Inaccuracy in Modern Biology Textbooks Concerning the Origin of Life

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From Pasteur and Darwin to Miller and Urey to Watson and Crick, the last 150 years of biological study has been characterized by one revolutionary breakthrough after another. Despite the recent massive gains in this field, meaningful progress in the study of biogenesis has been exceptionally elusive. All the while, authors of modern biology textbooks fail to present current research regarding the origin of life, thus revealing a priori commitments to a naturalistic paradigm rather than the scientific method. Their departure from non-empirical foundations for supposedly scientific conclusions is quite troublesome. This approach undercuts the very system that led to the scientific revolution, and comes dangerously close to propaganda and rhetoric under the guise of research and fact.

Current biology textbooks tend to focus on four major concepts concerning biogenesis. Starting with the historical development of the field, the famous Miller-Urey experiments are reported as the foundational breakthrough in origin of life study. Next, the Murchison meteorite, found in 1969 in Australia, contained numerous amino acids which would theoretically provide a sound basis for investigating extraterrestrial biogenesis. Turning to a terrestrial origin of life scenario on primordial Earth, deep-sea hydrothermal vents have become a leading candidate despite numerous objections concerning the plausibility of such a scenario. Finally, extreme difficulty in explaining the simultaneous development of DNA and proteins, which are necessary for the most basic life forms, has led many to hypothesize an RNA world which could have

given birth to life prior to DNA or proteins while serving as a forerunner of those structures. While each of these ideas present data that could be useful for determining the origin of life, each faces significant challenges.

Arguably the most significant breakthrough in the study of biogenesis is the Miller-Urey experiment. In 1951, Stanley Miller set out to conduct an experiment that would validate the Oparin-Haldane hypothesis of a reducing atmosphere. After constructing a glass enclosure containing the gases supposedly on primordial Earth according to Oparin and Haldane, Miller then added an electrical impulse to simulate lightning and provide an energy source. Now known as the famous Miller-Urey experiment, this project yielded many amino acids, the building blocks for proteins. Miller quickly published his results, claiming he had engineered life in the laboratory.[1] Unfortunately, it has been discovered that the primordial atmosphere suggested by Miller was very different than the actual primordial atmosphere, stripping his experiment of any value in answering the question of life's origin. Today's textbooks do recognize the conditions assumed by Miller are not likely to have been those of primordial Earth.[2] Upon this discovery, Miller and his team began to conduct experiments under more relevant conditions. Most tests did not result in the production of a single amino acid. Through this process, his team found that extremely high levels of hydrogen would enable the abiotic production of prebiotic molecules. Biochemist Fazale Rana notes the lack of geochemical relevance in such experiments, "because molecular hydrogen evaporates into outer space so readily, it most likely escaped early Earth's atmosphere rapidly and would not have been available to assist in the origin of life."[3] Even if

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[1] Ricki Lewis, Douglas Gaffin, Marielle Hoefnagels, and Bruce Parker. *Life*, 5th ed. (New York: McGraw-Hill, 2004), 348.

[2] Neil A. Campbell, Jane B. Reece, Lisa A. Urry, Michael L. Cain, Steven A. Wasserman, Peter V. Minorsky, Robert B. Jackson. *Biology: AP Edition*, 8th ed. (San Francisco: Pearson Benjamin Cummings, 2008), 508.

[3] Fazale Rana, *Creating Life in the Lab: How New Discoveries in Synthetic Biology Make a Case for the Creator* (Grand Rapids: Baker Books, 2011), 124.

hydrogen were available were available in large quantities, the problem would persist; the issue lies in failing to distinguish between creation and organization of amino acids.

One of the most widely used high school Advanced Placement (AP) biology text reports, "Miller-Urey type experiments demonstrate that the abiotic synthesis of organic molecules is possible."[4] While maintaining a strong commitment to the naturalistic worldview, renowned physicist Paul Davies comments on this equivocation, "there is a world of difference between building blocks and an assembled structure. Just as the discovery of a pile of bricks is no guarantee that a house lies around the corner, so a collection of amino acids is a long, long way from the sort of large, specialized molecules such as proteins that life requires."[5] Davies goes on to outline multiple reasons why self-assembly of amino acids could not have happened, but his distinction between creation and organization of building blocks remains the key.

