promoting evolutionary metamorphosis (Joseph, 1997).

In summary, if we accept the premise of an RNA-world, it would appear that at best the end result would be the formation of an imperfectly created RNA molecule. However, these RNA-entities, like viral organisms, could not have given rise to DNA, and would have been unable to replicate without the assistance of various DNA-based life forms (such as a human experimenter). However, as to the young Earth, these DNA-based life forms must have first "evolved" on other planets, or were the product of intelligent design (or both).

As only DNA begets DNA and as the young Earth was devoid of this essential ingredient, we must conclude that the first DNA to appear on this world, was either astrobiological in origin, and/or it was created by a highly intelligent life form.

CREATION SCIENCE

Although the heavens are swirling with the constituent elements and complex organic molecules necessary for life, the various "organic soup" theories cannot account for the creation of DNA and its complex life and cellular generating genetic instructions—at least on Earth. These theories have utterly failed to provide an explanation for the creation and emergence of DNA. As DNA is the foundation for cellular life, the organic soup/thermal vent, RNA-World theories therefore cannot explain the origin of Earthly-life. No matter which spontaneous generation or organic soup scenario we choose, the fact remains that on Earth, the purported "organic" alphabet "soup" was actually a thin broth missing three important letters: DNA.

There are thus two remaining possibilities for the emergence of life on Earth: Creation Science and astrobiological contamination/infection theory. However, Creation Science and Astrobiology, are not incompatible. Indeed, those who first formulated the theory of "creation science" some 6,000 or more years ago, also believed that life did not originate on this planet, but rained down from the heavens, perhaps encased in all manner of extraterrestrial debris. They also believed that these "seeds of life" gave rise to the gods.

THE SUMERIAN CREATION "MYTHS"

Modern day "Creation Science" is rooted in the story of Genesis which in turn appears to be a retelling of the Sumerian tales of creation (Heidel, 1988; Kramer, 1991; Roux, 1992). Although different modern-day Biblical interpretations abound, at least some creation scientists have addressed the issue of the missing "DNA" (alluded to above) by attributing its manufacture to a Creator. This "creationist" view is compatible with the claim by Darwin (1859) that it was a "Creator" who first created and "breathed" life into living creatures, and that the emergence and evolution of life has unfolded in accordance "with what we know of the laws impressed on matter by the Creator" (Darwin, 1859).

There is now a convergence of opinion that the story of Genesis, as retold in the Hebrew and Christian Bible, bears a striking resemblance to the "creation myths" including the "flood myths" penned almost 6,000 years ago by the peoples of Sumer—which was located in what today is Iraq. These stories were still in fashion with the rise of the Babylonian state which had risen with the fall of Sumer (Roux, 1992). Abraham, the presumed patriarch of all modern day Jewish peoples, hailed from Ur of the Chaldees, which was originally a Sumerian city. In fact, a considerable proportion of the ancient Sumerian population consisted of Semitic peoples (Roux, 1992) and Abraham may well have been a prince of the city.

According to Roux (1992, p. 85), "For more than three thousand years the gods of Sumer were worshipped by Sumerians and Semites alike; and for more than three thousand years the religious ideas promoted by the Sumerians played an extraordinary part in the public and private life of the Mesopotamians, modeling their institutions, coloring their works of art and literature."

As succinctly put by the renowned Sumerian scholar, Samuel Noah Kramer (1991, p. 75), "There is good reason to infer that in the third millennium BC., there emerged a group of Sumerian thinkers and teachers who, in their quest for satisfactory answers to some of the problems raised by their cosmic speculations, evolved a cosmology and theology carrying such high intellectual conviction that their doctrines became the basic creed and dogma of much of the ancient Near East."

Following the destruction of the Temple, around 600 B.C. the Jews were exiled to Babylon, where and when, it is believed, the story of Genesis underwent extensive editing. Hence, it could be argued that the true authors of Genesis were the Sumerian peoples.

THE ANUNNAKI: GODS FROM ANOTHER PLANET

Our knowledge of ancient Sumer comes from a variety of ancient texts, including epic tales, hymns, poetry, proverbs, prayers and incantations. Some of these texts are written in ancient Sumerian, others are Akkadian and Babylonian copies that were found in the ruins of palaces and temple libraries.

The Sumerian account of "Genesis" is remarkably similar to the "creation myths" of ancient people throughout the world.

According to Sumerian theology, a pantheon of gods, human-like in form, but possessing extraordinary superhuman scientific powers and technological capability, took possession of the Earth in order to exploit this world for its resources.

