

Reports of the National Center for Science Education

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Entrance to Dinosaur Adventure Land in Pensacola, Florida.
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FEATURE

Dinosaur Adventure Land, or How Max Defeated the Creationist Swing Set

George Allan Alderman III

Kent Hovind, the founder of the Creation Science Evangelism ministry, opened Dinosaur Adventure Land (DAL), a young-earth creationist theme park in Pensacola, Florida, in 2001, just a few months before I moved there with my family. It gained a minor degree of notoriety in the skeptical community for its laughable stance on science (Martinez 2004, for example), and a major degree of notoriety in the Pensacola community for Hovind's criminal conviction for tax evasion.

RNCSE readers are well acquainted with DAL (Duncan 2009), and a comprehensive local review is available at Pensapedia (http://www.pensapedia.com/wiki/Dinosaur_Adventure_Land). Even though DAL appears to be in eclipse at this point, it is not a unique manifestation of creationism. Answers in Genesis is planning a very large biblical theme park in Kentucky focused on Noah's Ark (<http://arkencounter.com/>). So, rather than to repeat the information in those articles, my intention is to present a parent's experience with DAL. The experience for parents whose children attend other creationist venues is probably of a similar nature.

Pensacola is a pleasant place to raise a family, with gorgeous white sand beaches, mild weather, and friendly people. The area leans Republican, and the inhabitants are very religious. I grew up in LaBelle, Florida, which is in a very conservative area of south Florida, so I'm comfortable with life in this sort of community; I have the antibodies.

In grade school, my favorite subject was always science, and it was not easy to reconcile what I was taught on Sunday with what I learned the rest of the week. I remember my 7th-grade biology teacher's apologizing for having to discuss evolution. "I am required to present the *theory*, and you need to understand the *theory*," she explained, obviously troubled, and heavily stressing the word *theory*. There was no doubt what her actual beliefs were.

Now that I'm a father, I'm trying very hard to ensure that my two children have access to the best science and mathematics education I can find for them. It's surprisingly easy to do, because they are both very bright kids, voracious readers, and talented students. My wife and I basically just have to keep our home bookshelves stocked and help the kids with their homework, and they devour any information put in front of them. My daughter Amy, 12, was laughed at by two classmates because she didn't know who Justin Bieber was. "So what?" Amy sniffed. "They don't know what an *Archaeopteryx* is." She wants to be a paleontologist. My son Max's favorite TV show is *Mythbusters*, and he loves to listen to Brian Dunning's *Skeptoid* podcast on the way to school in the mornings. He's 10 and is fascinated by planetary geology.

SHOCK AND AWE

About five years ago, a boy living two houses down the street invited Max to a birthday party at DAL. At the time I had a vague idea of what DAL was about, but didn't know who Kent Hovind was and had no idea how over-the-top the park really was. So please imagine my horror driving into the DAL parking lot and seeing the big sign stretched over the opening in the Jurassic Park font: "DINOSAUR ADVENTURE LAND: The place where Dinosaurs and the Bible meet!"

"Uh-oh," I thought. "I've made a mistake bringing Max here, and now it's decision time: turn around or stick it out." I was already in the parking lot. We had accepted the invitation and I didn't want to have to lie my way out of the party. The birthday boy's mother is a very, very nice lady, a widow and single mother, and we have a very tight-knit neighborhood, having been through Hurricane Ivan together. I didn't want to hurt anyone's feelings. Plus, Max had already seen the dinosaurs, and he wanted in.

To a child, the coolness of dinosaurs is absolute and the presence of the Bible does not attenuate that. I also realized that he would inevitably face creationism, no matter how many Junior Scientist books I bought for him, so this could be a teaching moment, a chance to inoculate him against creationism. I decided to be as graceful as I could, and bite my tongue during the party, and have a long talk with Max afterward.

DAL was a small place. It was essentially a playground with a few exhibits, several fiber-glass dinosaurs, a climbing wall, and a couple of buildings. The smallest building was the "Creation Museum," bedecked with a grinning *T rex* head. Next to it was the much larger "Science Center" (which was closed because Hovind hadn't purchased the proper permits to build it). When we entered the park, Max's party of young children was gathering on the steps of the Science Center for an introductory lecture by the park's staff. The park guides were all clean-cut young adults. Later, I asked some of them where they came from, and they answered cheerfully that they were mostly students from the nearby fundamentalist Pensacola Christian College.

The staff began their lecture to the birthday party. "You're going to have so much fun! And you're going to fill your heads, too! You're going to be soooooo smart when you leave here! Are you ready? Praise Jesus!"

While the guides were warming up the kids, I noticed a large diorama nearby. It had a diagram of the Grand Canyon, with a poorly written explanation of how it was formed by the Noachian Flood. I browsed some of the other exhibits set up on the porch of the Science Center—evidently moved out of there after it had been closed. Nearly every exhibit in the park featured a Bible verse, to drive home a scriptural lesson. The majority of these were pretty generic—verses attesting to God's truth, his greatness, the duty of followers to proclaim such greatness, and so on. But some were uniquely chosen to counter particular tenets of modern science. Favorite topics were the age of the earth and the six-day sequence of creation events.

The kids were led through several of the exhibits, while the guides explained them in bright, cheerful, age-appropriate language. At every stop, the science was perfunctory, the Scripture lesson was emphasized, and the kids were pulled into the discussion as much as possible. "Do you think your great-great grandparents were monkeys? That's silly, isn't it?"

This was a young group, so they didn't get taken through the Creation Museum; rather, they were quickly moved to more lively activities. They were shown a climbing wall—complete with a verse and lesson about how God helps you climb over obstacles. They were placed in a seat suspended by a pulley system that demonstrated mechanical advantage—or more importantly, the lift that God gives you.

The kids could jump off a trampoline and dunk a basketball, and learn some vague spiritual lesson about slam-dunking sin or stuffing a two-pointer with God's love or something equally inane (I'm not sure, because I had taken a bathroom break, and was thumbing through the fine selection of Jack Chick tracts in the DAL men's room). Or they could look at human footprints pressed into concrete next to some dinosaur footprints, complete with a lesson fit for pasting to a shellacked wooden plaque and selling in a truck stop.

My favorite "exhibit" was a harness and swivel arrangement in which shrieking children were spun around wildly and taught for 10 seconds about centrifugal force and two minutes about how the devil spins you around and makes you sick and confused, just like the dizziness the poor, nauseous kids felt when they climbed out of the harness. After this experience, the little children were indeed suffering to come to Him, stumbling and trying not to vomit. Finally, the kids were cut loose to swarm the swingsets and playground equipment.

While Max burned off some energy on the jungle gym, I stepped into the Creation Museum. It was like a tour of the inside of the Unibomber's head. Inside was a handful of rooms filled with a disorganized jumble of anti-science screeds and near-illiterate rants against the "liar" Charles Darwin and the "fruits" of his theory: concentration camps, eugenics, slavery, Marxism, liberalism, and other horrors. You could see displays about how human co-existed with dinosaurs, how dinosaurs are still alive (the Loch Ness Monster is one, of course!), and how radiometric dating is invalid. I could only take a few minutes of it before I had to leave the museum and go sit by the picnic tables, wondering if I had done my son a disservice.

ON CLOSER EXAMINATION

I can sum up DAL in a word: shabby. The dinosaurs looked shabby, the displays were shabby, the attractions and activities were shabby, and above all the ideas were shabby. All of this was earnestly sold to visitors and their children as a learning experience, something that would enlighten them. The word TRUTH was scattered around the park and appeared in much of the displays' text. TRUTH was DAL's talisman. I could see why DAL's designers felt it so important to stamp the word TRUTH all over the park, and why they had to scatter so many Bible verses around; it's because doing so seems to add substance to arguments that are as hollow and flimsy as Hovind's fiberglass dinosaurs.

There were few arguments presented in that place that couldn't be utterly destroyed by a basic knowledge of biology or geology—even a reasonably bright high school student could dismiss most of them. Most children really are taught better than this, but DAL was an attempt to dissolve its visitors' learning. By attaching scripture—something that has a lot of emotional weight to many people—to their slapdash exhibits, DAL leveraged that weight to short-circuit any reasoned analysis of their arguments. Creationists like Hovind associate their ideas with TRUTH, and righteousness, and all that they find good and im-

portant and defensible because they want to exempt those ideas from competent analysis. It was not so much an attempt to manipulate people as an example of a worldview that if an idea doesn't come directly from and agree completely with Scripture, it doesn't exist, it isn't true, and it must be resisted. "TRUTH" is simply more important to creationists than facts, or reason, or science.

I left DAL very angry. My children live in a world that they are allowed to question. They believe that if they read and study long enough, they can learn about anything they want. The world is understandable, researchable, and wonderful to them, and there is no point past which they are expected to stop thinking. TRUTH isn't a sign that blocks them from continuing to ask questions, and it's not a Bible verse that conditions them to reflexively accept slipshod thought as unassailable fact. If they encounter a limit to our knowledge, their response isn't to pray passively for enlightenment; it is to find ways to push those limits further.

