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PRESIDENT'S MESSAGE

World View Distorts Vision

Jesse Johnson

My great grandfather hated shrimp. It was neither the texture nor the taste that bothered him. It was one of his many experiences throughout his life. You see, during WWII, he saw shrimp feeding on many of those who had fallen in battle. The shrimp would attach themselves to the bodies, then he would see those bodies covered with shrimp when the tide went out. That killed any desire he might have had to eat shrimp for the rest of his life. But that was Pop, my great grandfather.

Not all of Pop's experiences in life were so revolting. During the 1950s, he traveled the world for the state department, doing work as a consultant and gathering information. He spent some time in Vietnam, only to come home and tell my grandmother that the US was going to get heavily involved over there and that it was going to be bad. Another place where he spent a considerable amount of time was Afghanistan. He was there to help build the road from the Soviet Union to the Khyber Pass. After coming back, he stated that the road was only going to be used by the Soviets to invade Afghanistan. Like many of the other predictions and analyses he made throughout his career, these were dead on.

Rabid conservative was a very good description of Pop. I'm pretty sure that Truman was the only Democrat he ever liked, at least as a public official. This was a major part of his world view, yet he never let that influence any of his analyses. He knew how to be objective when he needed to be and he understood that his own personal biases had no place when it came to describing the world as it stood at the time.

When people do not leave their world views out of real world analyses, they are in essence assuming that the world is how they think it should be rather than how it really is. It is most problematic when people who make policy do this, because they are often wrong and they are also telling everybody to view the world as they do. There are policy makers who operate this way, and some of them are on our school boards.

In October, the Rio Rancho School Board was voting on a resolution to seek a $500,000 grant from the New Mexico Public Education Department for the purchase of a 100kW solar panel system. The resolution included a sentence stating its justification: "Whereas: this dependence on fossil fuels contributes to *global warming* and unhealthy air pollution for New Mexican citizens and our students; and..." Three out of the five people on the school board objected to the words "global warming" being included. They then amended the resolution to

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strike those words, and voted to pass it with no mention of global warming.

"I don't agree with the statement and I believe it is a very debatable point of data, I'm not comfortable seeking the grant if we pass something that states something I don't believe is true. I don't think it's (fossil fuels contributing to global warming) an accurate statement."
—Don Schlichte, Rio Rancho School Board

There exists more than just one "very debatable" point of data supporting global warming. A lot more than just one. The consensus based on the many existing data points is that global warming is real and human activity is a primary cause. The real scientific debate over global warming is precisely what the long term effects will be and how drastic it will be in the future, but whether or not it is real has already been settled.

Two of the members who voted to amend the resolution, Don Schlichte and Marty Scharfglass, are pastors at the Rio West Church. The third member, Craig Brandt, is the Associate Pastor of Counseling & Evangelism at Celebration Baptist Church. I am convinced that they object to the idea of global warming on religious grounds and they seem to be anti-science in general. The problem here is not that they are religious. The problem is that they are trying to apply their religious views to science as well as public policy, like they (Schlichte and Scharfglass) did with Policy 401 (a policy which would have allowed the teaching of Intelligent Design Creationism in science classrooms) in 2005.

As with global warming, the board members who supported policy 401 did not believe that there was enough evidence to support evolution. One of them even tried to apply a moral judgment to evolution by implying that evolution led to the holocaust. That is a very slippery slope to stand on, especially considering that there are references to carrying out the will of God by eliminating the Jewish people in *Mein Kampf*.[1]

I don't intend to argue or even imply that Christianity is inherently evil because Hitler used Jesus as a justification to carry out the holocaust. A vast majority of Christians believe that the holocaust was one of the most heinous events in human history, so any such argument would be wrong. My intent is to point out that we should not use the words Hitler wrote to validate or invalidate ideas because

[1] *"Hence today I believe that I am acting in accordance with the will of the Almighty Creator: by defending myself against the Jew, I am fighting for the work of the Lord."*
—Adolf Hitler, *Mein Kampf*

Hitler was a mad man who twisted powerful ideas to manipulate people. We should not let Hitler dictate what is or is not taught in our science classrooms.We should use our own standards and we should use real, peer-reviewed science.