Dissatisfied with results for biogenesis on Earth, many have turned to extraterrestrial origins for the needed building blocks for life. Around 1970 a large meteorite struck Australia, providing fresh opportunity for scientists to study the compounds being transported from outer space to Earth. For meaningful results, scientists must insure that the meteorite had not been contaminated by Earth's atmosphere. The simple reading of a textbook endorsed by the National Science Teachers Association indicates clear success in this endeavor, "Because the meteorite was recovered before it was contaminated with organic compounds from Earth, these compounds must have formed in space. So, organic compounds from space could have accumulated on the surface of early Earth."[6] If accurate, this would open countless doors to further investigation of

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[4] Campbell, 508.

[5] Paul Davies, *The 5th Miracle: The Search for the Origin and Meaning of Life* (New York: Simon and Schuster Paperbacks, 1999), 88.

[6] John H. Postlethwait and Janet L. Hopson. *Modern Biology*, (Austin: Holt, Rinehart and Winston, 2006.) 285.

extraterrestrial origins of life. However, seven years prior to the publication of this textbook, renowned geologist Keith Knenvolden presented findings to the contrary. According to Knenvolden, the meteorite found in Australia had been heavily contaminated by Earth's atmosphere, thus rendering the textbook information patently false. Due to the conflicting claims between Knenvolden's research and others in the field, he reanalyzed the Murchison fragments with techniques more sensitive than had been previously used. Following this additional study, Knenvolden commented at the 1999 conference for the International Society for the Study of the Origin of Life (ISSOL), "the outside of the meteorite had been exposed to significant terrestrial contamination and … samples of the Murchison meteorite can be affected to varying degrees by terrestrial influences."[7] At best, the authors of the aforementioned textbook are far too cavalier in their assumptions that uncertainties regarding an extraterrestrial origin of life will be reconciled within a naturalistic paradigm. At worst, the writers ignored the most recent and advanced research and reported as fact that which has been disproven when in conflict with their philosophical foundation. In either case, the attempt to influence the youth of a nation through curriculum that poses as scientific while valuing philosophical presuppositions over empirical data is highly disturbing.

Returning to primordial Earth in search of prebiotic compounds that could have contributed to life's beginning, many textbooks are now reporting that deep sea hydrothermal vents were instrumental in biogenesis.[8] Without any significant research to support this hypothesis, the textbooks' claims appear modest and use terms such as may have, could have, and perhaps led to life. Consider the following excerpt from a leading college textbook, "some

[7] Fazale Rana and Hugh Ross, *Origins of Life: Biblical and Evolutionary Models Face Off* (Colorado Springs: NavPress, 2004), 131.

[8] Campbell, 508.

biologists hypothesize that early polymerization leading to the origin of life may have occurred in cracks in the deep ocean floor where hot water, carbon monoxide, and minerals such as sulfides of iron and nickel spew forth."[9] However, these claims with the appearance of modesty are just that – an appearance of modesty. The implausibility of such scenarios is usually not mentioned, and some textbooks go so far as to suggest that hydrothermal vents were likely. One such introductory college text, published by McGraw-Hill states, "Here, in a zone where hot water meets cold water, a life-sustaining warmth prevailed where prebiotic chemical collections could have been continually exposed to a rich brew of minerals spewed from Earth's interior."[10] Far from a life-sustaining warmth, the extreme heat present in these hydrothermal vents would have been highly destructive to any building blocks of life. Among others, astronomer Hugh Ross takes exception with this claim, "molecular decomposition outstrips composition at hydrothermal vents, making vents more damaging than helpful."[11] Some may object that his conclusions are jaded given his rejection of Darwinian evolution; however, the aforementioned Stanley Miller offers an even harsher critique of the hydrothermal vent hypothesis, "it is difficult to accept that organic compounds were synthesized at 350^{o} C in submarine vents. Rather, we have abundant data indicating that such conditions favor decomposition of many compounds in time spans ranging from seconds to hours. Thus, the suggestion that life originated in such a setting is highly improbable."[12]

Recent discoveries of organisms that love extreme conditions have produced newfound optimism within this line of thought. As was the case in debunking the relevance of Miller-Urey

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[9] Eldra Solomon, Linda Berg, and Diana Martin. *Biology*, 7th ed. (Belmont: Brooks/Cole-Thomson Learning, 2005), 387.

[10] Lewis, 348.

[11] Rana, *Origins of Life,* 102-103.

