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ABSTRACT

A creationist has called Dobzhansky's dictum a myth. Discussion of this debate could be used as an object lesson for critical thinking.

Key Words: *Critical thinking; creationism; Darwinism; empirical data; logical reasoning; scientific debates.*

Perhaps the most widely cited declaration of truth in the biological sciences was published in the March 1973 issue of *The American Biology Teacher*. "Nothing in Biology Makes Sense Except in the Light of Evolution" was the title of an article by world-famous geneticist and evolutionist Theodosius Dobzhansky (1973; posted with permission at <http://people.delphiforums.com/lordorman/light.htm>; Figure 1).

Dobzhansky first published the title statement, in a slight variation, in a 1964 article in *American Zoologist*, "Biology, Molecular and Organismic," to assert the importance of organismic biology in response to the challenge of the rising field of molecular biology. The term "light of evolution" – or *sub specie evolutionis* – had been used earlier by biologist Julian Huxley. (http://en.wikipedia.org/wiki/Nothing_in_Biology_Makes_Sense_Except_in_the_Light_of_Evolution)

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Dobzhansky (1973) quoted the renowned French philosopher and Jesuit priest Pierre Teilhard de Chardin (1881–1955) as follows: "Evolution is the light which illuminates all facts, a trajectory which all lines of thought must follow – this is what evolution is."

As with so many popular sayings, relatively few people have read the original source. Dobzhansky (1973) summarizes numerous biological facts that make logical sense only under the theory of natural selection, as an argument against supernatural creationism. "[W]hat a senseless operation it would have been, on God's part, to fabricate a multitude of species ex nihilo and then let most of them die out!" He discusses the diversity of living beings, the unity of life, comparative anatomy and embryology, adaptive radiation in Hawaii's flies, and the strength and

acceptance of the theory of evolution. The following passages are especially noteworthy (Dobzhansky, 1973):

- "But what if there was no evolution, and every one of the millions of species was created by separate fiat? However offensive the notion may be to religious feeling and to reason, the antievolutionists must again accuse the Creator of cheating. They must insist that He deliberately arranged things exactly as if his method of creation was evolution, intentionally to mislead sincere seekers of truth."
- "Of course, at no stage of its development is a human embryo a fish, nor does it ever have functioning gills. But why should it have unmistakable gill slits unless its remote ancestors did respire with the aid of gills? Is the Creator again playing practical jokes?"
- "It is wrong to hold creation and evolution as mutually exclusive alternatives. I am a creationist and an evolutionist. Evolution is God's or Nature's method of Creation."
- "Any competent biologist is aware of a multitude of problems yet unresolved and of questions yet unanswered.... Disagreements and clashes of opinion are rife among biologists, as they should be in a living and growing science. Antievolutionists mistake, or pretend to mistake, these disagreements as indications of dubiousness of the entire doctrine of evolution. Their favorite sport is stringing together quotations, carefully and sometimes expertly taken out of context, to show that nothing is really established or agreed upon among evolutionists."

○ Accusation & Rebuttal

Jerry Bergman is a creationist who has written several anti-evolution articles in the creationist website trueorigin.com. He attacked Dobzhansky's dictum in his 2006 article titled "The 'Nothing in Biology Makes Sense Except in the Light of Evolution' Myth: An Empirical Study and Evaluation" (<http://trueorigin.org/biologymyth.asp>). Bergman reviewed college-level life-science textbooks and found that "Darwinism was rarely mentioned." From this, he concludes that the claim "Nothing in biology makes sense except in the light of evolution" is not true. The word "Darwinism" appears



Figure 1. Theodosius Dobzhansky (1900–1975).

18 times in his essay. Bergman appears to equate modern understandings of evolution with “Darwinism” and then notes that “Most biochemistry/molecular biology, genetics, and cell biology texts we have used never, or hardly ever, mentioned Darwinism.... None of the anatomy and physiology textbooks we have used *ever* mentioned evolution.”

Charles Darwin did not have the biological knowledge we enjoy today. He did not know how heredity works. He did not have the wealth of fossils we now have. He did not have data from a plethora of scientific field and laboratory studies that confirm Darwin’s theory of evolution by natural selection and the predictions of mathematical models of selection, mutation, gene flow, genetic drift, and other evolutionary mechanisms. It may be true, at least in part, that many modern biology textbooks do not discuss Darwinism because evolutionary science has moved well beyond what Darwin knew.

Bergman cites another author as stating, “[I]t seemed improbable [to mathematicians] that the mere shuffling of genes could yield such combinations as a DNA molecule of the human brain, or move through populations and produce dramatically new species.” This statement says nothing about the role of mutations as the ultimate source of new genetic material or the role that natural selection plays in moving gene frequencies through populations.

