
SUBJECT: Creationism and Evolution
DATE: 1/97

Dear Colleagues:
I am a neophyte general bio. instructor (using Starr's Basic Concepts in ..) at a small, private midwestern college, and new to the biolab list. I really enjoy it! It is for the latter reason (along with the nature of my question), that I hesitate in asking. I searched the archives for previous threads and found none, so here goes. How do you handle the concepts/questions concerning creationism and/or scientific creationism when teaching evolution? My Chairman mentioned this issue would eventually come up in class, and suggested my answer should be simply that creationism isn't part of the curriculum of this course, seek answers in a religion or philosophy course. Frankly, as a veterinary pathologist by training, it has been years since I've even thought about the theory of evolution, much less any alternatives; so his suggestion sounds very expedient. Unfortunately, there is a part of me that considers it somewhat patronizing, so I'm looking for help. Any suggestions, short references? I'm just looking to field students' questions, not become an expert.

Thank you,

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(1870-1953)

When I teach intro biology for nonmajors, I try to make 3 points about evolution vs. creationism:

1. We are frequently presented with the media with a choice between "atheistic evolution" and "Biblical creationism". But this is a false choice, as there are many positions in between these extremes that are held by people of good faith.

2. Students have to decide where they fall on the spectrum of beliefs, and how this relates to their personal values. It is not the job of a biology course to indoctrinate them.

3. However, evolution is a cornerstone of biology, and students must be

familiar with it to have any idea of how real biology is done.

David J. Hicks djhicks@manchester.edu
Biology, Manchester College

Barbara,

I once had a student (in Kentucky) bring me a few books on creation science (unsolicited). I briefly read through the least inflammatory of them and concluded that many of their arguments are reasonable interpretations of data !! IF !! one can accept the notion that the speed of light and the rate of radioactive decay has decreased over time. Personally, I don't accept the assumption that physical contants change. Their "evidence" for this is that the measured value for the speed of light has decreased slightly in the last century (I would argue that today's measurements are simply more accurate). Thus, the large amount of isotopic decay measured in older biological materials would reflect less age if the rate of decay was higher in the past.

I'm looking forward to this discussion (if one arises). I'm sure there are other arguments, this one just stands out in my mind as a major flaw.

Jeff

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I'm afraid that nothing you assign for reading will convince a creationist of evolution, just as nothing an evolutionist reads will convince her of creation. This is because the evolution/creation debate is not one of science

but of faith: does one believe what he sees or what the Bible (or another scripture) says?
If you can get this past your students, tell them that the purpose of a science class is to teach we can observe about the world and how we interpret those interpretations. Today the observable evidence against evolution is greatly swamped out by the evidence for it. In my opinion, Scientific Creationism is a bastardization of science and academic inquiry in general. (hmm...perhaps it has some pedagogical use in teaching what good science is) Beyond this, suggest that the students take a course in scientific philosophy. If they can stand it long enough, they should reach Paul Feyerabend, and be able to believe whatever they want to.
Good luck. I haven't run into the situation you are preparing for yet, but
I hope I can handle it well when it pops up.
Doug Jensen
Berea College

Barbara,

With regard to the questions about creationism:
I think your Chair's answer is fine, but further, I think you should give answers that YOU feel comfortable with. If you've not thought about evolution in a long while, then, like all of us teaching a subject or topic when our thoughts have been elsewhere (it's inevitable, especially in teaching freshman courses) you have some study to do anyway.

I always simply tell my students (if I'm asked, which is very rare)

that creationism isn't science, but that they will find substantial discussion of the topic in philosophy, religion, legal circles, and I point out that the Supreme Court has ruled that schools cannot compel the teaching of creationism.

I have a creationist colleague, who has some difficulty because of both his inability to accept normal scientific approaches to proof and the integration of evolutionary principles into all parts of biology. I'd guess you won't have nearly the difficulty he faces!

Good luck, and welcome to the the club!

Dave McNeely, Biology, University of Texas at Brownsville, 80 Fort Brown, Brownsville, TX 78520; mcneely@utb1.utb.edu

I say to my students that the evidence for evolution is tangible and clear, though our understanding of the mechanisms, like our understanding of all mechanisms is tentative. This is not to say that I don't have confidence in it. I doubt evolutionary theory about as much as I doubt the cell theory ... hardly at all. Nevertheless, we don't talk about "proving" things in science, because by nature our understanding is imperfect.

For me, then, I don't have to rebut all the picky, tricky "evidences" that the Christian Right has so very carefully taught their faithful to point out to me. I just say that biological variability being what it is, exceptions will always be found, we just have to figure out what the general pattern is. (I always bring up that I had an aunt who claimed that she had 3 kidneys, but this does not make it untrue for us to say that human beings have 2 kidneys.)

I always wear a cross or other bit of religious jewelry on the days I teach evolution. I do, fairly regularly, have students who are having actual faith crises come to talk with me in my office. There I can make the rules a little different and we can be clear that we are talking person to person and not just science instructor to student. Then I am comfortable talking about seeming conflicts between historical religious sources and historical science sources. Nevertheless, I still make it clear that I see evolution as the organizing principle of biology.

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A reference that I've found helpful is "Science on Trial:The Case for Evolution" by Douglas Futuyma. It is written for the general reader and specifically addresses some of the points brought up by creationists.

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There is a pretty good discussion of human evolution and defenses against creationist claims at

http://earth.ics.uci.edu:8080/faqs/fossil-hominids.html

Many of the points can be applied to evolution vs creationism in general.

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Biolabbers,

Many good suggestions have been made already for dealing with questions regarding creationism etc. There is also an organization, the National Center for Science Education, that deals with these issues in the public schools, colleges etc. They also provide information, literature etc on these issues to help combat the sometimes overzealous tactics of so-called creation scientists. If you're interested, they can be reached at NCSE
PO Box 9477
Berkeley, CA 94709-0477
(800)290-6006

On another note, I had a colleague at another school who had a technique for dealing with really hard core creationists. I don't recommend this, but here goes. When confronted by an adamant creationist student, he would state that he had his own theory about the creation of the earth. He stated that the world was created yesterday! When the student protested that he had memories from two days ago or last week, this instructor said no, these were implanted in your brain to test your faith. He then challenged the student to prove him wrong. The argument is the same, just the time frame is different. Needless to say the student, would protest the ridiculousness of the argument, and possibly recognize the same features in some of the creationist arguments.

I've never tried this myself, and I doubt that it has much chance of success, but it might make an interesting last resort!

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It's very important to define "evolution". Many mistakenly believe it includes the origin of life, and since our actual EVIDENCE regarding the biochemical origin of life is scant, they claim the entire theory of evolution is weak.
Darwin's theory of evolution is DESCENT WITH MODIFICATION. And for that, we have so much evidence, scientists can't imagine it NOT being true [although of course, the "cornerstone" of science is that indeed it IS falsifiable]. The strongest evidence is the "genetic record", comparison of DNA sequences throughout phylogeny.
What this evidence shows, beyond any "reasonable doubt", is that the existing species all were created from one another, that is, share common ancestors. If I can get my students to see that, I've come a long way!
The rest of "evolution", the exact mechanisms for instance, are indeed still open for debate. But that doesn't alter the "truth" of the core, descent with modification.
And there is indeed room for "middle ground". Could "evolution" have been God's tool for creation? We certainly have no evidence to suggest otherwise. I try to leave students with that thought. yes, it often

leaves them with the posibility of a "teleology" to evolution; but getting them to see and accept the core of evolution is perhaps more important!

Final note of emphasis: It is VITAL that we ALL get our students to understand what EVOLUTION IS, and the distinction between "evolution" and the origin of life.

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Bob, thanks for pointing out this distinction. It is important. I have begun separating my discussions of "origin" and "descent" in time. I talk about origin when I talk about chemistry. I discuss descent later in the semester. I think that it works OK. I also learned from a master teacher here at BGSU to put ALL theories of origin on the table including spontaneous generation and cosmozoic. I can outline the evidence that disproves spontaneous generation and I explain how cosmozoic begs the issue. (That was a fun discussion this fall with the Mars stuff!!) We talk about divine creation and how we don't have the ability to measure, observe, or quantify faith or a divine being. Perhaps some day we will, then we can do the experiments. For now we will talk about those areas where we do have the ability to measure, observe, and quantify. I've only had one student, who missed the original discussion, complain about my coverage. I sat down with him and talked person to person and it worked out fine. --cmw

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Jean Desaix comments on "exceptions" to the theory of evolution. What are they? I am not aware of a single "exception" to descent with modification. Is there any organism on earth known to have a genetic code unrelated to that of all the others? Or to have genetic material that isn't DNA? Or any other evidence suggesting [SERIOUSLY suggesting, that is,] that a single organism on the planet has some other "independent" origin? I kinda doubt it.

