Dissecting Darwinism

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John Hunter, the acclaimed "father of scientific surgery," understood human anatomy through a process of careful dissection. From 1750 to 1793, he revolutionized modern surgical anatomy through the dissection of thousands of human samples derived from fresh human cadavers, which came from fresh graves (1). He was credited with educating over 2000 surgeons globally based on the doctrine of observation, experimentation, and application of scientific evidence, rather than a reliance on potions, humors, and superstitions to manage disease. The early American surgeons who attended these highly desired anatomy courses included Philip Syng Physick, William Shippen, John Morgan, and many others who helped establish the foundations of American medical education.

John Hunter was also a brilliant biologist and naturalist, having dissected and stored thousands of animals and plants. His considerable samples represented the entire initial display of the Royal College of Surgeons Museum. In two lengthy volumes, entitled *Essays and Observations on Natural History, Anatomy, Physiology, Psychology, and Geology*, he identified the remarkable similarity of muscles and organs between various species. John Hunter proposed a gradual formation of species through mutation 70 years before Charles Darwin published his observations in *On the Origin of the Species*. Therefore, history reveals that surgeons are uniquely capable of gathering information, making observations, and reaching conclusions about scientific discoveries.

As the scientific community is faced with new challenges to time-honored conclusions regarding the origin of the species, the origin of humans, and evolution, it is appropriate to dissect this new corpus of information with fairness and modern knowledge. Hence, the purpose of this paper is to review the arguments that have been leveled against the concept of evolution as proposed by Charles Darwin and John Hunter, surgeon and biologist extraordinaire.

Since this review is offered by a physician and surgeon, it might be appropriate to provide evidence of qualification and credibility for such a scientific endeavor. Medicine is a field that attracts some of the brightest minds, based on competitive test scores and undergraduate performance. Modern premedical education commonly includes a typical bachelor's of science degree in biology, chemistry, mathematics, biochemistry, or molecular biology. Medical education includes 2 years of basic science education in molecular biology, biochemistry, biology, anatomy, physiology, and pharmacology, among other topics. Participation in clinical or basic research is common during medical education or residency. Physicians then continue their education by practical application of basic science into problem-solving situations with the human body. Regarding the human body, physicians also have an intimate and integrated knowledge of the complete interrelationships, biochemistry, and molecular processes involved with various systems. In fact, the physician represents the penultimate expert on applied molecular pathways as they relate to human conditions. Many surgeons, including this author, are actively involved with gene therapy, vaccine therapy, and the latest molecular targeting based on the incredible breakthroughs in our understanding of the science of DNA (2–4). Therefore, the physician is indeed an excellent source to dissect evolution based on modern science and applied medicine.

In a 2005 survey of 1472 physicians, almost 78% favored a belief in evolution as an explanation for the origin of the species (5). Among the nation's scientists and biologists, 99% believe in Darwinian evolution (6). The definition of evolution has changed over the years. However, the basic tenets of Charles Darwin suggested that random mutations occur and natural selection continually acts on the surviving mutation, leading to slight improvements and changes in species over time. Neo-Darwinism was coined in 1895 and reflected knowledge of reproduction and recombination, leading to potentially greater shifts in species. The "modern synthesis" of evolutionary thought was proposed in 1950 to incorporate the knowledge of genetics, systematics, paleontology, and other fields. Taken together, the basic concepts recognize that random mutations occur and natural selection continually acts on the surviving mutation, leading to improvements and changes in species over time. These mutations can occur gradually or rapidly via a term called saltation or punctuated evolution. This process of mutation and natural selection has been proposed to explain the descent from a common ancestor, even from the original prokaryocytes billions of years ago. On the basis of natural

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selection and time, it has been theorized that single cellular organisms may have arisen from a primordial mixture of ancient elements and energy.