THE AFTERMATH

After the birthday party was over, we were driving home. Max was rifling through his goodie bag full of plastic dinosaurs and crunching malted milk balls. I decided that it was time to start repairing the damage. "What did you think about that place?" I asked him.

"The swingsets were fun," he said. "But they said humans lived at the same time as dinosaurs. Everyone knows humans didn't exist until millions of years after the dinosaurs."

That's my boy!

DAL is now closed, and has been since 2009. Its creator's own misdeeds brought it down. No surprise; Hovind is considered extreme even by other creationist organizations. This is a man who heartily recommends *The Protocols of the Elders of Zion* (but he "loves the Jews!") and firmly believes 9/11 was a US government plot, and his conviction record suggests that he feels he can ignore any law that does not agree with his dogma. Even Answers in Genesis thinks his ideas reflect badly on the creationist movement.

DAL was kept open by the Christian Science Evangelism ministry for a few years after Hovind's conviction on tax evasion charges, but it is now closed, and its URL (<http://www.dinosauradventureland.com>) now takes users to the website of "The Creation Store" in Pensacola where they can buy "charts and graphs ... books and DVDs as well as many other items, all explaining the truth about our great creator." On August 31, 2011, the Creation Store held an event they called the "Dog Days Kids Event". It featured Eric Hovind (Kent's son) and Paul Taylor of Answers in Genesis UK and promised "Fun Activities Including: dog petting, creation lesson on dogs, dog training lessons." A video on their home page invites viewers, "Join us as we celebrate the creation of man's best friend, the dog! We will have several special guests, including Deputy Patrick Crossly and his canine partner, Dasty!" Let that sink in: a deputy of the Escambia County Sheriff's office was a featured attendee for a creationist kids' event.

DAL was a silly, shoddy, risible, and stupid institution. It was built and operated illegally and when it closed, it was a laughing stock, even here in deep-red Pensacola. It was an embarrassment to a movement that desperately wants respectability. But the creationist movement sees their activity as a calling; and when God calls, you don't let a setback stop

you. Since DAL closed, Hovind's movement is evolving (pun intended). Note that a sheriff's deputy was recently featured at one of their events, and they're working with international creationist groups. And if you follow US politics, you know that creationist groups have the ear of powerful political figures. DAL is gathering dust these days, but its creators are not going to stop trying to recruit children and families to their cause.

But they won't get my Amy and Max.

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FEATURE

Battle over Science in Louisiana

Ian C Binns

INTRODUCTION

Science is under attack around the country. Tennessee, Florida, Texas, Alabama, and Louisiana are just some of the states where science is attacked by their respective legislatures each session. In each state, opponents of science continually attempt to redefine science. They claim that the current definition of science, that is “[t]he use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process” (National Academy of Sciences 2008:10), is inadequate. While I acknowledge that there is discussion on what the exact definition of science should be, there is a considerable amount of agreement that science can only address natural phenomena. These attacks on evolution and now human-induced global warming are just representative of the real agenda: to allow supernatural explanations into the definition of science. The opponents of science fail to understand the potential impacts of their campaign. Their efforts won’t affect only the current generation; instead, their antics could very well guarantee that generations of citizens will remain ignorant of the process of scientific inquiry and the benefits that it can bring.

LOUISIANA’S ATTACK ON SCIENCE

To date, Louisiana has pushed this attack further than any other state. On June 25, 2008, Louisiana Governor Bobby Jindal signed Senate Bill 733, a stealth creationism bill dubbed the Louisiana Science Education Act (LSEA), into law. The introduction and passage of the LSEA is the main event that started this most recent attempt to redefine science in Louisiana. The passage of the LSEA is well documented (<http://lasciencecoalition.org> and <http://ncse.com/news/louisiana>), so it is not within the scope of this article. Instead, this article will focus on several events that started in September 2010 and ended in June 2011 and use those events as evidence for the continued attempts by the Louisiana Family Forum (LFF), the state affiliate of the religious right organization Focus on the Family, and others to redefine science in order to serve their narrow agenda. For more detailed accounts of what else has happened in Louisiana since the passage of the LSEA, see the Louisiana Coalition for Science website (<http://lasciencecoalition.org>).

TEXTBOOK ADOPTION

Louisiana’s latest adoption of science textbooks occurred in 2010. Since this process was open to public comments, it provided another opportunity for opponents to attempt to redefine science. All twelve members of the High School Life and Environmental Science Committee—eleven teachers and one curriculum specialist—individually evaluated the proposed textbooks from May to September. From June to September, the textbooks were on display at various public libraries throughout the state to allow the public the opportu-

nity to review them. Any person wishing to make comments, either positive or negative, filled out and submitted a form to the State Textbooks Office so their comments could be taken into consideration when the adoption committee met to discuss the textbooks. Publishers were given the opportunity to respond to each comment and submit their responses to the adoption committee.

The adoption committee met for a week at the end of September to review each textbook, citizens' comments, and publishers' responses. During this week, the public was also given the opportunity to present additional comments to the members of the adoption committee. This was followed by a State Board of Elementary and Secondary Education (BESE) meeting in October in which all textbooks recommended by the various committees were accepted for adoption—except for the textbooks recommended by the High School Life and Environmental Science committee.

The vote for these textbooks was deferred to allow for the Textbook/Media/Library Advisory Council to meet and reread the public comments. This was the first meeting of this type in several years. The council's purpose was to indicate if they agreed with the decision of the original adoption committee. This advisory council meeting was open to the public and was held on November 12. The last event in the textbook adoption process was the BESE meetings from December 7 to December 9.

PUBLIC COMMENTS ON TEXTBOOKS

On July 22, 2010, retired judge Darrell White, co-founder of the LFF, wrote a letter to the editor in the *Hammond Daily Star* in which he encouraged "Louisianans to visit their local libraries to review and comment upon these science texts." This was followed by a call to action from the LFF on two separate occasions: in the August 10, 2010, edition of its *Family Facts* newsletter and the Reverend Gene Mills's *End of Week* newsletter on September 10, 2010. The LFF even provided the official comment form as a download to their supporters. (The LFF was the author and primary supporter of the LSEA.)

This led a small group of people to submit several objections to the proposed biology textbooks because of how they treat evolution. The critics complained that the textbooks "put too much credibility in the theory of evolution" (Sentell 2010). Fourteen people submitted a total of 38 comments about the life science textbooks. Of those fourteen people, only one was in favor of evolution. The other thirteen were clearly against the teaching of evolution. Two even went so far to say that the textbooks should also teach "intelligent design" (ID) alongside evolution. The effect on science education of including ID is perhaps most clearly articulated in *Kitzmiller et al v Dover Area School District* in 2005, in which "Judge Jones ... concluded that intelligent design is not science, and that the only way its proponents can claim it is, is by changing the very definition of science to include supernatural explanations" (Goodstein 2005; emphasis added).

The main players, led by Darrell White, never mentioned anything about creationism or "intelligent design". Instead, they focused on what they called the "weaknesses of evolution". Additionally, Darrell White and his son, Winston White, included an article by Stephen Meyer and Michael Keas entitled "The Meanings of Evolution," which argues that there are six different definitions of evolution, with each comment form. In my opinion, the sole purpose of including this document was to confuse the members of the adoption

committee. It is interesting to note that all of these written comments came after Darrell White's letter on July 22 and an overwhelming majority of the comments, 26 of 38, came from LFF supporters.

PUBLIC MEETINGS: TEXTBOOK/MEDIA/LIBRARY ADVISORY COUNCIL

There were two public meetings throughout this process that are of interest. The first was the Textbook/Media/Library Advisory Council meeting on November 12, 2010. This advisory council was convened by BESE to reread the written public comments. The council consisted of twelve people, including two members of the Louisiana legislature, Senator Ben Nevers and Representative Frank Hoffmann. Nevers and Hoffmann were responsible for the passage of the LSEA through their respective chambers in 2008. After several hours of testimony, the majority of which supported the biology textbooks, the advisory council voted 8–4 in favor of the textbooks.

From this meeting, I was mostly interested in the documents that were distributed by Lennie Ditoro, a supporter of the LFF, during her testimony. Lennie Ditoro worked with the LFF during the previous science textbook adoption in 2002 and has introduced herself as a representative of the LFF Education Resource Council on at least one occasion. The document entitled "Louisiana Science Framework" concerned me the most. This document included bits and pieces from the real Louisiana content standards, several of which were taken out of context or entirely misquoted in order to serve a specific agenda: in this case, redefining science. For example, one quote on the handout said that "science should be 'presented as a ... continuing process for extending understanding of the ultimate, unalterable truth.'" I found this quote troubling, considering that I knew this is not the purpose of science. This quote leaves out some key words from the real Louisiana document, one of which changes the entire meaning. The actual passage (with the omitted words emphasized) is "science is presented as *a human enterprise and* a continuing process for extending understanding, *instead of* the ultimate, unalterable truth."