These same gods, the Anunnaki, claimed credit for creating the Earth, the heavens and the stars—claims the Sumerians rejected. According to the Sumerians, these human-like "gods" were in turn ruled by laws and regulations that were promulgated and enforced by yet other gods who lived in different regions of the cosmos (Kramer, 1991). Different "gods" through agreements worked out between them and their various factions, were in charge of different regions of the cosmos and thus ruled over and exploited different worlds and those life forms which dwelled on the different planets. The Earth was but one of these exploited planets, and was ruled by a pantheon of human-like gods, the Anunnaki.

As based on his interpretation of ancient Sumerian cuneiform writing and glyphs, Kramer (1991) informs us that these gods formed and "functioned as an assembly with a king at its head, its most important groups consisting of seven gods... and fifty who were known as the great gods." The chief "god" who ruled over the Earth was Enlil who was exceedingly arrogant, exploitive, and brutal. The other chief gods included Ninhursag who was his wife, and Enki who was a scientist and the half-brother of Enlil.

The Sumerians did not view the Anunnaki as being spiritual-like beings, but similar to humans. They did not believe the Anunnaki had created the Earth, or life, for first and foremost of the Sumerian pantheon, was "An" (Anu in Egyptian, or Anum in Akkadian). "An" was the "eternal sea" of space, the creator of the gods, including the peoples of Earth.

With the exception of the mysterious heavenly life force, An, the Sumerians repeatedly acknowledged that Enlil, Enki and the others were not really "gods" but technologically advanced people who had come to the Earth from the heavens, from another planet, Nibiruo (Sitchin, 1990). Thus their names, the "Anunnaki" which means: "Those who came from Heaven to Earth."

According to the Sumerians, the "Anunnaki were space-traveling peoples who not only flew in spherical and winged air ships, but who, according to Sumerian calendars, first arrived on this planet almost 500,000 years ago (Sitchin, 1990) —at about the same time that a new breed of humanity, the first archaic Homo sapiens, emerged, the earliest remains being discovered in the Middle East.

Although in charge (king) of the Earth, Enlil was bound by rules and regulations dictated by yet other gods who dwelled in other regions of the cosmos, and he was required to carry out their instructions (Kramer, 1991). Apparently those instructions involved depleting the Earth of certain resources, which in turn required a huge work force.

A problem soon arose. The Anunnaki did not have enough workers.

One of the Anunnaki gods "Enki," was a master scientist who carried a staff upon which coiled the double helix of two entwined snakes. The snake was also his emblem. As for his double helix, there is an obvious similarity to modern depictions of DNA.

Enki performed experiments on these primitive human-like animals and other creatures, creating all manner of hybrid beasts—what today might be referred to as "transgenic animals." These creations included half-human animals who could entertain the gods, but which nevertheless remained unsuitable for working the fields or the mines.

These experiments are depicted in Sumerian glyphs in which Enki and his assistants, are shown dressed in aprons and holding flasks and other scientific instruments. Also depicted are the results of his hybrid experiments, e.g. bulls with human heads, animals with human limbs.

The ancient Sumerians state that archaic humans also lived on the Earth, but that they were so primitive and animal-like, that they could not serve as a work-force.

Enki, the priests of ancient Sumer claim, decided to solve the problem of an insufficient workforce by mixing the tissues of the gods with that of the primitive humans. Enki, the Anunnaki god, created the first modern woman and man.

"Man I will create. He shall be charged with the service of the gods that they might be at ease."

Enki, the double helix god of the snake, took the blood and tissues from the body of the gods and a primitive human, and mixed it in his flasks and then impregnated one of the female gods ("Eve"). This female god gave birth to an advanced, almost god-like Homo sapiens, who was essentially created in the image of the gods; a superior god-like human who could be instructed in the art of culture, science, medicine, and technology (Heidel, 1988; Kramer, 1991). These "men" were essentially formed in the image of the gods, in the image of the Anunnaki, and were thus part-god.

The Biblical account in Genesis echoes the Sumerian account: "And God said, Let us make man in our image, after our likeness. So God created man in his image, in the image of God created he him; male and female he created them."

Again the purpose of this creation was to fill a labor shortage. God-like human were created to be employed as forced labor, and they were endowed with intelligence so they could be instructed to tend the gardens and care for the live stock of the gods.

Likewise, as stated in Genesis, God created the first man to serve the gods as a laborer. "And the Lord God planted a garden eastward in Eden and there he put the man whom he had formed...The Lord God took the man and placed him in the garden of Eden to till it and tend it." Hence, according to Genesis (2:15), the entire purpose of the creation, was to create workers "to till and tend" the gardens and fields of the gods.