[PS: Yes, of course I know about RNA viruses; that's clearly NOT an exception to evolution... they clearly evolved from the same stock as the rest of us!]

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I agree about 95% with Robert Moss (almost always do 95-100%), and

really appreciate his comments and suggestions, but I have a
concern/question related to his comments shown below:
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It's very important to define "evolution". Many mistakenly believe
Darwin's theory of evolution is DESCENT WITH MODIFICATION. And for
that, we have so much evidence, scientists can't imagine it NOT being
true [although of course, the "cornerstone" of science is that indeed
it IS falsifiable]. The strongest evidence is the "genetic record",
comparison of DNA sequences throughout phylogeny.
****
--end quote--
One of my "strong" memories of the Reagan era was a discussion on
evolution in which the President made a statement
somewhat to the effect that he did not understand all the concern
about the evolution/creationism debate, because "Evolution is just
a theory anyway". (May not be the exact quotation, but the ideas
are the same.)

I am comfortable in talking about evolution as being an observation
not unlike gravity; we see it all around us, from the gross level
to the molecular level. We recognize "changes in organisms", an
"evolution" as it were. Where the word "theory" comes in, is in
our attempt to explain these observations. Darwin's theory of
natural selection is the best explanation, and with modern
understandings of the mechanisms of population genetics
and of molecular genetics, Darwin's basic "theory" may better
be called a "principle" (or some related term) to explain
these observation of change or evolution.

What I'm suggesting then, is to avoid the use of the phrase
"Theory of Evolution", because a change in organisms over
time should no longer be considered a theory.

Comments/brickbats, please!
Jim Freed
Delaware, OH

Jim, another good point. There is a difference in the definition of the
word theory that the average freshman brings to class and the word Theory
that precedes Evolution. It is important to point out to students that a
scientific theory has the weight of evidence behind it. It is more than a
proposed mechanism e.g. space aliens made OJ tape Newt's conversation with
Paula to set up Bill. --cmw

Charlene M. Waggoner, Ph.D. "Great art is eternal;
Department of Biological Sciences great science tends to be
Bowling Green, State University replaced by greater science."
Bowling Green, OH 43403
-- John A. Moore
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Charlene

The example use is to remind my students that we always hear people talk
about their own personal theory about why their favorite team is not
winning the pennanat in baseball (or fill in your favorite sport). I point
out that if I really had a theory and not a hypothesis about why they are
not winning, I would be in the baseball dougout rather in front of the
class teaching biology. That then leads into a discussion of the
difference between theory and hypothesis.

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As a biologist who is also a Creationist, I think the most important thing in discussing the Creation/Evolution debate is to be as honest as we can with each other. For example, I recognize that faith is a foundational part of the Creation Theory. But that doesn't make it unexceptable or that it shouldn't be discussed in science class. Evolution Theory (common ancestry) is also based on faith, yet it is descussed in science class. Both theorys have testable hypotheses within their grand schemes and both have aspects or assumptions that can and never will be provable. I think the Creation/Evolution debate is a great tool for a more multidisciplinary science course.
In reguard to someone's comment about science being limited to only what is observable, if that were so, then Evolution (common ancestry) should not be discussed in science classes either since we have never observed one life form ever given rise to another life form.

Dave Netzly
Hope College

I meant that I don't have to debate whether or not exceptions exist, and that seems to me what folks want to engage me to do. You know, the old "missing link" arguments. I just say that having a missing link (an exception in the mind of some) doesn't bother me.

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I tell my students that evolution is the best SCIENTIFIC explanation for the diversity & adaptations of living things.

I then point out that science is explicitly naturalistic - from the outset it refuses supernatural explanations. In contrast, religion embraces and prefers supernatural explanations. Thus, science will NEVER accept divine creation through supernatural processes, because even if it did happen it is "out of bounds" for science.

I use these "ground rules" to make it clear that students don't have to choose between evolution and their faith. One of the biggest problems we have in teaching evolution is telling students that they must give up their faith & values. That is the choice that the Inst. for Creation Research wants students to see - it does not serve educational purposes tell students that evolution and their faith & values are mutually exclusive. (Some folks like Will Provine are evangelistic athiests when they teach evolution. I think that's the wrong way to go about it.)

The National Center for Science Ed. has a web site... but I couldn't find it yesterday. Some of their materials are excellent).

-Frank

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"All a frog wanted was an education, and he could do 'most anything." -Twain

910-334-5391 x23

Jim Freed suggested that evolution should no longer be called a "theory" since we can observe it all around, evidence is strong and so on in an argument that we can really accept this stuff now. President Reagon's dismissal of evolution as "just a theory" argues, according to Jim, that we should stop calling evolution a "theory," apparently since evolution is less tentative than implied (to Jim? to President Reagan?) by the term "theory."

Well, Jim! I agree that evolution is observed and unarguably is ongoing, as it has since the begiinning of life (and before - don't forget the realm of the chemist - prebiotic evolution) by "descent with modification."

But the problem with the dismissive statement, "It's just a theory", goes somewhat deeper, or is more fundamental. The speaker means to say that the theory is tentative and therefore can be dismissed. It's almost as if the speaker believes that a theory is someones belief or opinion, or that it has the tentative nature of an hypothesis. The statement reveals a fundamental misunderstanding of how science works, of how hypotheses evolve through test into the complex mixtures of observation, fact, hypothesis, model that is the work in progress that serves to at the same time explain a phenomenon and provide for its further exploration. In short, the speaker reveals a lack of respect for the substantial scientific effort and sophistication that the label "theory" recognizes.

A scientific explanation doesn't get to be a "theory" by someone espousing it. And that's what President Reagan, and many other laypersons fail to see, or find confusing about any "Theory of ...." They seem to think that theories are like opinions, and everyone has one. One of the things that I regularly point out to my students is that when one says "The Theory of ....." s/he is recongnizing that as meant in that label, there are very few "theories" in science. Too few things are understood well enough to warrant the term.

So I say let's keep the term "Theory of Evolution," to stand alongside "The Cell Theory," "Atomic Theory," "Theory of Relativity," "Quantum Theory," and so on.

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Dave Netzly claims that creationsism is a theory, despite, as he said, it is based on faith and not on observation. He claims that it is testable. Scientifically? Rubbish.

The old foolish claim that one life form has never been observed to give rise to another is simply untrue. Darwin himself used the analogy of variation under domestication, and we have numerous examples of species and varieties that are in domestication and differ from their known progenitors.

Whenever you state from the outset that your "theory" is built on faith, you've defined it as outside science.

Now, the fact that evolution has and is occuring is an observation. The details of how, all the mechanisms involved are being investigated.

If Netzly wants to believe in magic, he can go ahead. The rest of us have science to do.

Dave McNeely, Biology, University of Texas at Brownsville, 80 Fort Brown, Brownsville, TX 78520; mcneely@utb1.utb.edu

I am really enjoying this thread and hope that we can respect one another's position, even if we disagree violently. I am planning two teacher workshops in the next year dealing with evolution and the teaching of it, so this conversation is great for me.

I remember reading an artical about lack of scientific literacy (you've probably seen it) and one evidence was that many science teachers thought that people and dinosaurs existed at the same time and the other was that many teachers believed in angels. I consider the first a strong comment on the lack of science literacy and I consider the second irrelevant.

I think it is outside of our educational realm as teachers of biology to deal with what one comes to believe through faith. I have a strong personal faith. I hope that all of us believe that "love" exists, but we would not allow a student to use love as a variable in a controlled experiment in the lab. (The spinach that was more loved gave a greater level of photosynthesis????)

So my faith in God is not subject to hypothesis testing and is not disprovable, and therefore is, as several have agreed, totally out of the realm of what is appropriate content for my science classroom. I gain my wholehearted acceptance of and appreciation of evolution in an entirely different way, a way that is objective and a way that, I think, should be readily acceptable to most rational folks. Is it the (erroneous in my opinion) idea that one has to reject faith to accept evolution the crux of this being such a "hot" topic?