Several academic organizations have developed guideline statements to promote Darwinian evolution (including neo-Darwinism, modern synthesis, and punctuated evolution) as the single basic principle to be taught in high schools, universities, and colleges (7). School systems have debated the educational merits of Darwinian evolution and have found themselves in various state and federal courts. In *Kitzmiller v the Dover Area School District,* the US District Court ruled in 2005, among other things, that the school board could not require teachers to denigrate or disparage the scientific theory of evolution (8). In 2010, the Texas State Board of Education accepted testimony for 3 days from scientists and citizens regarding the teaching of evolution. Representatives of the National Center for Science Education testified that teaching the weaknesses of evolution would unfairly mark future high school seniors as poorly prepared to compete for college positions based on an education that might be considered nonscientific (9). However, numerous other scientists, citizens, and educators brought forth evidence that emphasized the weaknesses of Darwinian evolution. Ultimately, the board took a controversial position and voted to require future textbooks in the state to explain the weaknesses and the strengths of Darwinian evolution.

Two specific strengths of Darwinian evolution are generally agreed upon:

1. Species adapt to a change in environment (bird beak changes, bacterial resistance, fruit fly experiments). This is called microevolution.
2. There is similarity in the DNA across species (called homology).

During the Texas State Board of Education testimony, weaknesses were raised about three issues:

1. Limitations of the chemical origin of life data to explain the origin of DNA
2. Limitations of mutation and natural selection theories to address the irreducible complexity of the cell
3. Limitations of transitional species data to account for the multitude of changes involved in the transition

In the sections below, I discuss these three weaknesses and then provide some concluding thoughts on paradigm shift.

CHEMICAL ORIGIN OF LIFE

In 1953, the field of abiogenesis took a large step forward when Stanley Miller and Harold Urey reported that a collection of five simple amino acids could be formed from placing a combination of chemicals in a jar and subjecting the jar to energy in the form of electricity (10, 11). This experiment continues to be used in high school and college texts as the unquestioned fundamental explanation for the origin of life based on a purely natural process (12). Unfortunately, the experimental conditions of a low-oxygen, nitrogen-rich reducing environment have been refuted by many (13–15). The experiment actually produces a racemic mixture of amino acids that would inhibit the production of useful proteins.

After Watson and Crick unveiled the double helix nature of DNA in 1953, the origin-of-life research began to focus on the nucleotides and the complex chemical processes that might create the energy for the primitive cell. Modern textbooks expand on the largely debunked Miller-Urey experiment and further propose that the nucleotides form together in a primitive environment with explanations that include the RNA world hypothesis (16), thermogenesis (17), and hypercycles (18). Unfortunately, the student is not taught that those theories still require complex and specified information contained in functioning proteins, which cannot be explained or self-generated (19). Furthermore, the student is not taught that the four nucleotides do not spontaneously form in nature (20). There is no self-organizing principle that would guide or facilitate alignment of nucleotides (21, 22). Any experimentally manufactured nucleotides are mixtures of L (left-oriented) and D (right-oriented) isomers. Since DNA is composed of only D isomers, the probability of alignment of thousands of specified D isomers becomes even more remote (23, 24). Even if there was a self-organizing pattern, the probability of even a short strand of nucleotides occurring in a precisely specified linear pattern that would code for even the smallest single-celled organism with approximately 250 genes has been calculated to be 1 in 10^{150}—1 in 10^{70} less than the chance of finding a particular electron in the entire universe (25).

In addition to the lack of evidence for self-formation of proteins or nucleotides, the fundamental and insurmountable problem with Darwinian evolution lies in the remarkable complexity and inherent information contained within DNA (26). Modern scientists have unraveled the incomparable elegance and protein-coding information of DNA over the past 50 years. The fundamental blueprint of the cell is found in the DNA, which is composed of four different nucleotides (adenine, cytosine, thymine, and guanine). The individual human cell has 5 billion nucleotides arranged in precise order, allowing for the coding and formation of 25,000 complex enzymes and proteins.

This protein development process involves at least 200 unique proteins and cofactors *(Figure 1).* First, transcription involves the copying of the DNA into a matching strand of messenger RNA composed of similar nucleotides and slightly different sugar molecules. Second, the messenger RNA migrates out of the nucleus into the cytoplasm and is translated into a protein in a ribosome, which coordinates the delivery of a specific transfer RNA-amino acid moiety. A codon, composed of three specific nucleotides, allows for the integration of a single specific amino acid into a long series of amino acids, which then folds into a specific three-dimensional structure called a protein. The 25,000 enzymes and proteins being coded for in each cell of the human body have thousands of minute functions, including signal transduction from the surface, maintenance of specific electrolyte concentrations within very tight limits, storage and utilization of energy, manufacture of proteins, and cell division. In summary, the DNA within each cell is responsible for the production and processing of carefully orchestrated and interrelated functions within the cell. As an analogy, DNA far surpasses the complexity of the blueprints and production of a