Bergman states that “None of the anatomy and physiology textbooks we have used *ever* mentioned evolution.” Yet, in appendix I of his article, he cites only two college natural science textbooks on anatomy and physiology that he has used in his teaching over the past 20 years, whereas all three general biology texts he cites contain discussions of evolution. Because metabolism is so nearly identical in most species, it might be considered beyond the scope of an introductory physiology textbook to make comparisons of the structural differences of an enzyme that carries out the same function in all aerobic cells despite the fact that it is constructed differently in different taxonomic groups. Dobzhansky makes this point in his discussion of cytochrome *c*, “found in most diverse organisms, from man to molds.” Once an author has made such a comparison, it would be negligent to avoid a discussion of why these differences exist (evolution being the only logical natural explanation). Even without making comparisons between organisms, an author of a general physiology text might prefer to avoid explaining more basic

information regarding how these enzymes are encoded in the genome or the details of biochemistry that produce the nucleotide building blocks from which DNA is synthesized, and so on. Nor would the genes and gene products of humans likely be compared with those of other organisms in the construction of phylogenetic trees. These and many other fundamental subjects would likely be covered elsewhere earlier in the curriculum if needed (perhaps by an introductory biology textbook). But they would need to be discussed if lines of causation are followed to their ultimate limitations. According to Bergman, “most scientists can conduct their work quite happily without particular reference to evolutionary ideas.” This may be true, but if any biological subject is given to intense questioning, evolution would have to be involved. For example, how did humans and other mammals come to have three middle ear bones whereas frogs have only one? Why do human embryos develop gill slits they never use for respiration? Why do humans have remnants of tail bones and muscles that seem to perform no useful function? Why do humans and chimps seem to be so much alike in their anatomy, physiology, and even in some behaviors? Why would humans and chimps share more than 95% of their genes in common if they were created independently (unrelated by descent)?

Bergman concludes that

a person who rejects Dobzhansky’s claim can be a better biologist than one who accepts it uncritically. The distinctive feature and greatest virtue of natural science, we are told, is its reliance on evidence. Someone who starts with a preconceived idea and distorts the evidence to fit it is doing the exact opposite of science. Yet this is precisely what Dobzhansky’s maxim encourages people to do.

Conversely, Dobzhansky’s dictum grew out of a mass of empirical scientific data and logical reasoning as a conclusion, not as a precondition for guiding biological studies. Fundamental creationists, on the other hand, start with the precondition that God created all living things *de novo* (without ancestors) and those first organisms have reproduced their “kind” by conventional biological processes since then (no new species). Some psychological research has suggested that the more people doubt their own beliefs, the more they are inclined to proselytize in favor of them. This is also suggestive of Shakespeare’s line from “Hamlet,” act 3, scene 2: “The lady doth protest too much, methinks.”

Dr. Gerald R. ‘Jerry’ Bergman is an adjunct associate professor at Medical University of Ohio and an instructor in the Division of Arts & Sciences at Northwest State Community College in Archbold, Ohio. He teaches biochemistry, biology, chemistry and physics. He has taught at the college level for 35 years including 7 years at Bowling Green State University, 6 years at the University of Toledo, and 20 years at Northwest State. (http://creationwiki.org/Jerry_Bergman)

Bergman is highly educated and has many publications to his credit. However, he claimed that he had been denied tenure because of his religious beliefs, including creationism. Bergman has published several articles in <http://trueorigins.org>, an online publisher dedicated to “exposing the myth of evolution.”

○ Relevance for Science Education

National science-education curriculum guidelines cite the need for students to practice and demonstrate “critical thinking.” There are many scientific subjects currently open to debate, including the projected effects of global warming, the value and potential harm of genetically altered crops, the necessity of early mammograms for women, and others. These are all good subjects for students to engage by using critical thinking, provided that they are old enough to read and understand relevant scientific papers or critiques thereof. The debate between proponents of evolution and those of creationists may be more controversial than most other topics because the debate pits science against supernatural religious beliefs rather than vetting competing concepts totally within the purview of science. It therefore might be wise to delay, if possible, philosophical discussions of the evolution/creation debate until college. However, most students do not go from high school into college and they may now be conflicted by their secular and religious teachings. Perhaps, if done sensitively, biology teachers could use the story of Dobzhansky’s dictum vs. Bergman’s pronouncement as an object lesson in critical thinking at the high school level. Both Dobzhansky’s and Bergman’s articles are available online. Students can download and read both of them before a scheduled class discussion. Students should be reminded that the dispute is not evolution vs. creationism, but whether or not Dobzhansky’s dictum is true or false (a myth). The teacher can provide questions to guide the discussion if the class fails to do so. How do Dobzhansky and Bergman define “Darwinism”? What kinds of evidence do these authors provide

to support their conclusions? How good is the evidence in each case? Has any of the cited evidence been independently replicated? If relatively few textbooks cited by Bergman discuss Darwinism, how might this be explained? Why didn’t Dobzhansky offer an explanation for this in his 1973 *ABT* paper? (Without reading the present article, will any students discover on their own that Dobzhansky died in 1975, whereas Bergman’s paper was published in 2006?) One aspect of critical thinking is to learn as much as possible about the people who make claims contrary to the best current scientific explanations. What is their expertise and where do their allegiances lie? For example, if research on drug X reports that it is safe, and more effective than any other drug, how much trust would likely be given to it if the researcher was funded by or held stock in the pharmaceutical company that manufactured X? Another major take-home lesson from such a discussion would be that one can understand and appreciate or even produce good scientific research without necessarily giving up one’s religious beliefs.

Reference

Dobzhansky, T. (1973). Nothing in biology makes sense except in the light of evolution. *American Biology Teacher*, 35, 125–129.

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