[12] Stanley L. Miller and Antonio Lazcano, "Formation of the Building Blocks of Life", in *Life's Origin: The Beginnings of Biological Evolution,* ed. J. William Schopf (Los Angeles: University of California Press, 2002), 102.

experiments, this optimism is based on conjecture and equivocation rather than fact. In the same way that production of amino acids does not equal their synthesis, the existence of organisms that love extreme heat offers no explanation for why their chemical components were not destroyed by the extreme temperatures while they were being formed. Thermophilic and hyperthermophilic organisms could certainly exist at hydrothermal vents now, but the discussion is not about their current state, but rather their origin. These organisms would never have formed at a hydrothermal vent because their most basic components would have been destroyed by the heat before they had the opportunity to form such advanced structures. Presented with all the evidence, one is left bewildered when attempting to decipher why textbooks present only a small portion of the research.

The fourth primary area of focus in modern biology textbooks relates to a supposed RNA world that would resolve what is commonly known as the "chicken-and-egg"[13] problem. This problem involves the debate over whether DNA or proteins formed before the other. Unfortunately, both are equally codependent upon one another, and even naturalistic scientists do no go so far as to theorize a simultaneous development of both DNA and proteins. It was hypothesized that RNA could have served a dual function, effectively accomplishing the purposes of DNA and proteins, thus allowing life to evolve before DNA and proteins had arrived. But, like a great deal of origin-of-life research, this hypothesis was invented out of necessity rather than empirical data. Iris Fry comments, "The concept of the RNA world, suggested in the late 1960s prior to the existence of any direct evidence in its support, was itself a theoretical scaffold constructed to resolve the chicken-and-egg problem."[14] Prominent origin-

[13] Davies, 123.

[14] Iris Fry, *The Emergence of Life on Earth: A Historical and Scientific Overview* (New Brunswick: Rutgers University Press, 2000), 189.

of-life researcher Leslie Orgel notes the significance of the RNA world hypothesis, "The idea that there was once a protein-independent biological world, the so-called RNA World, has by now come to be widely accepted (although it remains unproven.),"[15] and "the problem of the origin of life is the problem of the origin of the RNA World."[16]

Surely this hypothesis would solve a great deal of the problems currently faced in the search for biogenesis, but as with the other common claims, this one lacks research-based data. While Orgel maintains that life could not emerge without an RNA world, he openly admits that such a world is highly improbable. At a 2002 origin-of-life conference, Orgel remarked, "It would be a miracle if a strand of RNA ever appeared on the primitive Earth."[17] Orgel is not alone in his sentiments; Paul Davies echoes a similar inference, "The conclusion has to be that, without a trained organic chemist on hand to supervise, nature would be struggling to make RNA from a dilute soup under any plausible prebiotic conditions."[18]

Despite the well-documented difficulties for such a theory from strict naturalists, a simple reading of biology curriculum reveals some inexplicable omissions. Notice the assumption of an RNA world in the aforementioned AP text, "After DNA appeared, perhaps RNA molecules began to take on their present-day roles … and the RNA world gave way to a "DNA world.""[19] Another highly distinguished high school textbook reports, "self-replicating systems of RNA molecules have been created in the laboratory. These finding support the hypothesis that life could have started with self-replicating molecules of RNA."[20] As previously noted by Paul Davies, these results would be significant if a trained organic chemist were present on primordial

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[15] Leslie E. Orgel, "The Origin of Biological Information", in *Life's Origin: The Beginnings of Biological Evolution*, ed. J. William Schopf (Los Angeles: University of California Press, 2002), 142.
[16] Orgel in Rana, *Creating Life in the Lab,* 157.
[17] Orgel in Rana, *Origins of Life*, 115.
[18] Davies, 131.
[19] Campbell, 510.
[20] Postlethwait, 288.

