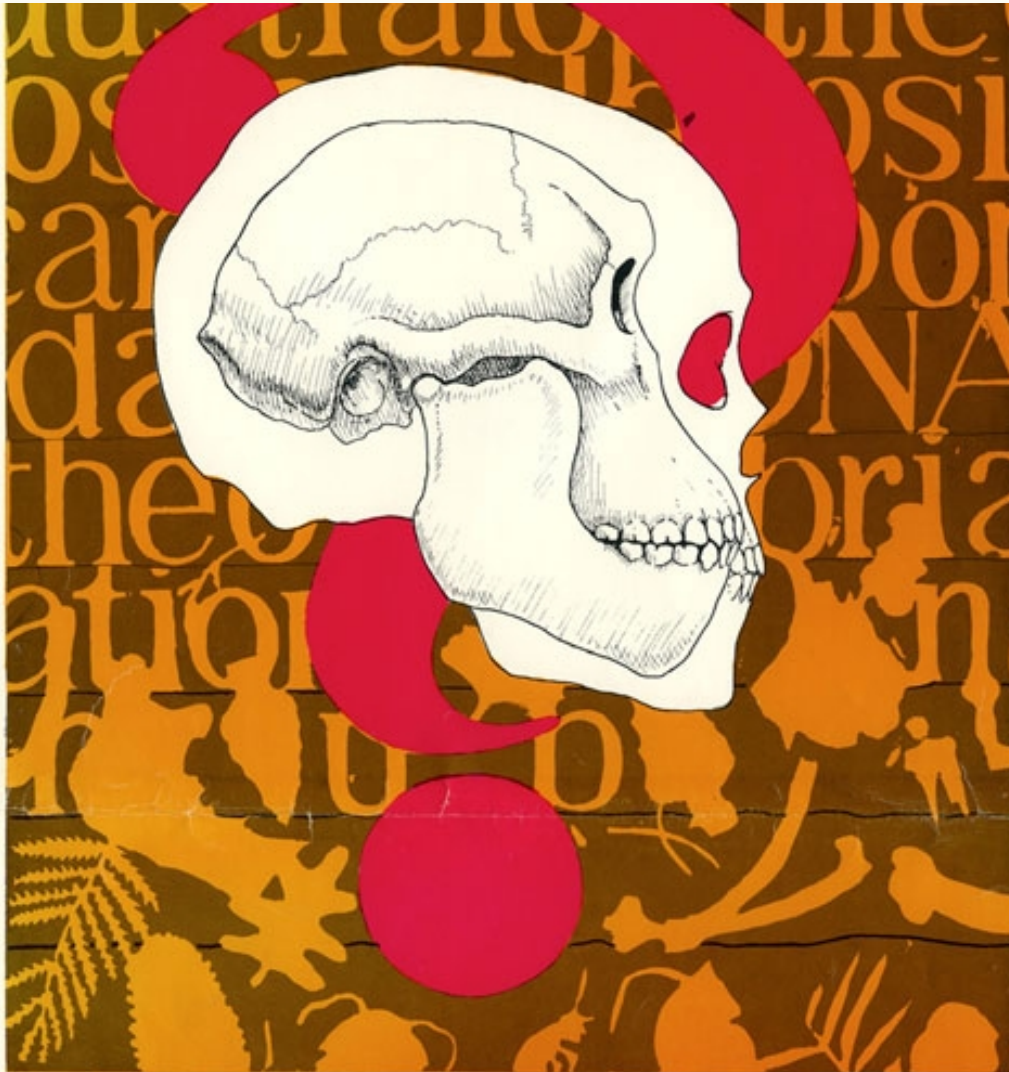


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- DEBATE -

Origins: Evolution vs. Creation

Proposition : ... "The theory of evolution is superior to the idea of special creation as an explanation for the scientific evidence related to origins."

AFFIRMATIVE:

Dr. Kenneth Miller,
Brown U. Dept. of Biology.

NEGATIVE:

Dr. Henry Morris, dir.
of the Institute for Creation
Research, San Diego, California.

Friday, April 10th 7pm. Meehan Aud. free with Brown ID gen. adm. \$1

Sponsored by: Assn. of Fraternity Presidents / Brown Christian Fellowship / Brown Young Republicans / Cranston Christian Fellowship Outreach Ministries / The Dean of the College / The Dean of Student Life

Poster advertising a 1981 debate between Kenneth R. Miller and Henry Morris on "Origins: Evolution vs. Creation."

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FEATURE

Extraordinary Scientific Delusions about Metamorphosis: Frank Ryan's *The Mystery of Metamorphosis*

Michael W Hart and Richard K Grosberg

No one is immune to self-deception. In *Extraordinary Popular Delusions and the Madness of Crowds*, Charles Mackay (1841) collected stories that help to explain why and how we engage in this practice. Mackay is most well known by recent readers for his colorful characterization of earlier financial manias and their parallels with the 2008 economic crisis (Roubini and Mihm 2010). However, Mackay also considered alchemy, witch trials, “magnetising,” and other manias that had some kind of technological (not to say scientific) basis for the associated mass delusion. An important trait shared by the people participating in these events was a deliberate indifference to evidence that would have dispelled the mania, for example, for tulips or collateralized debt obligations or the transformation of base metals into gold.

Unlike these popular delusions, scientific delusions tend quickly to encounter the self-correcting mechanisms of independent replication and of quantitative theory, so that deliberate indifference to such evidence rarely spreads far or persists for long. However, occasional scientific delusions endure within small cliques of self-styled iconoclasts. Focused case studies of specific scientific delusions such as cold fusion (Taube 1993; Seife 2008) suggest that a critical book-length study of many diverse scientific delusions, written by a 21st-century Mackay, could have a wide readership and many potential uses and benefits.

Unfortunately, Frank Ryan has not written such a book. *The Mystery of Metamorphosis* (2011) instead is a relatively uncritical examination of one peculiar, though not necessarily popular, delusion and its progenitor, the marine biologist Donald Williamson. Metamorphosis is the more or less dramatic change in form between early larval stages (like the tadpole or the caterpillar) and later adult stages (like the frog or the butterfly) in some animal life cycles, and Williamson is the chief advocate for a distinctive line of magical thinking in which differences among larvae of closely related species (and similarities between the larvae of some species and the adults of others) arise through hybridization and “larval transfer” between species in distantly related major animal groups that are separated from each other by tens or hundreds of millions of years of evolutionary history. *The Mystery of Metamorphosis* is his story.

Parts One (“Anomalies in the tree of life”) and Three (“New perspectives”) review Williamson’s early and late career (and the early and late stages in the development of “larval transfer”), the details of which are less tedious to relate the more likely one supposes “larval transfer” to be true. To Ryan’s credit, he does not attempt a forceful argument in support

of either Williamson's general or specific claims, for example, that caterpillars are larvae added to the insect life cycle by hybridization with velvet worms (non-insect arthropods in the distantly related taxon Onychophora in which adults superficially resemble caterpillars [Williamson 2009]). Instead, the subtext of this biography seems to be that the idea of "larval transfer" may be true in the same way that some other iconoclastic ideas like the endosymbiotic theory for the origins of the eukaryotic cell were only maybe true for a while before they were confirmed through multiple independent lines of evidence and elevated to the status of textbook staple (Margulis 1970). Ryan's apparent intention is to give the reader a sense of being there as Williamson describes the genesis of his own similarly fateful idea, delivered with a bit of breathless isn't-this-exciting? This subtext is clearer from the content of chapter 6 on the role of the late Lynn Margulis in fostering Williamson's ideas, as well as from the foreword (coauthored by Margulis). Such truthiness-by-association (Rogak 2011) is helpful to Ryan's telling of the Williamson story because the reader's pulse races a little less rapidly at the thought of being present at the still-birth of an idea that has proved to be neither useful nor true. It hardly warrants biographical documentation of Williamson's life, which like so many others has included achievements, setbacks, humor, and tragedy, but has been otherwise unremarkable.

Part Two, "The butterfly's tale," stands out from the rest of the book as a clearly written account of 20th-century studies of insect metamorphosis. The subjects of these chapters are the physiologists who directly observed insect larvae transform into adults, and dispelled much of the mystery surrounding the hormonal mechanisms that control caterpillar-butterfly (and many other) metamorphoses. The purpose of these chapters, sandwiched between two servings of "larval transfer," is much less obvious but seems to be to show a successful example of careful experiments over several decades, the results of which gradually transformed radical ideas about insect metamorphosis into widely accepted scientific truths about life cycle evolution. By weaving biographical characterizations of the main protagonists (like his biography of Williamson) into his characterizations of their laboratory achievements, and layering this material with "larval transfer," Ryan indirectly implies that similar careful experiments by Williamson document the occurrence of "larval transfer" between distantly related organisms via hybridization in the laboratory.

In the foreword, Margulis and her co-author Dorion Sagan call these experiments "[t]he most telling proof that Williamson is correct." This is faint praise indeed, because the evidence from these experiments leaves much (that is to say, everything) to be desired. They involve experimental insemination of the eggs of tunicates (or sea squirts, members of the phylum Chordata) with the sperm of sea urchins (members of the phylum Echinodermata), and later observation of swimming larval forms like those of sea urchins and unlike those of tunicates. The number of times this experiment has been reported to succeed (two, both by Williamson, in 1989 and 1990) is so small, the interpretation of those observations (that a haploid sea urchin sperm genome can reprogram the development of a tunicate egg into a sea urchin larva) is so outlandish, the documentation of those effects (a handful of sketchy drawings, and a few photographs of sea urchin larvae) is so poor, and the independent evidence against the occurrence of "larval transfers" either in the lab (Hart 1996) or in evolutionary history (Hart and Grosberg 2009) is so overwhelming that an essay considerably longer than this book review (and featuring observations, information,

and material not in Ryan's book) would be needed to fully describe just how shabby and pathetic is "larval transfer" as experimental science.

That future essay could also consider the enigmatic "spheroids," organisms with forms that were neither sea urchin nor tunicate, that replaced most of Williamson's "hybrids" in the 1990 experiment, and that figure prominently in the text of Part Three and literally in the intriguing graphic beneath the title of chapter 19 ("A new life-form"). After examining preserved samples of "spheroids" sent by Williamson for possible genetic analysis, one of us concluded that the "spheroids" are collections of diatoms and other benthic marine denizens of the microbial film that colonizes nearly every hard surface (including laboratory aquaria) that is covered for any length of time by seawater, and that undoubtedly grew by absorption of organic material from the decaying bodies of dead sea urchin larvae that accumulated in Williamson's cultures.

In Part Four, "The molecular age," Ryan attempts a synthesis, but without much success. He touches on the evidence for shared molecular processes that explain morphological variation across a wide swath of animal evolution from insect embryos to human brains. Understandably only the most superficial coverage of such a complex area of research is possible even over many pages (p 187–242). Only in the epilogue (p 243–264) does Ryan return to Williamson's story, but because "larval transfer" is a delusion rather than a scientific theory this closing section is limited to speculation (rather than evidence) regarding possible molecular mechanisms underlying "larval transfer."

In these ways *The Mystery of Metamorphosis* is a work of journalism, with its balanced treatment of both conventional and crackpot views of the evolution of metamorphosis, its he-said-she-said quotations of Williamson and his critics, and its emphasis on biography over biology. It is not much like a detective story (and far less a work of science), which would have developed a critical analysis of evidence and theory and a more or less strong conclusion about "larval transfer" based on the quality and weight of that evidence. A better detective (and a more interesting book) might have looked more deeply into:

1. Strong parallels between experimental studies of hormones and metamorphosis in insects and in marine animals.

One such parallel is the shared hormonal control of metamorphosis in diverse organisms. Part Two delves into these functional details of hormone control in insects, but the absence of such details from Parts One and Three for the organisms of Williamson's study (tunicates, sea urchins, and other marine invertebrates) implies that little or nothing is known. In fact, much of the mystery of metamorphosis in these groups has also been dispelled by careful experimental research that has many parallels to and benefited greatly from earlier and ongoing insect research like that described in Part Two. A recent book summarizes the achievements and future directions of this research on the physiology, ecology, and evolution of marine invertebrate metamorphosis (Flatt and Heyland 2011), most of which was well known long before the publication of Ryan's book, some of which could have easily been summarized without greatly lengthening *The Mystery of Metamorphosis*, but all of which was either unknown to Ryan or ignored by him in favor of "larval transfer."

A different sort of parallel involves other "larval transfers" among insects. For example, the life cycles of some Neotropical moths and butterflies include caterpillars with spectacular

morphological and behavioral traits (including large eye spots, head-shaped abdomens, and undulating movement) that mimic the structures, coloration, and movement of snakes. At least one species is reported (Nentwig 1985) to mimic several different models during different parts of the life cycle, including bird feces during an early caterpillar stage, followed by a rolled plant leaf and a cobra-like snake during subsequent stages. The physiology and evolution of such metamorphoses is understudied. To a conventional mind they suggest parallel evolution of superficial similarities (for camouflage of caterpillars that live among birds, plants, and reptiles), but for those inclined toward “larval transfer” these metamorphoses could be considered to be evidence as strong and convincing as anything else in Ryan’s book showing that ancient moths hybridized with coprolites, trees, and snakes as well as with velvet worms.

2. The scientific and popular responses to Williamson’s (2009, 2010) most recent attempts to expand “larval transfer” to additional groups of organisms and types of metamorphosis.

Ryan blandly notes in passing (p 248) that the most significant publication of Williamson’s career, in *Proceedings of the National Academy of Sciences*, “would prove to be the most controversial expansion.” This comment hardly does justice to related subsequent events, most of which happened long before Ryan’s book went to press, and included:

- extensive coverage in venues ranging from the popular science magazines, to the national newspaper *USA Today*, to the website of the Institute for Creation Research;
- designation as “The Worst Paper of the Year” by the blogger and past president of the Society for the Study of Evolution, Jerry Coyne;
- the demise of the backdoor submission route (formerly called “Track 1”) by which National Academy of Sciences members were able to “communicate” otherwise unpublishable manuscripts for publication in *PNAS*;
- rumors of editorial misconduct by Lynn Margulis, who “communicated” Williamson’s 2009 paper and reportedly violated editorial policy by soliciting a long series of reviews until two came back with positive recommendations;
- a rebuttal (Hart and Grosberg 2009), published in *PNAS* at the same time as Williamson’s (2009) paper, that refuted each of its predictions (about the genetic evidence from genome size comparisons between groups that Williamson hypothesized to have been the source or the recipient of a ‘transferred’ larval form and its associated paternal genome); and
- retraction by the editors of *Symbiosis* of Williamson’s (2010) last paper, cited by Ryan (p 262) as in press, the flaws of which were reported by us to the journal editors and included inadequate or previously published diagrams, tedious repetition of previously published (and refuted) claims, and lack of new data or observations.

3. The transformation of tunicate eggs into sea urchin larvae.

This is the single most important and potentially interesting “metamorphosis” in Ryan’s book (and Williamson’s research). The transformation must be visually astounding given the morphological and developmental differences between the eggs and embryos of the

tunicate and sea urchin species used in Williamson's experiments (Gilbert 2010). For example, tunicate eggs are surrounded by complex layers of cells and extracellular coats; the early development of the embryo and the tadpole larva occurs inside these extraembryonic cell layers; that early development includes cell division patterns that are strikingly different from sea urchins, and leads to the formation of tissues and organs without large persistent internal spaces; these embryos and larvae lack a functional digestive tract, cannot feed, and do not swim using ciliary propulsion. In contrast, Williamson's sea urchin eggs have simpler acellular coats; the early embryo undergoes multiple rounds of cell division to form a hollow ball of cells called a blastula; the blastula becomes ciliated and swims within its fertilization envelope before hatching; the first internal structure to develop is the digestive tract, which becomes functional shortly after the larva hatches and becomes free-swimming. Spectacular examples of these differences, in the form of both still images and time-lapse videos, are readily available (see, for example, <http://celldynamics.org/celldynamics/gallery/timelapse.html>).

A more inquisitive detective might have asked at what point in the sequence of tunicate development did Williamson's experimental hybrids (fertilized by sea urchin sperm) become less tunicate-like and more sea urchin-like? How did that transformation unfold? What combination of tunicate- and sea urchin-like traits did the "metamorphosing" embryos display? For example, did the cleavage-stage tunicate embryos come to resemble the hollow sea urchin blastula early in development while still inside the extraembryonic cell layers of the tunicate egg? Or did "metamorphosis" occur later, after hatching, by transforming the muscle-powered tadpole larva of the tunicate into the ciliated feeding sea urchin larva? Such questions appear never to have been asked, because Williamson has not claimed to have watched the progress of this transformation in order to answer them, and has only claimed to witness its fulfillment in the form of fully fledged sea urchin larvae swimming in a dish of seawater previously populated only by tunicate eggs. The need to photograph, or draw, or at least narrate a text description of the progress of this most significant "metamorphosis" seems astonishingly obvious to the reader of Ryan's book (and of Williamson's books and papers). One can only conclude that this was more of a nuisance than an imperative to Williamson, and not worth a mention to Ryan.

4. An alternative explanation for Williamson's experimental "larval transfer" observations.

As a more famous fictional detective is supposed to have said, "[w]hen you have eliminated the impossible, whatever remains, however improbable, must be the truth" (Doyle 1890). "Larval transfer" by hybridization between tunicates and sea urchins is as nearly impossible as any such event can be declared through scientific inquiry, but *The Mystery of Metamorphosis* betrays no corollary interest in exploring improbable alternative truths. One candidate is the perpetration of an unfortunate practical joke on Williamson. Under this alternative hypothesis, the supposed metamorphic transformation of tunicate eggs into sea urchin larvae was instead a more prosaic transportation of sea urchin eggs or embryos into Williamson's tunicate cultures in 1989 and 1990. We have explored this alternative hypothesis in correspondence with Williamson (who understandably rejects it out of hand), and with some of his contemporaries at Port Erin, but without much success so far in either testing that hypothesis or soliciting an admission from the practical joker(s). We hope that, by publicizing this effort and alternative hypothesis, the "larval transfer" delusion might

have a denouement like other more popular delusions such as crop circles, in which the hoaxsters eventually felt compelled to come forward and admit their role in propagating the joke partly in order to limit the embarrassment to those who willingly chose to participate in the delusion and its more fantastical interpretations (Sagan 1996). Until such a happy end is realized, “larval transfer” is likely to persist in the minds of a deluded few, and be otherwise widely ignored. And *The Mystery of Metamorphosis* will be relegated to the lower division of science biographies, “a chapter only in the great and awful book of human folly which yet remains to be written” (Mackay 1841).

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FEATURE

People and Places: Dudley Field Malone (1882–1950)

Randy Moore



FIGURE 1. *Dudley Field Malone. Undated; Library of Congress LC-USZ62-87882.*

Dudley Field Malone (Figure 1) was born in New York City on June 3, 1882. The son of William Malone (a Tammany Democratic official) and Rose (McKenny) Malone, he became a lawyer and member of the Democratic Party, and in 1913 was appointed Collector of the Port of New York. Four years later, Malone resigned to protest President Woodrow Wilson's failure to advocate a Women's Suffrage Amendment. In 1920, Malone ran for governor of New York on the Farmer-Labor Party ticket, but his 49 953 votes fell far short of the 1 335 617 votes garnered by the winner, Republican Nathan Miller. When Wilson appointed William Jennings Bryan as Secretary of State, Malone was appointed Third Assistant Secretary under Bryan. Later, Malone developed a thriving international divorce business in New York.

Malone, a witty and well-dressed orator, was in Dayton for the Scopes trial because of his work with Arthur Hays, his legal partner, who was a part of Scopes's defense team. Despite his rather accidental presence, Malone delivered a speech in the fifth day of the trial that generated the loudest and longest applause. According to John Scopes and others, Malone's speech was the turning point of the trial; when Malone was finished speaking, Scopes said he could tell that Bryan felt defeated. The press, breaking its customary silence of neutrality, gave Malone a standing ovation (the court stenographer's transcript noted the loud, prolonged applause) and legislator-turned-reporter John Butler described Malone's speech as the best of the century. Scopes agreed, noting that Malone's reply to Bryan was the most dramatic of his (Scopes's) life. Even Bryan begrudgingly acknowledged that Malone's speech was the greatest he'd ever heard. Years after the trial, Malone admitted that his famous speech in Dayton was the only extemporaneous speech he ever made.

After Scopes's trial, Malone was asked by Will Rogers to join him on stage at the Ziegfeld Follies. When the Tennessee Supreme Court set aside Scopes's conviction on a technicality (thereby eliminating the chance of further appeal), Malone—the only professing Christian on the defense team—condemned the decision as legal trickery used to protect Tennessee's religious fundamentalists.

When Bryan died in Dayton five days after the trial, Malone—unlike Darrow, Mencken, and others—praised Bryan. Later, however, Malone later became critical of Bryan. For example, on September 19, 1925, Malone used a speech at the national convention of the Laymen of the Unitarian Church of America in Lenox, Massachusetts, to respond to Bryan's posthumous Last Message. Malone expressed his contempt for Bryan's views and branded him the leader of a sinister movement.

Malone, who had been accompanied to Dayton by his wife, returned to his divorce business in New York, and got divorced. His work often took him to Europe, and during the voyages he often oversaw wagers on the accuracy of the day's projected mileage. Malone represented some of the biggest names in sports, including Jack Dempsey (the heavyweight boxing champion) and Gertrude Ederle (the first woman to swim across the English Channel, breaking the men's record by almost two hours). Malone also spoke at the funeral of his friend George Lewis "Tex" Rickard, a promoter who in 1925 built New York's Madison Square Garden. In 1929, Malone's most memorable speeches were published in *Unaccustomed As I Am: Miscellaneous Speeches*. The book included texts of Malone's speeches about Woodrow Wilson's policies, women and suffrage, Russia, prohibition, and his electrifying "There is never a duel with the truth" speech from the Scopes trial.

After serving as a delegate from New York to the Democratic National Convention in 1932, Malone used his booming baritone voice to launch a new career in Hollywood as an actor. His most prominent role came in 1943 when he played Winston Churchill in *Mission to Moscow*, a wartime film requested by President Roosevelt to support America's Russian allies.

Malone died on October 5, 1950 in Culver City, California.

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Randy Moore is the HT Morse–Alumni Distinguished Professor of Biology at the University of Minnesota. His latest book, coauthored with Sehoya Cotner, is *Arguing for Evolution: An Encyclopedia for Understanding Science* (Santa Barbara [CA]: Greenwood, 2011).

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FEATURE

I Also Survived a Debate with a Creationist (with Reflections on the Perils of Democratic Information)

Kelly C Smith

IT WAS A DARK AND STORMY NIGHT

When I was an undergraduate many years ago at Georgia State University, I had a biology class with Fred Parrish. I vividly remember him relating the tale of his harrowing experience debating a creationist, about which he later wrote a classic cautionary article (Parrish 1988). I went on to become a philosopher of science and evolutionary biologist myself, and I make it a point to teach my students all about the dangers of debating creationists (see, for example, Bartelt 2004; Naff and Bechtel 2003; Edwards 1982). So when I accepted the latest evolution debate invitation to come my way, I thought I knew what I was doing.

In May 2011, I received an email from Clemson's media relations department notifying me that someone needed an evolution expert to call in and debate evolution for an internet radio program out of Pittsburgh called The Total Education Network. The notice had come to the media people through ReporterConnection.com, a service that helps connect reporters on a deadline with relevant experts. I am sufficiently passionate about the need to educate the public that I try to participate in these sorts of things when time allows, and since I was basking in the warm afterglow of having completed spring grading, I decided I would look into it.

The debate was to be the following evening, so time was very short. Keeping in mind all those pitfalls I teach my students about, I first did an internet search on my opponent, a Rob Roselli. Roselli, it turns out, is an engineer who has written on a variety of right-wing and conspiracy themes and seems to be the crudest type of young-earth creationist. As far as a debating adversary goes, he's definitely a lightweight. Indeed, the engagement promised to be the sort of blowout PZ Myers wrote about so amusingly four years ago (Myers 2008). The trick, I thought, was going to be not giving free rein to the kind of rhetorical acid Myers wields so effectively in his article. It's not that I have any objection to acid, mind you—I was delighted when my recent piece in *Synthese* received “first prize” for “condescension and sneers” (Luskin 2011). But there's a place to be brutally honest and a place to be diplomatic. In this situation, my target was the audience of the show, not Roselli. I had to be sensitive to the fact that many of the listeners would likely be put off by too “direct” an approach. So it seemed my problem would be trying to make my points clearly and forcefully without coming across as a condescending, pointy-headed intellectual.

I e-mailed the host, Neil Haley, that I would be willing to help out if the format seemed okay. I heard back the next morning that he would like to have me come on and that I

should call in at 10:38 PM that evening. He didn't say anything about the format, and he didn't answer a follow-up e-mail along these lines, but he did mention that he was having e-mail problems, so I decided to let it slide. The extremely precise timing was a little weird, but I assumed that he just wanted me to call in about twenty minutes before the show began at 11 to make sure we had an opportunity to go over the rules, check phone lines, and so on (this is not unusual for phone interviews).

That evening I finally had an hour free to listen to an earlier show with Roselli on the same radio station (Total Education Network 2011a). This just increased my level of confidence, because it was clear Roselli didn't really know much of anything about science in general, much less evolution. The tactic he repeated over and over was to put his opponents on the defensive while avoiding saying anything specific himself—in particular, he kept coming back to the supposed inconsistency of the laws of motion with the elliptical orbit of the planets. The pro-evolution callers on that show were well-intentioned, but none of them had either the science background or the rhetorical skills to deal with this very effectively. So I was confident, but to be sure, I took some time to think about how I would respond to Roselli's favorite issue.

At 10:35 PM, I called in. I was expecting to meet the host and Roselli, go over the rules, and so on. Instead, it immediately became clear that the show has been going on for some time, and I was on the air, like, *now*. Not only was this totally unexpected, but since I was on the air from the very first second, I couldn't really ask questions about the format or take time to collect my thoughts. It also didn't seem a good sign that, instead of being introduced as an expert, I had to remind my host who I am and why I am there. After I regained my footing a bit, I thought to myself, "Well, I have 25 minutes and I am familiar with Roselli's arguments, so there is still enough time for the relative weight of broadsides to register tellingly."

I did make a few good, if extremely elementary, points. For example, I explained how evolution's status as a "theory" is not a bad thing if you consider what a scientist means by that term. You can listen to the performance for yourselves (Total Education Network 2011b, beginning about 35 minutes in) but to give you some idea of how very elementary it was, here is a paraphrasing of one exchange:

ROSELLI: I'd like someone to tell me where we can find one transitional fossil.

ME: Well, pick any natural history museum in the country—there are hundreds of museums with thousands of such fossils on display.

HOST: Wow! You are the first of our guests to say you can find a transition-type fossil!

With some effort, I avoided channeling Myers with a snarky comment about the level of the "debate" or the provenance of the previous guests. Then Roselli asked me his favorite stumper about the laws of motion, and I responded with a thought experiment showing the inconsistency he makes much of just is not there. The preliminary sparring out of the way, I was then ready to ask Roselli a few questions of my own. For example, why do we not find any fossil birds below a certain geological layer? Why do so many different dating methods indicate a very old earth? Why are there so many examples of seemingly poor design? I wanted to show the audience that, even if modern evolutionary theory is not per-

fect, it's far better than anything the creationists can come up with. However, just at this point, the host thanked me and politely shepherded me off the air!

The abrupt end of my involvement was even more surprising than my entrance had been. I was prepared for complex creationist arguments (though I didn't really expect them from this particular opponent). I was on watch for rhetorical sleight of hand. I knew to be careful to present myself as studied and reasonable. But it simply never occurred to me that I would only be on the air for about six minutes, which is not enough time to make a concerted argument of any description. As I listened (muted in the wings) to Roselli blather on about my counterexample being "too philosophical", it gradually dawned on me that, for the purposes of this "debate", I had been granted the exact same status as a Pittsburgh housewife with time on her hands and a pet theory about evolution.

THE PERILS OF AN INFORMATION DEMOCRACY

I admit that my first reaction was anger—it take enormous chutzpah to use the Reporter-Connection system to get professors to fill the ranks of your call-in show! It also seemed a colossal waste of my time, since I didn't really get to land a telling blow (though fortunately the very next caller was an articulate MD who made many of the points I had planned to make, making me feel much better). But the more I thought about it, the more I became convinced that what had happened to me was important to discuss within the evolutionary science community. I had prepared for the last war, but things have changed and we need to shift tactics accordingly.

What we take for granted is what usually gets us in trouble. As experts, we are used to having center stage and receiving a certain amount of deference from the lay public. Our methods of presentation assume that we will be given the time to make involved arguments and that the audience is at least somewhat interested in hearing them. We understand that we need to pitch our material at a level non-experts can appreciate, but other than that we usually don't change our tactics much from what we would do in a classroom setting. Even someone like me, who has written on the critical need to target the average Joe or Jane in one's evolution presentations (see Smith 2011), was caught completely off guard when these implicit expectations failed to be met. Whether we like it or not, more and more of the public engagement with creationism will be in these kinds of venues, where the audience's commitment to anything like a serious discussion cannot be assumed.

Now, one obvious lesson to be learned from this experience is never to assume that "debate" means actual debate. The problem was that this wasn't a debate in any sense of the word, even the "traditional" creationism/evolution format with rules tilted toward creationists. Indeed, though the listeners of Total Education Network were exposed to fully two hours of talk about evolution, very little of it even rose to the level of intelligent discussion. If the host, Neil Haley, is a creationist with an agenda, he is an exceptionally inept one, because it's hard to imagine picking a less capable champion for your cause than Roselli. My guess (and it's hard to know, since subsequent attempts to communicate by e-mail have failed) is that Haley is sincerely interested in exploring the topic. It's just that he himself is so profoundly ignorant concerning science in general and evolution in particular that he honestly considers Roselli to be well informed; and his intuitive notion of an intellectual exchange is having lots of people say lots of interesting things, whether they have any deep understanding or not.

As this style of media presentation becomes more and more common, the American public is increasingly assuming an implicit, unquestioned attitude towards information exchange which differs importantly from what experts expect. I call this attitude “democracy of information”. More and more information is easily available with modern technology, and that information represents an increasingly diverse sampling of the opinions of other people. As a consequence, these attributes—ease of information flow and diversity of content—are coming to be seen as good in and of themselves. Of course, there is much good that comes from having both free flow of information and high diversity. But they are certainly not good without qualification, as my own experience shows.

In the old days, if you wanted to learn about something, you had to visit an expert. If you lived in ancient Athens and you wanted to learn a little trigonometry, you had to walk down to the agora and invest some time hanging with, say, Aristotle. Things were certainly democratic in the sense that you were free to disagree with the old man, but he was also free to point out the error of your ways. Moreover, the exchange between you would be publicly judged by others who cared enough to show up and listen. For thousands of years, this is how information was disseminated—from the experts to the learners in a more or less direct fashion.

To be sure, the democratization of information has been underway for some time—at least since Gutenberg. However, until very recently, the activation energy needed to disseminate one’s ideas was still relatively high. Books have been (relatively) easy and cheap to print for the last hundred years, but not so easy and cheap that publishers would print anything from anyone. If you view this process as a kind of natural selection of ideas, the fitness function determining which ideas thrived and which withered was defined by truth. And truth was judged by the collective opinion of experts (scientists, publishers, and so on.). That’s because the experts decided when and where they would present ideas and learners had to accept that if they wished to learn. Experts have thus become used to a seller’s market, if you will.

For some time, however, the situation has been changing. It is no longer necessary to visit an expert at all, even indirectly through his books. Instead, learners can get their information from a wide variety of sources with trivially small amounts of effort and all manner of people have taken advantage of the new technologies to post their pet theories and claims for the world to see. The result is a stupendously huge mass of “information” which has not been tested, vetted or critiqued in any way. To make matters worse, there is evidence that people respond to such diversity by selectively accessing information which confirms their existing opinions (see Knobloch-Westerwick and Meng 2009). The information market is now very clearly a buyer’s market to which the sellers—experts like us—have yet to adapt.

In one sense, this is a golden opportunity for the experts. After all, what we are good at is evaluating information. A scientist, for example, will examine all sorts of evidence and apply the tools of scientific method to try to determine, as objectively as possible, which ideas seem best supported by the evidence. Almost any idea can claim some evidence in support of it—the question is how good that evidence is, both in absolute terms and relative to the evidence for competing ideas. So there is clearly lots of work in this new democratic information system for the experts. The problem is that we now have to compete for

the job. The lay public decides who they will listen to and they have to be convinced of our value, and on their terms, since we no longer have a monopoly on information access.

Even if the public is convinced of the need to talk to an expert, it's not at all clear they will choose the right expert. One effect of democratic information flow is to increase the number of people claiming to be experts, so how does the public figure out who really knows what they are talking about? The Dunning-Kruger effect (Dunning and Kruger 1999), for example, suggests that people who know least about evolution will probably feel more confident of their ability to detect accurate evolutionary information compared to someone who actually knows more about the subject. If the public is not even exposed to information from genuine experts in venues they frequent—for example, on a call-in radio show—then the problem of detecting pseudo-experts becomes more difficult still.

While there is nothing specifically creationist about the democratization of information, it is nevertheless a trend which plays to the creationists' advantage. In many fields of science, including evolution, the scientist has the challenge of explaining something which is both complex and counterintuitive. To the average layperson surfing creationist websites, the information found there seems as authoritative as what the evolutionary experts say, fits well with their own preconceptions, and flatters them by making it clear they are intelligent enough to make up their own minds about this. Contrast that with the nasty scientist, who has the unenviable task of pointing out to interested but clueless parties that they really don't know what they are talking about. Then she must try to explain complex evidence that doesn't make a lot of sense without a fair amount of effort. Listeners are left with the choice of believing that the scientist is right and thus they have been making fools of themselves, or that the nasty scientist is trying to trick them and they were right to believe the other "experts" all along. We are all loath to confront our own foolishness, even when presented with the evidence.

This dynamic helps explain a puzzling situation most of us have probably encountered where people with little background in biology spend just a few hours on the internet studying creationist sites and somehow manage to convince themselves that they have found basic errors of logic or scientific method in evolution. These errors are always blindingly obvious, yet they have somehow escaped the notice of thousands of actual scientists. In my experience, it is extremely difficult to talk to such a person without coming across as condescending.

LESSONS LEARNED

Getting back to the "debate", we should perhaps all be aware that being asked to weigh in for just five minutes in some passing way is going to be increasingly common in a culture of short podcasts, tweets, and internet blogs. Even we "experts" make use of increasingly short presentations—for my part, I am addicted to *Scientific American's* 60-Second Science podcast because it allows me to productively mine very small blocks of time in my busy schedule. But this shift forces us to reconsider our tactics as well.

In this case, for example, I would have been well advised not to use my carefully prepared thought experiment about the Big Bang. It certainly did address Roselli's favorite argument, but it was also too complicated to use in a situation where I could not be sure either that I would be allowed follow-up to deal with confusions or that the audience was

listening with sufficient care to follow all the intricacies of a hypothetical analogy. Instead, I should have simply deflected discussion of the Big Bang by pointing out (quite correctly) that this is only tangentially related to evolution. I also should have opened with questions of my own to put my adversary on the defensive—even just five minutes of listening to Roselli stumble for answers would probably have been very effective.

After that, the lessons are harder to draw. Perhaps I should have taken the advice I give my own students about the necessity of having the ground rules for any debate spelled out clearly in advance. But would it have been better for me to refuse to talk on this show at all? In traditional debates, it may well be better to refuse to participate than be made to look the fool by a rhetorically skilled opponent. But, in fact, I made a few good points—just not as many or as effectively as I would have liked. To some listener who has never thought much about what “theory” means, my two sentences on that subject might have triggered an epiphany.

Besides, it is a zero-sum game—if people who know what they are talking about refuse to enter the fray, then others who do not know what they are talking about will try to defend science in their stead. Listening to the callers to these two shows, it seems that in some ways more harm was done to science by its defenders than by its detractors. Therefore, despite the difficulties, I don’t think it would have been better not to participate.

Perhaps I should have agreed to participate, but then been more vocal when I found myself being ushered off the air so quickly? I could have pointed out, for example, that I was the only actual expert they had gotten on either of the two shows and thus I deserved a bit more time to defend the honor of science. This might have bought me a few more minutes. On the other hand, since the producer has his finger on the button and there is a seven-second delay before anything I say gets on the air, I might just have been cut off (not uncommon in talk radio when the host is being seriously challenged). Moreover, it’s not clear how a more aggressive stance on my part would have affected the chance of my points being taken seriously by the audience. I honestly don’t know about this one, partly because I have no real data on the expectations of the audience.

CONCLUDING MUSINGS

Now I want to step way back from the individual trees and examine the contours of the forest. It seems science educators have three basic options to deal with this trend. First, we can refuse to engage in this new world at all. I suspect this is an echo of an archaic attitude, one where experts could be confident they would ultimately win the fight because they controlled the market of information. To persist in this attitude when circumstances are clearly changing is to bury your head in the sand and hope the threat leaves. As I have argued elsewhere (Smith 2011), although the impulse to refuse to engage is certainly psychologically understandable, it also ultimately leads to loss by default.

The second option is to try to work on the general public to help to ensure they can navigate the flow of information with more skill. We should definitely be teaching people better critical thinking skills and doing a better job of showing them how scientists think rather than merely what they think. I am certainly in favor of this, yet I do want to offer a note of caution here. This is, at best, an extremely complex project with a very long timeline. While we should certainly expend considerable effort in this, we have to accept that

positive results will be long in coming and likely relatively subtle when they do arrive. It is absolutely critical, then, that voicing support for this approach not be used as an excuse not to do something more immediate.

If we want to do something immediate, and I would argue that we must, it seems there is no option but to try to figure out how to play effectively on the field as it is right now. We can complain about this all we like and we can try to make changes in both the long and short term, but we can't stop engaging the public while we wait for the fruits of these efforts. As I hope my personal experience shows, traditional methods of presenting science are not always well suited to the world of modern media. It's my belief that we can win on this new battlefield, but it will require a new strategy for marketing scientific ideas—something the science community typically has not valued highly. What we need to do is spend some time thinking very seriously about how to meet this new challenge with new techniques. I don't pretend to have all the answers, but true to my philosophical training, I can identify some good questions. For example: How can we effectively convey a telling response to common creationist arguments in a 140-character tweet? How can we make our arguments in a public forum without coming across as condescending? Which of our common arguments and critiques are actually most telling with the lay public? How can we address the confirmation bias that seems to occur when people seek sources of information on the internet? Formulating answers to these sorts of questions will be critical to our success in the war against creationism and other forms of pseudoscience—and that's a war we simply can not afford to lose.

ADDENDUM

I was invited back to do another debate with Roselli on June 29, 2011. This time I was careful to extract a promise that I would be one of the main speakers and would be allowed thirty minutes of airtime to engage with Roselli. This gave me an opportunity to apply some of the strategies I discuss above, in particular adopting a much more aggressive stance. This seemed to work much better, though certainly not perfectly. Readers will have to listen and judge for themselves (Total Education Network 2011c).

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REVIEW

Theology after Darwin

edited by Michael S Northcott and RJ Berry
Milton Keynes (UK): Paternoster, 2009. 222 pages

reviewed by **Daryl P Domning**

This collection of essays by eleven authors, mostly representing the humanities, is a mainly British production embracing both Protestant and Catholic perspectives. Its title left wide latitude for focus—historical retrospective, present state of the art, exploration of future possibilities for development of doctrine, or a bit of each—but nearly all the authors have leaned toward the first choice.

Geneticist RJ Berry lays the groundwork by briefly outlining the history of Darwinian thought, and a little of its reception by theologians.

Denis Alexander, editor of *Science & Christian Belief*, analyzes the “intelligent design” (ID) movement, concluding (like many others) that it represents “a rather poor natural theology.” He stumbles, however, in his discussion of ID and “naturalism” when he ignores the elementary distinction between methodological and metaphysical naturalism.

Moral theologian Amy Laura Hall offers a perceptive critique of Victorian social and theological Darwinism, as epitomized by “Darwin’s churchman” Charles Kingsley. In his influential writings, the popular themes of providence and progress were readily read into the idea of natural selection, reinforcing contemporary currents of racism and colonialism. Kingsley’s “Christian Darwinism,” superficially congruent with some of today’s evolutionary theology, is in fact a serious distortion of the Christian message, which (far from favoring competitive replacement of one nation by a “fitter” one) seeks to supplant genetic kinship, and nationhood itself, by the Reign of God.

Ellen Davis, a biblical scholar with interests in agriculture and its ecological, social, and religious dangers, finds in what she calls “Deep Darwinian thinking” a sense of ecological limits that is also deeply biblical: “The intertwined symbols of manna and Sabbath point to the biblical understanding that only an economy disciplined by restraint does justice to the God who created heaven and earth, and therefore to all the creatures that God sustains in life” (p 71). In our present crisis of overpopulation and overconsumption, no more relevant or urgent theological conclusion could be drawn.

Professor of divinity David Fergusson traces the development of ideas of divine providence from Darwin’s time to modern acceptance of evolution as continuous creation in a world “governed by law and processes of emergence” (p 88).

Francisco Ayala outlines the paleontological data on human evolution, and discusses three

major research frontiers in human biology: the transformations from egg to adult, brain to mind, and ape to human. Disappointingly, however (for a geneticist who is a former priest), he says almost nothing about theological implications beyond hinting at the problematic nature of the concept of “soul.” He does not even cite his own most theologically pertinent paper (Ayala 1995), nor any other literature for that matter, limiting the usefulness of his chapter.

Professor of ethics Michael Northcott, after a somewhat convoluted sketch of Victorian ideas on evolutionary ethics, concludes with the more fruitful observations of modern comparative ethologists like Frans de Waal. Northcott argues for the fundamental “mindfulness” of all living things (similar to Teilhard’s “inwardness”), but also affirms that empirical observations of life and evolution cannot justify moral positions. Other species, nevertheless, have “moral worth” that Christian ethics must recognize; this reflects immanent divine creative activity, which is the ultimate source of moral principles.

Ethicist Neil Messer, drawing on Christopher Southgate, lucidly classifies attempts to deal with the “problem of evil.” Messer offers his own solution, based on Karl Barth, and then critiques some aspects of Southgate’s synthesis. Of course I have a dog in this fight too (Domning and Hellwig 2006), and would quibble with both of them; but the fact that our views overwhelmingly overlap suggests that we are converging on a common answer.

David Grumett, a theologian specializing in modern French Catholic thought, argues for the relevance and viability of natural theology after Darwin—along the lines of Teilhard, as defended by Henri de Lubac and Donald MacKinnon. For example, Grumett compares the Scholastic idea of “soul” with Teilhard’s theory of spirit, which is more satisfactory due to its cosmic scope. Grumett also notes that “[w]ell-founded evolutionary natural theology has the potential to correct the abstract and privatized character of much current spiritual and theological reflection, which lacks meaningful references in the material world” (p 169)—an observation with which a scientist can heartily agree.

In the last chapter (perhaps fittingly, the one that seems the most forward-looking in terms of progress of theological thought), theologian Denis Edwards addresses the eschatological redemption of “all things”. Based chiefly on St Paul, on the patristic tradition (especially Maximus the Confessor), and on Karl Rahner, Edwards argues intriguingly for participation in redemption and resurrection by each individual animal that has ever existed. Correct or not, he at least tackles a topic that most Christian theology has failed to address explicitly.

This book is a useful resource for anyone interested in its subject; I will probably use it myself as a source of readings in a planned course on evolution and its theological implications. But it is a resource compromised by a gross editorial oversight: the “composite bibliography” omits many of the references cited in the chapters, not excluding those by the editors themselves. This, plus inconsistent dates between text and bibliography given for yet other references, will repeatedly frustrate the serious reader.

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REVIEW

Making Sense of Evolution: Darwin, God, and the Drama of Life

by John F Haught

Louisville (KY): Westminster John Knox Press, 2010. 163 pages

reviewed by George L Murphy

It is an article of faith for many Americans that biological evolution and belief in God are fundamentally incompatible. Some Christians think that acceptance of Darwin's theory would destroy the basics of their religion. At the spectrum's other end are those who claim that really understanding Darwin's theory forces one to see that belief in a God involved with the world is impossible. Like many articles of faith, this one is held in the teeth of the evidence: There are a lot of religious believers who understand and accept evolution, and some of them have provided expositions of such a position.

Prominent among theologians who have made the case for accepting evolution has been the Roman Catholic John F Haught, Professor Emeritus of Theology at Georgetown University. His previous books include *God after Darwin* (2007) and *Deeper than Darwin* (2004). *Making Sense of Evolution* seems more aimed at a general audience and provides a clear treatment of the issues that assumes no technical expertise in science or theology. The subtitle is significant. Plenty of books claim to make sense of evolution. Haught's wants to make sense of Darwinian evolution and belief in God together and to show that only in that way can the drama of life be fully appreciated.

Haught has previously shown a fondness for alliterative listing and here organizes his eleven chapters with "D" titles: Darwin, Design, Diversity, Descent, Drama, Direction, Depth, Death, Duty, Devotion and Deity. The topics of the earlier chapters are standard fare in scientific presentations of evolution, though the present book goes beyond the science in discussing them. Later chapters set out the depth and drama that result from considering Darwin's theory in the context of deity.

In the first chapter, Darwin's scientific views and his movement from traditional Christianity to what Haught calls "scientific naturalism" are considered. Throughout the book Haught points out ways in which the ideas that underlay that move continue to appear in today's debates. But he also emphasizes Darwin's courtesy and desire to avoid offense, in contrast to the "in your face" attitude of some contemporary Darwinists.

"Design" is a controversial word today. Haught points out that with natural selection Darwin was offering a scientific answer to what had previously been considered a theological question. But the critical error of both "intelligent design" proponents and scientific naturalists is to think that one has to choose between a scientific description and a theological one. In contrast, the important idea of "layered explanation" (p 23), which goes back to

Greek philosophers and theologians such as Augustine and Aquinas, emphasizes that there can be multiple answers to the question of why something happens. This is hardly an abstruse concept, as Haught illustrates with answers to the question of why the page you are reading exists. That can be explained in terms of the mechanics of the printing process, but also in terms of the author's intent and in other ways.

A failure to appreciate layered explanation is one example of the lack of "Depth" of scientific naturalism that Haught considers in the chapter with that title. While he has no problem with natural selection and other aspects of scientific explanation on their own terms, he sees the insistence that they are the *only* explanation of life as superficial. The God who creates is seen, following Lutheran theologian Paul Tillich, as the depth of the world rather than a cause within the world.

Unwarranted assumptions about characteristics that God must have also skew many arguments about the diversity of living (and extinct) things. Why, the question is asked, would God use a wasteful process like natural selection to create species? But there is no reason to think that God must be primarily an efficiency expert, as Haught suggests by pointing to Tillich's sermon "Holy Waste." His citation of Aquinas shows that theologians long before Darwin were aware of the diversity of living things and gave reasons why God would maximize it. It would be wise for critics of theology to learn something about it.

At the heart of Haught's connection between Darwin and deity is drama. The *Origin of Species*, he observes, "tells the story of a long struggle accompanied by risk, adventure, tragedy, and by what Darwin called 'grandeur.' A Christian theology of evolution locates this drama within the very heart of God" (p 53). But while theology brings out the depth and significance of evolution, it does not simply replace the scientific account. It is primarily from evolutionary science that theology has learned to see creation as dynamic rather than static, "a narrative unfolding in time" (p 54). A genuine dialogue between science and theology enriches both.

It is hardly surprising that Haught chose Darwin to speak for evolution. Equally unsurprising for those familiar with his other work is his choice of Teilhard de Chardin to speak for deity. Teilhard, a Jesuit paleontologist, was one of the first to attempt a full-fledged theology of evolution. His understanding of Christian faith was in the category of process theology that sees God involved along with the world in development. Such a theology does not just accept but demands some kind of evolution. Teilhard's views did not sit well with conservative church leaders and he was not allowed to publish them during his life.

Therein lies the reason why Haught's case for compatibility of evolution and Christianity will probably not convince many of those belonging to one of the groups to which I referred initially. Theologians like Tillich and Teilhard are seen by most conservative Christians as having abandoned too many of what they consider religious fundamentals. (At the risk of being numbered among "timid theological minds" [p 141], I confess that I think that while Teilhard made important contributions to Christian thought, there are problematic aspects of his theology.) On the other hand, it can be hoped that open-minded scientific naturalists, while perhaps not convinced of the truth of Haught's construction, will recognize that there are coherent ways to understand Darwin and deity together.

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REVIEW

Intelligent Faith: A Celebration of 150 Years of Darwinian Evolution

edited by John Quenby and John MacDonald Smith
Ropley (UK): O Books, 2009. 330 pages.

reviewed by **Robert J Schneider**

The editors of *Intelligent Faith* have gathered together lectures and essays by eighteen British scholars working in various areas of religion and science. As the titles of their essays suggest, the contributors include scientists in the fields of evolutionary biology, astrophysics and cosmology, and climate studies; other writers are knowledgeable in the history of science, theology and biblical hermeneutics. Several are Anglican priests. Some essays evidently were written for this collection; others, such as Simon Conway Morris's Boyle Lecture, have a previous venue. All the contributors are influenced by Darwin's work and honor it in these papers.

The purpose of this collection is to offer an "intelligent faith" from a Christian perspective that is built upon a sound, contemporary theology in dialogue with the modern scientific paradigm of cosmic and biotic evolution. Such a faith offers a fruitful alternative to the invalid claims of biblical creationists and "intelligent design" (ID) advocates. As John MacDonald Smith notes in the introduction, the publication was launched in part out of a concern that ID has been making its way into the British educational system, creating confusion among students as to the nature of sound science and also sowing among believers misunderstandings of the nature of God as creator. "The real harm done by ID," Smith trenchantly asserts, "is that it is an item in a market place of shoddy ideas sold off to the easily fooled at knock-down prices" (p 5). Nearly every contributor offers a critique of ID, though most tend to be brief and pretty much standard fare. However, Denis Alexander criticizes in detail the ID concept of "design," and Andrew Robinson and Christopher Southgate present a more extensive, probing review of the arguments of Michael Behe, William Dembski, and Stephen C Meyer. One also finds in several essays an ongoing concern over the inroads made in Great Britain by young-earth creationism.

It is difficult in a brief review to do justice to the entire work, so I will focus on just two topics that converge in this collection. One is the idea, set forth in particular by Alexander and RI Vane-Wright, that there is design in nature, but design that is internal to and emerges within the cosmos and within organisms, not imposed from without. Living organisms exhibit a kind of purposefulness that is not teleological but teleonomic (to borrow a thought from Jacques Monod). The notion is thoroughly developed by Vane-Wright. He uses the remarkable intergenerational journeys of the Monarch butterfly as an example. Rather than merely the passive recipients of random mutation and selection, organisms are involved in a complex interplay of organic selection and environment(s) in which learned

behavior in one generation becomes instinctual in later generations. “Once life has begun, there need be no telos, final cause, or external designer—just the inexorable internal workings of intelligent, self-organizing, autonomous yet coherent populations of organisms as they live, develop, reproduce and die in their ever-changing world” (p 43).

This concept, added to such notions as cosmic fine-tuning and convergent evolution, among others, also allow for a theological model of a non-interventionist God who is present throughout the whole creation from the Big Bang to the latest stage of its evolution. God has made a creation exhibiting the possibility of possibilities, not predetermined or designed in the ID sense, but an emergent world that, in Archbishop Frederick Temple’s oft-quoted phrase, is able to make itself, yet a world that, believers can assert, reveals God’s purposeful presence.

Let me also single out a few essays in history of science and biblical interpretation for special mention. RJ Berry offers an especially informative essay on the reception of Darwin since the publication of the *Origin*, focusing on responses from Christian individuals and communities up to the present time. Paul Badham presents an excellent review of Christian interpretations of Genesis 1 and 2 prior to the eighteenth century. He points out that treatment of the Bible as a source of scientific information, including chronology, does not become established until the late seventeenth century, and that biblical literalism is a modernist concept. Anthony Phillips offers some interesting insights into the sources and initial purposes of the Genesis narratives.

On the whole, the writers have sought to make their topics accessible to an educated reading public, and presumably in particular those who teach science or religion courses in British secondary schools. The expositions are for the most part marked by clarity and good organization. A few or portions thereof may be a bit hard to follow; for example, readers may find John Quenby’s dense, technical reconstruction of our current understanding of the early universe tough going.

The aim of the collection as a whole is not to break new ground, but to pull together for the reader’s education and enlightenment the most recent work in the evolutionary sciences, theology and biblical studies, offering *in toto* a model of an intelligent faith while honoring Darwin’s revolutionary work. In that respect I think they have largely succeeded. And I hope, along with Smith, that their efforts will help to stem the tide of creationist assaults on the teaching of evolution in Britain.

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REVIEW

Living Large in Nature: A Writer's Idea of Creationism

by Reg Saner

Chicago: University of Chicago Press, 2010. 136 pages

reviewed by **Lisa H Sideris**

Reg Saner's book *Living Large in Nature: A Writer's Idea of Creationism* explores the concept of creation from a writer and nature lover's perspective. The book is part memoir, part argument for the superior charms of a Darwinian view of life—not to mention the charms of the American West. Throughout this nontechnical and highly readable book, Saner celebrates creationism with a lowercase *c*, by which he means the creative process—a process of self-evolution and self-discovery—that occurs in and through the act of writing. Uppercase Creationism, and its more recent manifestations in “intelligent design” (ID), are examined and criticized at regular intervals throughout the book. Saner offers his own encounters with wonder in the natural world, and his experiences of self-evolution through writing, as examples of what living large—being more fully alive—might mean. He suggests parallels between the mysterious (at times, inexplicable) processes of creativity known to all writers and the ancient and ongoing processes of evolution all around us.

The motif of “largeness” recurs in various clever ways throughout the book. Saner reflects, for example, on his relocation from the flatlands and impoverished vistas of the Midwest to the wide open skies and breathtaking mountain glory of the American West. Western landscapes seem naturally to evoke feelings of awe and openness to ideas on a much grander scale. One such grand idea is evolution. Saner recounts his Creationist (in the usual sense of the word) childhood in a bleak and uninspiring Midwestern town: “even on the clearest days,” he recalls, “I couldn't see the world from there.” In winter months, “bleakness over vistas of ploughed furrows induced a subspecies of Arctic melancholia ... your heart would struggle not to feel like a coal mine” (p 12). Open skies, he suggests, may facilitate open minds, for they engender in us “interrogative moods” (p 116). Saner acknowledges (in a way) the absurdity of claiming the West to be objectively superior to the Midwest. Still, as a Midwesterner myself (by birth and at least partly by choice), I found his appraisal of the aesthetic and intellectual deficits of my bioregion a tad condescending.

Saner seems to relish giving a bit of offense now and again; in this respect, his writing exhibits some of the swagger and self-congratulatory posturing characteristic of Darwin defenders such as Richard Dawkins. The image of the closed-off world of a coal mine is suggested again in Saner's frequent recourse to the imagery of Plato's cave allegory. He likens Creationists to Platonic cave-dwellers who prefer the shadowy retreat of the cave to the bright light of truth and enlightenment that beckons just beyond. The idea that Creationism is rooted exclusively in fear and delusion shapes Saner's negative view of religion in general—even while he hails his own writing as essentially religious. “Every god,” he observes, “is born of our fears and wishes” (p 41). Some of Saner's talking points on religion seem

to come straight from Dawkins's *The God Delusion*, and are equally innocent of any actual theorizing with regard to religion, its meaning, history, or function (aside from simplistic accounts of religion's alleged role in maximizing evolutionary fitness. Saner suggests, for example, that humans' preoccupation with a deity who is up above us somewhere stems from an ingrained mammalian association of size with dominance. This theory is corroborated by the fact that women prefer to mate with tall men. *Et voilà*: behold Saner's "theology of up"). Readers already familiar with Dawkins's extended diatribe will find nothing new in Saner's portrait of the Biblical God as a vengeful, narcissistic, bloodthirsty, and jealous tyrant. Saner chronicles God's genocidal activities and mocks the image of a "divine Sky Cop" (p 35) whose teachings mandate death by stoning, and whose son, Jesus, assails all family values. In one gratuitous aside, he suggests similarities between Christian faith and the certitude of suicide bombers bent on indiscriminate death and mutilation (p 62). To be fair, and as Saner notes, some Creationists rush headlong into such associations as well, linking Darwin's theory to the evils of Nazism, eugenics, and such extreme acts of violence as the slayings at Columbine High School (p 91). Still, hurling epithets back and forth does little to capture hearts and minds, as a good writer ought to know. "In a nutshell, Creationists simply can't stand the facts of life," Saner concludes. "That's why they throw hissy fits" (p 4). Such insights, if they can be called that, are not worthy of a writer of Saner's stature.

A more nuanced understanding of the forces that contribute to Creationism or "intelligent design" might reveal motives other than simple fear and a stubborn preference for ignorance. Saner maintains that ID proponents reject Darwin's theory because they do not want nature to matter so much. They seek to preserve a space for divine creativity. Yet the wave that ID rode in on is part of a larger dissatisfaction with the materialist excesses of neo-Darwinism. ID's objections are not so different from those of other theologians (for example, process theologians who accept Darwinian theory) who take issue with what they see as the reductionist, materialist philosophy (and not mere methodology) that grounds neo-Darwinism. Though ID has pursued a different path, insisting that its alternative be taught as science in the classroom, its misgivings are not idiosyncratic. Many a commentator on the culture wars has noted that ID would not have such a receptive audience were it not for a vocal subset of Darwinists who proclaim organisms, including humans, to be machines programmed by genes—and then treat all objections to such characterizations as a simple failure of courage in the face of facts. There is no doubt that ID fails utterly as science; its mysterious processes of irreducible complexity are asserted rather than scientifically explained and defended. But its motivations are complex and are shared by others who bear Darwin no particular animus but wish to restore enchantment, mystery, or wonder to natural processes (even if doing so necessitates invoking a *deus ex machina*, as it apparently does for ID). Indeed, an understanding of evolution as a creative, surprising, and somewhat mysterious force seems close to Saner's heart. Saner's insistence on describing complex human and animal behaviors as "encoded" is puzzling, and does little to convey his obvious sense of awe before the creative, autonomous forces at work in the universe and in the writer's own mind.

While I doubt that fear is the fount of all religious rejoinders to Darwin's theory, Saner may be right that widespread flight from evolution has something to do with the ego-crushing effects of an evolutionary worldview. Evolution undercuts the idea that the world is made with us in mind, but for all that it takes away, it offers a universe more strange and won-

drous than anything humans could imagine, Saner argues. I agree with him. Yet, if wonder engenders humility, there is not much evidence of that particular sensibility in Saner's writing. Not infrequently, he describes his amazement at the greatness of his own writing. While he credits the outpouring of creativity to a mysterious process almost beyond, or other than, the self, a surprising percentage of Saner's book is nevertheless devoted to Saner: his past achievements as a writer, his awe at his own creative process and products; his recounting of his own pithy, punchy ripostes aimed at Creationists and other ignorant opponents in his path. This seems an odd focus for a book that seeks to celebrate nature's power to decenter humans and their egoistic or small-minded preoccupations.

Readers may be intrigued, as I was, by Saner's discussion of the atomic bomb ("Arias and atom bombs"), and the decidedly aesthetic attractions it held for physicist Robert Oppenheimer—though precisely why Saner includes this discussion remains somewhat unclear to me. Saner seems to offer it as an example of how the process of writing unexpectedly altered him (that is, Saner) and his perceived relationship to the bomb. Drawing on an essay he wrote decades ago, Saner shows how Oppenheimer's sense of beauty played a critical role in the development of the bomb. Oppenheimer was irresistibly drawn to the "technically sweet" puzzle of how to create such a device, just as he was drawn to the enchanted landscape of New Mexico where the first bomb was detonated. Beauty and wonder, it seems, may be turned to unimaginably destructive ends. Saner reflects on the duality of human nature—our predatory and our cooperative sides—as revealed in this paradox. One might expect that this glimpse of the dark side of human nature would lead Saner to temper his great enthusiasm for science as the clear path to enlightenment and salvation. Not so. Readers will search the book in vain for any acknowledgement that science—and not just religion—sometimes provides a ready vehicle for humans' darker impulses. Nor does Saner seem aware that for every prominent ID advocate who instructs the faithful that Darwinism equals atheism, there is a prominent scientist or science writer celebrating that same simple equation. In the end, Saner's book is a sermon to the converted. I doubt that it will succeed in dragging any Creationist cave-dwellers into the bright light of evolution, though it may convince some melancholy Midwesterners to strike out for sunny Colorado.

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REVIEW

I Love Jesus and I Accept Evolution

by Denis O Lamoureux

Eugene (OR): Wipf and Stock, 2009. 184 pages

reviewed by **Dennis R Venema**

One might wonder, given the recent flurry of books on reconciling evolution and Christianity, if there is any need for yet another foray into what appears to be well-travelled territory. For those working primarily in evangelical settings, however, the answer is yes: there remains a need for works that have theological as well as scientific depth. Denis Lamoureux's work *Evolutionary Creation: A Christian Approach to Evolution* (2008) was such a book, but at over 500 pages it is not suitable for most readers. Lamoureux's latest work, *I Love Jesus and I Accept Evolution*, is an attempt to condense the heart of *Evolutionary Creation* into less than 200 pages, including endnotes.

While many evolution-and-faith books focus on the science, Lamoureux's book is weighted toward theology. The thrust of the opening chapters is to open the reader's mind beyond "creationist" and "evolutionist" as popularly perceived by evangelical Christians (that is, young-earth creationism and atheistic materialism, respectively). A main tenet of this section is removing dysteleological overtones from the word "evolution" and introducing the concept of "evolutionary creationism" as a conservative, evangelical Christian approach to origins. This material is derived from Lamoureux's long-taught material on the subject and clearly benefits from its honing in the lecture hall.

Staking out a distinctively evangelical position that embraces evolution immediately raises two concerns for a theologically conservative evangelical: primary is "What about Scripture?" secondary only to "What about the lack of evidence for evolutionary theory?" While both of these concerns must be addressed in a book of this nature, Lamoureux wisely tackles the theology first. What evangelicals need, first and foremost, is not better evidence for evolution. What evangelicals engaged in the origins controversy need is a deeper understanding of the contextual and cultural backdrop for two sections of the Bible: Genesis 1–11 (naturally), but also the writings of the Apostle Paul, particularly how he uses Adam as a typological figure in contrast to Christ in Romans 5. Lamoureux is the first evangelical author of whom I am aware who tackles these issues in detail in a book targeted to a popular audience.

The theological tack Lamoureux takes in two tightly-argued chapters is to establish that the Bible assumes an ancient science: ancient cosmology, ancient biology, and ancient anthropology. As a result, Lamoureux's hermeneutic for Genesis is very literal: the firmament really is a solid sky-dome; animals, plants and humans are truly created *de novo*; and Adam's transgression is understood to be the source of genuinely *physical* (that is, not "spiritual") death. Lamoureux fully accepts that this is what God inspired the original authors of Gen-

esis intended to convey—but acknowledges that it is (obviously) scientifically inaccurate. While this would be a theological impasse for a young-earth creationist, Lamoureux moves on to discuss how, in his view, a high view of scripture can be held with an understanding that Genesis is not modern science. The expectation that Genesis should agree with modern science at some level (that is, scientific *concordism*) is common to virtually all forms of creationism, and Lamoureux sets it squarely in his sights. The key, in his mind, is the doctrine of divine accommodation: that God, in order to communicate theological truth to the original recipients of scripture, took for granted the “science-of-the-day” as not to dilute the message with potentially confusing ideas. Accommodation as Christian theology has been around at least since Calvin, and Lamoureux does a thorough job of appropriating it for the origins debate. What truly distinguishes this book from other evangelical treatments, however, is that he applies this approach to both Genesis *and* Paul’s use of Adam typology. Indeed, he uses his past experience as a young-earth creationist to tackle virtually *every* portion of scripture that is used in antievolutionary apologetics. Lamoureux certainly knows the territory, and he goes chapter-and-verse with all comers.

Having done the theological heavy lifting, the book turns to scientific evidence for the antiquity of the earth and biological evolution. This section, which covers two chapters (one devoted to human evolution) is done well enough, and covers a broad sweep of evidence in short order (for example, radiometric dating, fossil succession, transitional cetaceans and hominids, genetic homology, and so on). Lamoureux’s doctoral thesis focused on teeth, and dental evolution is prominently featured. While I was personally quite interested in the material, I felt that the comparative genomics evidence received proportionally short shrift. Anatomical homology is more easily resisted than molecular evidence, in my experience. While the fusion of human chromosome 2 and pseudogenes do receive mention (and to good effect), I could not shake the feeling that a stronger treatment of evolutionary genomics would have been a benefit. The closing portion of the human evolution chapter returns to theological concerns, where Lamoureux discusses how he integrates the Christian theology that humans are made in the image of God with evolutionary biology. Also noteworthy in this section is that Lamoureux rejects monogenism—the scientific concordist expectation, based on the Genesis narratives, that the human race is derived from a single pair in the recent past. Monogenism remains a hurdle for many evangelicals, even if they accept common ancestry (for example, see Keller 2009). A short summary chapter rounds out the book, a breathless run of only 168 pages.

Lamoureux’s strengths for an evangelical audience are several. First, he brings a wealth of personal experience to the discussion. Second, he has PhD-level training in evolutionary biology *and* theology (as well as dentistry)—and he puts all three to good use. Third, he is strongly evangelical and speaks from that perspective with language familiar to that “in group” (though his tone, as a result, may be off-putting to non-evangelical readers). This is a book that calls for evangelicals who view their theology as robust to accept no less in their science, and to recognize the theological resources within their own tradition that allow them to do so. I have already begun to recommend it to those in my sphere.

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REVIEW

Creation or Evolution: Do We Have to Choose?

by Denis Alexander

Oxford: Monarch Books, 2008. 382 pages

reviewed by **David R Vinson**

The title alone gives a lot away. The audience, for starters, isn't hard to guess. What major group in the Western world is even faced with a choice between creation and evolution? You got it—conservative evangelicals, the bulk of whom are caught in the snares of a false dichotomy: “choose one (only one!),” they are told, “creation or evolution.” Pulpits and press conspire tirelessly to sustain this polarity, which usually runs along these lines: “Either believe that the God of the Bible made all species separately by inexplicable miraculous means or chuck your faith, reject Scripture, and give in to the secular, God-denying lies of macroevolution.” Sadly, this is no caricature. When these are the only available options, it is no wonder that the faithful turn a blind eye to the otherwise compelling (and faith-inspiring) case for evolution.

Fortunately, both for science and for Christianity, these aren't the only options at hand, as our revealing title suggests. A *tertium quid* is on offer that happily integrates both poles of the creation/evolution divide. If evolution is viewed as the creator's magnificent means of bringing diversity and complexity to life, then evolutionary science can be seen as exploring the very works of God. So asserts Denis Alexander in his enlightening book *Creation or Evolution: Do We Have to Choose?* Working past the divide, Alexander aims to win over disciples in the evangelical world to the simple and liberating paradigm of creation-via-evolution.

Though simple, this perspective remains subversive for many within evangelicalism. Why? It challenges and overthrows two popular, though misguided, tenets of belief: (1) evolution is ungrounded—the evidence is spurious; (2) Christian scripture teaches special creation, on which hangs humanity's distinctive glory (being created in the divine image) and spiritual need (as exemplified and inaugurated by the “fall” of humanity).

People cannot be led out of their captivity to creationism without addressing these twin assumptions. Scientific evidence for evolution must be marshaled in such a way as to demonstrate that evolution doesn't undermine central theological truths. Who is qualified for such an ambitious task? Only someone able to move with facility within both the scientific and the evangelical worlds.

Fortunately, Alexander is able to speak intelligibly and credibly in both realms. On the scientific front he earned a PhD in neurochemistry from the Institute of Psychiatry, London University, later switching to research in immunology and cancer. He was previously Chairman of the Molecular Immunology Programme and Head of the Laboratory of Lym-

phocyte Signalling and Development at the Babraham Institute, Cambridge. On the theological front he stands solidly within the conservative evangelical tradition with its distinctive views of the Bible's divine inspiration and God's active relationship with the world. Working constructively at the nexus of science and faith, Alexander is now Director of the Faraday Institute for Science and Religion, St. Edmund's College, Cambridge, editor of the journal *Science & Christian Belief*, and currently serves on the National Committee of Christians in Science.

With the publication of this book, he himself notes that he is filling a sparsely populated lacuna: "I have found surprisingly few books written by professional biologists who take the Bible seriously..." Another book that fits this bill is Darrel Falk's *Coming to Peace with Science: Bridging the Worlds Between Faith and Biology* (Downers Grove: InterVarsity Press, 2004; reviewed in *RNCSE* 2004;24[3-4]:32). Whereas both books speak to conservative evangelicals, Falk's irenic introduction is understandable at the high school level, while Alexander's more thorough treatment seems to have a more highly educated audience in mind.

The first two chapters of Alexander's masterful work lay out the biblical landscape of creation. The author observes that all Christians are united in believing that their God creates and sustains everything. But *how* creation is implemented is where opinions vary. Before looking at the Bible's creation texts, Alexander provides a helpful, though necessarily brief, introduction to biblical interpretation, giving attention to topics like literary genre, cultural contexts, authorial intent, and literal versus figural language. A discussion follows on various ways of understanding, which allows scientific and religious knowledge to complement, not contradict, each another. He closes this section with an historical excursus of magisterial figures in the Christian and scientific tradition, including Galileo, from which Alexander draws the instructive parallels with today's science/faith conflict.

Alexander then turns in the next three chapters to an introductory summary of evolution written for the non-specialist who needs to be brought up to speed on the basics of evolutionary theory. Though compact, Alexander's explanation is crisp, lucid, and well-organized. His assemblage of topics ranges from the science of an ancient earth, the basics of genomics, the mechanisms of genetic variation, the logic of natural selection, as well as speciation and "fossilized" pseudogenes. Frequent real-life examples are given to illustrate how these things play out in the workshop of life.

The largest section of the book—eight chapters—is devoted to objections that the conservative evangelical community commonly lodge against evolution. The wisdom that Alexander has acquired from his long experience in the fray of public discourse on the interface of science and faith is evident as he navigates these contentious topics. Addressed in full are the opening chapters of Genesis, with particular attention given to the figures of Adam and Eve, the "fall" of humanity, the introduction of death and natural evil in the world, and divine agency, that is, how the God of the Bible might work through the unfolding of this evolutionary narrative.

As the book closes, Alexander turns his attention to the "intelligent design" (ID) movement, which he accurately characterizes as "episodic creationism". In one chapter, he exposes the

fallacies that riddle the ID enterprise, fallacies both scientific and theological. Whereas proponents of ID restrict their designer's hand to a few complex biochemical processes that they can't imagine having evolved, Alexander takes the wiser and more encompassing approach. He celebrates divine handiwork in all of biology, whether aspects of its evolutionary history are currently well explained or whether the details require further elucidation. Citing Augustine, a fourth- and fifth-century theologian, Alexander affirms that "nature," the whole of it, "is what God does."

The title encapsulates succinctly what this substantive book is all about: *Creation or Evolution: Do We Have to Choose?* The answer that is palpable in every chapter is "No—that choice is unnecessary and runs counter to the evidence." Alexander's *tour de force* of scientific, biblical, and theological argument provides a better way, one that is sure to be of great value to open-minded Christians who are puzzled by the frenzied debate and eager to find some well-informed, biblically-sensitive guidance out of the dichotomous snares and into a constructive reconciliation between faith and science.

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