A second example is how opponents of the textbooks cited the benchmark "recognizing and analyzing alternative explanations and models" as a reason to have "balance" and "critical thinking" when it comes to teaching evolution. Opponents claim that the textbooks fail to satisfy this particular Louisiana benchmark. While we can all agree that it is important for students to be able to recognize and analyze alternative explanations and models, this does not mean analyzing any non-scientific alternatives, that is, supernatural causes. The alternative explanations and models can only address natural phenomena, be testable, and be based on evidence.

As a science educator, I knew that these particular quotes were either taken out of context or just plainly misrepresented science. However, the students, the general public, and decision-makers most likely would not recognize these errors and accept this information without thinking twice. This has already happened in Louisiana with the passage of the Ouachita Parish Science Curriculum Policy in 2006. This science curriculum policy includes all of the above quotes and has already had an impact on how evolution is taught in that parish. I can only imagine the type of science instruction students in Ouachita Parish are experiencing. I found the use of these quotes in the meeting and in the science curriculum policy very troubling because these individuals using them deliberately misrepresented the entire purpose of science.

PUBLIC MEETINGS: BESE

On December 7, the Student/School Performance and Support Committee (SSPS) of BESE met to discuss the recommendations from the textbook adoptions committee and the Textbook/Media/Library Advisory Council. As with all previous meetings, this was open to the public. Several supporters of the LFF testified as did several supporters of the biology textbooks. There were over three hours of testimony, some more heated than others.

Many opponents of the textbooks addressed concerns with science, used the key phrases “strengths and weaknesses” and “critical thinking,” and claimed that the textbooks were outdated. The comments on the textbooks concerned me because of the fact that so many teachers rely on their textbooks in some way to teach (Chiappetta and others 2006; Weiss and others 2001; Yager 1983). If teachers start to think that the information in their textbooks is outdated, they could potentially feel less confident about what they are teaching. This creates the perfect opportunity for organizations like the Discovery Institute and the LFF to encourage teachers to use supplemental materials like the textbook addenda found at creationist websites (such as <http://TextAddOns.com>). Not only would these sources create confusion when it comes to learning about evolution, they could also create confusion when it comes to understanding science in general.

As with the first public meeting, the testimony that really concerned me was Lennie DiToro’s testimony. Although she has incorrectly quoted the Louisiana standards in the past, she used this occasion to argue against the current definition of science. She tossed out words like “materialism” and “naturalism” throughout her testimony. She claimed that the definition of science is too narrow because it only focuses on natural explanations. In other words, the definition of science does not consider any supernatural explanations. She called this “the root of the problem.”

Finally, some of the comments by the chairman of this committee, Dale Bayard, were troubling. For instance, during Barbara Forrest’s testimony, Bayard interrupted her to say, “But it’s a theory. It’s a theory. Parts of evolution are factual, but a lot of evolutionary concepts are theory that we teach our children [and] are not factual.” After the meeting, several of us were outside of the room discussing the outcome (the board voted 6–1 to adopt the textbooks) when Bayard approached us. He said that it should be a panel of scientists answering these questions and not people like us. Before I could answer, an evolutionary biologist with us said that “science already does this, it’s called peer review.” The scariest part of this is that Dale Bayard is an elected official and makes decisions that directly impact the future of Louisiana students. If he does not understand some of the basic aspects of science, then how can we expect him to respond intelligently when he is presented with information that clearly misrepresents science?

REPEAL EFFORT

This past spring, Zack Kopplin, a recent graduate (in spring 2011) from Baton Rouge Magnet High School, led a repeal effort with the help of State Senator Karen Peterson. This effort had the support of multiple science and education organizations as well as forty-three Nobel Laureates. Unfortunately this effort failed in the Senate Education Committee. While an explanation of the repeal effort is not appropriate for this article (visit <http://www.repealcreationism.com/> and <http://lasciencecoalition.org> for more information), it is

important to understand that during the testimony in front of the Senate Education Committee, several comments were made that indicated this continued attack on science is not going to end anytime soon.

Of the several opponents to the repeal effort testifying, three stood out the most. Darrell White handed out a copy of the Ouachita Parish Science Curriculum Policy to support his argument that teachers need to teach “both sides.” He also said that the LSEA would allow teachers to teach other ideas like irreducible complexity, a key tenet of “intelligent design”. In both instances, Darrell White is clearly misrepresenting science. First, he promotes the notion that science is a democracy, that scientists vote on what idea they like best. Second, he indirectly referred to the teaching of “intelligent design” in the science classroom. Unfortunately, the members of the Senate Education committee seem not to understand evolution and science in general because if they did, they presumably would have questioned him on this comment.

Lennie Ditoro also testified against the repeal effort. As before, she claimed that the definition of science is inadequate because it focuses solely on natural explanations. She also made this point in the hall after repeal failed. Although I knew that a discussion would be pointless, I constantly reminded her that science can only deal with the natural world.

Finally, Suzanne Passman, a former science teacher, claimed that we confused the definition of science. She argued that there are two areas of science, observational science and origin science or historical science. She claimed that origin science or historical science “is not a true science” like observational science because it is not observable, not repeatable, and not testable. This was her definition of science. There are two concerns with her argument. First, she clearly does not understand that scientists use both observations and inferences to construct scientific knowledge, a key part of the nature of science (Lederman 2007). Second, she conveniently left out natural explanations as an important part of the definition of science. Like other opponents of science, she is trying to redefine science to allow a place for supernatural explanations.

CONCLUSION

I couldn’t have agreed more with Lennie Ditoro’s comment at the BESE meeting on December 7, when she argued that “the root of the problem” is the definition of science. She, and others, have argued that only focusing on natural phenomena is inappropriate. The real “root of the problem” that we are facing in Louisiana is that a select group, supported by the religious right, is trying to redefine science to include supernatural explanations. This is not just a Louisiana problem. In 2005, a small group of individuals supported by the Discovery Institute convinced the Kansas State Board of Education to redefine science (Overbye 2005). The board removed the phrase “natural explanations” and instead added the phrase “adequate explanations.” The only reason for this change was to allow teachers to tell students that supernatural explanations are acceptable in science. Thankfully, in 2007, a new Kansas board fixed this mistake and restored the original definition of science found in the initial state standards (Hanna 2007).

However, redefining science is what this all comes down to. The danger here is that if science begins to consider supernatural explanations, then potentially scientific advances would stop. As Miller (2008:197–198) argued, allowing science to consider supernatural

explanations would mean that “science will cease to be an empirical search for the truth of the natural world. ... It will cease to explore, because it already knows the answers. And humankind will be the poorer for it.” Additionally, changing the definition of science would affect generations to come. People would not be able to make informed decisions on important topics simply because they do not have a true understanding of science and its limitations.

Finally, a glimmer of hope emerged here in Louisiana during this last legislative session. A small group of state senators successfully stalled a bill proposed by Representative Hoffmann that would have drastically changed the textbook adoption process. Although Hoffmann argued that this bill was not motivated by the recent biology textbook fiasco, it was clear that he wanted to make it possible for local school systems to incorporate supplemental materials, that is creationist materials, into the science classroom. Hopefully this defeat is a sign that people are finally starting to wake up and protect science education in Louisiana.

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FEATURE

People and Places: Henry Ward Beecher (1813–1887)

Randy Moore



FIGURE 1. Henry Ward Beecher (*Library of Congress*).

Henry Ward Beecher (Figure 1) was born on June 24, 1813, in Litchfield, Connecticut. Beecher—whose father Lyman was one of the last great Puritan preachers in America—graduated from Amherst College in 1834 and earned a degree from Lane Theological Seminary in Ohio in 1837. After working as a pastor in Indiana, he was appointed pastor of the Plymouth Congregational Church in Brooklyn, New York, where he became one of the most famous preachers in America. Beecher's congregations included celebrities such as Mark Twain, Walt Whitman, and Abraham Lincoln. He was popular and widely admired, and his sermons were printed in newspapers throughout the US.

Beecher advocated rational thought and progressive causes, including women's suffrage and the abolition of slavery. He raised money for anti-slavery activists, and his church was a vital philosophical and geographical link in the Underground Railroad. During the Civil War, Beecher's church equipped an infantry regiment, and guns bought with the money he raised became known as "Beecher's Bibles". Beecher was the main speaker at the ceremony when the US flag was raised at Fort Sumter near the end of the war.

In the 1870s, when many preachers were denouncing evolution as atheistic, Beecher fused religion and evolution into a new form of spiritual evolution. Beecher taught that Genesis is poetic rather than scientific and claimed that it was inefficient for God to design each species separately, so He designed laws that generated everything. Beecher published a popular collection of his sermons in 1885 entitled *Evolution and Religion* and often preached about evolution, noting that, although evolution might restructure some aspects of theology, it would not detract from true religion.

Not surprisingly, Beecher was condemned by fundamentalists. For example, Jonathan Blanchard (1811–1892)—who wanted the United States to pass a constitutional amendment making the nation "a Christian Nation"—claimed that Beecher was leading a campaign to corrupt society. In 1919, Blanchard's son Charles drafted the doctrinal statement of the World's Christian Fundamentals Association (and in 1925 William Jennings Bryan delivered the eulogy at Charles's funeral).