In addition to working as slave labor, the Anunnakis creation was given dominion over the lands, the beasts, including a ruling responsibility over the more primitive humans who had independently evolved on Earth. Thus the "gods" according to the Sumerians "lowered from heaven... the throne of kingship," and these specially created individuals were part god and part human and were expected to act as overseers as well as slave labor. According to the Sumerians Kings lists, the Anunnaki created these first god-kings, over 240,000 years ago (Roux, 1992).

"GOD" CREATES MAN & WOMAN IN THE IMAGE OF THE GODS

Biblical accounts of creation tell us that increasingly complex life forms emerged upon the planet, in a step-wise, "day to day" sequence, beginning with simple life forms, and then simple creatures, culminating, on day 6, with the creation of woman and man. This same progression is evident from the fossil record.

Genesis 1: "And God said, Let us make man in our image, after our likeness. So God created man in his own image, in the image of God created he him; male and female created he them. And God saw every thing that he had made, and, behold, it was very good. And the evening and the morning were the sixth day."

Genesis 2: "And on the seventh day God ended his work; and he rested on the seventh day from all his work which he had made. And every plant of the field before it was in the earth, and every herb of the field before it grew: and there was not a man to till the ground. And the LORD God formed man of the dust of the ground, and breathed into his nostrils the breath of life; and man became a living soul. And the LORD God planted a garden eastward in Eden; and there he put the man whom he had formed. And out of the ground made the LORD God to grow every tree that is pleasant to the sight, and good for food; the tree of life also in the midst of the garden, and the tree of knowledge of good and evil. And the LORD God took the man, and put him into the garden of Eden to tend it and to keep it...So the LORD God caused the man to fall into a deep sleep; and while he was sleeping, he took one of the man's ribs and closed up the place with flesh. Then the LORD God made a woman from the rib he had taken outof the man, and he brought her to the man."

Thus, after creating man and woman on the six day, on the seventh day, "God" rested —for even Gods grow weary. And then, after the seventh day, there is a second act of creation; i.e., the creation of a spiritually endowed man and woman by a "Lord God;" a "man" and a "woman" who were expected to tend the gardens and the livestock of the Gods; superior god-like men and women who also shared the Earth with the more inferior humans who were the remnants of the first natural progression that ended on day six.

Thus, as retold by Genesis there is a natural progression that starts with simple creatures and on the 6th day, involves the creation of woman and man by "God." However, after the 7th day, there is a second act of human creation by a "Lord God." This Lord God appears upon the scene after "God ended his work... and rested on the seventh day." And it is this Lord God (vs God) who is credited with creating modern woman and man--humans who differed from those created on the 6th day, in that they were fashioned in the image of the gods and possessed intelligence and a living soul.

Later, in the next chapter of Genesis, we are told that Cain, the son of Adam and Eve, feared

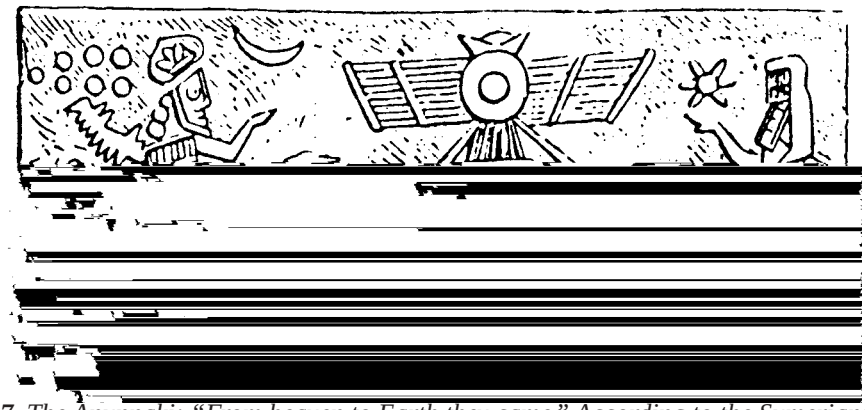


Figure 27. *The Anunnaki: "From heaven to Earth they came." According to the Sumerians, they came in space craft from another planet.*

