

An Evaluation of the Myth That “Nothing in Biology Makes Sense Except in the Light of Evolution”

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Abstract

Darwinists commonly claim that evolution is the foundation of all of the sciences, especially the life sciences and that “nothing in biology makes sense except in the light of evolution.” To evaluate this claim I reviewed both the textbooks used for life science classes at the college where I teach and those that I used in my past university course work. I concluded from my survey that Darwinism was rarely mentioned. I also reviewed my course work and that of another researcher and came to the same conclusions. From this survey I concluded that the claim “nothing in biology makes sense except in the light of evolution” is false.

Keywords: Teaching of evolution, the application of evolution, creationism, college text books

Introduction

In 1929, an article in *Popular Science* was written to encourage the teaching of the theory of evolution in spite of the laws that were passed by several states to curb the teaching of Darwinism. The article claimed that “The theory of evolution is altogether essential to the teaching of biology and its kindred sciences” (Armstrong 1929, p. 135). The most popular biology book in the 1920s by Dr. Truman Moon, entitled *Biology for Beginners*, stated that the theory of evolution is “the cornerstone of all recent science and the foundation of all modern thought” (quoted in Armstrong 1929, p.133). Almost a half-century later, the eminent American evolutionist, Theodosius Dobzhansky (1900–1975), claimed that “evolution” is the cornerstone of biology and is central to understanding both living and extinct organisms (Dobzhansky 1973, p. 125).

His statement that “nothing in biology makes sense except in the light of evolution” has been repeated in thousands of articles to argue that Darwinism must have a central place in all areas of life-science education, including biology, anatomy, medicine, agriculture, and biotechnology (for example, see Antolin and Herbers 2001, p.2379). Orthodox Darwinism is defined as the evolution of all complex life forms on earth from a single common ancestor as a result of natural selection acting on random mutations in the genome over vast periods of time through strictly naturalistic processes. A recent internet search revealed over 50,000 hits for Dobzhansky’s quote. As a result of this oft-repeated assertion, many argue that evolution must be a central part of all public school and college life science classes. In the words of the National Academy of Science, evolution is “*the most important*

concept in modern biology, a concept essential to understanding key aspects of living things” (emphasis mine) (National Academy of Science 1998, p. viii). This claim is made because Darwin’s

Origin of Species has had more influence on Western culture than any other book of modern times. It was not only a great biological treatise, closely reasoned and revolutionary, but it carried significant implications for philosophy, religion, sociology, and history. Evolution is the greatest single unifying principle in all biology (Prosser 1959, p.539).

Dawkins opines that, without Darwinism, “biology is a collection of miscellaneous facts.” He adds before children “learn to think in an evolutionary way” the material that students learn

will just be facts, with no binding thread to hold them together, nothing to make them memorable or coherent. With evolution, a great light breaks through into the deepest recesses, into every corner, of the science of life. You understand not only what is, but why. How can you possibly teach biology unless you *begin* with evolution? How, indeed, can you call yourself an educated person, if you know nothing of the Darwinian reason for your own existence? (Dawkins 2002, p. 58).

The claim that evolution is central to biology has been around for decades. For example, the Scopes Trial transcript included the following words penned by Vanderbilt University biology professor Dr. E.N. Reinke:

To deny the teacher of biology the use of this most fundamental generalization of his science would make his teaching as chaotic as an attempt to teach ... physics without assuming the existence of the ether (Reinke 1927, p.8).

The ether idea has now been fully refuted, a fact that illustrates the fallibility of the biology claim if the analogy were true. The evolution-is-central-to-biology belief has even made the *Doonesbury* cartoon; the lead character stating that “Evolution is the foundation of all life sciences. Without it, whole fields from genetics to ecology can’t exist!” (Trudeau 2011).

Although Darwinists often talk about the central importance of “evolution” in gaining a basic understanding of the natural world, in the daily work of both scientific education and scientific research, evolution is rarely mentioned or even a concern. This has been my experience as a research associate involved in cancer research in the department of experimental pathology at the Medical University of Ohio and as a college professor in the life and behavioral sciences for over 30 years. As Conrad E. Johanson, Ph.D., Professor of Clinical Neurosciences and Physiology and Director of Neurosurgery Research at Brown Medical School in Rhode Island noted, research scientists

rarely deal directly with macroevolutionary theory, be it biological or physical. For example, in my 25 years of neuroscience teaching and research I have only VERY rarely had to deal with natural selection, origins, macroevolution, etc. My professional work in science stems from rigorous training in biology, chemistry, physics, and math, not from world views about evolution. I suspect that such is the case for most scientists in academia, industry, and elsewhere (Johanson, pers. comm.).