Earth to guide the process. Obviously, this was not the case, and while expanding our knowledge of potential chemical pathways, these studies are void of any geochemical relevance. Unfortunately, this textbook goes a step further, "Perhaps most or all of the chemistry and genetics of early cells were based on RNA."[21] To be fair, the authors are not dogmatic about this claim, but their failure to mention of a lack of research for this assertion is baffling. Naturalist Iris Fry's explanation for the origin of the RNA world appears synonymous with the current acceptance of the hypothesis – required within a naturalistic paradigm, but also without supporting data.[22]

While many texts at least imply and sometimes overtly declare biogenesis as a probable event within naturalism, a closer look reveals that many of the fundamental claims surrounding the origin of life lack relevant research-based data to support their conclusions. The regularity of assertions which are rooted in philosophical assumptions forces one to question why these assertions are still widely present in reputable curriculum. A staunch supporter of Darwinian evolution, Paul Davies concluded that the origin of life community was unwilling to admit their lack of meaningful progress for two reasons: it could open the door to religious worldviews to proclaim their merit and an admission of limited progress would highly diminish federal funding for further research.[23] More important than his conclusion is the reality that naturalistic scenarios have been met with failure at every turn up to this point.

The failure of biology textbooks to report this unfortunate news indicates that the curriculum is being driven by philosophical bias, not empirical data. While many in western countries may find this claim appalling, outlandish, and preposterous, it is relatively well known

[21] Ibid, 288.
[22] Fry, 189.
[23] Davies, 17-18.

within the greater scientific community. After conducting a historical analysis of the rise of modern science, Iris Fry offered the following summary, "My historical analysis demonstrates that the examined facts themselves, as well as common sense, were conditioned by many non-empirical presuppositions. Hence, not only did different beliefs depend each on its own conceptual framework, but the overturn of these beliefs did not result necessarily from empirical refutation."[24] Davies comments in a similar vein, "Science takes as its starting point the assumption that life wasn't made by a god or a supernatural being: it happened unaided and spontaneously, as a natural process."[25] Here we find a frank admission that the conclusions reached by naturalistic scientists are based on a priori assumptions. While all investigations are bound to be seen through the lens of the investigator, it seems problematic to immediately dismiss significant metaphysical theories before beginning the search. Of course, this problem is not relegated to naturalism, in fact, it is at least as big a problem within Christian Theism. That said, one's propensity to accept the assertions of a given worldview should not remove him from the discussion of worldviews, for no one would be left in the discussion! Rather, an environment of open admission of one's philosophical presuppositions should be cultivated to help each investigator minimize personal bias in their assessment of the data. When this admission is discarded and blanket statements are made which do not have support from the most current research, the claims made depart from the world of empirical data and enter the world of rhetoric based propaganda.

Of course, this departure from verified truths to assumptions is most-often brought as a charge against Christian Theism, particularly in the West. Consider the remarks of Richard Dawkins concerning Christians, "Nor do they appeal to evidence. There isn't any, and nowadays

[24] Fry, 2.
[25] Davies, 28.

the better educated admit it. No, they appeal to faith. Faith is the great cop-out, the great excuse to evade the need to think and evaluate evidence. Faith is belief in spite of, even perhaps because of, the lack of evidence."[26] Further accusations of Christian Theism using propaganda based education come from political commentator Bill Maher, "I think religion stops people from thinking … If you look at it logically, it's something that was drilled into your head when you were a small child. It certainly was drilled into mine at that age. And you really can't be responsible when you are a kid for what adults put into your head."[27] Unfortunately for Dawkins and Maher, the knife cuts both ways. Their own statements about the dangers of rhetoric-based education serve to lay the groundwork for overturning the popular themes in today's biology texts.

Following Louis Pasteur's rejection of spontaneous generation, a great deal of success has been made in understanding the requirements for biogenesis. Problematic for scientists at large, however, has been the last century's lack of progress toward answering the question of how life originated. If the concern is truly the development of young minds that can critically think about complex issues, then Dawkins, Maher, and producers of today's textbooks would readily include the shortcomings of origin of life research within a naturalistic framework. The reality is that modern biology textbooks are not driven by science – they are driven by philosophy. In order to avoid a civilization that is unable to deeply think about complex issues, our education system must turn to intellectual honesty and present all sides of controversial issues. The evidence must be able to and allowed to speak for itself; if this does not happen, the inevitable result is a nation that is educated on the foundation of propaganda, rhetoric, and

[26] Richard Dawkins, "Lecture from 'The Nullifidian'", The Richard Dawkins Foundation for Reason and Science, http://old.richarddawkins.net/articles/89, December 9, 2013.

[27] "Bill Maher: Christians Have Neurological Disorder", WorldNetDaily, http://www.wnd.com/2005/02/28970/, December 9, 2013.

assumption – an abject failure for the most scientifically advanced society in history.