At the peak of his popularity, Beecher—a married man—had an affair with Elizabeth Tilton, a member of his congregation and his best friend's wife. Although Beecher described the affair as a sacred "highly religious love" (Applegate 2006), it produced one of the most famous scandals of the 19th century. Tilton's husband sued Beecher for "criminal conversation"—adultery. Beecher's trial, which began on January 11, 1875, lasted six months. There were 52 jury ballots, but jurors could not reach a verdict. In two separate extrajudicial enquiries, Beecher's church exonerated Beecher, but excommunicated Elizabeth Tilton and her husband.

Beecher often bragged of having "more health than I know what to do with" (Applegate 2006). But on March 8, 1887, after whispering "Now comes the mystery," Beecher died of a brain hemorrhage. Brooklyn declared a day of mourning, and condolences poured in from throughout the world, including from President Cleveland. Beecher was buried on March 11, 1887, in Green-Wood Cemetery in Brooklyn beneath the epitaph "He thinketh no evil" (the same sentence used by Herman Melville to introduce his Confidence-Man). Nearby is the grave of Elizabeth Tilton, who died 10 years after Beecher (and one month after Beecher's wife).

Beecher is memorialized by a statue in Brooklyn's Columbus Park, as well as by a statue by Gutzon Borglum (who created the Mount Rushmore memorial) in the garden of Beecher's church, which is now called Plymouth Church of the Pilgrims and is a National Historic Landmark.

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REVIEW

Charles Darwin's Religious Views: From Creationist to Evolutionist

by David Herbert

Kitchener, Canada: Joshua Press, 2009. 174 pages

reviewed by Marc-André Lachance

One would have hoped that David Herbert's religious biography of Charles Darwin might be more than a variation on the slanderous themes exploited by Ray Comfort or Benjamin Wiker in recent months (Gliboff 2009; Scott 2010). At first glance, one gets the impression of a dispassionate and endearing narrative. Herbert's agile pen would seem to paint a warm portrait of what he regards as Darwin's religious journey. But this work is a deception, a carrier wave for a disparaging message; not entirely surprising, as Herbert is candid enough to confess his allegiance to biblical inerrancy and the resultant frame of mind.

We're off to a particularly bad start with the foreword by one Heinz G Dschankilic, who writes: "Darwin is no longer taken seriously. Any reasonable and consistent scientist, regardless of religious stripe, is distancing himself or herself from the sheer logical folly that randomness and nothingness can explain life in any rational manner" (p x). This preposterous statement demonstrates that Dschankilic knows nothing about evolution or its place in science and sets the stage to Herbert's presentation of Darwin's science as if it were a religious view rather than as a scientific explanation for the diversity of life on earth.

Herbert treats evolution as a religion, but only after redefining religion as a response to the fundamental questions of our origin, our existence, and our destiny, at great variance with the definition offered by the *Oxford English Dictionary*: "The belief in and worship of a superhuman controlling power." The confusion continues as Herbert addresses William Paley's *Natural Theology*. Paley was an excellent naturalist and his biology was of high quality. But his theology was frail. Any biological phenomenon that could not be explained was attributed to a divine designer who ensures, as did Voltaire's Dr Pangloss, that all is best in the best of worlds. Herbert tells us that by "the age of thirty, Darwin had rejected Paley's supernaturalism and embraced Naturalism in which Natural Selection would be the creative genius rather than God" (p 129; note the author's dextrous use of lower case and capitals).

Instead of evaluating Darwin's ideas for their immensely rich content, Herbert pigeonholes them into facile "isms". Evolution metamorphoses into "evolutionism". John Henslow's (and Charles Lyell's and Charles Darwin's) scientific thinking is reduced to a beatific fervor, the doctrine of uniformitarianism. "Darwin rejected the fixity of species, and for the same reason, denied a global flood," all because of his "lack of faith in the biblical record" (p 54). "The deistic influence of Lyell [...] had undoubtedly taken its toll. Deism with its appeal to reason as the sole arbiter of truth regarded any type of divine revelation as suspect" (p

66). Herbert should at least contemplate the possibility that logic and evidence, and not some -ismic ganglionic reflex, led Darwin to recognize the value of Lyell's geology and the absurdity of Noah's flood.

The worst "ism" of all is "Naturalism", a "worldview [that] answers the three eternal questions of life"—which, you may recall, constitutes Herbert's (but not the *OED*'s) definition of religion. Naturalism (with a capital N) is the heresy of those who seek the truth from observational evidence (science). Even worse, Naturalism is, according to Herbert, a religion. In Herbert's words, the *Origin* is no less than "a sacred writing which propagated naturalistic theology," an "encapsulation of Darwin's new Gospel." Darwin, Herbert's "scientist turned evolutionist," allegedly recruited Joseph Hooker, Thomas Huxley, and Herbert Spencer to be the "missionaries" of his new religion. Darwin's self-indictments as a naturalist ("You are a theologian, I am a naturalist") and a "zealous disciple of Lyell" finalize his case. And by repeating incessantly that Darwin's scientific journey was a sacred crusade, Herbert apparently hopes that his fable will become fact: "In reality, when Darwin was wrestling with the problem of the origin of species, he was engaged in a religious endeavour, not a scientific one" (p 118).

And what was the divinity of Darwin's new religion, according to Herbert? Natural selection. In Darwin's own words, punctuated by Herbert's exegesis, "Natural Selection is daily and hourly scrutinizing, throughout the world, the slightest variations [omnipresence]; rejecting those that are bad, preserving and adding up all that are good [omniscience]; silently and insensibly working, whenever and wherever opportunity offers, at the improvement of each organic being in relation to its organic and inorganic conditions of life [omnipotence]" (p 115). Again, Herbert shows no interest in the evidence. On he goes: a "new theological framework [...] had been established. In reality, Darwin's research occurred within a new framework of which he was unaware. First, there was the doctrine of uniformitarianism which provided the necessary time for evolutionism to occur, and second, the principle of gradualism. Everything, he postulated, developed little by little over a long period of time" (p 115). It would seem that Herbert got lost on his way to the science library, for he concludes: "Neither of these two positions can be demonstrated scientifically but rather are faith positions" (p 116).

From Naturalism to Evolutionism, and now Deism. In Herbert's fanciful universe, James Hutton "discounted the supernatural biblical flood" because he was a Deist, as did Adam Sedgwick and Charles Lyell, also Deists (but not uniformitarians, I must add). The truth is that these pioneers of modern geology rejected the notion of the biblical deluge simply because of the utter absence of evidence. But in Herbert's words, Darwin reached his conclusion because he was "looking through Lyell's eyes." Not so. All sensible scholars, be they deists, theists, uniformitarians, Unitarians, Trinitarians, or vegetarians, should reach the same conclusion, based on the evidence.

Having wondered whether Darwin was a Theist, a Deist, an Atheist, or an Agnostic, Herbert thought it "best to conclude that the father of modern evolutionism was a 'muddled religionist'" (p 130).

Those interested in a serious Darwin biography should read Janet Browne's magnum opus (1995, 2002). Those wishing instead for a short but scholarly account of his religious views

should peruse relevant articles in the Darwin Correspondence Project published on the Internet by a group at Cambridge University (<http://www.darwinproject.ac.uk>). Neal Gillespie (1982) gives a thorough analysis of the epistemology underlying Darwin's dealings with creation. But those curious to see yet another muddled religionist's attempt to conflate science and religion in a vain hope of discrediting one of our greatest thinkers will be well served by Herbert's recycled musings.

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REVIEW

A Meaningful World: How the Arts and Sciences Reveal the Genius of Nature

by Benjamin Wiker and Jonathan Witt

Downers Grove (IL): InterVarsity Press, 2006. 257 pages

reviewed by John M Lynch

In a document written in 1998, the Discovery Institute articulated its notorious “Wedge Strategy,” a plan to defeat “scientific materialism and its destructive moral, cultural and political legacies” and “replace materialistic explanations with the theistic understanding that nature and human beings are created by God.” This change would come about through advocacy of “design theory,” initially within the natural sciences, before conquering the social sciences and humanities. Within twenty years, the concept of intelligent design (ID) would “permeate our religious, cultural, moral and political life” and the cultural renewal would be complete. (The “Wedge” document is freely available on-line, for example at <http://lynch.faculty.asu.edu/pub/wedge.pdf>). Having seen design on the earth (see the writings of Michael Behe and Stephen Meyer) and in the heavens (see the writings of Guillermo Gonzalez), the ID movement has recently found other arguments for design, and this discovery is outlined in the book under review.