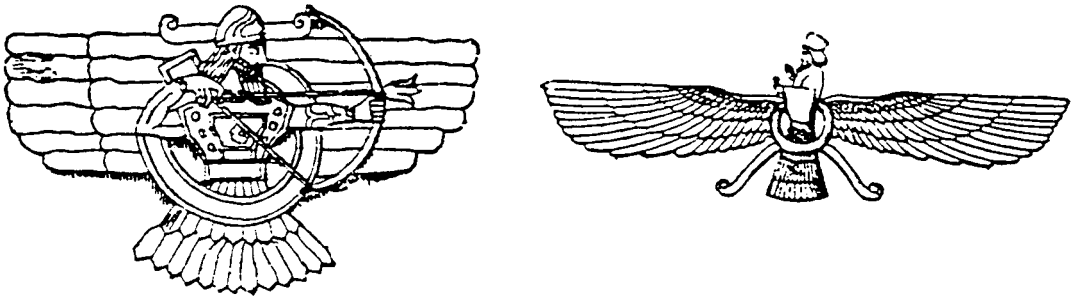


Figure 28. *Babylonian/Akkadian and Persian gods in their flying discs*

he might be killed by these other humans. The Lord God, however, assures Cain that he will not be killed, because he is different from the other humans. Cain has a "mark."

Thus we see that the man created after the seventh day differs from the man created on the sixth day, in two important respects. The man created on the sixth day, was created by "God," as part of a natural progression beginning with simple creatures. This first man, however, was unable "to till the land." The man fashioned after the seventh day, after "God" had rested, was created by the "LORD God" after all the natural sequential acts of creation had come to an end. And, this new man, created after the seventh day was able to till the gardens, and was provided with a "living soul."

As noted, according to Sumerian "mythology," the Earth was alive with all manner of beasts, including primitive humans who were little different than animals. The "gods" determined that the human-like animals that roamed the planet were unsuitable. In order to obtain a suitable work force, they called upon Enki whose emblem was the double helix.

Enki, the Anunnaki god of science and wisdom, fashioned humans that were created in the image of the gods and provided the spirit, the living soul of god. Enki's emblem was the sign of the double helix, and his symbol was that of two entwined snakes.

Enki, not only improved on the beast-like humans, but created a superior human which included women so beautiful that even the Anunnaki "gods" lusted for and desired them. In consequence, the Anunnaki had sex with these women and fathered innumerable children—and broke the laws formulated by the supreme lords of the universe.

We see the same story in Genesis:

"When men began to increase on earth and daughters were born to them, the divine beings saw how beautiful the daughters of men were and took wives from among those that pleased them... It was then, and later too, when the divine being cohabitated with the daughters of men, who bore them offspring. They were heroes of old, the men of renown," --Genesis 6.