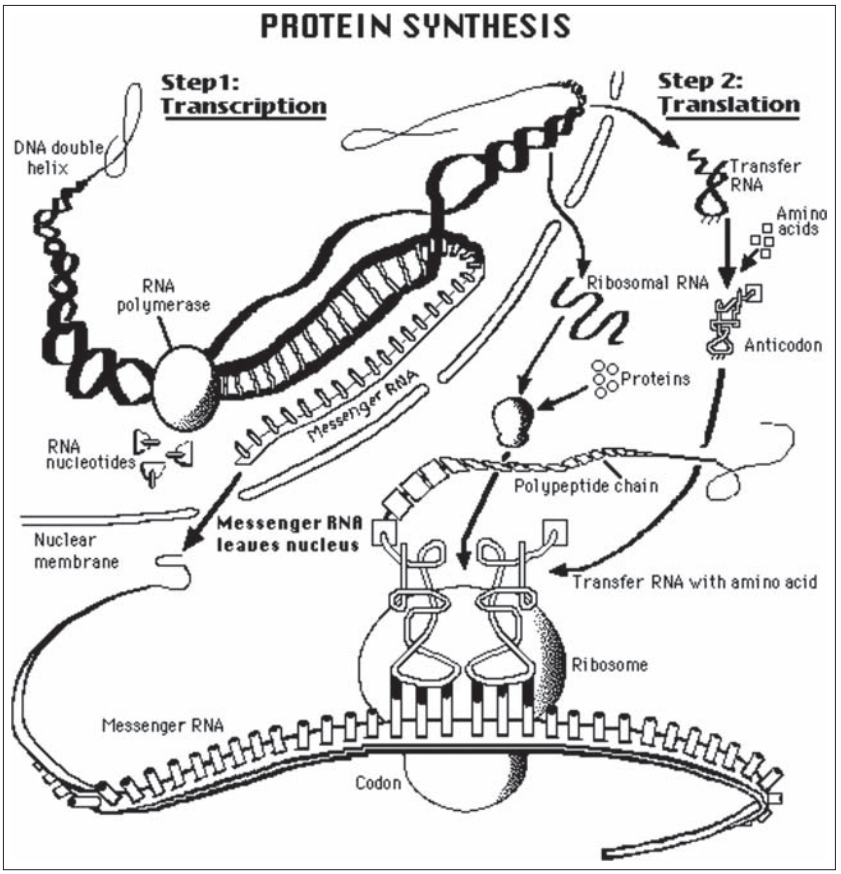

Figure 1. Steps in protein synthesis. Reproduced with permission from Genentech's Access Excellence.

30-story building with elevators, electricity, plumbing, computers, and air-conditioning.

Based on an awareness of the inexplicable coded information in DNA, the inconceivable self-formation of DNA, and the inability to account for the billions of specifically organized nucleotides in every single cell, it is reasonable to conclude that there are severe weaknesses in the theory of gradual improvement through natural selection (Darwinism) to explain the chemical origin of life. Furthermore, Darwinian evolution and natural selection could not have been causes of the origin of life, because they require replication to operate, and there was no replication prior to the origin of life.

IRREDUCIBLE COMPLEXITY OF CELLULAR SYSTEMS

The physician studies and understands the enormous complexity of the human body and the human cell. Some aspects of Darwinian evolution in the human body are readily agreed upon—for example, mutation and natural selection acting to influence malarial resistance, skin characteristics, and many other minor changes within the species. However, the origin of and explanation for the formation of complex organs remains unclear. Starting from a single germ-line cell, the DNA is sufficient to code for and control development of 50 trillion cells that organize into complex organs based on expression of different sections of DNA, leading to entirely different "factories" that have such diverse functions as the liver, the brain, the heart, and the eye.