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It's very important to define "evolution". Many mistakenly believe Darwin's theory of evolution is DESCENT WITH MODIFICATION. And for that, we have so much evidence, scientists can't imagine it NOT being true [although of course, the "cornerstone" of science is that indeed it IS falsifiable]. The strongest evidence is the "genetic record", comparison of DNA sequences throughout phylogeny.

Is that the way my message came through? If so, my apologies....
Of course Darwin's theory IS DESCENT WITH MODIFICAITON.
I had meant to say that many mistakenly believe that Darwin's theory encompasses the ORIGIN OF LIFE. I hope you all got that from the context... Sorry for the confusion!

****

Robert Moss, PhD
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Dave Netz wrote to me off the group, that we have never seen descent,and thus cannot say it occured. I disagree. I think we CAN see descent whenever we look at the genetic record. True we can NEVER "see" anything occur that ever happened in the past... but its "footprints" are quite clear int he present.
I use an analogy in class:
Imagine I assign a large essay, say 3 billion words or so, to my class of 10 students. I get back one EXCELLENT paper from one student. Another

student gives me the SAME paper, except there's now a MISTAKE at word #512. Yet another student hands in the SAME paper, except it shares the SAME TYPO at word #512, plus a NEW ONE at word #5,178,233. And another has those same two typos, plus a new one... and so on. Is there ANY WAY to interpret this OTHER THAN "descent with modification"? Make that argument and then present the sequence of globin genes from plant through man, and then see if we aren't "seeing" descent.
Of course, we can also show descent with modification in the lab by selecting spontaneous mutants [yes, we can DEMONSTRATE they're NEW mutations, not just preselection of old ones]. But creationists usually say that these changes are too "small"... The old catch 22. The changes we can see over our lifetimes are too short to be valid, and we can't possibly see the long ones in our lifetimes. Oh well.

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Robert Moss wrote [snip]....
I use an analogy in class:
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[snip].....

I argue that you are fitting these 'observations' to the paradigm of evolutionary theory, and that they are just as easily fit to a creationist paradigm. It seems perfectly reasonable that a 'creator' would use a similar design (e.g. amino acid sequence) for similar purposes in different organisms? Moreover, wouldn't it be logical that the variations in the design increase as the overall differences in the organisms increase? In my opinion, these questions are very strong criticisms of your argument. Your argument is much stronger when you bring in the evidence of the stratigraphic record of fossils and the heirarchical distribution of characteristics (versus convergant characters) seen in phylogenetic reconstructions. Nevertheless, these data could still be fit to a creationist paradigm, and I suppose that they are.
Another example of this: I showed my botany class the video 'Sexual Encounters of the Floral Kind,' which is about different pollination mechanisms and the interplay between the pollinators and floral morphology. Beforehand, one of my colleagues told me that a student of hers had recommended it to her as first thing he had seen that really allowed him to understand evolution. On the other hand, one of the people who saw it with my class is an evangelist (and I assume a creationist). His comment afterwards was 'Isn't God wonderful?' Both people interpreted the same examples as illustrating their different points of view, although my guess is that the arguments for either are not very strong. When combined with other observations, though, one argument becomes much stronger to me. This is why I tell my students that science relies on 'observations,' and what we observe. I agree with David Netzly that we cannot observe scientific theories; we fit our observations to the theory. We cannot observe gravity; we observe that a pencil falls, and that fits with the law of gravity.

The problem is that our observations are bound in theory (Why do I believe that the pencil is falling just because it appears to fall?). We must define where science places its faith, and this faith is generally in what we see. Metaphysical arguments are not scientifically kosher, even though there is always an element of metaphysics in our interpretation of what we see.

NOW: I am willing to discuss this secret with professionals, but I will not bring it up in class. Why? (1) It is philosophical, not scientific; (2) there is not enough time to explore it; (3) I believe our students are often not mature enough to grasp it (I am still wrestling with it!). However, our students,can understand the argument in bits and pieces,

and perhaps we should introduce
bring up parts of it without putting all the steps together.

Doug Jensen
Berea College

I personally don't think the choice of words between "theory" and "principle" is at all consistent in science, and I can't see that using "theory" for "evolution" is that much of a problem. Don't we have "cell theory"? Yet no one doubts it's "correctness". More important, I think, is again that we make a serious effort to DEFINE evolution, rather than just have it be an amorphous "thing" that is somehow considered "anti-God".

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In response to Dave Netzly:
Dave, of COURSE science isn't limited to what we can SEE. But what we can test, demonstrate, etc. We can't SEE the movement of molecules in air, yet we can obviously demonstrate it.

I don't mean this to be a PERSONAL comment, I hope you don't take it so, but I honestly have a tough time understanding how someone can be a "biologist" and "creationist", if by "creationist" you mean what I think you do, which is mutually exclusive of evolution/common origin. Not only is the evidence for "descent" overwhelming, but evolution is perhaps THE central concept to all of biology today. Without it, the science is to a large degree useless or invalid. Everything from molecular bio, to development, to ecology incorporates evolution into it's very core.

****

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To Jean Desaix:
Thanks for the clarification; you're absolutely right. It's also important for students to understand that just because science doesn't have ALL THE ANSWERS to a question, doesn't mean that science "can't explain it", and that we must thus invoke some sort of mysicism!

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Frank Hensley suggests we have our students separate their "theistic" life from their "scientific" one. Although I think that's a reasonable approach, it's also somewhat of a cop-out.
If it means that we accept what knowledge science has to offer, and then invoke theistic views that INCORPORATE that, great. We have no evidence to disprove that evolution is a tool of God for instance. But if it means that M-F we can be evolutionists, and on Sunday we damn Darwin, what does that accomplish but confuse the hell out of everyone?

The only way we can reject "descent with modification", and thus our "ape" ancestry, is to reject biology as a valid discipline. Conversely, if we believe science is a valid discipline and can give valid knowledge, we cannot reject "descent", even on Sundays!

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I usually am a reader of this forum, seldom a writer but I cant leave this one alone. I just want to comment on one element of this argument and that is the "we cant see the changes" stuff. Listen, I can get some fruit flies and in a couple of weeks select for traits which can be make true breeding in all further generations. We make corn bigger, apples prettier, viruses more virulent, bacteria more resistant. This is descent with modification. I dont see how anyone can see the evidence from genetics, amino acids, biochemistry, ontogeny, morphology, anthropology, and archeology and say that there is not the kind of evidence necessary to accept, strongly, the theory of evolution. If this were any other principle which didn't happen to contradict some Judeo-Christian gobbledygook, we wouldn't have to spend half our time defending it. It would be accepted like quantum mechanics (which cant be "seen" either but doesn't elicit the kind of fervor in quantum physics that simple adaptation does in biology) is in physics.

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Greetings from Tennessee where "Scopes II" was before our state legislature this past spring. Not surprisingly, I had more intro. biology students who wanted to know if evolution should,indeed, be taught as fact. I have been to both Dayton, Tenn. and the hallowed grounds of Down House, England (a former dogmatic evolutionist professor of mine marvelled that I was not struck by lightning at the latter) and yet I remain unconvinced that we have enough factual evidence to support what we and our textbooks say about macroevolution.

I appreciate David Hick's (and others) point about allowing students to decide for themselves after evolutionary concepts have been presented to them. Why should biology professors debate their students so aggressively or even stand in lab doors after evolution (fruit fly) labs and not allow students to leave until they admit that evolution has occurred? What is really at stake here? Does everyone really agree with Theodozius Dobzhansky's "nothing in biology makes sense except in the light of evolution" or can students actually learn biological concepts without such an indoctrination?

I suggest that biolab subscribers read Phillip E. Johnson's "Darwin on Trial" and especially his recent "Reason in the Balance" about naturalism. Both books are well written, address the above questions, and are worthy of the brief but valuable reading time that biology instructors enjoy.

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Steve Murphree wrote:
>
> Greetings from Tennessee where "Scopes II" was before our state legislature
> this past spring. Not surprisingly, I had more intro. biology students who
> wanted to know if evolution should,indeed, be taught as fact. I have been
> to both Dayton, Tenn. and the hallowed grounds of Down House, England (a
> former dogmatic evolutionist professor of mine marvelled that I was not
> struck by lightning at the latter) and yet I remain unconvinced that we
> have enough factual evidence to support what we and our textbooks say about
> macroevolution.
>
> I appreciate David Hick's (and others) point about allowing students to
> decide for themselves after evolutionary concepts have been presented to
> them.