Science and religion are very different. and one should not be applied to the other. The Bible is not a science text and it would be hard to get meaningful spiritual guidance out of a quantum physics book.

A common misconception is that science is a search for some "grand truth," when science is really a method for determining physical explanations of physical phenomena based on physical evidence.

It is easy to see how somebody who holds this "search for the grand truth" view of science could equate science with religion.Such a view is bound to breed ideological conflict and lead to viewing explanations of natural phenomena through a biased world-view lens. I believe this is a trap that many policy makers across the US have fallen into, including three of the Rio Rancho school board members. Evolution and global warming have popped up as issues of contention all over the country.

By teaching pseudoscience we will only further these misconceptions. Students need to be taught more than just the explanations that science has given us. They need to be taught what science is and how it works on a conceptual level. That will never be accomplished if we encourage students to view science through their own biased world-view lenses. Like my great grandfather, they need to learn how to view the world as it stands rather than seeing it as how they think it should be.

Settled Science

Dr. Mark Boslough

Nobody claims that the global warming debate has ended among editorial writers, media pundits, and politicians. The calculation of the mass of CO_2 produced from burning a gallon of gasoline was the subject of a vigorous debate on the *Albuquerque Journal* letters page a while back. This is a question that a decent high school chemistry student should be able to answer, but the highly opinionated letter writers were not able to resolve their differences--despite the fact that reaction stoichiometry is settled science.

Likewise, a competent high school physics student understands how the greenhouse effect works, called conservation of energy, also settled science. It has been known for over a hundred years that adding CO_2 to the atmosphere increases its infrared opacity, and when this happens, more energy from sunlight enters the Earth's atmosphere than escapes. The atmosphere must heat up, on average. *There is no scientific debate about this fact, and nobody has ever published a zero-warming theory to explain how it could be otherwise.* [Italics added.]

What is not settled science is the degree of climate change, and in the peer-reviewed scientific literature there is a healthy, open, honest, and active scientific debate going on. The best scientific estimate of the amount of warming (when CO_2 levels double, which is likely to happen this century) is about 3^0 C. There are those who disagree, and have published the basis for their disagreement. The most useful assessments are not limited to the best estimate, but include quantification of the uncertainty, which is one of the hallmarks of honesty in science. There is a broad range of possibility, from below 2^0 C to greater than 6^0 C.

Ida, Ardi, Lucy, Eve

Dr. Paul Braterman

A century ago, it was possible without absurdity to think that there was some kind of discontinuity (a "missing link") between humans and the great apes, or to be more accurate, between humans and the other great apes. Alfred Russel Wallace, co-discoverer with Charles Darwin of the principle of evolution by natural selection, certainly thought that there was, and that humankind was in some sense a special creation. This position became untenable as early as 1926, with the discovery and description of the Taung child skull, a fossil dating back to around 2 ½ million years. This is now classified as an example of Australopithecus Africanus, a relatively small brained creature compared with modern humans but with an upright posture and small, human-like, canine teeth, and numerous studies since that time confirm its placing on, or more probably very close to, our own line of descent.

Ironically, the full significance of this finding was not generally appreciated at the time, because of the credence given to the clumsy forgery known as "Piltdown Man". Creationists like to point to this hoax in an attempt to discredit the many well-established ape-to-human intermediates, although as usual the boot is on the other foot. If it were possible even with 1950s technology to debunk this fraud, what chance would a similar imposture stand today?

Human evolution is a rapidly developing field, with shifting interpretations of the data as we learn more. This is as it should be for a lively and still-developing branch of science. Again, there are those who would disparage it for these reasons, but such people have evidently managed to cultivate a total ignorance of how science can, and should, operate.

It is in this spirit that I would like to look at four of our ancestors, or at any rate near ancestors, two of whom hit the headlines in 2009.

It's not all that easy to become a good fossil, but some places make it a lot easier than others. If this is your ambition, arrange to be deposited in some place where you will be very quickly covered up by fine clay and silt. In a few million years time, with any luck, these will be converted to fine-grained shale and you will be beautifully preserved.