Proponents of mutation and natural selection point to a scientific publication regarding eye evolution. Nilsson offered a simulation explaining how a light-sensitive spot with a light-absorbing layer gradually transitioned to a cup, then a hemisphere filled with a transparent substance, and then, with the ends brought together, an aperture (27). Natural selection would theoretically lead to a gradually improved species, which would evidently mate and create progressively better eyes, including the natural formation of a lens, a retina, and the neural transmission to the brain.

However, biochemists have shown that even a simple light-sensitive spot requires a complex array of enzyme systems. When light strikes the retina, a photon interacts with a molecule called 11-cis-retinal, which rearranges within picoseconds to trans-retinal. The change in the shape of the retinal molecule forces a change in the shape of the protein rhodopsin. The protein then changes to metarhodopsin II and sticks to another protein, called transducin. This process requires energy in the form of GTP, which binds to transducin. GTP-transducin-metarhodopsin II then binds to a protein called phosphodiesterase, located on the cell wall. This affects the cGMP levels within the cell, leading to a signal that then goes to the brain. The recognition of this signal in the brain and subsequent interpretation involve numerous other proteins and enzymes and biochemical reactions within the brain cells. Thus, each of these enzymes and proteins must exist for the system to work properly. Many other mathematical and logistical weaknesses to the Nilsson example of eye evolution have been uncovered (28). In summary, the eye is incredibly complex. Since it is unreasonable to expect self-formation of the enzymes in perfect proportion simultaneously, eye function represents a system that could not have arisen by gradual mutations.

The concept of irreducible complexity suggests that all elements of a system must be present simultaneously rather than evolve through a stepwise, sequential improvement, as theorized by Darwinian evolution (29). Within each individual cell, there are tens of thousands of additional interrelated complex actions, enzymatic steps, and processes that automatically maintain cellular homeostasis, protein transport, self-protection, and replication. The fact that these irreducibly complex systems are specifically coded through DNA adds another layer of complexity called "specified complexity" (30). Geoffrey Simmons, MD, has presented 17 examples within the human body of irreducibly complex systems that could not have formed by sequential or simultaneous mutation, since all components must be present to work correctly (31). These infinitely complex systems include vision, balance, the respiratory system, the circulatory system, the immune system, the gastrointestinal system, the skin, the endocrine system, and taste. In addition, virtually every aspect of human physiology has regulatory elements, feedback loops,

and developmental components that require thousands of interacting genes leading to specified protein expression. These functions and the corresponding specification of the DNA code are too inconceivably complex to have arisen by accidental mutation or change.

When John Hunter and Charles Darwin saw similarities in muscles and body structure across species, they had no knowledge of the enormous complexity inherent within those organs. In the 1850s, Hunter and Darwin might have accomplished the same simulation as Nilsson with the simple alignment of a series of eyes from less complex to complex and the assumption that some sort of gradual evolution over billions of years would be responsible. Modern scientists applying knowledge of the intrinsic complexity within each cell would understand that each sequential mutation in the DNA within the eyeball would require simultaneous mutations in bone structure, nerves, brain function, and hundreds of proteins and cell signaling pathways to make even the smallest change in only one organ system. Such changes would require far more than could be expected from random mutation and natural selection. Since these systems are irreducibly complex and individual mutations in one organ would not be beneficial for the organism, these random mutations in all aspects of vision would need to occur simultaneously. Therefore, the human body represents an irreducibly complex system on a cellular and an organ/system basis.

TRANSITIONAL SPECIES DATA

The transitional species from primitive primates to man have been illustrated in textbooks for over 100 years. These drawings form the visual imagery that supports Darwinian evolution for high school students, university students, medical students, and the public. However, honest dissent exists in the accuracy of most of the transitional prehominoids, with many found to be frauds or animal species. Reconstructions based on fragmentary and scattered bones, surface bones, and gross morphologic features are limited. Anomalous findings of stone tools, bones, and hundreds of other artifacts have suggested that *Homo sapiens* were actually present 2 to 7 million years ago (at the same time as early proposed transitional species) (32). Certainly, there has been no additional transitional mutant or species change from the first generally accepted *Homo sapiens* over 200,000 years ago. The DNA homology between ape and man has been reported to be 96% when considering only the current protein-mapping sequences, which represent only 2% of the total genome. However, the actual similarity of the DNA is approximately 70% to 75% when considering the full genome, including the previously presumed "junk DNA," which has now been demonstrated to code for supporting elements in transcription or expression (33). The 25% difference represents almost 35 million single nucleotide changes and 5 million insertions or deletions (34). The ape to human species change would require an incredibly rapid rate of mutation leading to formation of new DNA, thousands of new proteins, and untold cellular, neural, digestive, and immune-related changes in DNA, which would code for the thousands of new functioning proteins. This rate of mutation has never been observed in any viral, bacterial, or other organism. The estimation for DNA random mutations that would lead to intelligence in humans is beyond calculation. Therefore, the recently discovered molecular differences between apes and humans make the prospect of simple random mutation leading to a new species of *Homo sapiens* largely improbable (35).