SHOULD STUDENTS ALSO DECIDE FOR THEMSELVES WHETHER THEIR BODIES INCLUDE CELLS, AND WHETHER ENZYMES PROMOTE BIOCHEMICAL ACTIVITY? OR WHETHER ELECTRONS AND PROTONS CONTAIN ENERGY?

Why should biology professors debate their students so aggressively
> or even stand in lab doors after evolution (fruit fly) labs and not allow
> students to leave until they admit that evolution has occurred?

I'VE NEVER HEARD OF A PROFESSOR DOING SUCH A SILLY THING, AND DOUBT THAT ONE EVER HAS. STUDENTS CAN LEAVE WHENEVER THEY LIKE AND CAN FOR THAT MATTER BELIEVE WHAT THEY LIKE, BUT THEY SHOULD UNDERSTAND THAT A BELIEF IS NOT A SCIENTIFIC UNDERSTANDING, AND THAT OPINIONS DIFFER FROM THEORIES.

What is
> really at stake here? Does everyone really agree with Theodozius
> Dobzhansky's "nothing in biology makes sense except in the light of
> evolution"

YES, EVERYONE DOES WHO PRACTICES LEGITIMATE BIOLOGICAL SCIENCE. FROM DNA SEQUENCES TO INTERACTIONS AMONG POPULATIONS, DOBZHANSKY WAS RIGHT. SINCE WE UNDERSTAND SOME ASPECTS OF EVOLUTIONARY GENETICS WE UNDERSTAND EPIDEMICS BETTER, AND CAN HANDLE THEM BETTER THAN BEFORE WE UNDERSTOOD. fOR EXAMPLE, WE KNOW BETTER THAN TO USE FLU VACCINES FOR OLD STRAINS.

or can students actually learn biological concepts without such
> an indoctrination?
>

WHAT INDOCTRINATION? WE HAVE AN ACADEMIC RESPONSIBILITY TO TEACH BIOLOGY AS IT IS UNDERSTOOD BY PRACTICING SCIENTISTS, INCLUDING ALL THE CERTAINTY AND UNCERTAINTY IT CONTAINS. ACADEMIC RESPONSIBILITY PRECLUDES OUR INTRODUCTING PSEUDOSCIENCE OR PROPOSING OR ESPOUSING PSEUDOTHEORIES AS LEGITIMATE ALTERNATIVES.

> I suggest that biolab subscribers read Phillip E. Johnson's "Darwin on
> Trial" and especially his recent "Reason in the Balance" about naturalism.
> Both books are well written, address the above questions, and are worthy of
> the brief but valuable reading time that biology instructors enjoy.

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Dave McNeely, Biology, University of Texas at Brownsville, 80 Fort
Brown, Brownsville, TX 78520; mcneely@utb1.utb.edu

Steve Murphree wrote (And Dave McNeeley responded):

[snip]
>
> I appreciate David Hick's (and others) point about allowing students to
> decide for themselves after evolutionary concepts have been presented to
> them.

SHOULD STUDENTS ALSO DECIDE FOR THEMSELVES WHETHER THEIR BODIES INCLUDE CELLS, AND WHETHER ENZYMES PROMOTE BIOCHEMICAL ACTIVITY? OR WHETHER ELECTRONS AND PROTONS CONTAIN ENERGY?

----Students decide for themselves whatever believe. But they must understand what these scientific concepts are and be able to apply them. Much of what we teach as fact now, may not be in the future. There is a large school of plant morphologists (not just a bunch of wackos) which argues that plants are actually one large cell with incomplete partitions between various nuclei. This flies in the face of the 'cell theory', which we teach on the first day of biology.
[snip]
What is
> really at stake here? Does everyone really agree with Theodozius
> Dobzhansky's "nothing in biology makes sense except in the light of
> evolution"

YES, EVERYONE DOES WHO PRACTICES LEGITIMATE BIOLOGICAL SCIENCE. FROM DNA SEQUENCES TO INTERACTIONS AMONG POPULATIONS, DOBZHANSKY WAS RIGHT. SINCE WE UNDERSTAND SOME ASPECTS OF EVOLUTIONARY GENETICS WE UNDERSTAND EPIDEMICS BETTER, AND CAN HANDLE THEM BETTER THAN BEFORE WE UNDERSTOOD. fOR EXAMPLE, WE KNOW BETTER THAN TO USE FLU VACCINES FOR OLD STRAINS.

----It is difficult for me to assess whether EVERYONE who practices biology believes this. My research is in evolution, so I am not a good person to ask. Evolution certainly allows us to connect many things in a manner we couldn't otherwise, but some parts of biology certainly don't use evolutionary theory. I suppose that these fields may have some very good scientists who don't believe in evolution; they just understand things a little differently than the rest of us.
Dobzhansky's statement smacks of dogma, which is bad for science. I would water it down and hedge my bet.

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----Doug Jensen
Berea College
dpjensen@berea.edu

I don't want to clutter things up more in this discussion but I wrote a fairly lengthy response about how I do things for the biopi-l list about

a year ago. We were having the same discussion.

The essay is much to long to post here but can be found at:

http://okra.deltast.edu/~bhayes/crevol.html

I hope you find it useful.

Best wishes,
Bill

William A. Hayes, II, Ph.D.
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P.O.Box 3234
Delta State University
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Bob, You point out the possible schizophrenia that can come from keeping science & religion seperate - but I was trying to emphasize that the two are not competing, mutually exclusive ways to look at the world. My point was to make sure that we don't tell students that they must choose one or the other. I want them to understand why science and religion are predisposed to disagree on certain issues because they operate by different sets of rules. So when they ask themselves "Why am I here?" they will know what assumptions/ground rules underly the scientific vs. philosophical approaches to such questions. I want students to come to an understanding of evolution that is correct, and that they can use 7 days a week.

-Frank Hensley
UNC Greensboro

I agree essentially with Dave McNeely, but think you may want to check out the National Center for Science Education, Inc. The information which I have from them is about 5 years old, so I don't know their current status. They are at 1328 6th St., Berkely, CA 94710. Tel. (510)526-1674. They have a "Hotline" (800)290-6006. This is meant to help educators who are having difficulty handling creationism issues. The NCSE publishes _Reports_ and a journal _Creation/Evolution_. They also provide reviews of creationist books, a reading list of books that counter creationist views, etc.

Once you have additional information, you might then decide to respond according to the view of your department Chairperson or according to some of the additional responses in your "idea bag" depending upon your mood.

Tom Smith
Van Nuys, CA

PS: If you can't contact the NCSE, I'll provide some of the references listed on their information.
PPS: Science on Trial mentioned by Bette Nicotri is one of the references.
PPPS: Sorry for the partial repeat of Guy Farish's response, but his message didn't have a subject and I didn't read it until after I prepared this reply!

Tom:
A colleague forwarded a copy of your post to me. Thanks for the plug for NCSE. The current address is PO Box 9477, BERKELEY CA 94709-0477; the phone number

stays the same. Our publications are changing -- somewhat -- in format only, not in content. THe new street address is 925 Kearney Street, EL CERRITO CA 94530 (incase you need to dorp in).
We have a web site -- http://www.natcenscied.org -- and you can contact people at the Center using the generic email address -- ncse@natcenscied.org. Thanks for your support.
Anj
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I am greatly enjoying the evolution banter on biolab. As a textbook author, writing the evolution unit is a joy but a great challenge. Instead of preaching, I attempt to present as much evidence as my editors will allow me to cram in, to show students that evolution is all around them and happening everyday, rather than tell them to believe it because we say so. One way I do this (which would work in a lecture too) is to combine the Darwinian material with a look at modern epidemiology -- antibiotic resistance, re-emerging diseases, "new" diseases, etc. Bring the study of evolution into the present.

I'm keeping everyone's comments to guide me when I next write an evolution chapter. Your ideas are wonderful. We should figure out a way to archive discussions such as these. Many thanks, Ricki Lewis

Ricki Lewis makes an excellent point, that instructors should emphasize the application of evolution in modern technology. A useful full text article at the Medscape web site is titled Guarding Against the Most Dangerous Pathogens: Insights From Evolutionary Biology.

Another article that is, quote - detailed documented evolution of one species into another - was published in Science, 6 November 1981. Title is No Gap Here in the Fossil Record. I have my students read it.

A beneficial classroom technique is to have groups of students brainstorm testable predictions of a phylogenetic hypothesis such as birds evolved from reptiles and also the creationist hypothesis. The results are interesting as the students must grapple first hand with the process of science rather than just listening to an instructor.