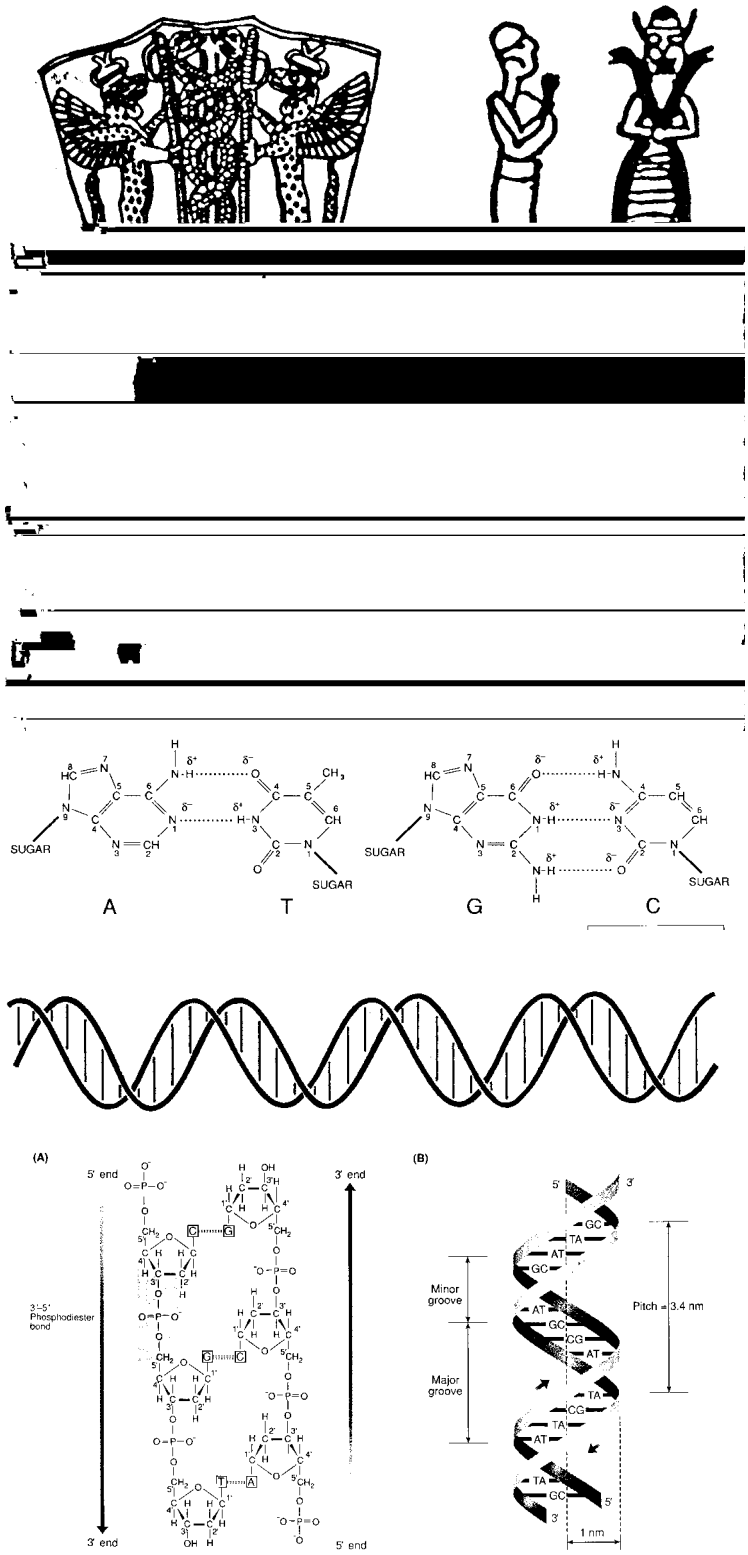


Figure 29. *(Top) The Anunnaki "god" Enki is associated with entwined serpents that form a double helix. Reprinted from Sitchin, 1990. Genesis Revisited. Avon, New York. (Below) The molecular and structural organization of DNA.*

Figure 30. *(Left) An Anunnaki goddess "Eve."According to Sumerian mythology, Enki (depicted as the serpent) created all manner of primitive workers which were part human and part animal. Enki's creations play music. Enki and an animal-human he created and which serves as his assistant. (Bottom) A stone bull with a human head. The "crown" upon its head indicates that the creature is of divine origin.*