The 2004 transitional species between water- and land-based creatures *(Tiktaalik roseae)* was based on a recovered bone fragment representing the wrist structure that would be necessary for moving on land (36) *(Figure 2).* Even though this species has been disparaged by scientific circles, it is important to realize that any transition from a water-based organism to an air-breathing land-based organism would also require thousands of simultaneous mutations in the basic physiology of the eyes, nose, alimentary system, lungs, muscles, and bones. This would entail thousands of discrete mutations in the DNA, which would code for the underlying changes in the individual cellular systems and enzymes responsible for the changes. A transitional species change would also require a simultaneous change in another organism, allowing for reproduction and duplication of the markedly mutated DNA.

The transitional species concept has been most extensively studied through invertebrate species of plants, shells, and mollusks in carefully preserved fossil fields in Japan, Malaysia, and Asia. Thousands of specimens were available at the time of Darwin. Millions of specimens have been classified and studied in the past 50 years. It is remarkable to note that each of these

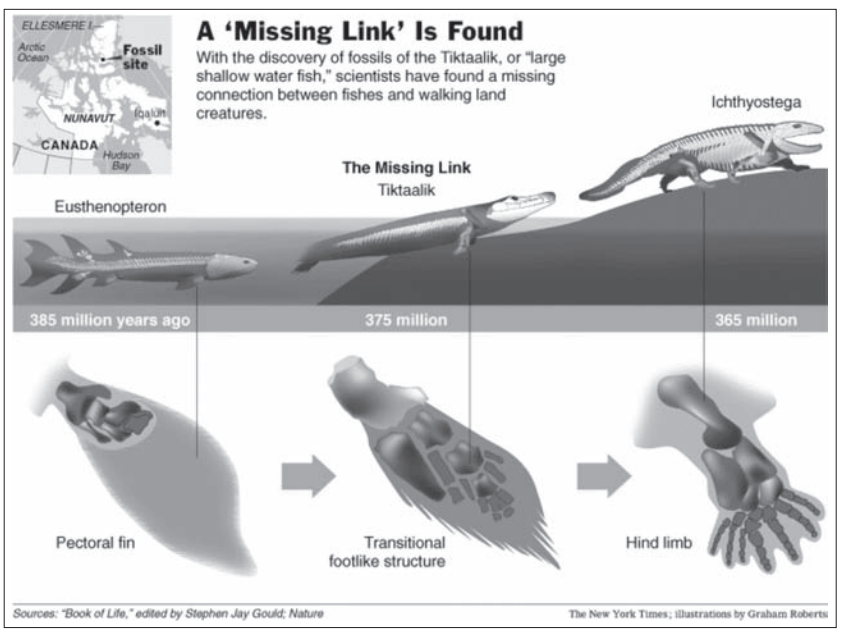

Figure 2. The *Tiktaalik roseae* proposed as the missing link between water-based and land-based organisms. Reprinted with permission from the *New York Times*.

fossil beds shows a virtual explosion of nearly all phyla (35/40) of the animal kingdom over a relatively short period during the Cambrian era 525 to 530 million years ago (37) *(Figure 3).* Since that time, there has been occasional species extinction, but only rare new phyla have been convincingly identified (38). The seminal paper from paleoanthropologists J. Valentine and D. H. Erwin notes that the absence of transitional species for any of the Cambrian phyla limits the neo-Darwinian explanation for evolution (39).