When a book begins with a wild parody of modern life, it becomes hard to take what follows seriously. Yet Benjamin Wiker and Jonathan Witt—both senior fellows of the Discovery Institute—expect us to do so and accept their subsequent argument as being intellectually rigorous and factually bound. Their prologue (pages 11–13) asks us to imagine an alien who, upon visiting the earth, witnesses a prevailing air of despair and despondency manifested in “sullen graduate students … soulless modern architecture … the death of meaning and wealthy fashion models half-starved and aping death with charcoal makeup.” Setting out to inquire why this is so, the alien is told (by a “self-published poet in Birkenstocks” who is reading Nietzsche) that “we’re atoms in the void … [d]ust in the wind” and that this viewpoint comes from “Science … survival of the fittest, everything’s relative, indeterminable”. And why is the poet convinced of this position? Through the writings of “influential human intellectuals,” the “visionaries—Dawkins, Sagan, Weinberg”. Suffice it to say, the world envisioned by Wiker and Witt bears no clear resemblance to the one most readers of this journal live in (though I’ve known a few sullen graduate students), and the influence attributed of Dawkins, Sagan, and Weinberg in the culture at large is surely overstated.

The whole book is, in fact, infused with similarly bizarre views. I offer two, almost at random. Meaninglessness is apparently “the last truth one can still assert in the company of intellectuals without embarrassment, having now the status of a conversational icebreaker, a cocktail party talking point that has taken the place of the weather” (p 17). More astounding is the claim that “in assuming that ‘species’ are not real, Darwinism and the larger re-

ductionist program burn away the original ties that bound the meaning of mathematics to the world and instead leave it stranded in a solipsistic island of the human imagination” (p 237). While there are various schools of thought about the meaning of mathematics (Mario Livio’s *Is God A Mathematician?* [2009], offers an entry-level discussion of these), the claim that “Darwinism and the larger reductionist program” has anything to say about this—and indeed the authors provide no references — is not only bizarre but a trifle paranoid regarding the influence of the English naturalist.

Wiker has a PhD in theological ethics from the Divinity School at Vanderbilt University and has taught philosophy at a number of venues. This has not stopped him offering skewed—and frankly wrong-headed—views of various philosophers. For example, both Jean-Paul Sartre (p 24) and Friedrich Nietzsche (p 107) are described as nihilists. As anyone with even passing knowledge of the writings of these philosophers will know, neither was a nihilist and Nietzsche, in particular, strongly excoriated nihilism. Most egregious perhaps is the treatment of the Greek philosopher Epicurus. Epicurus has served as something of a *bête noire* among theists for millennia now, and while he is not the secular saint that some imagine, he is also not the influential hedonistic nihilist that Wiker and Witt present. Their viewpoint was first articulated in Wiker’s earlier work, *Moral Darwinism: How We Became Hedonists* (2002), and has subsequently been echoed by other DI functionaries such as John West. It is clear that Epicurus serves a similar function for ID proponents that Nimrod did for Henry Morris—the individual on whom all subsequent ills can be blamed. (Nimrod, it will be remembered, received the tenets of evolution from Satan himself at the summit of the Tower of Babel, or so Morris speculated.)

The central argument of the book is simple: certain aspects of nature reveal a purpose that reveals the “Genius of Nature”. This term is not to be seen as figurative—there literally is a Genius (namely, God) behind nature, and we can demonstrate this by the example of the existence of Shakespeare’s works, Euclid’s geometry, the periodic table and its elements, fine-tuning in the cosmos, and biological complexity. The degree to which one is convinced by the marshaled arguments will be dictated by one’s exposure to both philosophical argumentation and contemporary science. I remain unconvinced. Of course, the authors would argue that their inability to convince is a product of the brainwashing that the “materialists” have managed to enforce in schools. At fault is not the “average” person but those who “have assiduously sought out and controlled entrance to the seats of academic power, and so they are represented in the tenured offices of higher education and the benches of our courts in disproportionate numbers” (p 239).

There are many other problems with this book. Throughout there is a lack of solid quotes and much nebulous talk of what scientists think and feel. Individuals such as Stephen Weinberg and Richard Dawkins are overly relied on and used as exemplars of the much richer and diverse community of scientists. For a book coauthored by a former instructor of creative writing (Witt), the prose is often florid, even if one is willing to ignore the tendentiousness of the sentiment being expressed: for example, “Materialism has created a kind of flatland that crushes the life out of life, despoiling its native richness, denying its true depth, mudding over its brilliant and variegated hues” (p 46). In short, for a popular work, reading this was a remarkably tedious and miserable task.

A Meaningful World is certainly a work that would not have survived review by a mainstream press. In fact, I would say that it would not have survived as an undergraduate thesis. The very fact that it has appeared in print is symptomatic of the ID movement's ability to find sympathetic pulpits from which to preach to the choir. No one without pre-conceived sympathy is going to be convinced by the arguments presented by Wiker and Witt and, like much ID literature, it serves as a justification of belief rather than a scientific or philosophical investigation. It is notable that the publisher chose not to classify the work as science but as discussing religious aspects of nature and meaning.

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REVIEW

Creation and Evolution

by Lenn E Goodman
London: Routledge, 2010. 222 pages

reviewed by Arthur McCalla

Lenn E Goodman (of the Philosophy Department at Vanderbilt University) is a distinguished scholar of metaphysics and ethics, specializing in Jewish and Islamic philosophy. Having previously (Goodman 1996) argued that the God of Abraham is also the God of philosophers, Goodman here further develops his ongoing reflection on the relationship between God and the good and his long-standing conviction that our idea of God and our values are dialectically intertwined so that natural theology and natural law “inform, critique, and enlarge the other” (Goodman nd). The book consists of an introduction, five chapters of exposition and argument, and a brief afterward. Chapter 5 is the heart of the book.

Goodman’s aim is “to lower the temperature” in the debates over the “fit of Darwinian discoveries with religious values and beliefs” (p 1)—in fact, there is very little in this book about belief and a great deal about values. Writing against both biblical fundamentalists and militant secularists, Goodman hopes to show that religion is no threat to evolution and that Darwinism doesn’t mean that God is dead. His grand theme is that proximate and ultimate causes need not be rivals and therefore that evolution and theism are complementary; God works in and through nature.

Comments in chapter 1, which presents a short history of anti-evolutionism in America interspersed with conceptual clarification of philosophical concepts, betray Goodman’s irritation with Dawkins, Hitchens, and their ilk. Contemporary anti-evolutionism, he says, is not a manifestation of ignorance or backwardness, but an understandable reaction against the atheist and morally relativist constructions put on evolution by some of its most vocal champions. Despite his sympathy for anti-evolutionists’ defense of their faith, however, Goodman’s discussion in chapter 2 of how we ought to read the Genesis creation story rejects out of hand the literalist reading favored by fundamentalist anti-evolutionists. Instead, he endorses a traditionalist reading of Genesis as teaching ethical and spiritual truths, not scientific or cosmological ones. He emphasizes that Genesis, as a polemic against ancient Near Eastern paganism, naturalizes nature and points to a transcendent God as the cause of the natural order.

Chapter 3 outlines “The case for evolution” from Darwin to recent DNA evidence. Chapter 4 then considers “Three lines of critique” that have been offered against it. Goodman tells his readers up front that he does not think that the critiques are fatal to the evolutionary hypothesis, but that they “reveal evolution’s strengths and limits” (p 112). The three critiques are: (1) the nineteenth-century charge that evolution rests on a tissue of circumstantial evidence, pursued in the twentieth century by the creation science movement and

elaborated by Alvin Plantinga; (2) Karl Popper's mid-twentieth-century charge that Darwinism is not falsifiable and therefore vacuous because evolution is a near tautology: types that survive are, by definition, well adapted; but adaptive traits are those that promote survival; and (3) the recent charge from proponents of "intelligent design" (ID) that living structures and processes are irreducibly complex and therefore cannot have come into being through evolution alone.

Goodman judges that the first charge is simply wrong: the scientific evidence for evolution is robust. He bluntly rejects as special pleading Plantinga's attempt to claim equal epistemological status for biblical and scientific evidence. Goodman next shows that evolution eludes Popper's charge because it is not, in fact, tautological and it does risk predictions that require confirmation by evidence. In turning his attention to ID, Goodman notes that ID does not refute Darwinism but rather offers supernatural design as the solution to any questions currently unanswered by science. Goodman regards this "God of the gaps" argument as both tactically and strategically ill-advised. Tactically, because such a God must shrink as knowledge grows; strategically, because rather than seeing God only where our knowledge fails, theists should see God everywhere, including in the operations of nature revealed by science. He criticizes both secular Darwinists and ID proponents for taking natural causation to be opposed to theism, and then either enshrining natural causation as the final explanation for reality in place of an ultimate source or, out of fear, supplementing natural causality with miraculous causality. Goodman identifies both moves as idolatry: the displacement of reverence for God onto "the works of our own hands or figments of our fears and wishes" (p 132). This is an interesting statement because it clearly shows that Goodman here is not merely engaging in philosophical analysis of the concept of idolatry (in the manner of Halbertal and Margalit 1992), but using the concept normatively, that is, practicing philosophical theology.