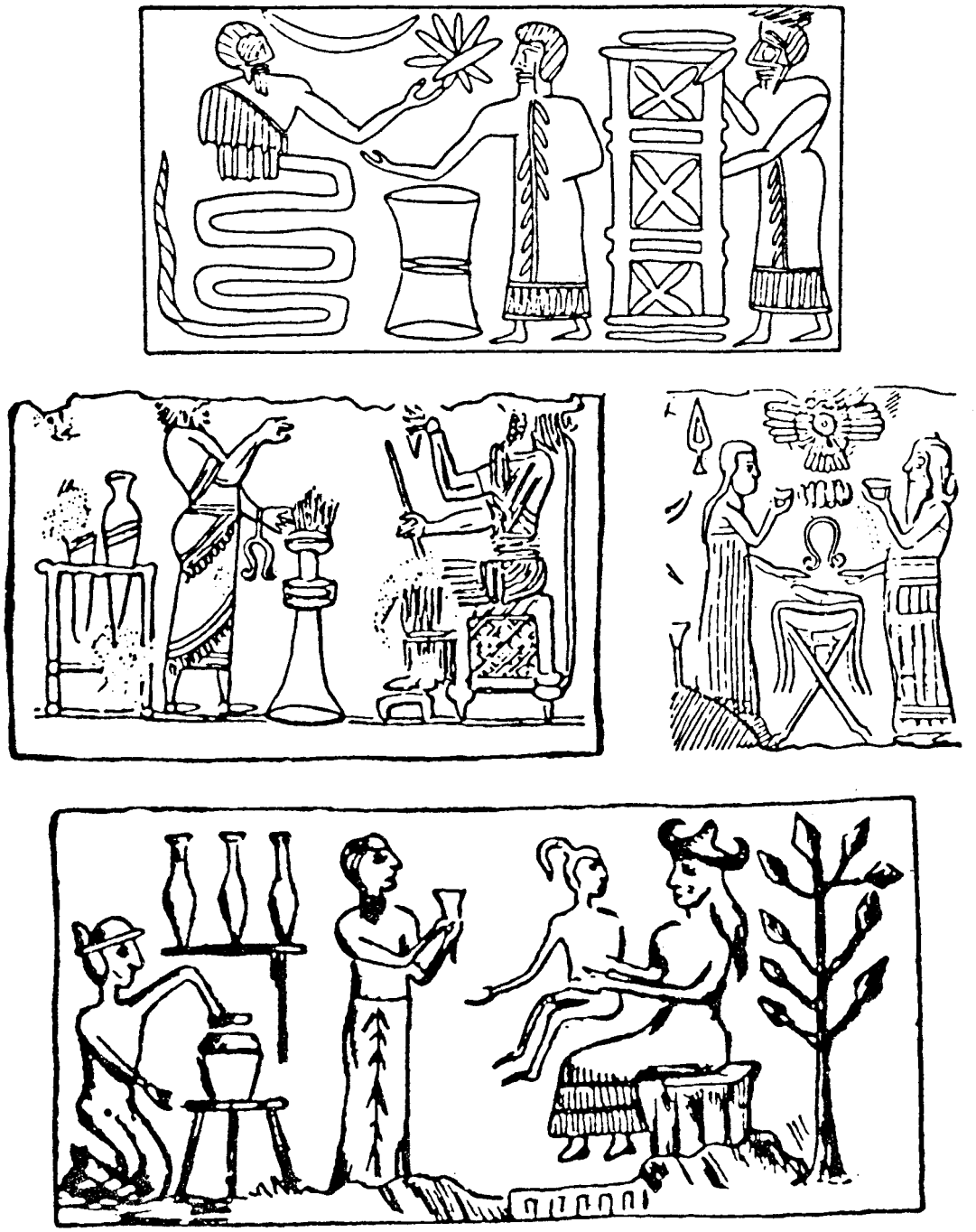


Figure 31. *The Anunnaki, Enki, is associated with the serpent and is described by the Sumerians as a master scientist.According to the Sumerian version of creation, the "new man" was created in a laboratory and placed into the womb of a goddess. According to Sumerian mythology, it is a goddess who serves as the "host" who gives birth to the "new man" that is created in the laboratory of Enki—a "new" man who is created in the image of the gods, and who possess wisdom. (top) Sumerian depiction of a laboratory experiments in which the solar disc hovers above. (middle) Sumerian depiction of a laboratory experiment in which a more advanced part-god, part-human is created. Note the laboratory flasks, and vat to the left and the stylized tree to the right behind the woman holding the new "man." (bottom) "Eve" and the "new man." Reprinted from Sitchin, 1976. The 12th Planet. Avon, New York.*

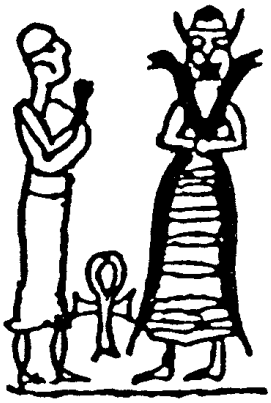


Figure 32. *The Anunnaki, serpent god, Enki*

Figure 33. *(Below) "The Fall of Man and the Expulsion from the Garden of Eden." Michelangelo. 1508.*

Figure 34*. From Ape to Adam, by Rudy Zallinger.*

Sumerian & Biblical Parallels

The first 25 verses of the first book of Moses (Genesis) repeats much of the creation saga, as told by the peoples of ancient Summer and Babylon, including, in verses 26-31, the story of the creation of "man" and "woman" as part of a natural progression beginning with simple creatures. Again, however, this first man and woman, created on the sixth day, were created by "God" as part of this natural progression.

According to the Biblical version of Genesis: "The Lord God formed a man of the dust of the ground and breathed into his nostril the breath of life; and man became a living soul. And the Lord God planted a garden, eastward in Eden; and there he put the man he had formed. And out of the

ground made the Lord God to grow every tree that is pleasant to sight and good for food" —for even Gods grow hungry. "But of the tree of knowledge," God warned, "thou shalt not eat."

According to the Biblical version, it is only after this warning that woman, "Eve" is created. And, we are told that Eve was beguiled by the wise serpent, and it is through Eve and the serpent that man acquired knowledge of good and evil.

The serpent is obviously Enki—the Anunnaki god of the double helix. As per "Eve" it is noteworthy that this name can mean "of the rib" as well as the "mother of all." And, according to Sumerian mythology, it is a goddess who serves as the "host" who gives birth to the "new man" that is created in the laboratory of Enki. That is, it is through Enki and this woman, this goddess, that a new man is created, a man who is part-god, and who possessed wisdom.

It is also noteworthy that the serpent did not approach Adam, only Eve, and it was through Eve that the serpent was able to create a new Adam, one who now possessed knowledge.

It is also implied in Genesis that the serpent had sex with Eve, and impregnated her with his "seed."

"I will put enmity between you and the woman, and between your offspring and hers... and to the woman He said, I will make most severe your pangs in childbearing. In pain you shall bear children," --Genesis 3.

