

Creating Life in the Lab

By: Fazale Rana

1 Waking Up in Frankenstein's Dream

- First, James Watson and Francis Crick unveiled the structure of DNA (deoxyribonucleic acid), [J. D. Watson and F. H. C. Crick, “Molecular Structure of Nucleic Acids: A Structure for Deoxyribose Nucleic Acid,” *Nature* 171 (April 25, 1953): 737–38; J. D. Watson and F. H. C. Crick, “Genetic Implications of the Structure of Deoxyribonucleic Acid,” *Nature* 171 (May 30, 1953): 964–67.] [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 119-120). Baker Publishing Group. Kindle Edition.]
- To his credit, origin-of-life researcher and Nobel Laureate Jack Szostak acknowledged in an interview with the Harvard University Gazette, If we make something everyone agrees is alive, that would provide a plausible scenario for the great event [the origin of life]. But, because the trail is billions of years cold, we'll never really know for sure if we're right. [William J. Cromie, “Creating Life in a Lab,” *Harvard University Gazette*, September 12, 1996, <http://news.harvard.edu/gazette/1996/09.12/CreatingLifeina.html>.] [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 187-190). Baker Publishing Group. Kindle Edition.]
- In *Life's Origin*, veteran origin-of-life researchers Alan Schwartz and Sherwood Chang highlight this point: Today, many researchers would probably agree that a particularly critical event in the origin of life was the appearance of self-replication in some set of information-containing molecules (such as, for example, primitive nucleic acids or proteins). [Alan W. Schwartz and Sherwood Chang, “From Big Bang to Primordial Planet: Setting the Stage for the Origin of Life,” in *Life's Origin*, ed. J. William Schopf (Berkeley: University of California Press, 2002), 73.] [Fazale Rana:

Creating Life in the Lab (Reasons to Believe) (Kindle Locations 194-198). Baker Publishing Group. Kindle Edition.]

2 Life Is like Music

- Without consensus about how to distinguish between living and nonliving entities, many biologists give up the effort and become like music enthusiasts who resort merely to listing common characteristics, features shared by all life on Earth. Instead of providing a definition for life, they merely describe it. [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 337-339). Baker Publishing Group. Kindle Edition.]
- According to the cell theory, cells are the fundamental units of life. They are the smallest entities that can be considered “life.” As a corollary, all organisms consist of one or more cells. [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 351-352). Baker Publishing Group. Kindle Edition.]
- By the mid-1950s, biologists recognized two fundamentally distinct cell types: eukaryotic and prokaryotic. Eukaryotic cells contain a nucleus, organelles, and internal membrane systems. Organelles are large structures embedded within the cytoplasm that carry out specific functions for the cell. A membrane, similar to the cell membrane, surrounds most organelles. The nucleus houses the cell’s genetic material (DNA). As with other organelles, a membrane also surrounds the nucleus. [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 356-359). Baker Publishing Group. Kindle Edition.]
- Prokaryotic cells are typically about 1 micron in diameter. These cells appear to be much simpler than eukaryotic cells. Apart from a cell boundary, prokaryotes possess no visible defining features—no nucleus, organelles, or internal membranes. The genetic material of prokaryotes consists of “naked” DNA that resides in the cytoplasm. Bacteria and archaea are prokaryotic organisms. [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 361-364). Baker Publishing Group. Kindle Edition.]
- A Vital Force? Many who take the position that life stems from the work of a Creator hold to some form of vitalism, whether explicit or implicit. While they may not directly espouse a classical form of this belief, adherents to it still seem to regard life’s basic operations as more than the outworking of

physicochemical processes. They see life—animate matter—as possessing a unique property stemming from the Creator that makes it distinct from the material that makes up the inanimate realm. To date, I've seen no compelling evidence for vitalism of any type. [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 386-391). Baker Publishing Group. Kindle Edition.]

- The rejection of vitalism in no way undermines the case for a Creator. The following analogy might help me make my point. Consider life to be like an automobile engine. A car's motor runs in accord with the laws of physics and chemistry. No vital force is necessary to make an automobile work or to describe its operation. Still, the laws of physics and chemistry don't explain how the engine originated. A motor's defining features clearly must stem from the work of an intelligent agent, such as an automotive engineer. While the laws of physics and chemistry readily explain the operation of biological and biochemical systems, those laws cannot account for life's beginnings. [See Fazale Rana and Hugh Ross, *Origins of Life* (Colorado Springs: NavPress, 2004); Fazale Rana, *The Cell's Design* (Grand Rapids: Baker, 2008).] [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 393-398). Baker Publishing Group. Kindle Edition.]
- Characteristic 8: Life Evolves Organisms can change as their environment changes. This ability occurs through mutations in their genetic material. In rare circumstances, these mutations can create new biochemical and biological traits. If these new characteristics impart a greater ability to survive, the organism will reproduce more effectively. Over time, this new trait will take hold in the population, transforming the species. [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 434-437). Baker Publishing Group. Kindle Edition.]
- Evolutionary change takes place at four distinct levels. Microbial evolution, the first level, involves transformations in viruses, bacteria, archaea, and single-celled eukaryotes—changes such as the acquisition of antibiotic resistance in bacteria. Microevolution is the second level and refers to evolutionary variation within a species in response to selection pressures and genetic drift. One example includes the peppered moth's change in wing color. Speciation is the third level of evolutionary change. In this case, one

species gives rise to another closely related sister species. A well-known example is the evolution of the finches of the Galapagos Islands. The ancestral finch species came to the Islands, then diversified into closely related species that vary in size and beak shape in response to different ecological niches on different islands. Evolutionary biologists and most creationists agree that an abundance of evidence exists for microbial evolution, microevolutionary changes, and speciation. Biological evolution at these three levels is well documented and largely noncontroversial. Controversy about biological evolution centers primarily on the fourth level: macroevolution. This term refers to the creative potential for large-scale biological changes. Evolutionary biologists assert that over vast periods of time, the processes that generate microevolutionary changes and speciation can yield large-scale transformations (e.g., whales from a raccoon-like creature or birds from dinosaurs). [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 438-449). Baker Publishing Group. Kindle Edition.]

