Finally, evolutionary theory can only illustrate how life changed and diversified over time. It cannot explain how life came into existence. While Glass acknowledges this, I would have preferred a more explicit statement that we do not know how self-replicating entities evolved from nothing. I am always surprised to hear that most people think that science has all the answers, in spite of introductory biology textbooks being very clear about this. More generally, I am not proposing that we imply divine action in this or that area where scientific understanding is currently lacking ("God of the gaps" approach), nor am I negating the evidence for evolution. I think Glass could have presented a more balanced case, clearly pointing to areas where science does not have all the answers to date.

In Part 4, "The Politics of Evolution," Glass covers a brief history of creationism and the ID movements. The last chapter entitled "Darwinism" talks about the misuse of Darwinian theory. Herbert Spencer coined the phrase "survival of the fittest" and took it to the next level by claiming that the poor were unfit and inferior. Darwin's half-cousin Francis Galton came up with eugenics. His idea was supported by many prominent people including Winston Churchill, Theodore Roosevelt, and Adolf Hitler. Glass notes that "Today, thankfully, such ideas are seen as horribly immoral" (p. 266). This part of the book is an interesting read and places Darwinism in a more historical perspective.

Glass's compelling case for evolution's compatibility with Christianity in Part 1 of the book is an enjoyable read. The remainder of the book is a fairly comprehensive introduction to evolutionary biology; it might be of benefit to those who are unfamiliar with evolutionary theory and the evidence that supports it but not as compelling as other books on evolution. However, the fact that the evidence is presented by an impartial observer makes it suitable to readers of all viewpoints.

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**BIOLOGICAL INFORMATION: New Perspectives**
by Robert J. Marks II, Michael J. Behe, William A. Dembski, Bruce L. Gordon, and John C. Sanford, eds. Hackensack, NJ: World Scientific Publishing, 2013. 584 pages. Hardcover; $178.00. ISBN: 9789814508711.

This volume contains the proceedings of a symposium held May 31, 2011, through June 3, 2011, at Cornell University. Since the famous 1967 Wistar Symposium on "Mathematical Challenges to the Neo-Darwinian Interpretation of Evolution," the mathematical and biological challenges posed to the modern evolutionary synthesis (neo-Darwinism) have not been resolved. As far as I know, this symposium is the first to address these challenges, incorporating the intelligent design perspective as a possible *scientific* approach. All contributors are active researchers from reputable institutions who question the conventional perspective of neo-Darwinism that natural selection accompanied by mutations is capable of generating new information in the biosphere.

*Section One: Information Theory and Biology*
The first authors define biological information theoretically as what enables the narrowing down from prior uncertainty to later certainty. Using human language as an analogy, Oller suggests biological information has to be generated and comprehended by intelligence. Random mutation and natural selection lead to pruning of pre-existing content. Basener applies mathematical dynamic modeling analysis to evolution based on an extinction of human civilization and in vitro Qβ replicase experiments. They predict that either evolution runs its course to the equilibrium or the system will continue to repeat some state infinitely often. As a result, no new information is generated.

Ewert, Dembski, and Marks II examine the computer program Tierra that simulates the creation of artificial life with evolution. It is characterized by an initial period of high activity producing a number of novel adaptations followed by barren stasis. New functional instructions are generated but these are dwarfed by the size of other changes. Long-term evolutionary progress is dependent on the generation of new information as exemplified in the Cambrian Explosion, which is not explainable by the Tierra model.

Montañez, Marks II, Fernandez, and Sanford demonstrate that DNA in higher genomes is often optimal and poly-functional with nucleotides being used in overlapping genes. Thus, using analyses of the balance between beneficial versus deleterious mutations and the multidimensional analogy with crossword puzzles, beneficial mutations necessary for directional evolution are extremely rare. Sewell addresses the thermodynamic improbability of an open earthly system amenable to evolution from molecule to human. While this may be an argument of the improbability of building order, the need for capturing sunlight energy into usable biological energy is the crucial challenge to abiogenesis. McIntosh contrasts bottom up, materialist, emergence models with top down, nonmaterial, constrained models. He aptly identifies the weakness of the former models as the need

for the conversion of free energy in an open system into usable biological energy necessary for the compensation of the increasing disorder of earth, namely, conversion of sunlight energy into ATP by a machine such as chlorophyll. He proposes the third model in which nonmaterial information constrains the local thermodynamics to be in a non-equilibrium state of raised free energy.