Thus, according to Genesis, the serpent is joined to Eve, his seed is mixed with her seed, and, Eve is also described as "the mother of all," --Genesis 3.

And what are we to make of the promise of "pangs in child bearing?" Perhaps only that her babies would have a bigger head and thus a bigger brain, thus making it more painful when the newborn passes through and emerges from the birth canal.

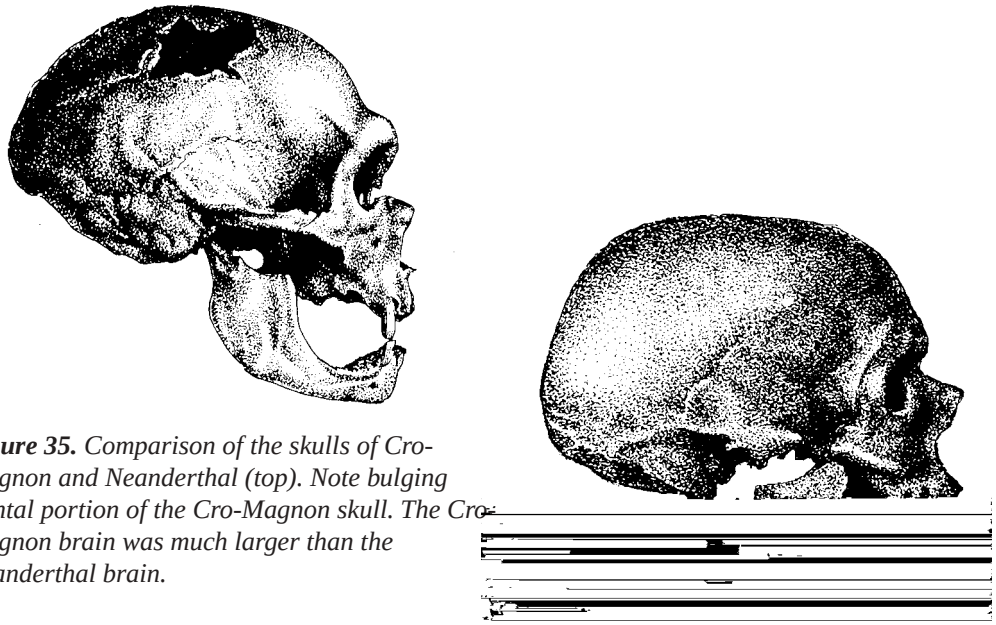


Figure 35. *Comparison of the skulls of Cro-Magnon and Neanderthal (top). Note bulging frontal portion of the Cro-Magnon skull. The Cro-Magnon brain was much larger than the Neanderthal brain.*

THE CRO-MAGNON AND NEANDERTHALS

The Sumerian peoples tell us that they, and in fact all of humanity, are descended from the men and women created in the image of the gods, though they also admit that over the eons we have lost and progressively shed our god-like physical, intellectual and technological capabilities.

They also tell us that when the Anunnaki created men and women in the image of the gods, that other, more primitive humans still roamed the planet. We are informed that these god-like creations also interacted with the more primitive beast-like humans, and after first waring against one another, established friendships.

Likewise, the fossil record indicates that the short, brutish, Neanderthals, a slope-headed, extremely primitive and violent peoples, shared the planet with the physically and intellectually advanced Cro-Magnon peoples, for over 20,000 years.

The Cro-Magnon peoples were physical and intellectual giants, the men standing 6 foot tall on average, and sporting a brain one third larger than that of modern humans and the Neanderthals; i.e. 1800

cc compared to 1350 for present day peoples.

The origins of the Cro-Magnon peoples, however, are completely unknown. There are no transitional forms that link them with Neanderthals or the still primitive "early modern" peoples of the Middle Paleolithic who were decidedly more archaic in appearance.

Whereas there is an obvious progression from Australopithecus/H. habilis to H. erectus and archaic humans and Neanderthals, as is evident from an examination of the skull and the poorly developed frontal lobe (Joseph, 1996, 2000a), the same is not true of the Cro-Magnons.

Neanderthals did not evolve into Cro-Magnons, and these two species of humanity coexisted for over 20,000 years. However, after a 400,000 year history (if we include the first Homo sapiens in their lineage), the Neanderthals died out and disappeared from the face of the Earth, around 29,000 years B.P. (Mellars, 1996); a consequence of disease or widespread ethnic cleansing on the part of the Cro-Magnon peoples.