Renowned chemist and National Academy of Science Member, Dr. Philip Skell, Professor Emeritus of Pennsylvania State University (see Lewis, 1992), surveyed his colleagues “engaged in non-historical biology research, related to their ongoing research projects.” He found, in answer to the question, “Would you have done the work any differently if you believed Darwin’s theory were wrong?” that “for the large number” of the Darwinist researchers he interviewed, “differing only in the amount of hemming and hawing” was “in my work it would have made no difference.” Some added they thought it may make a difference for other researchers (Skell, pers. comm.).

Another scientist, Professor Henry F. Schaefer III, the Graham-Purdue Professor of Chemistry and Director of the Center for Computational Chemistry at the University of Georgia, added that

Darwinian assumptions are not needed for the day-to-day work of science. If you look at the biochemical literature for scientific papers that try to explain how biochemical systems developed step-by-step in Darwinian fashion, there aren’t any. It’s startling. Most biologists completely ignore evolution in their work, and the ones that think about it simply look for relationships and don’t bother with Darwinism.

My University of Georgia colleague in biochemistry, Professor Russell Carlson, has expressed the same sentiment to me privately (Schaefer 2004, p. 102).

From 1981 to 1997, Professor Schaefer was the sixth most highly cited chemist in the world out of a total of 628,000 chemists whose research was cited at least once. The Science Citation Index reported that, as of December 31, 2010, his research had been cited over 47,000 times.

Of interest is that the fact that molecular, cell, and developmental biology majors at Yale University Graduate School are no longer required to complete courses on evolution (Hartman 1997). I have noted from my own research, both to my frustration and over my objections, that many of the subscriptions to journals focusing on evolution at both the University of Toledo Medical College and Bowling Green State University have been dropped. I was told by the reference librarian that there was little demand for them.

I also interviewed several biology professors. Typical is Tony Jelsma, who obtained his Ph.D. in Biochemistry in 1989 and did postdoctoral research for almost eight years before landing a position teaching at the Department of Biology, Dordt College (Sioux Center, Iowa). His B.Sc. (1983) and Ph.D. (1989) were both completed at McMaster University. He stated that he did not encounter Darwinism in his work or studies except in one undergraduate biochemistry class where he studied the abiotic synthesis of adenine (Jelsma, pers. comm.).

A Survey of Textbooks

Having taught biology, genetics, zoology, psychology, and related courses at the college level for the past 40 years, I evaluated this claim by examining the content of the major textbooks that I have used to teach science courses. I found most of the biochemistry/molecular biology, genetics, and cell biology texts we have used never, or hardly ever, mentioned Darwinism (see Table 1). The only courses that covered it in any detail were Biology 101, zoology, and anthropology. In my experience, even in these classes, many instructors skipped the section on evolution.

Even those textbook chapters labeled “evolution” often spend much time on non-evolution topics, such as basic genetics, human development, population genetics, and similar areas. None of the anatomy and physiology textbooks we have used *ever* mentioned evolution. The only reference to Darwinism in the microbiology texts we used was on the development of bacterial resistance (which is not a concern for intelligent design or even creationists because many of the mechanisms producing resistance are well known and do not support orthodox evolution, see Bergman 2003).

Table 1. The college natural science texts I have used in the past 20 years and their evolution coverage.