*Section Two: Biological Information and Genetic Theory*
Wells presents evidence for the functionality of nonprotein-coding DNA to refute the concept of "junk DNA." This includes pervasive transcription of the genome, conservation of many nonprotein-coding sequences, sequence-dependent functions of RNAs transcribed from introns, pseudogenes, repetitive DNA, functions almost independent of the exact nucleotide sequence, chromatin topology in gene expression and centromere placement, and the light-focusing property of heterochromatin in inverted nuclei.

Sanford and others use numerical simulation of evolution by random mutation and natural selection by a population genetics program, Mendel's Accountant. Applying realistic levels of biological noise such as the actual mutation accumulation with the H1N1 influenza virus, they show an ongoing accumulation of low-impact deleterious mutations, with deleterious mutation count per individual increasing linearly over time that will not generate new information. Typical functional nucleotides in a large eukaryote genome have contributions to fitness much smaller than is necessary for the origin of these nucleotides. They contrast their results with another evolutionary simulation program, Avida, which leads to production of genetic information by the neo-Darwinian mechanism of mutation and natural selection. The apparent disparity between the two programs results primarily from differences in default settings. When settings reflecting biological systems are applied to both, they reveal barriers that can prevent the progressive evolution of novel genetic information. The theories of mutation count and synergistic epistasis that accelerate selection against deleterious mutations are falsified with realistic biological conditions. To demonstrate the efficacy of their Mendel Accountant simulation program, they report that it models the observations that most strains of influenza appear to routinely go extinct because of natural genetic attenuation due to mutation accumulation in recent viral outbreaks in Asia and Africa.

Seaman compares the human genome with computer codes. Data visualization reveals that executable codes regularly make extensive use of tandem repeats that exhibit similar visual patterns in higher genomes. These suggest convergent evolution constrained by design algorithms. Johnson presents the new fields of biocybernetics, the study of life's hardware and software systems, and biosemiosis, which studies biological systems made of two independent worlds connected by the conventional rules of a code. He uses the artificial synthesis of a bacterium by Craig Venter's team to illustrate that when the operating system (DNA) was replaced, the interacting computers in the cell (ribosomes, ER, etc.) remained intact and were able to function by using the replacement software. Thus, neo-Darwinian theory needs to provide scientific explanations of the origin of cellular information compatible with information science.

*Section Three: Theoretical Molecular Biology*
Macosko and Smelser present recent evidence that the Standard (genetic) Codon Table is optimally tuned for the transmission and maintenance of biological information. If design is considered without materialistic bias, the discovery and future research of its optimization may be accelerated as compared to the discovery of the Rosetta Stone in deciphering hieroglyphs. Dent proposes that the high fidelity and efficiency of intracellular processes and the molecular motion in the cytoplasm is not truly random, but is vibrationally directed and coherent due to a community of oscillator structures within chromosomes and proteins. Even though no surface vibrations were detected by laser-Doppler vibrometry in living cells, DNA vibration evidence may suggest future productive research.

Behe examines experimental work in recent decades and current genomic studies of adaptation in natural populations. They attest to the importance, even dominance, of loss-of-function mutations in short-term evolutionary episodes, thus threatening the progressive evolution of new traits that depend on the accumulation of gain-of-function mutations. Wells reviews the evidence that two- and three-dimensional information-carrying patterns in membranes are likely to entail more specified complexity than the one-dimensional information in DNA sequences, making beneficial "mutations" in such patterns much less probable than beneficial mutations in DNA.

Axe and Gauger review the systematic difficulties that a bottom-up Darwinian process of a metabolic pathway faces, from the multiple levels of gene expression to causal metabolic interactions networks. They propose tentative principles that assume a top-down paradigm consistent with biomimetics, reapplying biological innovations in human technology, and sys-

tems biology, performing measurements on whole systems instead of their isolated parts to replace it.