The Neanderthals were of a completely different race; and not just physically, but genetically, for when they died out, so too did their genetic heritage and all traces of their DNA (Ovchinnikov et al., 2000). An examination of Neanderthal mitochondrial DNA sequences taken from a 29,000 year old Neanderthal specimen recovered from the Mezmaiskaya Cave in the northern Caucasus and DNA samples taken from a second Neanderthal specimen found in the Feldhofer Cave in the Neander valley, indicates that although both are closely related, genetically they are significantly different from that of modern (European) humanity (Krings et al., 1997; Ovchinnikov et al., 2000). Neanderthals and their genetic lineage, apparently completely died out without contributing anything to the modern mitochondrial gene pool.

Thirty thousand years ago, and with the demise of the Neanderthals, the Cro-Magnons gained dominion over the earth. And it is thirty thousand years ago that the ancient Egyptians claim that first kings came to rule Egypt; kings who had been created by the gods.

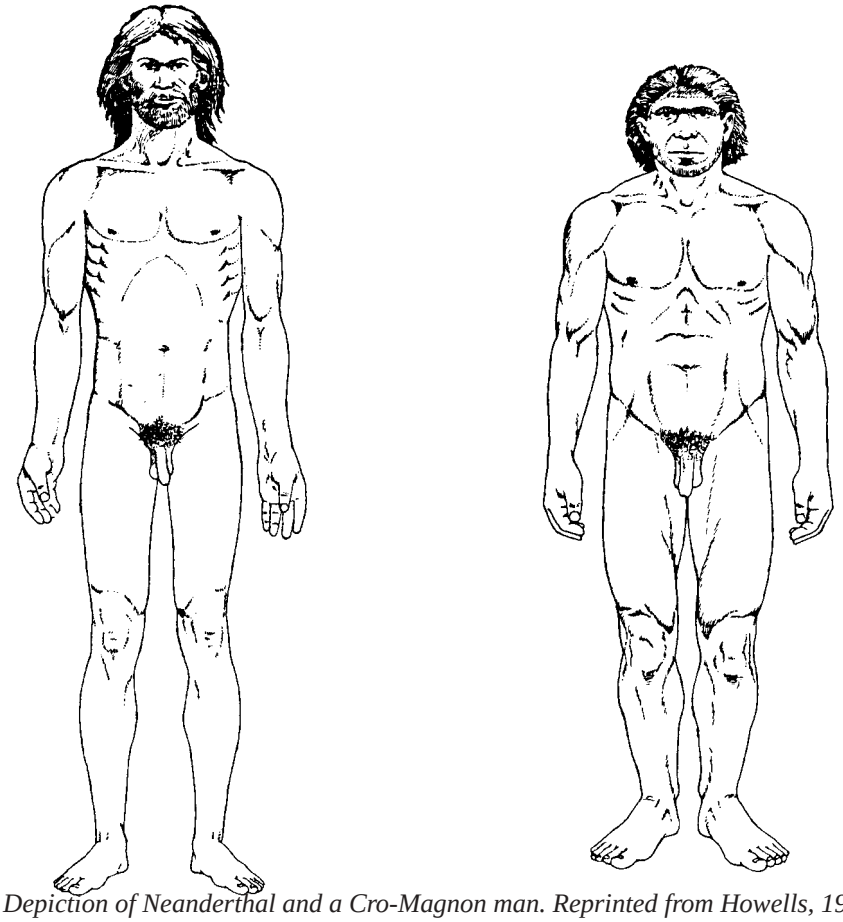


Figure 36. *Depiction of Neanderthal and a Cro-Magnon man. Reprinted from Howells, 1997. Getting Here. Compass Press, Washington D.C.*

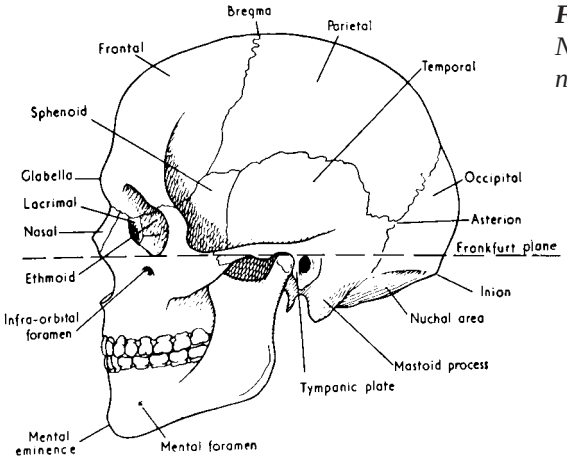


Figure 37. *Modern human cranium. (Below) Neanderthal skull from the Monte Circeo, near Anzio, Italy.*

Figure 38. *Neanderthal tools (above). A Cro-Magnon spear thrower decorated with a leaping horse (left), carved around 30,000 years ago.*