| Text | Biological Evolution Content |
|--|--|
| 1. Introduction to Biology | |
| <i>Biology</i> (S. Mader) McGraw–Hill, 6th ed., 1998. <i>Life</i> (R. Lewis, et al.) McGraw–Hill, 4th ed., 2002. | A total of four out of 51 chapters cover evolution, occasionally mentioned in the other 47 chapters. One unit on evolution (five chapters out of 45) occasionally mentioned elsewhere. |
| <i>Essential Biology</i> (N. A. Campbell, J. B. Reece, and E. J. Simon) Pearson, 2nd ed., 2007. | Mentions Darwinism in almost every chapter, and one whole unit on evolution (unit 3, chapters 13 to 17 plus parts of chapter 18). |
| <i>Biology</i> (N.A. Campbell et al.) Benjamin Cummings, 9th ed., 2011. | Mentioned in most every chapter, covered in detail in chapters 22–26. |
| 2. Anatomy and Physiology | |
| <i>Hole’s Anatomy and Physiology</i> (D. Shier, J. Butler and R. Lewis) McGraw–Hill, 10th ed., 2003. | None |
| <i>Principles of Anatomy and Physiology</i> (G.J. Tortora, S.R. Grabowski and B. Roesch) Harper Collins, 8th ed., 1996. | None |
| <i>Anatomy & Physiology</i> (E. N. Marieb and K. Hoehn) Benjamin Cummings, 4th ed., 2011. | None |
| 3. Biochemistry/Molecular Biology | |
| <i>Biochemistry, A Foundation</i> (P. Ritter) Brooks/Cole, 1996. | A few sentences or very short paragraphs added, seemingly as an afterthought, in a few sections. |
| <i>General, Organic, and Biochemistry</i> (W.H. Brown and E. P. Rogers) Brooks/Cole, 1987. | None |
| <i>General, Organic, and Biological Chemistry</i> (S. Solomon) McGraw–Hill, 1987. | None |
| <i>Foundations of Life: An Introduction to General, Organic, and Biological Chemistry</i> (D. M. Feigl, J. W. Hill, and E. Boschmann) Macmillan, 3rd ed., 1991. | None |
| <i>Fundamentals of General, Organic, and Biological Chemistry</i> (J. McMurry and M. E. Castellion) Prentice–Hall, 2nd ed., 1996. | None |
| 4. Microbiology | |
| <i>The Microbial Perspective</i> (E. W. Nester and M. T. Nester) Saunders, 1982. | Mentioned only in relationship to bacterial resistance. |
| <i>Microbiology</i> (J. Black) Wiley, New York, 7th ed., 2008. | Microevolution briefly discussed (such as in the section on the development of bacterial resistance). |
| 5. Genetics | |
| <i>Human Genetics</i> (R. Lewis) McGraw–Hill, 8th ed., 2008. | Parts of one chapter out of 22, a few sections elsewhere. |
| 6. Zoology | |
| <i>College Zoology</i> (R. Boooloitian and K. Stiles) Macmillan, 10th ed., 1981. | One chapter (chapter 41, pp. 664, 686); also mentioned in a few other places. |
| <i>Integrated Principles of Zoology</i> (C. P. Hickman, L. S. Roberts and A. Larson) McGraw–Hill, 12th ed., 2003. | Parts of one chapter and short sections in several other chapters out of 38 chapters. |
| 7. Anthropology | |
| <i>Anthropology</i> (C. R. Ember and M. R. Ember) Prentice–Hall, 5th ed., 2003. | Parts of five chapters out of 22 chapters. |
| <i>Cultural Anthropology</i> (C. P. Kottak) McGraw–Hill, 10th ed., 2003, 14th ed., 2011. | Major parts of three chapters and small sections of two other chapters out of 25 chapters. 2011 ed., chapters 5, 6, 8–10. |
| 8. Chemistry | |
| <i>Fundamentals of Chemistry</i> (R. A. Burns) Prentice–Hall, 4th ed., 2003. | None |
| <i>Chemistry and Society</i> (M. M. Jones et al.) Saunders, New York, 5th ed., 1987. | None |
| 9. Geology | |
| <i>Essentials of Geology</i> (S. Chemicoff and H. A. Fox) Houghton Mifflin, 2nd ed., 2003. (S. Chemicoff and D. Whitney) Houghton Mifflin 4th ed., 2007. | Rarely mentioned. Coverage in a few paragraphs. |
| 10. Physical Science | |
| <i>Physical Science Principles and Applications</i> (C. A. Payne, W. R. Falls and C. J. Whidden) William C. Brown, 1992. | None. (Mentioned only once on page 320 in reference to DNA). |

Methodology

The methodology employed in this study to determine if a textbook and college class promoted Darwinism involved reading the entire text and reviewing all of the class notes. This was necessary because if textbook indexes were scanned for the terms “Darwinism” and “evolution” the number of expected hits would be fairly low because phrases can be used in textbooks to teach the ideas inherent in Darwinism without mentioning the terms evolution, Darwinism, or Darwin.