*Section Four: Biological Information and Self-Organizational Complexity Theory*
Noted self-organization theorist Stuart Kauffman boldly proposes that no law entails the detailed evolution of the biosphere and the end of a physics worldview. He uses self-organization as a kind of "natural magic." The spontaneous assembly of molecules interacting with selection creates the biosphere. It seems to echo James Shapiro's natural genetic engineering, a form of vitalism.

Finally, acknowledging the challenges posed by developmental biology and the evolution of complex systems, Weber advocates an emergentist position, in which both the upper and lower levels are with causality. He and Kauffman seek a possible fourth law of thermodynamics and see progress being made under the Darwinian Research Tradition. He seems to represent the paradigm of current thinking in meta-evolution that emphasizes the evolution of mechanisms that assist evolution.[1]

This volume is a milestone in the scientific discussion of the origin and development of biological information not encumbered by a commitment to methodological naturalism (MN). Even though many Christians believe that a commitment to MN is not the same as a commitment toward philosophical naturalism, some argue that in the realm of origins science, philosophical commitment directly influences the direction of research.[2] Since MN is a *provisional* and not a *necessary* requirement for scientific research,[3] this volume should serve as a stimulus for others who question the efficacy of neo-Darwinism to persist in their effort to find new solutions in the controversial origins of biological information.

**Notes**

[1]L. Caporale, *Darwin in the Genome: Molecular Strategies in Biological Evolution* (Columbus, OH: McGraw-Hill, 2003).
[2]P. Pun, "Response to Professor Alvin Plantinga's article on 'When Faith and Reason Clash: Evolution and the Bible,'" *Christian Scholar's Review* 21, no. 1 (1991): 46–54; N. Geisler and J. K. Anderson, *Origin Science: A Proposal for the Creation-Evolution Controversy* (Grand Rapids, MI: Baker, 1987).
[3]A. Plantinga, "Methodological Naturalism?, Part 1 and Part 2," *Origins and Design* 18, no. 1 and no. 2 (1997), http://www.arn.org/docs/odesign/od181/methnat181.htm; http://www.arn.org/docs/odesign/od182/methnat182.htm.

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## Religion & Science

**IN PRAISE OF DARWIN: George Romanes and the Evolution of a Darwinian Believer** by J. David Pleins. New York: Bloomsbury Academic, 2014. xviii + 294 pages, chart, appendix, notes, bibliography, index. Paperback; $34.95. ISBN: 9781623565947.

Some books do not fit neatly into genre categories. J. David Pleins offers us an excellent example of a multidisciplinary work with *In Praise of Darwin*. It is part history, part literary critique, part philosophy, and part theology.

The book begins with a chapter exploring the personal history of George John Romanes. Romanes, a lesser-known figure amongst the giants of Victorian science, was the youngest of Darwin's close friends, and the heir apparent to Darwin's work at the time of his death. The opening chapter sketches Romanes's personal struggle with faith and his relationship with Darwin. Stricken by grief and existential angst after the death of his mentor in 1882, Romanes crafted over the following years a 50-page *Memorial Poem*, wherein he struggles through the questions of life, death, love, and faith.

Pleins found the full version of this poem, long thought to be lost, and has published it here for the first time. The heart of *In Praise of Darwin* is a five-chapter, poem-by-poem exposition of the composite *Memorial Poem*. Pleins calls the whole piece "one of the most daring treatments of the relationship between faith and science to come to us from the nineteenth century" (p. 14). The savvy reader, after the opening chapter, will not proceed directly to chapter 2, but will flip to the book's appendix and read the full *Memorial Poem* to experience the raw passion and power of the piece at once.

Chapters 2–5 each explore a different theme that groups the short poems of the larger work into sections. Chapter 2 explores the poems relating to Darwin's funeral in Westminster Abbey, which serve to shed further glory on the already-immortal figure of Darwin. Chapter 3 contains poems of the passionate struggle with the finality of death, including what Pleins calls an "anti-sermon on greatness and grief" in which Romanes chastises those who extolled from pulpits Darwin's great accomplishments without having known or loved the man behind the work. These reflections lead naturally into chapter 4 on the nature of fame. To pursue it is folly, yet—paradoxically—fame still stands as a sure marker of greatness.