One of the world's best shale pits, from the point of fossil preservation, is the Messel pit in south central Germany, and one of the most significant finds from this pit is a specimen known as Darwinius masillae, or, more informally, as Ida. Ida was announced last May amid a blaze of publicity in collaboration with Atlantic Productions, with her own book and her own website. She was identified as the "missing link," not between humans and apes but between early simians (the group that includes apes and monkeys) and their common ancestor with lemurs. She was even described in the press as "the fossil that proves that Darwin was right," as if such a thing were either possible, or necessary

The common ancestry of simians and lemurs, like our own place in the family of simians, has long since been established beyond all reasonable doubt, not only from the fossil record but by the modern methods of molecular phylogeny. It was certainly not the case that this one specimen swung the balance in Darwin's favor, since the issue had long since been decided in his favor anyway. Ida is a particularly well preserved specimen, with soft tissue, fur, and even her last meal (she was a vegetarian) detectable by x-ray tomography, in addition to the fine detail of her skeleton. She is also spectacular evidence of the rapid evolution and diversification of mammals around 47 million years ago. But within days of the announcement, serious doubts had been expressed as to whether or not she was truly an ancestor, with too few characteristics having been pre-

sented to place her conclusively in our direct line of descent. At the time of writing, the most recent informed opinion seems to be that she is a specimen of a now-extinct group closely related to the simians, with the simian-like details described in the original paper being largely the result of convergent evolution. Similar lifestyles will favor similar adaptations. As our next example shows, neglecting this possibility can lead to totally incorrect conclusions about the nature of ancestral species.

Fast forward about 40 million years (or about five months in terms of publication date) to Ardipithecus ramidus, better know as Ardi. This species was described in a series of eleven long-awaited papers in the October 2, 2009, edition of the journal Science, summarizing the results of some seventeen years work by a large international team on a collection of 36 separate specimens in various states of preservation collected, like so much of the fossil record of our recent ancestors, from the Afar rift region of north-eastern Ethiopia. This is not, so far as we know, because it was a particularly important area for evolution, but rather because its topography and the opening up during the relevant period of a rift valley make it particularly favorable for specimens to be buried, fossilized, and retrieved. Most conveniently, this rifting has also been associated with volcanic activity, providing accurate age markers for the relevant sediments. All the specimens described in these papers had been collected from material that had been laid down, some 4.4 million years ago, within the span of at most 10,000 years, and were analyzed in conjunction with detailed studies of their contemporary flora and fauna. There is a huge amount of information, and the AAAS have made much of it freely available at a dedicated website[1].

The findings are important for two distinct reasons. Firstly, and most obviously, they take us back far closer to the chimp-human divide. But in addition, whether by the chance of preservation, or the intensity of effort, the information we now have about Ardi is actually far more complete on many points than what we have on the australopithecines (such as Lucy) who succeeded her.

If the appearance of these papers had long since been expected, their detailed conclusions had not. Habitat, diet, ways of walking, skeletal development, and as far as we can tell lifestyle, all differed from what had been expected. Chimps are ripe fruit specialists, but Ardi was an omnivore. Our ancestors shortly after their divergence from chimps were expected to be chimp-like, but it turns out that they are not, because chimpanzees themselves have diverged from this point more than expected. It had been assumed that walking upright had evolved on the open savannah, but Ardi, already bipedal, lived and ate in woodlands. These were cooler than at present and well supplied with groundwater, with hackberry, fig, and palm trees, but no closed canopy forest. Small mammals were abundant, with up to twenty new species having been observed in the course of this work. The soil was conducive to the formation of good fossils, but most of the larger skeletons had been severely damaged, probably by hyenas shortly after death. Fortunately, in the case of Ardi there is one spectacularly well preserved exception.

Isotopic analysis of carbon and oxygen in the tooth enamel of the various mammals found in the same horizon gives additional information. Carbon gives information about the kind of plants eaten, while oxygen (see Beacon, January 2009) gives information about the temperature. Leaf and fruit browsing were common, with grasses having made up only a small part of the total animal diet. All of this confirms that the parting of the ways between humans and the ancestors of chimpanzees occurred in a wooded environment, before our ancestors emerged onto the grasslands.