Chapter 5 (and Goodman's entire reconciliation project) is built on the premise that Darwinism does not eliminate value or teleology from nature. Evolution, in this reading, is a progressive (albeit not unilinear) process in which, as a result of the pursuit by every living being of the good of survival, intrinsic values of order, awareness, and personhood emerge. This immanent teleology points Goodman to theism, not in the sense of a divine Designer, of course, but in the sense of an ultimate cause of the values perceptibly emergent in the natural order. He ascribes these finite goods "to the Infinite Goodness where immanence and transcendence meet" (p 170). Darwinism in this reading displays one of the secondary causes through which God as Ultimate Cause works. Far from opposing the biblical creation narrative, Darwinism adds to it "a plotline, the trajectory by which species win their local good" (p 145).

Goodman's opponents are clear enough; and so are his fellow travelers. Throughout the book he cites approvingly ancient and medieval rabbinic and, occasionally, Christian biblical commentators, while in chapter 5 he aligns himself with the modern natural theologians Aubrey Moore, Teilhard de Chardin, and Arthur Peacocke. The overall picture is one of a theistic Idealism without miracles or a personal God (he never states this latter point explicitly, but it seems likely from among other things his extensive and positive use of Spinoza's *Ethics*). Like the Romantics, Goodman is seeking the Infinite in the finite, and indeed his motto could be Friedrich Schleiermacher's "we should do everything with religion, nothing because of religion" (1996:30).

As a practical matter, it is important for secularists and religious moderates to work together against anti-evolutionism. But two final points suggest difficulties that the author's reconciliation of evolution and theism may present to secular readers. First, in his afterword, Goodman states, "Nature, like scripture, demands careful, active, thoughtful and responsible reading and readily falls prey to misinterpretation" (p 176). Reversing the emphasis of this sentence, we may ask why the Bible deserves such reverent treatment. Is this not a variation of Plantinga's special pleading? Relatedly, here and there Goodman takes passing swipes at the modern historical science of biblical criticism, which seeks to locate the books of the Bible in the socio-historical context in which they were written and edited. Second, values exist; does it matter ethically whether they come from an ultimate source or emerge from an entirely materialistic evolutionary process? While Goodman would rightly deny that he argues from authority or revelation, his reconciliation project depends on seeing the Infinite in the finite. Readers who do not share this religious perspective may be unwilling to reconcile evolution and theism at the price of renouncing naturalistic explanation of values and religion. It may be that this thoughtful book will fulfill its goal of encouraging readers to develop their own models of reconciling Darwinism and religion only for readers who share its author's religious interpretation of the world.

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REVIEW

Inside the Human Genome: The Case for Non-Intelligent Design

by John C Avise

New York: Oxford University Press, 2010. 240 pages

reviewed by Arcady Mushegian and Eric Kessler

Evolution takes place at the natural history scale: life originated on the earth as long ago as 3.5 billion years, and perhaps as long ago as 3.8 billion years (Knoll 2003), and the first *Homo sapiens* populations may have lived at least 200 000 years ago (McDougall and others 2005). Evolutionary biology as a science is much younger: direct scientific-style observations of nature by human beings did not start until several millennia ago at the earliest, and the methods of modern science have been in existence for only two centuries or so, while some, such as statistical inference, are even younger, and yet others, undoubtedly, still have to be developed. Such is the intrinsic difficulty of the scientific study of evolution: scientists were not around to observe most of the events that happened in the past. Those disinclined to accept evolution tend to seize upon this, to put forward two related arguments. First, they may say, because it is impossible to have direct evidence about the past, in the absence of any reliable eyewitness testimony, any claims about the past are simply speculation. Second, they may add, there is reliable eyewitness testimony about the origin of life and of the origins of its major groups, to be found in the book of Genesis (or perhaps a revelatory text outside of the Abrahamic tradition). It is this second argument that most often underpins creationism.

Fortunately, direct observation of natural phenomena is not the only way to learn about and understand them: the natural sciences team with methods, from the mundane to the sophisticated, for investigating the world that go beyond direct observation. Moreover, it is not only in the natural sciences that we justifiably make statements about past events without direct eyewitness accounts. (In fact, modern psychology teaches that eyewitness testimony is not the golden standard of truth, since witnesses tend to interpret what they observe, and unknowingly may impute their own motivations and prejudices even into an account of a random event [Wells and Loftus 2003]. And even if the omniscience of the narrator of Genesis is conceded, there remain serious questions about the accuracy of the transmission of the testimony [Ehrman 2005] and the way in which it is to be interpreted [Scott 2004].) In the human sciences, instead of relying on oral or written records only, we also learn about the societies of the past by the artifacts they left behind, by the changes of the environment that their lifestyle appears to have caused, and, most recently, by the historic record that is accumulated in their genes in the form of hereditary difference between human populations.

Not all creationists are skeptical about the possibility of scientific knowledge of the past. Those who are not do not deny the old age of the earth and the life on it, and they accept

the reality of the fossil record that helps to form the framework of the scientific understanding of evolution. Moreover, they accept the mechanisms of natural selection. They agree, for example, that abrupt spontaneous changes of hereditary traits sometimes happen—how this can be doubted when such “sports of nature” are the basis of many plant and animal domestications?—and they agree that different manifestations of a hereditary trait have different chances of survival in their natural habitat—and this also should not be in doubt, as the silkworm will not survive on its own even among the mulberry trees, on whose leaves it forages in a magnanery. (Note that very similar arguments about domestication were discussed repeatedly by Charles Darwin in the *Origin of Species*—not as the ultimate proof of evolution, but as examples of how we can understand the past through rigorous analysis of the relevant events observed today.) Such creationists will concede all these facts, but will attempt to identify obstacles to evolution in the complexity of biochemistry. It is this kind of assault on the evolutionary arguments that John Avise is examining in his book.

Avise is Distinguished Professor of Ecology and Evolutionary Biology at the School of Biological Sciences at the University of California, Irvine. He is a National Academy of Sciences member and a long-time advocate for better understanding of modern science by the general public. He has authored almost 150 research articles on ecological genetics and mitochondrial inheritance in various animals, as well as twelve books, many of them dealing with the public understanding of science and in particular with evolutionary approaches in biology. In his most recent book *Inside the Human Genome: A Case for Non-Intelligent Design*, Avise has three goals:

to help to educate a broad audience about the inner workings of the human genome; to challenge proponents of Intelligent Design to address, more critically, the ancient theodicy challenge as it applies at the biomolecular level; and in general to promote the evolutionary sciences as a preferred means to comprehend biological phenomena.
(p 40)

In his first chapter, “The eternal paradox,” Avise relates a brief history of human thought and study of organismal design, from its roots in natural theology through the Darwinian revolution and the subsequent creationist and “intelligent design” challenges to this movement. (Along the way, a convincing argument is presented that “intelligent design” is a secret child of creationism—not a scientific discipline, as the public is sometimes led to believe.) This sets the stage for his premise that a deeper, evolutionary, understanding of the genome could provide a meaningful, though complex, perspective on the age-old theological question, “Why does suffering exist in a world governed by a loving and all-powerful deity?” (Interestingly, though this problem has occupied theologians for a long time, it took a polymath scientist and philosopher, Gottfried Leibniz, to coin the specific term theodicy for the project of trying to solve it [Leibniz 1710]).

In the three chapters that follow, Avise delves into the structural details of the genome, building the case that it was non-intelligent processes that gave rise to the unnecessarily baroque, redundant, and inefficient features of the human genome, such as introns and repetitive genetic elements (duplicate genes, pseudogenes, and microsatellites), as well as intrinsic errors in genome copying, which manifest in human genetic diseases, often so severe, even in clearly innocent small children. None of this is easily explained by actions

of either a loving and merciful God or of an unnamed but highly competent Designer. In contrast, these features are well-explained by the stochastic nature of DNA mutation and the lack of foresight in the evolutionary processes of variation and selection. In fact, it has been noted (Kondrashov 1999) that it was Charles Darwin himself who pointed out, in the *Origin of Species*, that the evidence of evolution is brought into light not by perfection in the adaptations of the living species that we observe, but precisely by their non-optimality. The reasons for non-optimality are in part purely mechanistic (DNA copying, recombination, and repair mechanisms are error-prone, and they anyway can operate only on those genes that already exist in the species or can be produced by gene duplication) and in part involve population-genetic factors, such as finite population sizes and interplay of selection and stochastic changes in gene frequencies.

The suboptimality of genetic traits is in fact a crux of the debate between evolutionary biology and “intelligent design”. As explained in the last chapter of Avise’s book, it is there that the design proponents, such as Michael Behe, tend to lose their pretense of scientific discussion. Faced with challenges to explain suboptimality, they resort to appealing to our inability to “psychoanalyze” the purported designer. But, Avise argues, “if we cannot draw objective inferences about the designer from the many well-documented flaws of biological craftsmanship, then neither can we make logical inferences about the creator from any suspected artisries of design” (p 155).

Avise’s account is concise but rich in historic and medical detail, and the prose is elegant and lucid. The book is a joy to read, and is suitable for anyone who is interested in science and medicine enough to be a casual reader of *Scientific American* or *Discover* magazines. The main text is followed by twenty-six pages of extensive notes and references, allowing any reader to follow up with the science that informed the text. There is also a detailed glossary defining approximately 150 terms important in evolutionary biology and genomics, and a seventeen-page index.