Finally, bacterial evolution or adaptation offers an excellent opportunity to see mutation in a species with rapid cell division. Evolutionary biology can be modeled over a relatively short time (30 years), while observing DNA mutations over 10^{20} generations (40). This is analogous to observing mutations in man or any mammal over 200 million years. A recent review of numerous papers related to viral and bacterial evolution over the past 40 years revealed that the vast majority of mutations led to a loss or slight modification of function that conferred resistance or survival benefit (41). These specific mutations included simple deletions, substitutions, frame shift mutations, inversion, and insertion. No gain-in-function mutations were observed in any of the long-term bacterial evolution studies. There were only two gain-of-function mutations in the long-term viral evolution studies. The absence of mutations leading to a single new protein suggests the difficulty of using mutation to explain the development of numerous new proteins coded specifically by thousands of nucleotides in a precise order, interacting with numerous other enzymes in a simultaneous fashion to accomplish a single cellular action such as the cellular manufacture of a single nucleotide.

The complexity of creating two sequential or simultaneous mutations that would confer improved survival has been studied in the malaria parasite when exposed to chloroquine. The actual incidence of two base-pair mutations leading to two changed amino acids leading to resistance has been shown to be 1 in 10^{20} cases (42). To better understand this incidence, the likelihood that *Homo sapiens* would achieve any single mutation of the kind required for malaria to become resistant to chloroquine (a simple shift of two amino acids) would be 100 million times 10 million years (many times the age of the universe). This example has been used to further explain the difficulty in managing more than one mutation to achieve benefit.

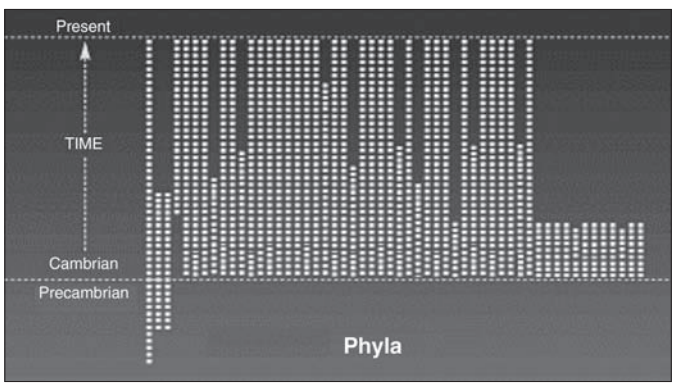

Figure 3. The origin of the phyla: the fossil evidence. Contrary to both Darwinian gradualism and punctuated equilibria theory, the vast majority of phyla appear abruptly with low species diversity. The disparity of the higher taxa precedes the diversity of the lower taxa. Reprinted from "On the Origin of Stasis" by Art Battson (http://www.veritas-ucsb.org/library/battson/stasis/index.html), courtesy of the Veritas Forum, University of California Santa Barbara.

In all fairness, there is convincing evidence, that is widely acknowledged, that random mutation and natural adaptation (Darwinian evolution) does occur within species, leading to minor changes in areas such as beak size, skin pigmentation, or antibiotic resistance. Some of these changes involve a simple biologic survival advantage for a population, without a mutation in DNA. Others might be influenced by a single deletion or insertion within the DNA strand. However, the modern evolution data do not convincingly support a transition from a fish to an amphibian, which would require a massive amount of new enzymes, protein systems, organ systems, chromosomes, and formation of new strands of specifically coding DNA. Even with thousands of billions of generations, experience shows that new complex biological features that require multiple mutations to confer a benefit do not arise by natural selection and random mutation. New genes are difficult to evolve. The bacteria do not form into other species. A reliance on gross morphologic appearances, as with fossils, drawings, and bone reconstructions, is severely inadequate compared to an understanding of the complexity of the DNA and coding that would have been required to mutate from a fish to an amphibian or from a primitive primate to a human.

PARADIGM SHIFT

In his landmark book, *The Structure of Scientific Revolutions,* Massachusetts Institute of Technology Professor Thomas S. Kuhn gave the term *paradigm* its contemporary meaning when he used it to describe universally recognized scientific achievements that, for a time, provide model problems and solutions to a community of practitioners (43). A paradigm shift can be heralded by the occurrence of "counterinstances or anomalies," which represent exceptions of the logic or exaggerations of the evidence. According to Kuhn, these shifts lead to conflict, debate, and great resistance, even with accusations that the new theorists have ignored "science." Examples of these gradual paradigm shifts, which began as chinks in the established armor of science, include Copernicus versus Ptolemy in astronomy, Lavoisier versus Priestly in gases, and Einstein versus Newton in relative dynamics.