Another useful discussion for students is to examine parallels between creationism and flat-earthism. In some parts of the world it is illegal to teach that the earth is round, as that idea contradicts religious teachings. This discussion helps students explore the nature and role of science in society and places science in some social context.

Peter Ommundsen
Selkirk College

Hello Labbers. Happy 1997.
Couldn't resist commenting on evolution/creationism. Several years ago I resolved that issue in my biology classes, and I have been drawing upon that experience for years. While an undergraduate, I took a comparative religions class. Since that first class, I have thouroughly enjoyed other social science classes such as various types of philosophy classes. I hope that some of you have had similar opportunities. Take a survey sometime (it can be anonymous) and find out how many different religious expressions your students have. You probably have students who neither practice nor know

anything about any religion. You may also be surprised to find that many religious expressions DO NOT have a conflict with evolutionary theory. it is my experience that individuals usually cannot be stereotyped into "accept vs. reject evolution" based upon their professed religious beliefs. In my classes, I have had students who profess a variety of Christian faiths--from the orthodox to various types of Protestantism. I have also had students who practice a variety of Eastern ways of life and rites including Jewish, Muslim, Hindu, Confucism, Shinto, Thaoist,and many others. Native (First) American tribal beliefs and practices about the origin of life are very different from one another. After exploring this issue, you may wish to present the results to your class. Perhaps it would be interesting to develop an integrated comparative religions/evolution course that explores Darwinism and later scientific evolutionary studies. It would be interesting to determine whether various groups of people accept or reject specific principles of evolutionary theory and why people have these beliefs. Does anyone know of such a course?
By the way, when the basic principles of progressive biological change over time are introduced, rarely do people find difficulty accepting the individual parts. It is when individuals lack sensitivity for individuals' feelings and beliefs that they set the stage for barriers, confrontation and emotionalism. Sensitivity to your students as "people with feelings" should be a prescription for presenting any emotional issue--from medical animal experimentation to contraception. Listen to your students--you can learn much from them.
Sharron Clark
Golden WEst College, Huntington Beach, CA

Dear Sharron,
In answer to your question, the Templeton Fund does a lot with religion/science dialogue. It has a lot of resources. Try its site at www.templeton.org.

Don Serva
Fr. Donald M. Serva, S.J.
Biology Department
316 Washington Ave.
Wheeling Jesuit University 26003-6295

As to whether students must accept the theory of evolution to be "biologists": I must say yes, they do!! Maybe I care too much, but when a student has been in my class for 9 months and can still look at me and say that I haven't convinced them that there is such a "thing" as evolution, I feel I have failed on many levels. If their minds are that closed to all the evidence and scientific research that support this theory, to what other issues are their minds closed? Students are future voters and policy makers. If they refuse to even consider the idea of evolution, what other ideas will they reject? Will they be the voters that refuse the farming community to use anti-frost bacteria on the strawberries because that genetic engineering used to "create" the bacteria is "interfering in God's great scheme?" Will these be the citizens that block the use of genetically altered animals such as the sheep/goats that can yield human compounds in milk for use in medicine because "God would alter the goat himself if he wanted us to do that?" Maybe I am being too extreme, but I often find the students that reject evolution are also very rigid in their thinking about other biological issues. One very bright students a few years back told me should would memorize the "right answers" to the questions on the test about evolution but that she would never believe any of it!! I am still disappointed that I never was able to reach her and to help her to not be so threatened by the theory of evolution.

This has been a fantatstic discussion! My printer is working over time to collect everyone's comments.

I use the following question to "break the ice" in one of my evoltuion lectures: "Which came first? The chicken or the egg?" Somebody always says

"Well, God made the first chicken" and we kinda take it from there!!

And, no, I am not at a relgion-associated college....just a small campus in good old rural Ohio!!

Emily Rock
Wayne College
Orrville, Ohio

Dear Colleagues,
Thanks to all for your generous contribution to my knowledge base concerning creationist isssues and evolution in the introductory biology classroom. The various websites, essays, philosophies and dialogues I followed are of tremendous help to my personal growth, and will hopefully translate into the academic growth of my students. I am humbled by, and grateful for all your input! Again as a neophite, I'm sure it won't be long before I come up with another gee-whizzer...

Barb Lewis
Lake Erie College
Painesville, OH
bclewis@harborcom.net

I have read with great interest all of the comments written on this issue and have felt pretty good about not entering into the conversation. But, since this is such a "hot" topic and I have a slightly different situation than any of the contributors so far, I thought I would throw in my 2 cents worth.

I teach biology at an Evangelical Christian liberal arts college... so you can imagine that this is a big issue here. But (to some of your surprise) the issue may not be what you think. I know many Christian biologists and very few of them are Scientific Creationists. Since our school is located just 10 miles from the Institute for Creation Science, you might imagine that we have a significant number of incoming students each year that hold to this philosophy. We therefor have to deal with this issue every year, in every class. With regards to this issue, all of our biology faculty (5) are in agreement that our biggest problem is to challenge the students in a way that will enable them to undo what has, by default, been learned from the Creation Science folks. I personally have more reason for disagreement with them than most of you because I believe that not only is their science bad (or absent...I can talk all day about this if you would like), their religion (ie interpretation of scripture) is bad. Because their science is bad and they profess to be Christians, many within the scientific community lump all Christians and Christianity in general in with these folk. For example,

>. If this were any other principle which didn't happen
>to contradict some Judeo-Christian gobbledygook, we wouldn't have to spend
>half our time defending it. It would be accepted like quantum mechanics
>(which cant be "seen" either but doesn't elicit the kind of fervor in
>quantum physics that simple adaptation does in biology) is in physics.
>
>Thomas Pitzer--Instructor/TA Coordinator

While this is not a fair assumption that is made, it is what happens more often than not. Did any of you see the show on Junk Science the other night (20/20 or Dateline or something like that)? How would you like to be lumped in with the "scientists" represented on that show just because you are called a scientist. That does not make much sense does it? In the same way it does not make sense to lump all Christians into the camp of a small, minority (albeit very vocal) group of Christians.

I am on a committee that is putting together a conference , with the help of

the Templeton foundation, that is looking at the issue of Science and Religion. To drive home the theological minority status of the Scientific Creationists, we could not find a single theologian within Weslyan circles to defend or define Creationist theology and interpretation of scripture. This, quite frankly, shocked me given the makeup of many of out incoming students. My immediate question was "why do our students think this way when our theologins do not? The answer, I believe, is the minority voice is very loud and their pens are very prolific. Their material saturates the bookstores where pastors and lay people alike, by default buy them because that is what the bookstores carry. There are several Christian books on this subject that do not come from the Scientific Creationist perspective, but the forceful machinery is not behind them to get them into wide circulation. (I apologize...I find myself rambling)

One more point before I briefly summarize what we try to present to our students.

You might wonder how I as a Christian can teach, support, and believe in evolution given some of the dialog that has occurred on this issue.

>But if it means that
>M-F we can be evolutionists, and on Sunday we damn Darwin, what does that
>accomplish but confuse the hell out of everyone? (Robert Moss)

As Robert alluded after this quote, I don't think it means this. For a moment, pretend (if you must) that you believed that God is the creator of all things and that the bible is His written word (or inspired by Him etc...). Science would represent the study of His creation (ie nature) and how it works etc... and Religion would be the study of His written word (ie the bible). If God is the author of both, and both are truth, how can they contradict eachother? They could not. Why then is there then all of these apparent conflicts between the two. My contention is that the only conflict can come when our interpretation of one or the other is bad. ie God's creation and His word do not conflict, either there is bad Religion or bad Science.

The Creation/Evolution debate is fueled by both...Creationists making dogmatic interpretations of scripture and trying to wave their hands fast enough to make us believe their skilled rhetoric is science... and "religious" evolutionists who claim that the scientific evidence for evolution in some way elevates it to a postion of creative power that negates the idea of God (I actually had a VERY well known Evolutionary Biologist that I was a TA for in grad school that said to the Gen Zoology class " Evolution has totally refuted the existence of God and anyone who believed such religious nonsense is a fool"). Two small, but very vocal minorites driving what should be a "Non Issue". And then there is the majority of us (having differences, yet willing to have an open mind) caught up in the mess of it all.