For example, Darwinism and biological evolution may not be directly mentioned in geology textbooks, but they assume evolution in the discussions of the organisms found in the various layers, and in descriptions of the millions of years involved in depositing the rock layers. If Darwinism and evolution was limited to overt statements of the biological aspects of Darwinism, its impact in the thinking shaped by what is taught in the textbooks and coursework will be misjudged. Nonetheless, it is still true that, although Darwinism and naturalistic evolution are the underlying assumptions of many textbooks, they have little impact on the actual day-to-day research and implications of the scientific work.

If the methodology involved in the textbook searches were limited to explicit references of biological Darwinism, then many geology textbooks would have little to say on the subject, although the underlying naturalism would still be the foundation for the teaching. In more advanced textbooks Darwinism is rarely even mentioned, supporting the research in this article: textbooks are able to teach the content without clear references back to the supposed evolutionary past. This illustrates the fact that an evolutionary understanding is not necessary to conduct most research or develop certain therapies, since those applications are dependent on the present physical processes, not on their origin.

In spite of the blatant teaching of Darwinism and naturalistic philosophy in some of the more recent textbooks, those ideas have little effect on the production of medicines, technologies, therapies, etc. A veterinarian does not need to know how the horse’s hoof evolved in order to treat an injury or infection.

Discussion

Judging by the textbooks reviewed, Darwinism (the naturalistic evolution of life from a common ancestor) is often judged as unimportant and thus totally ignored in most science classes. Although the evolution content of newer books is increasing, especially in introductory textbooks, likely in response to the intelligent design and creationist movements, it is still largely insignificant based on my review. Because I have much interest in the subject, I usually

cover it in more depth than is usual. Many of the instructors at the colleges where I have taught largely ignored the evolution sections of textbooks, partly because there is a great deal of other material that *must* be covered and *something* has to be cut—and many teachers elect to skip evolution because it is one of the least-important subjects in most science majors. How many healthcare workers need to understand Darwinian theories? They do need to understand antibiotic resistance and natural selection but not Darwinism as defined above. In short, judging by my survey of major textbooks, the oft-repeated claim about Darwinism being central to natural science is false.

If, as Dobzhansky claimed, “*nothing* in biology makes sense except in the light of evolution” (emphasis added) (Dobzhansky 1973, p. 1), why is evolution rarely mentioned in most natural science books? At my college we usually use the leading college texts in each area (for example, the anatomy and physiology text we have used for almost 20 years is the *Anatomy and Physiology*, Hole et al., 2003, 10th ed.), a standard text. It is a minor topic even in most introductory biology books that cover the subject in more depth than most all other courses except formal classes on evolution.

While developing a college-level course on evolution, I surveyed most four-year colleges and universities in Ohio and many in Michigan. Biology majors at the schools surveyed were required to take only one class in evolution (and all schools surveyed used the same text, *Evolutionary Analysis* (Freeman and Herron 2001) a fairly good text that I also considered for my own evolution class, which is now being developed).

My experience also conforms to the results of my research. Several studies have found that most future science teachers do not complete courses that focus on evolution as part of their training (Rutledge and Mitchell 2002; Rutledge and Warden 2000). Moore found that

many of today’s high school teachers don’t recall hearing the word *evolution* in their college biology courses, apparently because many biology professors do not teach evolution (Moore 2004a, p. 864).

This conforms to my survey of local college biology students living in northwest Ohio. Most schools either skip the chapters on evolution or only spend a class or two on the subject. About 30% cover both creation and evolution, and 20%, in one student’s words, “try to jam evolution down our throats” and succeed, primarily, in turning off students to biology, and often science as well. Another problem is that many teachers who teach Darwinism objectively are accused of not teaching it at all when, in fact, they cover it in much more depth than most teachers (Court Case 2002; Moore 2004b).

Coverage of Darwinism in My College Science Course Work

I also reviewed all of my graduate and undergraduate college course work in science to determine the time spent on Darwinism in each class. The review included course work completed at Wayne State University, Medical University of Ohio, Bowling Green State University, University of Wisconsin, Miami University (Oxford, