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FEATURE

Confessions of an Oklahoma Evolutionist: The Bad, the Ugly, and the Good

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In places such as Oklahoma, where I work, and Louisiana, the location of the Botanical Society of America's conference where the "Yes, Bobby, evolution is real" symposium was held, it is nearly impossible to teach or discuss evolution as simply a scientific matter. No matter what you do, the discussion will include religion. A science classroom is no place to teach religious doctrines. But we cannot always avoid religion itself. We can teach about cells and molecules without bringing up religion, but religion cannot and should not be avoided in a science classroom when evolution is the topic. I believe that by simply saying "religion is not science, so we will not discuss it at all" is to pass up a teachable moment. And religion is an important component of a science class about evolution.

First, religion is an evolved characteristic. The capacity for religion has evolved as part of human psychology by means of natural and sexual selection. The specific forms of religion have evolved by cultural evolution. We can say that religious explanations of the natural world (why the wind blows, where species come from) are wrong, but it is more interesting to inquire about where religion came from and why it is so compelling to us humans. Second, there is no avoiding the fact that religious groups have made their presence felt whenever evolution is mentioned. Students will want to know the scientific response to creationism—and this approach is appropriate, so long as creationism does not take up too much time in the course.

In this article, I wish to relate some of my experiences with evolution and religion in Oklahoma, as other contributors to this volume have done with their experiences in Louisiana. And not all of these experiences have been bad. I will tell you about the good ones too.

THE BAD

One way in which religion has proved to be bad for science is that people often oppose science for religious reasons. Evolution is not alone in receiving criticism from religious conservatives; they also attack other fields such as the science of global climate change.

In the early days of science, scholars anticipated a time, in the not too distant future, when science would displace religion as a source of knowledge about the physical world. Eventually, they thought, people would see the evidence and admit its clear conclusions. Charles Darwin was optimistic that the younger scientists would eventually all be persuaded about evolution. And Darwin noticed that his major opponents, such as St George Jackson Mivart and Richard Owen, were not opponents of transmutation itself. They believed in what we would call divinely-guided evolution. Darwin's American defender Asa Gray was a con-

ventional Christian while his American critic was the Unitarian Louis Agassiz (Livingstone 1987).

Scholars of previous centuries also expected reason to prevail within religion itself. In an 1822 letter to Benjamin Waterhouse, Thomas Jefferson wrote,

> I rejoice that in this blessed country of free inquiry and belief, which has surrendered its conscience to neither kings or priests, the genuine doctrine of only one God is reviving, and I trust that there is not a young man now living in the United States who will not die a Unitarian. (Bergh 1905)

Jefferson also looked forward to a time when there would be no slavery, although he found that getting out of the slavery business himself was more complicated than he thought it would be. Some scholars continue this optimism. Robert Reich (2005) expressed optimism that the progressive viewpoint, which includes a respect for science, will ultimately prevail in America; he called his book *Reason: Why Liberals Will Win the Battle for America.* In this respect, Darwin, Jefferson, and Reich have all been proved wrong, at least for now.

Creationism creates an unnecessary battle line between science and religion. Creationism is extremely common in Oklahoma. We can find it in fundamentalist churches. For example, a Baptist church in Durant, just blocks away from Southeastern Oklahoma State University, displayed a sign proclaiming "Evolution: The Science of Calling God a Liar" (Figure 1). I am the evolution professor against whom this sign is most likely directed.

Oklahoma also has several creationist museums, though none as famous as those run by Ken Ham in Kentucky and Carl Baugh in Texas. Furthermore, Oklahoma leads the nation in the number of creationist bills that have been introduced to the state house and senate over the last thirteen years—a total of twenty-six—although none of them has been passed (Victor Hutchison, personal communication). It may seem odd that the Oklahoma

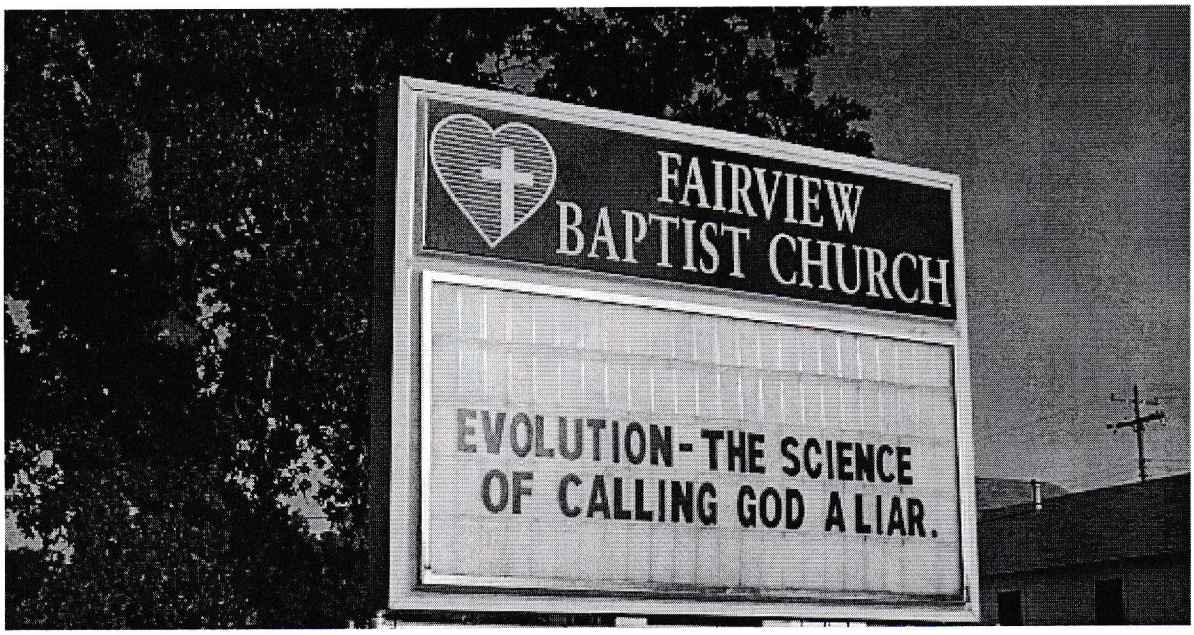

FIGURE 1. *A church marquee in Durant, Oklahoma, in 2011. Photograph: Stanley A. Rice.*

legislature does not pass creationist laws, especially since "standing up for God" is a cheap and easy way to gain popularity in Oklahoma. I believe an important reason for this is the efforts of an important organization, Oklahomans for Excellence in Science Education (http://www.oklascience.org) founded by Victor Hutchison, a retired zoologist from the University of Oklahoma. Whenever a creationist bill gets into a legislative committee, OESE members send letters to all members of appropriate legislative committees, urging them to not pass the bill on to the full house or senate.

But why should committee members listen to OESE evolutionists? OESE letters point out that creationist laws and school board policies have fared very poorly in the courts, and that passing creationist laws would most likely result in lawsuits which the state would lose, at public expense. The Oklahoma bills usually proclaim the right of students to believe whatever they want. Of course, students already have this right; they are not forced actually to believe evolution, so long as they learn it. Therefore one of the main arguments that OESE uses is that there is no problem to be solved by these bills. Our argument that anti-evolution bills are a waste of legislative time and taxpayer money has thus far convinced many legislators, even some conservative ones.

A second way in which religion can be bad for science is that it can disrupt the ability to reason from evidence. I will give a personal example. Creationists have long used, and still like to use, the "sudden appearances in the fossil record" argument. Botanist George Howe at the Bible Institute of Los Angeles (now Biola University) addressed a small crowd in a big auditorium at the University of California, Santa Barbara in 1976. A young, impressionable creationist student named Stan Rice was in the audience. Howe's main point was that angiosperms suddenly appeared, without recognizable ancestors, during the Cretaceous Period.

There are at least two problems with this creationist argument. First, most botanists would say that, indeed, there are recognizable ancestors, the Bennettitalean conifers. Just how close of a resemblance between Bennettitalean reproductive structures and flowers is necessary? The resemblance was not close enough to convince Howe. Second, creationists don't believe the fossil record represents the passage of time at all, whether of sudden appearances or gradual ones. In their view the sediments were all piled up during a single flood. What, then, does a creationist mean by "Cretaceous"? These obvious flaws in creationist reasoning were invisible to the people present at the talk—at least to me. My religious zeal blinded me to these flaws, which I recognized only years later.

This is a good example of how the human brain, especially but not only when it is high on religion, can see exactly what it expects to see. Take another Oklahoma example. There are Cretaceous limestone deposits in southeastern Oklahoma that are crammed full of fossils. The fossils of the Kiamichi limestone take up almost as much volume as the matrix (Figure 2). To a fundamentalist, this is visible evidence of the Flood of Noah. But someone whose mind is free to ask questions will begin to notice that the fossil record has an orderliness to it. The Kiamichi limestone fossils consist almost exclusively of one species, *Texigryphaea navia*, a mollusk (http://mrdata.usgs.gov/geology/state/sgmc-unit.php?unit=OKKki;0). Other Oklahoma fossil deposits, from the Pennsylvanian and Ordovician periods, have a lot of crinoids in them. I led the first annual Oklahoma Evolution Road Trip in the summer of 2013, in which ten participants saw these deposits and the differences among them.

Now, how could a flood produce these fossils? How could a flood sort out the crinoids and put them in certain mud layers that scientists would later call Pennsylvanian, and then on top of them lay down literally billions of mollusks, all of just one species, in mud layers that scientists would later call Cretaceous? But creationists can look right at this evidence and see it only as evidence for the Flood. Indeed, fundamentalist students in college classes (who are generally very nice people) can look right at the evidence and choose to not believe it. And some of them are very smart. The 2012 valedictorian at Southeastern got the best grade in my evolution class, but remained a creationist.

The conclusion from the two foregoing points seems to be that religion is a bad thing for the human mind, and that atheism is the road to understanding. Blogs such as those by PZ Myers (http://freethoughtblogs.com/pharyngula) and Jerry Coyne (http://whyevolutionistrue.wordpress.com/) reinforce this idea, more so than the more neutral blogs by Carl Zimmer (http://phenomena.nationalgeographic.com/blog/the-loom/) and myself (http://honest-ab.blogspot.com). Atheism is not, however, the belief of all or even most scientists. I think it is important to point this out to students and to citizens, who might base their entire rejection of evolution on the belief that it is atheism. Remember that church sign? "Evolution: The science of calling God a liar." If that statement is true, we cannot possibly win, and not just in Oklahoma and Louisiana. I am not trying to defend religion here, but just to say that religion itself is not the enemy. It is religious delusion memetically parasitized by cult leaders (such as the late infamous Garner Ted Armstrong) who want to control people and their finances that is the danger.

THE UGLY

Science presents another challenge to traditional religion, quite apart from evolution. I refer to genetics. John C Avise's book *Inside the Human Genome* (Avise 2010) lists hundreds of examples of mutations that, usually in homozygous form, bring immense suffering upon

FIGURE 2. *Kiamichi limestone deposits (Cretaceous) in southern Oklahoma consist of almost as much fossil as matrix. Photograph: Stanley A. Rice.*

their carriers. One of the worst of these is the mutation that causes Lesch-Nyhan syndrome, in which the sufferer mutilates himself or herself. The victim is aware of what he or she is doing, and feels the pain, but cannot stop. Avise intends this as an example of how the human genome could not have been intelligently designed. But it is also a challenge to the traditional belief that God has built goodness, or at least fairness, into the operation of the world. The victims of Lesch-Nyhan syndrome clearly deserved no such punishment. Random mutations, however, can show up anywhere, in anybody; evolution, in contrast to what religious people think about God, is amoral.

The defense of the goodness of God despite the suffering of the innocent is called *theodicy* and has been controversial for millennia (Hick 1978). Creationists make two responses to these ugly mutations. Some, like Cornelius Hunter (2001), claim that we should not attempt to deduce any moral attributes of the Intelligent Designer from such evidence. He criticizes the assumption of ID critics that the Intelligent Designer has to be morally good. It seems to me that giving up the idea of a good God is even worse than giving up the idea of a Creator God. Others, like AE Wilder-Smith (1980), suggest that the devil created all these mutations. This response is also unsatisfying, since the Intelligent Designer had to allow the Evil Designer to create these mutations.

Discussions of theodicy are rare in conservative churches, in Oklahoma as elsewhere; at least, my students seem never to have dealt with this issue. Religion can therefore also be bad when it discourages an examination of such questions as where ugly mutations come from, a discussion that should be important (to religious people) even apart from evolution.

The Good

Given all this, what might be good about religion and science? I will begin with what might be a startling assertion: religious illusions can be good for science, in some cases. Illusions, not *delusions*. A delusion is just an illusion that is demonstrably incorrect. But illusions are the way our minds work.

Here are some examples. Leaves are not actually green. They just reflect wavelengths of photons that are absorbed by the cones in our retinas. The optic nerves send impulses to our brains. Our brains create the *illusion* that leaves are green. We detect wavelengths of photons with our eyes but we *see* with our brains. We detect sound waves with our ears, but we *hear* with our brains. We detect volatile molecules with our noses but we *smell* with our brains. And so on. Our brains create a *model* of reality that is an illusion. Natural selection has made sure that, in most cases, the illusion closely matches reality.

But not always. Sometimes, illusion can pass into delusion. But even delusions are not always bad. Consider the example of synesthesia. Some synesthetic people taste and see sounds. Not surprisingly, many are amateur or professional artists or musicians. This kind of delusion causes no particular trouble in daily life. In fact, it enriches it. Don't you maybe, just a little bit, wish your brain worked like theirs? It is easy to see that someone with a greatly enriched mental life might convey a degree of charisma that would make them social leaders, and this is something natural and sexual selection would favor.

Clearly, even if religion is a delusion, it has been favored by natural and sexual selection. Sometimes this can lead to some pretty brutal things. A tribe that shared a strong religious

delusion that the gods have chosen them might fight harder and win more battles than the Stone Age version of rationalists.

But religious delusions can also lead to constructive things. For example, tribal peoples know a lot about plants. If this were merely a hobby, they might learn a little bit about plants in their environment. But if they believe that plants contain blessings from the gods, they will investigate plants with great zeal. It is a holy quest to them to figure out how to use these plants in just the right way: for example, to get just enough atropine, hyoscyamine, and scopolamine from *Datura* for a hallucinogenic visit to the land of the gods but not enough to get killed (Schultes and Hofmann 1992). And this zeal made them look for patterns and test hypotheses. Their hypotheses, such as the "doctrine of signatures," were often wrong, but they were and are practicing a primitive form of science.

The doctrine of signatures is still with us. Visit a health food store and you will find *Tribulus* pills to treat erectile dysfunction, since *Tribulus* capsules have pretty big horns on them. The mysticism surrounding herbal medicines is sometimes just as unscientific as creationism, though generally less of a political problem. Proponents of herbal medicine are not trying to get into our science classrooms. And even creationists can fall for delusions about herbal medicine. One of my students forwarded a creationist e-mail to me that illustrates the point. What do figs look like, especially pairs of figs? That's right, testicles. Therefore figs are good for male sexual function. What do lemons look like? That's right, breasts. Therefore citrus fruits are good for female sexual function. And of course walnuts look like brains, so they are good brain food. I am not making this up. In these examples, delusion about the natural world has gone too far. But in some cases over the millennia such illusions have led to a pharmacopeia that works, however imperfectly and even though the explanations are wrong.

How to Make Use of the Good and Avoid the Bad

It is unclear whether religion is innate to the human brain, or whether it is just a bunch of memes that have parasitized innate tendencies of the brain. My *Encyclopedia of Evolution* (2007) defends the first view in the first edition and the second view in the revised edition (to be available eventually as part of an on-line database). Take your choice. But religion is entrenched and powerful. I believe that what we as scientists and educators should do is to guide the power of religion in constructive directions.

And that is what we educators are already doing, even without taking religion into consideration. We need to continue getting students and other people outside to notice things. For example, people may never have looked closely enough at rocks to see the fossils. They may not have noticed how many different kinds of trees there are, or that the species of trees around a pond are different from those on the top of the hill. If they grow into adults that notice things, they may grow into adults that question things. And from there, we just need to have faith that their habit of thinking about what they see may lead them down the paths of reason, at least sometimes. For some of our students (alas, too few), religion inclines them to view the natural world with wonder and delight.

Another example is that we can teach evolution by getting students to just notice plant adaptations. I do this in workshops and with students all the time. In Oklahoma, post oaks (*Quercus stellata*) grow slowly, produce strong wood, and live for a long time in stable

(though stressful) environments. Cottonwoods (*Populus deltoides*) grow rapidly, produce weak wood, and live for a short time in unstable riparian environments. Alders (*Alnus maritima* and *A serrulata*) have a different way of living in riparian environments: the root clump persists but each trunk lives just a short time. Black oak (*Quercus velutina*) life history is intermediate between those of post oaks and cottonwoods: they live for a moderately long time in stable habitats that are not as stressful. Such examples as these illustrate how you can teach the evolution of life history adaptations using plant examples, without stirring up the kind of barriers that you would encounter if you started right off with chimps and australopithecines.

Life is too short to spend it in open conflict with the bad or calling attention to the ugly. I recommend that we cultivate the good—wonder and curiosity, which frequently arise from spirituality—and have a good time while we are doing so.

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