What we do with our students is (finally the point) is have them read an essay by Charles Hummel entitled "Creation or Evolution". This presents the issue to the students in a way that most of them have never thought of (remember our student makeup). We then have them write a reaction paper to the essay (this gives them an opportunity to vent, if they must....but more often than not causes them to open their minds to different ideas). We then, like many have indicated, talk about the difference between science and pseudoscience and why we will only deal with science in the course (I of course offer to talk to anyone one on one who wishes to). We then proceed to lay out all of the very convincing scientific evidences that support the theory of evoultion and encourage the students to think critically, with an open mind. We deal with the issue again in many of our upper division courses in a variety of ways...books on both sides of issue followed by discussion etc...) Happily, we have had much success with this approach.

I am sorry that this is so long...I promise to never vent like this again!
I apreciate the exhange of ideas and opinions that goes on here and I do not

want to take away from that.
^^

Kerry Fulcher
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Kerry Fulcher's post was much appreciated. He did a great job, I think, of explaining that there is not a forced division between those who have strong religious foundations and those who can think scientifically. Stereotypes about those of us who go to church are pretty amazing sometimes.

When I was a graduate student, our advisor was taking some students to a meeting in New York. I was, it seemed, not being invited. I said I wanted to go and asked why I was not invited. (My advisor knew that I went to church on Sundays, because I sometimes came into the lab to check on something still in church clothes.) He said, "we might go into the city." I said, "fine." He said, "we might go to a bar." I said, "fine." He said, "when they bring the drinks, you will probably say grace!"

He had actually decided that they might do things that I would find intolerable, and he had decided this based on the fact that I went to church! I did, in fact, go on the trip and I acted as outrageous as I possibly could, just to show him how wrong his stereotypes were! What a peculiar position!

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Kerry --

Thanks for your response to this continuing dialog. I expect that many on this list would appreciate a citation for Charles Hummel's article "Creation or Evolution that you use with your class.

Thanks again,
Al

Al Williams AAWilliams@Manchester.edu
Biology Department Voice 219-982-5308
Manchester College FAX 219-982-5043
N. Manchester, IN 46962

Dear Kerry,
I appreciate your comments on and experience of the Creation/Evolution controversy very much. I too am a believer in God as Creator and am a scientist as well.
This conflict between religion and science is quite unnecessary, unless there is a hidden agenda.
My own observations and ponderings on this conflict are twofold. On the religionist-side, the source of conflict lies with one's theological interpretation of Genesis 1, the seven-day creation. Throughout nearly 2,000 years of Christianity the literal interpretation of seven days has not been held by most Churches. The "fundamentalist Christians" however do hold that position because of their theological thinking on "sola Scriptura." They are

logically correct in that, if God created the world (universe) over more than 7 24-hour days, their theological position would be incorrect. (By the way, in Gn 1, "the day" is created on "the fourth day.") On the scientist-side, the source of the conflict lies in extrapolating quite successful scientific assumptions, limitations, and methods, that are limited to the natural world, to philosophical metaphysics or "philosophy of life." In other words, since no scientist, as a practitioner of science, seeks answers to observed phenomena beyond the natural world, it is tempting to conclude there is nothing beyond the natural world. Such a conclusion defies logic and is not consistent with the "humble" scientific approach to questions.
The discovery of evolution cannot be undone. The success of evolutionary theory cannot be turned back. The "evolutionary story" of "the big bang" and how all life is intimately related should thrill a religious believer with awe and gratitude at what God has brought into being. Most "atheistic" scientists are overwhelmed with awe at the cosmological unity of the universe.
I appreciate the opportunity that biolab gives me to respond to your contribution, Kerry. Take care.
Don Serva

Fr. Donald M. Serva, S.J.
Biology Department
316 Washington Ave.
Wheeling Jesuit University 26003-6295

I will add to Fr. Serva comments:
The 1st chapter of genesis refers to 7 days (6 of which were used for the process of creation).
The beginning of the 2nd chapter says "in THE day" that God did all this stuff.
I have always taken that as a message within the BOOK that warned not to take things too literally!

Best wishes,
Bill

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Professor of Biology
P.O.Box 3234
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Cleveland, MS 38733
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To add to the comment from Bill Hayes, I learned that one translation of the Greek word for day is period of time. If one uses that translation, Genesis makes a lot of sense and is consistent with reference to THE day later. Any Greek scholars out there?
Janice
****
Janice M. Glime, Professor
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I'm afraid if one wants to understand the meaning of the word translated "day" in Genesis 1, Greek isn't the place to go. Try Aramaic!

Roger Christianson

..oops. Genesis was written in Hebrew, not Greek.

From: "Frank Hensley (FHensley@uncg.edu)" <frhensle@hamlet.uncg.edu

Biolab group,

Several have posted both on and off the list that they would like the reference to the Charles Hummel essay entitled "Creation or Evolution". Here is the information I have:

ISBN 0-8308-1109-5 1989 by Career Goals Inc

It can be obtained from Intervarsity Press (1-800-843-7225) for a cost of 3 or 4 $.

Hummel has written a book entitled "The Galileo Connection" which I have heard is good, but have not yet read myself.

Thanks for the replies to my post.

^^^
Kerry Fulcher
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Phone = 619-849-2651
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E-mail = fulcheBI@ptloma.edu

I called Intervarsity Press to inquire about Charles Hummel's essay ("Creation or Evolution", suggested by Kerry Fulcher) and was told it went out of print in 1996. No copies left. No plans to bring it back.
Begging didn't help.

Thanks,

Barb Lewis
Lake Erie College
Painesville, OH
bclewis@harborcom.net

Barb & Biolabbers,

With regard to the availability of Hummel's "Creation or Evolution" Inter Varsity Press, I contacted IVP and picked up a few details. I spoke with Ms.Rhonda Skinner who answers questions regarding copyright issues. She tells me that Parson's Technology plans a CD-ROM that will include the 36 page booklet with other materials. I have contacted Parson's customer service http://www.parsonstech.com and I am awaiting a response as to avilability cost etc. In the meantime, I contacted a local book retiler in the Texarkana community who shows inventory at their distributor (16 copies). Barb as you pointed out there is no plans to reprint any more copies.

So I guess if you can find a copy on a store shelf somewhere... grab it. I hope to receive my copy in a week. I was quoted a price of $3.99.
I appreciated Kerry's comments and I look forward to reading the booklet.

Thanks

Mark

--
****
Mark A. Storey
Assistant Professor
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Texarkana College
(903)838-4541 ext 298
homepage: http://is.tc.cc.tx.us/~mstorey/MStorey.html

Doug:
I'm sorry, I don't quite get it. When you say:

I argue that you are fitting these 'observations' to the paradigm of
evolutionary theory, and that they are just as easily fit to a creationist
paradigm. It seems perfectly reasonable that a 'creator' would use a similar

design (e.g. amino acid sequence) for similar purposes in different organisms?

Moreover, wouldn't it be logical that the variations in the design increase as
Of course, the NUMBER of variations in the design would increase... but how
could it be that different species accumulate a non-trival number of the SAME
mutations, accumulating over the evolutionary tree, if these mutations are
NEUTRAL? Or, in the context of the analogy, how could student #3 make the
SAME TWO MISTAKES as #s 1 and 2, if he hadn't used them as a starting
material??

Were he to make just THREE MISTAKES, the chances that two of them would come
out to be the SAME mistakes as #2 would be ASTRONOMICALLY LOW!! How can
Creation explain this? I would really appreciate an explanation, as I don't
want to keep using the analogy if there are holes in it. But I don't see them
yet.

****
Robert Moss, PhD
Wofford College
429 N. Church Street
Spartanburg, SC 29303

Email MOSSRE@WOFFORD.EDU
Fax 864-597-4620
Voice 864-597-4623

Robert,
I wrote and rewrote this answer several times, but it is not complete yet.
I hope it helps. Also, I hope that I can post it properly this time. My email
system is a little bizarre.
There are no holes in your analogy it is very good to fit these changes into
an evolutionary framework. And they support it well, however, they do not prove
it, and because of this, they leave room for doubt.