So what about the three stated goals of the book? We suspect that the second goal, to appeal to the moral seriousness of the “intelligent design” proponents to assume their fitting burden of scientific proof, will not be fruitful: judging by the arguments of Michael Behe examined in the book, the ID champions continue to shift the arguments and change their venues, while laughing the more serious concerns away. This leaves two other goals, and the intended beneficiaries of those are no longer the creationists or ID proponents, but rather the scholars and educators seriously interested with what genome biology has to say about evolution. Avise’s book fulfills this twofold educational objective in a number of ways. Besides being accessible to high school students directly, this book aids in bridging the gap that exists between the content covered in school textbooks, which are generally outdated, and the world of genomic science as viewed from an evolutionary perspective. The high school educator will find the book rewarding. The evolved genomic design features, explored in chapters 2–4, and the subcategorization of each of these topics with numerous examples, including the names of more than 100 distinct genomic disorders, provides a great framework and a clearinghouse of interesting topics for educators who would have their students explore the evolutionary view of the human genome.

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REVIEW

Creating Life in the Lab: How New Discoveries in Synthetic Biology Make a Case for the Creator

by Fazale Rana

Grand Rapids (MI): Baker Books, 2011. 235 pages

reviewed by Juli Peretó

The chemical origins of life are the ultimate target of creationists, and the latest book by Fazale Rana provides us with a nice illustration. Rana holds a PhD in biochemistry from Ohio University and is currently vice president of research and apologetics at Reasons to Believe, an old-earth creationist organization. According to the self-promotional text included at the end of the book, “research in biochemistry provided him with evidence that life must have a Creator,” which is reminiscent of the “intelligent design” (ID) movement, but without redacting the reference to a personal God. Throughout 13 chapters, an epilogue (the only text with Biblical references), an appendix, and 21 pages of notes with a rich selection of bibliographic references, mostly from peer-reviewed journals, Rana explores studies on the origins of life and concludes that “these research efforts provide direct, empirical evidence that apart from the work of an intelligent agent, this prebiotic chemistry could not occur in a way that leads to the origin of life” (p 162). This is the central idea of the book: the human contribution to all the experiments of prebiotic chemistry and the emergent field of synthetic biology shows that nothing could have happened on the early earth under the control of natural forces alone. Instead, God was in action, purportedly designing processes, purifying enantiomers, condensing monomers in polymers, and igniting biological evolution in a sort of a primordial lab on a lifeless planet. All in all, this offers us with a very pedestrian image of the Omnipotent as a busy lab tech.

Prebiotic chemists know very well—and publicly accept and acknowledge in journals and meetings—that one of the major problems they face is the geochemical relevance of the reactions under scrutiny. Since our knowledge about the earliest terrestrial environments is so fragmentary and incomplete, deciding which component of abiotic chemistry—that is, geo- or cosmochemical compounds or processes—is prebiotically relevant—that is, was on the way to the most primitive cells—has been, and always will be, the biggest challenge.

Over the last sixty years, scientific opinions have changed about what chemicals and reactions were plausibly involved in prebiotic chemistry. One of the most beautiful examples involves the very first experiment published by Stanley L Miller (Miller 1953). Miller and his coworkers showed afterwards that the quality and quantity of the products obtained during the electric discharge experiments were highly dependent on the mixture of gases used. It worked better on a reducing atmosphere—that is, one composed of hydrogen-rich gases. Since geochemists advocated for a more neutral atmosphere—mainly composed of carbon dioxide—the prebiotic relevance of the original experiments was questioned for many years. In 2008 there appeared a paper (Cleaves and others 2008, on which Miller

had collaborated before his death) showing that two important modifications in the experimental design—the acidic control of the aqueous solution where organic products accumulate, and the prevention of oxidation during the analyses—make the classic experiment independent of the atmospheric model. In other words, a geochemically plausible neutral atmosphere is *also* good for organic synthesis. It is a pity that the fifteen pages of chapter 9 in Rana's book are devoted to the geochemical unlikelihood of Miller's approaches. Why doesn't Rana refer to this remarkable paper published in 2008? This scientific article alone makes chapter 9 worth less than the paper it's written on. (The most recent reference in the book corresponds to a webpage accessed on July 30, 2010.)

At any rate, in the future we will continue to come up against serious difficulties when it comes to assessing the prebiotic significance of our lab experiments. Since research into the origin of life is a historical science, it will be impossible to demonstrate the exact chemical nature of the processes involved, although there is a minimal scientific consensus that the natural transition from geochemistry to biochemistry took place on our planet more than three billion years ago. There is an insurmountable gap in the ways scientists and creationists confront this challenge: with more work by the former and a renunciation of scientific explanations by the latter. The most curious thing about this book is that, if Rana is right, absolutely all quoted scientists are wrong regarding their research and the conclusions they draw from their experiments. Doesn't that seem a little odd? Even the most skeptical authors, like Robert Shapiro, author of a celebrated account on the origins of life (Shapiro 1986), used and abused by Rana for his own interests, have remained firmly inside scientific boundaries.

Although it is not commonly observed in the creationist literature, there is nothing new in this illegitimate use of scientific evidence in favor of a particular group of believers. Confronted with the excellence of Pasteur's experiments against the spontaneous generation of microorganisms under lab conditions, some Catholic scientists who accepted the evolutionary theory at the end of the 19th century made an exception when it came to the natural origin of life. For them, the existence of a personal creator was a real postulate of science (Peretó 2007). More than a hundred years ago, those neovitalistic authors categorically rejected the possibility of an artificial synthesis of cells. Conversely, Rana now proposes that the imminent synthesis of life in the chemistry lab will be definitive proof of the necessary intervention of an intelligent agent in the origin of life. Maybe he is unaware of those illustrious historical precedents, but his position can be regarded as a mere change of strategy under the weight of contemporary scientific endeavors.

The author also devotes chapter 3 to J Craig Venter and his colleagues' work on the chemical synthesis of bacterial genomes and potential biotechnological uses—the so-called top-down approach to synthetic biology. As spectacular and advanced as these technologies may appear, they actually teach absolutely nothing about life's origins on the primeval earth. On the contrary, they speak much about the speedy development of genetic engineering methods in the post-genomic era and the ambitions of some biotechnological companies.

Reading Rana's book, I had the same feeling of frustration as with Michael Behe's *Darwin's Black Box*: at first sight satisfactory scientific descriptions are followed by strained and implausible arguments for the religiously significant conclusions. As with Behe and other ID

authors, the arguments will appear compelling only if you are willing to desert the scientific domain. You must abandon the idea that, for a scientific explanation, you must remain within the boundaries of material, exclusively natural, causes. In other words, you must be prepared to desert the scientific domain. Since many Christians, scientists and laypeople alike, accept this idea, Rana's book will not appeal even to all Christians. It is thus only of sectarian, not scientific, interest.

But if Rana's book fails as a scientific account, does it serve at least as a theological contribution? Several authors, including Francisco J Ayala, have already dealt with the theological weakness of the creationists' proposals. "A theologian should not cast doubt on a scientific consensus, but should see how he can deal with it." This is the recommendation of the distinguished German theologian Hans Küng (Heneghan 2006), and it calls for just the opposite of what ID proponents do. Küng adds, "As soon as one tries to intellectually force scientists to recognize God, one is on the wrong track." Thus let scientists continue their never-ending and passionate search for life's natural origins, and let theologians look on and accept science for what it is.

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REVIEW

Why Us? How Science Rediscovered the Mystery of Ourselves

by James Le Fanu

New York: Pantheon, 2009. 320 pages

reviewed by Jeffrey Shallit

In 2000, James Le Fanu, a British physician and newspaper columnist, wrote a book entitled *The Rise and Fall of Modern Medicine*, which, among other things, attacked the claim that many diseases have a genetic basis. He wrote, "... genetics is not a particularly significant factor in human disease. This is scarcely surprising, as man would not be as successful a species as he is (many would argue too successful), were it not that natural selection had over millions of years weeded out the unfit" (Le Fanu 2000: 275). In 2000, then, it seemed—despite the faulty rationale for denying a genetic role in disease—that Le Fanu accepted evolution and natural selection.

Ten years later, things have apparently changed. In his new book, *Why Us? How Science Rediscovered the Mystery of Ourselves*, Le Fanu mounts a literate but unoriginal assault on the explanations of evolutionary biology and on "scientific materialism".

The thesis of *Why Us?* is simple: science has no answers to the questions that really matter—questions like: How did humans come to be bipedal and have large brains? How, precisely, does the human brain work? How does an immaterial mind affect the material body? What is awareness and free will? Science provides no explanations, and furthermore, Le Fanu argues, it is unlikely that it ever will: "there is no longer the expectation that the accumulation of yet more facts will ever provide an adequate scientific explanation of the human experience" (p 14).