For many reasons, the part of the skeleton that most interests us is the skull. Not only does this tell us brain size, but

[1] http://w.sciencemag.org/ardipithecus

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the position of the foramen (the opening connecting the brain to the spinal column) indicates posture, while the shape of the face, and the nature and wear patterns of the teeth, give information about chewing and diet. Unfortunately, well-preserved hominid skulls are rare (if you have a strong stomach, you can imagine exactly why), but enough scattered fragments of one Ardi skull were found to enable a detailed reconstruction. Ardi had a small brain, comparable in size with modern chimpanzees, and about a quarter the size of our own. However, the shape of the face lacked the forward projection and prominent canines and incisors of the chimp, as well as the prominent cheekbones of Ardi's descendant, Australopithecus. All of this suggests a softer and more varied diet than in Australopithecus, and a lower level of social aggression than in modern chimpanzees.

Modern (nonhuman) apes show strong sexual dimorphism in the form of their canine teeth, with the males having prominent canines that sharpen against a specialized premolar. No such teeth have been found for Ardi, strongly suggesting less male-on-male aggression, and even, by implication, the emergence of female sexual preference. Consistent with this is the absence of any strong difference in body size between male and female.

Another surprise in Ardi's skeleton is the shape of the wrists and hands. No complete hand skeletons have survived for Australopithecus, but it had been thought that the development of the human hand towards short fingers and long thumbs, making fine manipulation possible, was a relatively recent development. But again we find that Ardi is in some ways much closer to us than to the chimps, with the implication that the long-fingered, short-thumbed chimpanzee hand is something that they have developed since we parted company. In other ways, it resembles monkeys more than modern apes, with an extremely flexible mid-carpal joint that would have enabled it to run along branches. All in all, its movement through the trees would have been more similar to monkey palm-walking than to ape-like knuckle walking.

Ardi's feet, legs, and hips are adapted for a mixture of climbing and bipedal walking. The upper pelvis is human-like, showing that the gluteal muscles that make up the buttocks had moved to allow bipedal walking without swaying from side to side, but the lower pelvis is much more ape-like, with anchor points for strong muscles used in climbing. The big toe can cling, but the foot lacks the flexibility found in modern great apes.

Taking all these facts together, it would seem that the traditional assumption that of an ape-like ancestor was fundamentally mistaken. Things do not stand still, either for apes or for humans. In many details, as listed above, apes have features in common that are absent in Ardi. The best explanation at this time is that such features have evolved in parallel in chimpanzees and gorillas, as they adapted to life in the changing African forest, but were never present in our own ancestry. Unfortunately, there is a great shortage of fossils from the period immediately preceding the human-chimp split, and the search for these will now no doubt be pursued with heightened intensity.

Lucy, whom we have already mentioned, is the most famous specimen of Australopithecus Afarensis, a species that lived between roughly four million and three million years ago, and presumably lies on or close to the line of descent between Ardi and ourselves. (We can never be certain of these things, because we cannot convincingly distinguish between our grandmothers and our great-aunts.) Again, the most extensive remains come from the Afar region of Ethiopia; and this does not necessarily imply that this is where most of her species lived, since this region is so favorable to fossil preservation. She was somewhat larger brained than Ardi, but not dramatically so (some 400 c.c. as opposed to Ardi's 300, or our own 1,200 or so), and it was her discovery that first demonstrated that upright posture was adopted long before the dramatic

growth in brain size which characterizes our own species. She has lost the ability to grasp branches with her big toe, although strongly curved fingers and toes suggest that she was still a good climber. Too few specimens have been recovered for us to be able to tell whether or not this species showed sexual dimorphism, with all that implies for social structure.

At one time, australopithecines were characterized as gracile (the group from which we are descended, and of which Lucy is a member) or robust; the robust group has no surviving ancestors. In one of those changes in nomenclature that outsiders like me find infuriating, "robust anthropithecines" are now classified in the separate genus Paranthropus.

Eve (or mitochondrial Eve, to give her correct title) is a much more recent creature, inferred to have lived around 200,000 years ago (and incidentally a good 60,000 years before her male counterpart, Y-chromosomal Adam[2]). Mitochondria of course have been around a lot longer than that, probably some two billion years longer, and date back to a bacterial colonization of the primitive eucaryotic cell. For our present purposes, their important feature is that they are inherited almost exclusively in the female line, so that we can analyze their genetic structure without the complicating factor of recombination. We can measure the relative distance in time between related organisms (and of course, in the last resort, all terrestrial organisms are related) by the degree of single point differences in their DNA, and can approximately calibrate the rate of change and quantify the scale when we know divergence times from the fossil record. These "single nucleotide polymorphisms," SNPs, are particularly useful over short time periods, because such changes in many cases do not alter the meaning of the DNA instructions, and thus represent pure chance rather than the effects of selection.