- Creationists and intelligent design proponents remain skeptical of evolution at this level. I include myself among those skeptics. My view is that while organisms can adapt to changing environments and other selective pressures, they cannot evolve in dramatic ways. In other words, a Creator must be responsible for life's origin and history, and biological and biochemical systems show every indication of having been intelligently designed. Regardless of an individual's position on macroevolution, one of life's defining features is that it does evolve, at least to a limited extent. [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 450-455). Baker Publishing Group. Kindle Edition.]

3 Blessed by a New Species

- Despite how conceptually simple the steps may seem to reengineer a life-form from the top down, the amount of intellectual effort put forth by Venter's team has been astounding. Each part of the process required careful planning and expert execution of laboratory procedures by highly trained chemists and molecular biologists. [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 881-883). Baker Publishing Group. Kindle Edition.]

- Additionally, these researchers depended on the accomplishments of the scientists who came before them. The technology to chemically synthesize oligonucleotides represents a remarkable technical accomplishment resulting from the dedicated efforts over the last half century of some of the best scientists in the world (including Nobel Laureates). Without these brilliant minds and remarkable achievements, Venter’s team would have had no hope to carry out the total synthesis of the *M. genitalium* genome. [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 889-893). Baker Publishing Group. Kindle Edition.]
- As remarkable as it will be when Venter’s team succeeds in creating artificial life, it’s important to resist viewing their accomplishment as more than it is. Headlines describing this work give the impression that these researchers are generating life solely from building-block materials. In reality, when Venter and his colleagues succeed, they will not have made life from “scratch.” Instead, they will have merely remodeled an existing life-form to generate a novel creature. [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 898-901). Baker Publishing Group. Kindle Edition.]

5 Becoming Acquainted with the Principals—and Principles

- Is God Really Necessary? While some scientists and others suggest the (anticipated) creation of artificial life makes the need for a Creator obsolete, I take the opposite view. As evidenced in both the top-down and bottom-up approaches, only by deliberate effort, inordinate ingenuity, and astonishing skill can synthetic biologists even begin the process of making artificial life. Their work empirically demonstrates that even the simplest life-form cannot arise without the involvement of an intelligent agent. [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 1696-1700). Baker Publishing Group. Kindle Edition.]

6 A Scientist’s Splendor

- Some astrobiologists think life could be based on silicon because it belongs to the same chemical group as carbon and therefore should display similar chemical properties. However, while silicon can form rings and chains, these structures lack the stability and range of complexity found in carbon-based compounds. Silicon-silicon bonds are much weaker than the corresponding

carbon-carbon bonds, and unlike carbon-carbon bonds, silicon bonds are susceptible to oxidation. [Steen Rasmussen et al., eds., *Protocells* (Cambridge, MA: MIT Press, 2008).] [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 1772-1775). Baker Publishing Group. Kindle Edition.]

- Given how much effort these scientists expended to make AEGIS, it seems unreasonable to think the highly optimized structure of DNA[100] originated via naturalistic evolutionary processes. This work argues that any type of life, known or not, must come from the work of a mind and a will coupled with resources and power. [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 2060-2063). Baker Publishing Group. Kindle Edition.]

9 Promised Impossibilities

- Bada and Lazcano wrote: Is the “prebiotic soup” theory a reasonable explanation for the emergence of life? Contemporary geoscientists tend to doubt that the primitive atmosphere had the highly reducing composition used by Miller in 1953. [Jeffrey L. Bada and Antonio Lazcano, “Prebiotic Soup—Revisiting the Miller Experiment,” *Science* 300 (May 2, 2003): 745–46.] [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 2783-2785). Baker Publishing Group. Kindle Edition.]
- In his book *Biogenesis*, origin-of-life researcher Noam Lahav passes similar judgment: The prebiotic conditions assumed by Miller and Urey were essentially those of a highly reducing atmosphere. Under slightly reducing conditions, the Miller-Urey reaction does not produce amino acids, nor does it produce the chemicals that may serve as the predecessors of other important biopolymer building blocks. Thus, by challenging the assumption of a reducing atmosphere, we challenge the very existence of the “prebiotic soup,” with its richness of biologically important organic compounds. [Noam Lahav, *Biogenesis* (New York: Oxford University Press, 1999), 138–39.] [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 2786-2791). Baker Publishing Group. Kindle Edition.]

11 United by No Link

- According to the worldview of many people, the creation of, manipulation of,

and control over life—particularly human life—belong exclusively to God. Perhaps this view explains why many people respond to origin-of-life researchers with a measure of suspicion. They see these scientists as undermining God’s position, replacing him with physicochemical processes. It’s true many in the origin-of-life community maintain that life’s origin needs no Creator. [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 3320-3323). Baker Publishing Group. Kindle Edition.]

12 A Thousand Other Miseries

- I argued that origin-of-life researchers have demonstrated, in principle, that physicochemical processes can generate the building blocks of RNA, combine them to form ribonucleotides, assemble them into RNA chains, and evolve these molecules into a collection of functional ribozymes able to sustain an RNA world—but only with an enormous investment of skillful, purposeful researcher involvement, and never with any realistic geochemical relevance. [Fazale Rana: *Creating Life in the Lab* (Reasons to Believe) (Kindle Locations 3791-3794). Baker Publishing Group. Kindle Edition.]

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