This failure is ultimately due, Le Fanu thinks, to the inadequacy of "scientific materialism". Darwin's theory, Le Fanu claims, was not driven by the evidence, but by the desire to have a materialistic theory that would do away with a Creator. Biologists are "irrational" to maintain the truth of "the evolutionary doctrine ... in the face of all the scientific evidence that would contradict it" (p 260).

If by now you suspect that Le Fanu might have become a creationist, you are not alone. If he is not one, he nevertheless drags out many of the usual creationist themes: cosmic "coincidences" (p 70); microevolution vs macroevolution (p 84); the unlikelihood of eye evolution (p 91); the Cambrian Explosion (p 99); the supposed lack of beneficial mutations (p 115); unbridgeable gaps in the fossil record (p 120); Darwinism is on the point of collapse (p 125, 262); information in DNA implies intelligence (p 259), and so forth. Le Fanu presents few novel arguments, and apparently relies on creationists such as Michael Behe, Phillip Johnson, and Jonathan Wells—he thanks all three in the acknowledgments at the end.

All of these objections have been answered, over and over again, and the readers of this journal will no doubt be uninterested in yet another refutation. I will content myself with pointing to two sources (Isaak nd; Morton nd) that deal with many of Le Fanu's claims.

But even back in 2000, there were signs that Le Fanu had problems with evolution. For example, in *The Rise and Fall of Modern Medicine* he suggested that the effectiveness of antibiotics (such as penicillin) was an unfathomable mystery. He rejected the explanation that naturally-occurring antibiotics had evolved as a form of "chemical warfare", claiming that the efficacy of these antibiotics in the wild had not been demonstrated.

In a review of his earlier book (Shallit 2001), I pointed out that, contrary to Le Fanu's claim, David Weller and Robert Bonsall, scientists at Washington State University, had shown that the root disease "take-all" is controlled by a naturally produced antibiotic called 2,4-Diacetylphloroglucinol.

How did Le Fanu respond? Did he withdraw his claim, or take issue with the results of Weller and Bonsall? He did neither. Instead, in a letter to me, he boasted about the good reviews his book had garnered and the award it won—and indeed, *The Rise and Fall of Modern Medicine* did win a 2001 Los Angeles Times Book Award.

So I must admit that it was with certain expectations that I approached his new book. In line with his previous book, I expected that *Why Us?* would be well-written; Le Fanu is well-read and has a good ear for language. But I also expected the book would make a number of controversial and poorly supported claims, all presented with a confident, even arrogant, assurance that the author was right and everyone else was wrong. In both expectations I was correct, although I have to admit being surprised by the sheer number of unsupported and incorrect claims.

Here are just a few. (Keep in mind that one of Le Fanu's rhetorical ploys is to quote, approvingly, ancient objections to widely-accepted ideas, without giving the reader any idea why these objections fell out of favor.)

1. Le Fanu is puzzled by "the discovery that the human genome is virtually interchangeable with that of our fellow vertebrates such as the mouse and chimpanzee—to the tune of 98 per cent or more" (p 15). He continues, "There is, in short, *nothing* to account for those very special attributes that so readily distinguish us from our primate cousins—our upright stance, our powers of reason and imagination, and the faculty of language" (emphasis in original).

But is there really nothing to account for human-chimp differences? Hardly. Clark and others (2003) found "key differences between chimp and human genome coding sequences" in "genes for olfaction and hearing, among others ... They concluded that 1547 human genes ... had experienced relatively rapid changes that likely endowed a survival advantage." (Pennisi 2003) And there is evidence that selection has occurred in FOXP2, a gene that differs in chimps and humans, and which is linked with the production of speech (Balter 2002; Enard and others 2002). There are no references to these papers in Le Fanu's book.

2. Le Fanu finds it "totally inexplicable" (p 15) that the DNA of humans and mice have about the same number of genes. But he fails to say precisely why the number of genes in an animal's genome tells us anything interesting about the complexity or behavior of that

animal. Does the number of pages in a book specify if it is the ravings of L Ron Hubbard or a physics text?

3. Le Fanu claims (p 39) that the “trivial *genetic* differences that separate our primate cousins from ourselves seem quite insufficient to account for those *physical* differences that set us apart” (emphasis in original). There are two things wrong here: first, even if the DNA of humans and chimps are 99% identical, that still leaves 30 million base pairs that are different. Second, we know that small changes to the genotype can result in large changes to the phenotype (Honeycutt 2008).

4. Le Fanu casts doubt on the evolution of bipedalism, saying (p 44): “the upright stance is staggeringly difficult to pull off, which is presumably why no other species has attempted to do it.” But this is not true: Macropods (kangaroos, wallabies, and so on), kangaroo mice, and the springhare (*Pedetes capensis*) all move bipedally.

5. Summarizing Chomsky (p 53), Le Fanu says, “Rules and meanings cannot evolve from the simple to the complex, they just ‘are’. The structure of sentences is either meaningful or meaningless. The naming of an object is either ‘right’ or ‘wrong’. An elephant is an elephant, and not an anteater.”

This is false: meaning evolves all the time (compare the definition of “nubile” in a modern dictionary with one a hundred years ago), and we have good models describing how meaning can evolve (Blume and others 1998; Searcy and Nowicki 2005).

6. (p 65): “It is fruitless—always has been, always will be—to pose that most elementary of all questions: ‘Why is there something rather than nothing?’”

This is typical of Le Fanu’s unsupported assertions. *Why* is it fruitless? *Why* will it always be fruitless? He doesn’t say, and he seems to be unaware that even this basic philosophical conundrum now has a tentative scientific answer (Wilczek 1980): that “something” is more stable than “nothing”.

7. (p 95): Le Fanu claims, “despite much effort, there is not a single empirical discovery in the past 150 years that has substantiated Darwin’s proposal that natural selection, ‘taking advantage of slight successive variations’, explains the ‘puzzle of perfection’ epitomised by so many different types of eye—which remains yet more puzzling than it was in 1859.”

Not a single empirical discovery? Le Fanu seems unaware of the current literature on the evolution of rhodopsins (for example, Sugawara and others 2002; Spady and others 2005; Sharma and others 2007).

8. (p 173): “‘No one has ever been able to relate any aspect of human social behaviour to any particular gene or set of genes,’ observes the geneticist Richard Lewontin. ‘Thus all statements about the genetic basis of human social traits are purely speculative.’”

Le Fanu seems not to know about GTF2I and GTF2IRD1, genes whose deletion results in significant changes of behavior, such increased eye contact and social interactions (Dai and others 2009).

Hopefully these eight examples give the flavor of the book: in between passages where Le Fanu rhapsodizes about the marvels of the human hand (unexplained by evolution, of

course) and the impossibility of reconciling the mind with the brain, Le Fanu relies on an incomplete understanding of the relevant scientific literature.

Two additional blunders, though minor, reveal a lot. On page 98, Le Fanu reproduces a picture from Stephen Jay Gould's book *Wonderful Life* of the odd creature *Hallucigenia*, as originally interpreted by the paleontologist Simon Conway Morris. But Le Fanu apparently doesn't know that subsequent investigation has revealed that the illustration depicted the animal *upside-down!* (Bengtson 1991; Ramsköld and Xiangguang 1991) And Le Fanu consistently and comically misspells "gemmales"—Darwin's hypothesized particles of inheritance—as "gemules".

For me, the most unattractive part of *Why Us?* is the book's anti-intellectualism. This is most apparent when he discusses the mathematical underpinnings of population genetics. Referring to the pioneering work of Ronald Fisher, author of "perhaps the most important book on evolutionary genetics ever written" (Cook 2000), Le Fanu writes (p 113): "The purpose of reproducing here just a small part of Fisher's twenty-five-page statistical proof of his major work, *The Genetical Theory of Natural Selection*, published in 1930, is not to clarify his argument, but simply to convey its most salient point—its impenetrable obscurity." Later, he sneers at WD Hamilton's mathematical explanation of altruism using nearly identical language.

It is too bad that Le Fanu can't be bothered to learn population genetics, but Fisher's work is covered in any decent university course on the subject. And while the work of WD Hamilton—who won the Crafoord Prize, the Kyoto Prize, and the Fyssen Prize, among others—may be difficult to understand, it is not hard simply for the sake of being hard, but because deep ideas may not always have easy expressions. Le Fanu seems to think he can wave his magic wand labeled "mathematical obscurantism" and be free of any duty to master the mathematics. He's wrong.

At the end, Le Fanu is reduced to invoking the nonsense of Rupert Sheldrake as a possible explanation for biological change, and to claiming that free will exists because he believes it to be so:

When the most certain thing I know is the reality of my non-material self as a unique, distinct, structured spiritual entity, then there is every reason to believe it to be so. And when I have the impression of myself as an autonomous being 'free to choose', then that is how it is, regardless of whether the ability of my non-material, freely chosen thoughts to influence my actions contradicts the laws of science. (p 228)

Despite its flaws, I enjoyed much of Le Fanu's previous book, *The Rise and Fall of Modern Medicine*. In *Why Us?*, however, the flaws are the most salient part. I suspect that most readers, upon finishing the book, will be reduced to asking, as I did, "Why me?"

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