To understand this argument, you must removing yourself from the paradigm of
evolution. What if we assume that creation is true (place yourself into another
paradigm), and attempt to address these problems... Strictly speaking, this is
bad science, but we tend to do the same thing as biologists with the
evolutionary paradigm.
1. A large part of your argument is based on probability. Evolutionary
events are very improbable. What is the probability that a single mutation
would occur? And what is the probability that all the mutations necessary for
the formation of the Hemoglobin gene occurred? And that the sickle-cell trait
would form as it did? The probability for the combination of these is just
about nil. Nevertheless, we assume that they did occur. As an aside, I did
hear a lecture about 2 years ago, in which a Nobel laureate (a biologist) argued
that specific evolutionary changes and the origin of life are very probable.
His arguments did not hold water with me, and I felt that he had a poor grasp of

how evolution works.
2. There are many places in evolution where we believe the same thing happened twice. Why? Often they are attributed to situations where the direction of possible changes is constrained in some way. Certain types of mutations may occur over and over because they are silent. Or perhaps there are sequences of nucleotides that cause the DNA to be structurally weak (I just made this up, don't know if it is true), allowing mutations at the same sites over and over.
Is it not possible that there were similar constraints on a creator? Or perhaps the creator had a difficult time with certain steps in making an organism repeating a mistake from one organism to the next. An analogous problem occurs when I play music. I am more likely to make the same mistake in subsequent playings of a piece than I am to make new mistakes.

3. Of course, these arguments give the creator human qualities of imprefection, which I don't think are allowed in Biblical creation. So, lets go back to the beginning (no pun intended).....Why do you assume that these are mistakes? Just because you and I might see them as mistakes, doesn't make them so. Furthermore, our inability to explain why they are there is not an argument against creation. Creationists use essentially the same argument with the lack of intermediate forms in evolutionary lines--because they are not prevalent in the fossil record, evolution is not correct.

I hope this helps. My arguments are creative (again, no pun intended), but this is how all scientific arguments begin. The next step, of course, is to gather evidence. This is where the science comes in, and where many people argue that 'creation science' is really not science at all.
Boy is my brain in a tizzy now!

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I'm not sure if this is relevant to Bob Moss' question, but one of my favorite creationist arguments is the one for L-amino acids. (Am I right here, they are L, right? I haven't taught evolution for many years and may be remembering incorrectly and don't have my evolution books at home.) The scientific creationist argument used is that the probability against ALL amino acids being of the same form is astronomically small, i.e., virtually impossible. Therefore, the only explanation is divine creation. In fact, the probability is more like 50% because of the nature of the molecules. Once a chain of one form was started (forming polypeptides), that set the pattern for all one form (I assume it was L). For any further reactions to work, all amino acids interacting with that one had to be the same form. Unless life started more than one time, we should then expect all progeny to have the same form, and any attempt at using the opposite form would fail because no R form could work with an L form. Therefore, the possibilities are only two - either all L or all R. There are many "scientific" creationist arguments dealing with probability that make the assumption that all events are equally probable, when in fact chemical molecules have properties that make most conformations and reactions highly improbable. This is the one that sticks in my mind. And it is one that I found my students in evolution (juniors and seniors about 15 years ago) could understand. They realized how easy it was to present a seemingly plausible argument to a lay public that would not challenge it, but it was an argument they could understand to be based on indefensible assumptions.
I solved the creationist problem by having a series of in-class debates by teams of four-five students. Students could choose which side they wanted to support (scientific creationist or evolutionist), and I encouraged additional students to take a side they did not agree with (scientific creationist) to balance the views. Students were encouraged to become familiar with the arguments on both sides so that they knew the arguments they had to counter. By that time, most had had biochemistry and virtually all had had genetics and microbiology, so they were prepared

to evaluate the evidence. Scientific creationism was reaching a peak throughout the country during that time, and a number of students were anxious to explore the arguments. The debates were good, and students saw the value of understanding both sides and evaluating both sets of arguments. Most of those who were wavering seemed to change their points of view toward evolution. In fact, some who had chosen the scientific creationist point of view complained because they could not find any valid arguments to present - they could shoot down the arguments they found. I provided them with as much scientific creationsist literature as I had, and some students found other sources as well. The debates took things out of the realm of my requiring them to know any of this for the tests, yet made them more familiar with the evidence than any lecturing I could have done. I have had students tell me 15 years later how much they learned in those debates.
Janice
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Janice,
I think the primary reason that proteins have all one stereoisomer (L) of amino acids lies in the evolution of amino acyl-tRNA synthetases. The first one (presumably an RNA molecule) probably bound (an?) L-amino acids but not the D isomers, just by chance. This event probably became fixed as ribonucleoproteins evolved functions necessary for the protocell(?) to survive natural selection. Of course all of this is dependant on accepting the "RNA World" theory (I would argue that there is sufficient evidence at this point to support using the term theory here). Wonderful discussion.

Jeff

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Hi, labbers:
What a great discussion! I'd like to toss in a few more cents.
First, a wonderful book on the topic is _Abusing Science_ by Kitcher.
I also recommend the talk.origins archive as a source of some amazing bits of information about "evidences" for evolution (in its various guises).

Like most of you, I find that beginning a course with a solid discussion of the nature of science goes a long way toward defusing the "E-word" angst that hits later in the semester. Like most of you, I touch on a couple of points:

1) What is a "theory"? Instead of using the "theory of why my team lost" (I used to use a similar one!), I now complain about how Captain Picard is always after Data for his "theory" on the subspace temporal anomaly.

2) How are hypotheses generated and tested? I use a black box experiment (students have to figure out what's in the box without looking or touching) and a "thought" experiment. In the latter, I propose a basic scenario (you come home from work, the upstairs

window is broken, and a baseball is on the floor) and ask groups to develop hypotheses. Then I ask them to play detective -- how would they investigate the occurrence? What's really cool is that, at least occassionally, someone will come up with a totally creative and wacky proposal. Using their answers, we can discuss uniformitarianism, parsimony, and other kinds of assumptions and tests we use.

It doesn't work for everyone. But it helps.

Cheers,
Kerry

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Kerry Fulcher's comments about the creationists being out of step with the majority of religious thinkers is very relevant. Education about biology, science or religion is much more about questions than answers. The "facts" (language - names - etc.) of science change quickly as different points of view are accepted and rejected, but the fundamental questions and principles don't change nearly as quickly. I think students should read the whole textbook (a well written, well integrated text like the first edition of Keeton) to develop intuition about how all of biology fits together and how scientists answer questions. Students don't need to be tested on all the details, just the fundamentals that we all appreciate as we grow with biology. Students who are drilled on language basics do well on some exams, but lack the intuition that comes with detail and experience with living materials.

The same can be said for religious thought. Simple, right answers don't get people to think. The best book I know of is an old one, but I know of no contemporary work that accomplishes the same task. THE MAKING OF THE MODERN MIND by John Herman Randall traces the history of western thought to WWII. It's an excellent book for students who need to understand the history of Christianity in relation to other scholary thought. A good history of the creationists can be found in Judge Overton's decision about creationism that was published in the American Biology Teacher about 1980. I haven't found debates about the details of creationism versus evolution to be very productive because its a poor way to get students who are intimidated by evangelical religions to deal with the problems the religion causes for them. I think it's better to emphasize that religions deal with questions about ethics and origin that science can't say much about. Science has reasonable explanations from hydrogen (plasma, what ever) onward, but infinity is incomprehendible. Students need to get an appreciation for scholary thought about these questions, not just one point of view. Needless to say, this is no simple task because superficial experience is no more useful in philosophy than it is in science.

I'm also interested in how others view JUNK SCIENCE, John Stossel's program on ABC last Thursday. I thought his comments at the end about the slow growth of scientific knowledge needed more emphasis to counter his dogmatism. His statements about Vitamin C were consistent with what I've read, except for an excellent program that may only be available in Canada. A new

program on the Discovery Channel here is call FOODSTUFF and is one of the most information packed, in depth programs I've ever seen on television. It contains lots of good information about food, nutrition and physiology. One show suggested there was some evidence that Vitamin C stimulated interferon production. Is anyone aware of studies that refute or support that idea?

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I am going to start discussing evolution soon in my nonmajors class. I wanted to emphasize the incompleteness of the fossil record, to show that the mysterious gaps so beloved of creationists are exactly what we would expect. Here are my calculations; can anybody give me better estimates of the numbers I've plugged in? Those followed by ? are the ones I'm least sure about.

1. According to the fossil record, a species is likely to persist 1-10 million years. This implies that 99% of the species that have ever lived are now extinct. (Based on calculations by Robert May, Patron Saint of the Back-of-the-Envelope Analysis.)

2. There are perhaps 10 million species now alive, depending on whose estimates you believe.

3. 1 and 2 imply that 1 billion species have existed during earth history.