By looking at the amount of mitochondrial genetic diversity within a region, we can estimate how recently that particular population established itself. In this way, we can locate Eve in space as well as time, placing her in east central Africa, in agreement with the "Out of Africa" hypothesis, according to which all modern humankind is descended from a single population, with migrations out of Africa having occurred within the past hundred thousand years or so, and more recently than the evolution of extinct species of Homo, such as the Neanderthals and Peking Man. Not all scholars would agree, however, and while the general outline of our ancestry now seems clear, the details will no doubt continue to surprise us.

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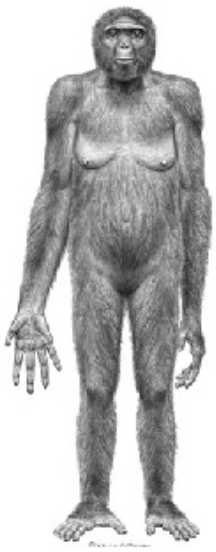

Ardi—*Ardipithecus ramidus*

[2] This is not really a paradox. It may be merely a matter of chance, or may reflect some bias. For example, it may have been more common for a male to have children by more than one female, than for a female to have children by more than one male. It is not certain whether this "Adam" and "Eve" actually represent individuals, or, merely small, relatively homogeneous, populations.

Creationist '*Origin*' Distorts Darwin

Ray Comfort donated 100,000 copies of Darwin's work (with plagiarized introduction) to colleges.

Dr. Eugenie C. Scott

Ray Comfort and I agree that "science is a wonderful discipline, to which we are deeply indebted." We agree that it would be nice for students to get a free copy of Darwin's best-known book, *On the Origin of Species....*

There's no reason for students to refuse Comfort's free—albeit suspiciously abridged—copy of the *Origin*. Read the first eight pages of the introduction, which is a reasonably accurate, if derivative, sketch of Darwin's life. The last 10 pages or so are devoted to some rather heavy-handed evangelism, which doesn't really have anything to do with the history or content of the evolutionary sciences; read it or not as you please.

But don't waste your time with the middle section of the introduction, *a hopeless mess of long-ago-refuted creationist arguments, teeming with misinformation about the science of evolution, populated by legions of strawmen, and exhibiting what can charitably be described as muddled thinking.* [Italics added].

For example, Comfort's treatment of the human fossil record is painfully superficial, out of date, and erroneous. Piltdown Man and Nebraska Man—one a forgery, the other a misidentification, both rejected by science more than 50 years ago—are trotted out for scorn, as if they somehow negate the remaining huge volume of human fossils. There are more specimens of "Ardi" (the newly described *Ardipithecus ramidus*) than there are of *Tyrannosaurus*—and any 8-year-old aspiring paleontologist will be delighted to tell you how much we know about the *T. rex!*

But you wouldn't learn any of this from reading Comfort's introduction. He says, "Java Man [a *Homo erectus*], found in the 20th century, was nothing more than a piece of skull, a fragment of a thigh bone, and three molar teeth." Well, that was from a single site—excavated in the 1890s. What about the dozens of other sites where fossils of *H.Erectus* are found, from China to Kenya to Georgia? Another whopper: "Java Man is now regarded as fully human." Trust me, if one sat down next to you on the bus, you would know the difference. . . .

It's not just human evolution that Comfort misrepresents. His main gripe is the old creationist standby, the supposed lack of transitional forms in the fossil record. (Darwin addressed the objection in Chapter 9 of the *Origin.)* . . . Comfort sneers at the fossil evidence for the terrestrial ancestry of whales and the dinosaurian ancestry of birds. Too bad for him that he has a knack for picking bad examples: There are splendid fossils of dinosaurs that have feathers and of whales that have legs—and even feet. Faced with ignorance like this, I'm reminded of a jeremiad: "Oh foolish people, and without understanding; which have eyes, and see not; which have ears, and hear not." . . .