The primary conflicts or anomalies with neo-Darwinian evolution lie in the failure of mutation and natural selection to account for the formation of DNA, the information of DNA, or the complexity of the human cell. In all fairness, many physicians, medical students, and college students have not been shown the weakness of Darwinian evolution. They haven't been shown the failure of the Miller-Urey experiments to explain DNA, RNA, or protein formation; the paucity of fossil data; or the refutations of transitional species based on a growing biochemical understanding of complex systems and the limits of DNA mutation to account for the formation of new DNA, new chromosomes, and therefore new species.

In contrast, how is it possible that the majority of National Academy of Science members (who should know the above

weaknesses) fully believe that random mutation and natural selection can explain the origin of DNA and the subsequent generation of a vast array of protein systems within complex cells? It is possible that the biologist, the paleontologist, and the anthropologist are each studying a small portion of the picture and do not have the education and training to see the full picture. More likely, their previous research relies on the established paradigm of Darwinian evolution to provide structure for their work. As the limitations of existing paradigms become apparent, adoption of a new paradigm typically requires at least a full generation, since existing practitioners and scientists often hold on to the old paradigm.

When the Texas State Board of Education voted to recognize the weaknesses of Darwinian evolution in explaining the origin of the species, it was a result of 3 full days of intense debate and scientific dispute. In 2011, when new textbooks were presented to the State Board of Education, 9 out of 10 failed to provide the mandated supplementary curricula, which would include both positive and negative aspects of evolution (44). Moreover, several of the textbooks continued to incorrectly promote the debunked Miller-Urey origin of life experiment, the long-discredited claims about nonfunctional appendix and tonsils, and the fraudulent embryo drawings from Ernst Haeckel. In essence, current biology students, aspiring medical students, and future scientists are not being taught the whole story. Rather, evidence suggests that they continue to receive incorrect and incomplete material that exaggerates the effect of random mutation and natural selection to account for DNA, the cell, or the transition from species to species.

The Texas State Board of Education guidelines do not propose teaching any other alternatives to Darwinian evolution. Rather, the students of tomorrow and teachers of today should appropriately recognize that there are weaknesses that have been pointed out by reasonable scientists. In this dissection of Darwinism, we have cut into the weaknesses of the fossil evidence for human evolution, the failure of the fossil data to demonstrate substantial transition species, and the awareness of the sudden formation of most species in a short window of time, with no significant subsequent variation. More importantly, this physician-perspective article emphasizes the extreme impossibility of the natural formation or self-formation of billions of nucleotides in a specific sequence, allowing for the coding of RNA and proteins in a complex cell with thousands of interrelated and irreducibly complex functions. The article also enlightens the reader regarding the conflicts and difficulty of using natural selection and mutation to explain the simultaneous or sequential changes in cellular DNA, involving entirely new strands of DNA and thousands of new proteins, which are necessary for the formation of new species.

John Hunter and Charles Darwin were limited to gross observation of physical appearance. The human cell appeared to be a glob of jelly under a primitive microscope. Both scientists observed mutation and adaptation, which clearly exist today. For almost 150 years following their proposal, thousands of articles and biology departments across the world made observations based on the paradigm of random mutation and natural selection to account for changes within species. These changes are uncontested truths. However, regarding the origin of the species and life (DNA), even Darwin commented, "If it could be shown that complex systems could not arise by small sequential steps, then my theory would completely break down." Irreducibly complex systems involving thousands of interrelated specifically coded enzymes do exist in every organ of the human body. At an absolute minimum, the inconceivable self-formation of DNA and the inability to explain the incredible information contained in DNA represent fatal defects in the concept of mutation and natural selection to account for the origin of life and the origin of DNA. As new theories emerge that explain the origin of life, the inevitable emotional accusations of heresy and ignorance are not surprising in a period of scientific revolution. It is therefore time to sharpen the minds of students, biologists, and physicians for the possibility of a new paradigm.

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