4. However, only a few hundred thousand fossil species are known. (?) So, this would represent less than 0.1% of all the species that ever existed.

5. Each species, at any given time, comprises c. 1 million individuals on average. (?) (I could swear I've seen some numbers on this for animal and plant populations, but I have no idea where.)

6. So, if a billion species persisted for a million years each, and produced a million individuals per year, a million million billion (10**21) individual organisms have existed.

7. But only a few million fossil specimens reside in museum collections. (?) So, this would represent less than 1/10**14 of the individuals that have ever existed.

Given the poor sample that the known fossil record constitutes of past diversity, it is no surprise that gaps are the rule rather than the exception.

Thanks for your comments on the calculations.

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I think this thread is more fun that a barrel of monkeys. Do you think this is a case where we can dialogue more easily electronically because these topics seem so related to personal issues? Could you imagine having this conversation with your departmental colleagues?

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Jean, we actually have had this discussion in our department. I am in a

Biology and Allied Health department with 7 faculty in the biology part and 13 in the allied health part. Last semester we started having dinner discussion meetings once a month. We decide ahead of time what the topic will be, people that want to attend sign up to bring a dish, and we eat and informally discuss a topic. As it happened, the first topic was evolution because one or our allied health instructors wanted to know more about the topic. We also discussed alternative forms of assessment that we currrently use, and development and use of multimedia presentations. Loots of fun, and great food. What more could you ask for.

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FYI The complete text of Judge Overton's Arkansas decision about Creationism in the schools can be found on pages 172 to 179 of the March 1982 issue of the American Biology Teacher. It's of interest because it shows that the major religious groups were against teaching creationism and because it contains background information on the advocates of creationism. ABT published it because they felt it was a good document to show school administrators faced with these decisions.

An old but relevant and very elegant speech about evolution, technology, and a variety of other issues is George Wald's 1970 CBC (Canadian Broadcasting Corp.) Massey Lectures "Therefore Choose Life". They were available on audiotape, but were never published in book form.

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Dear Barbara: I noticed your email message...you might tell your students to go to: http://emporium.turnpike.net/C/cs/ if they want to look at alternative views to macroevolution theory.There's a lot of very credible scientific work being done by the Creation Science Institute.
In Christ, Lance

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Lance, I'm sorry to be so blunt with you, but there is NO credible scientific wowork being done by the Creation Science Institute.

There IS a great deal of obfuscation and perverting of the scientific process done by the institute. Get one point and get it well:-}. One does science not by deciding that something is true and trying to shore up the belief. One does science by constructing testable hypotheses, devising observational protocol that will refute them and collecting the necessary data. Observations that are the basis for the hypotheses must come from nature. They can't be "revealed truth."

The Creation Science Institute is simply practicing false science and is teaching teaching falsely.

A colleague of mine used to simply dismiss them as some sort of bufoons, claiming they were misled but ultimately harmless, since their understanding of both evolution and the scientific process was so abysmal as to be laughable.

But he was given one of their books to read (I now don't remember which one) and he read it to discover that it was written by someone who understood very

well. My colleague could only conclude that the person was dishonest and dangerous to science and education. These folks are anti-intellectual in the extreme, and they misrepresent important principles and models in science, like thermodynamics.

Take care, Lance,

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The National Center for Science Education publishes a little book (ISBN 0-939873-51-6) titled "Voices for Evolution." In it you will find position papers on the teaching of evolution from Scientific Organizations, Religious Organizations, and Educational Organizations. My favorite is from Pope John Paul II, which reads in part "Cosmogony itself speaks to us of the origins of the universe and its makeup, not in order to provide us with a scientific trestise but in order to state the correct relationship of man with God and with the universe.... ...the Bible, which does not wish to teach how heaven was made but how one goes to heaven."

Also check out the American Scientist, 84, pp. 532-534 (nov-Dec 96): I used the article "The Revival of Experiments on Prayer" as an opener for intro biology for majors last week. It worked great to introduce the scientific method. There wasn't a problem getting copyright permission.

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Last fall, I had one of my classes do a survey of student opinion on the creation-evolution issue. Below is a summary of the results. Manchester College is a small (1000 students), almost entirely undergraduate, institution in Indiana. It is associated with the Church of the Brethren. The only significant bias that I could detect in the (admittedly small) sample is that first-year students are over-represented.

Some points that I found interesting are:
1. Although creationist views predominate, they are not as monolithic as one might guess. Many students rejected human evolution, but accepted evolution of other organisms, and an ancient earth.
2. Education seems to have surprisingly little effect on opinions. Having a natural science major, being an upper-class (rather a first-year) student, and having taken more high school science courses did not increase acceptance of evolution. The only significant correlation was with the degree of religious commitment.
3. An overwhelming majority feel that both creationism and evolution should be taught in public schools. Even those who supported evolution strongly felt that both should be taught.

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MANCHESTER COLLEGE EVOLUTION-CREATION SURVEY

SAMPLE SIZE = 63 Male = 58%, Female = 41%

HOME STATE
Indiana = 76% Other Midwest = 14% Other = 10%

YEAR IN SCHOOL

First = 59% Second = 16% Third = 14% Fourth = 8%
Other = 3%

MAJOR
Natural sciences= 27% Social sciences = 11% Humanities = 3%
Education/Prof. Programs* = 46% Undecided = 13%
* e.g. Accounting, Physical Education, Education

RELIGION
Roman Catholic = 21% None = 16% Church of the Brethren = 14%
United Methodist = 14% Lutheran = 8% Church of God = 6% Other = 19%

RELIGIOUS COMMITMENT
(weakest) 0 16%
1 2%
2 18%
3 32%
4 25%
(strongest) 5 8%

NUMBER OF HIGH SCHOOL SCIENCE COURSES
0 = 2% 1 = 8% 2 = 22% 3 = 44% 4 = 21% 5 or more = 3%

CREATION-EVOLUTION SCALE (respondents were asked to rank themselves on a scale from "pure creationism" to "pure evolution")
(creationism) 1 32%
2 27%
3 21%
4 14%
(evolution) 5 6%

VIEW OF DENOMINATION ON EVOLUTION (as known to respondents)
(opposed) 1 27%
2 20%
3 7%
4 5%
(accepts) 5 5%
(don't know) 36%

ORIGIN OF HUMANS BY EVOLUTION?
Yes = 38% No = 62%

ORIGIN OF OTHER ORGANISMS BY EVOLUTION?
Yes = 56% No = 44%

AGE OF THE EARTH?
Few thousand years = 19% Billions of years = 78% Other = 3%

SHOULD BOTH EVOLUTION AND CREATION BE TAUGHT IN PUBLIC SCHOOLS?
Yes = 82% No = 18%

MEAN EVOLUTION SCORE* = 3.14
* measure of overall acceptance of evolution; 0 = not at all, 7 = highest acceptance; combines answers to creation-evolution scale, acceptance of evolutionary origin of humans, acceptance of evolutionary origin of other organisms, and age of earth questions

COMPARISONS
Not significant:
Male vs. female Catholic vs. Protestant Indiana vs. other states
Natural Science majors vs. Education and Professional Programs majors
Significant:
No religious affiliation vs. any religious affiliation

CORRELATIONS
EVOLUTION SCORE correlates significantly with degree of religious commitment,

but not with year in college, number of high school science courses, or views of denomination (excluding "don't knows").

I want to express my thanks to Doug Jenson (14 Jan) for his response to another contributor whose installments have benefited the evolution string but who needs to "turn down his dogma" a bit (BTW, there really is a friend of mine at a university in Alabama who literally blocks the lab door until students admit that they have observed evolution take place in fruit flies).

Again, my concern is that it is easy to be dogmatic about evolution with both colleagues and students since the only alternative to evolutionary theory is the intelligent design of life on earth (from the natural to the supernatural). Granted, most of us are not likely to make the "evolution has refuted the existence of God" statement in our classrooms as Kerry Fulcher's prof did. I suppose many of you have seen ads for the tetrapod "Darwin Fish" bumper stickers, lapel pins, and refrigerator magnets asking us to "Support the theory of evolution..fight back with Darwin!" Would Darwin be pleased with this use of his name? What purpose do these and equally tactless creationist products serve?

My apologies if someone has already contributed this but often the way I introduce evolution to my students is by modifying one of Stephen Jay Gould's best analogies: "imagine that the history of life on earth is like a videotape (SLP). If we could rewind this tape to the beginning and start re

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That's all there is.