Evolution is taught matter-of-factly in the biology and geology departments of every respected university in the country, secular or sectarian, from Berkeley to Brigham Young. That's why the National Academy of Sciences . . . wholeheartedly endorse the teaching of evolution in the public schools.

This year marks the 200th anniversary of Darwin's birth and the 150th anniversary of the publication of *On the Origin of Species*, both occasions worth celebrating by anyone who cares about our understanding of the natural world. So it's no surprise that creationists are trying to piggyback on the festivities with cynical publicity stunts like Comfort's. But I have faith that college students are sharp enough to realize that Comfort's take on Darwin and evolution is simply bananas.

For entire article please see—http://www.usnews.com/blogs/god-and-country/2009/10/30

Eugenie Scott, Ph.D. is executive director of the National Center for Science Education, the leading group promoting and defending the teaching of evolution in public schools.

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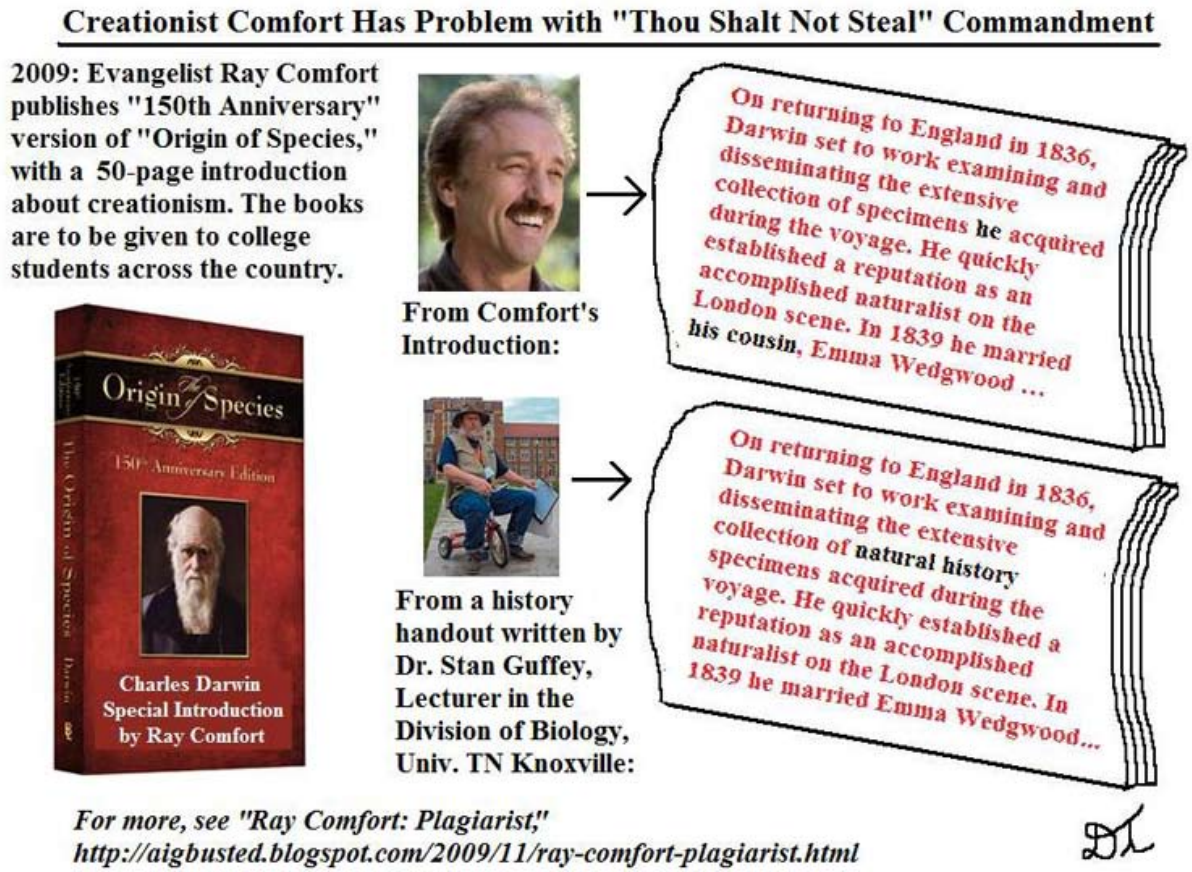

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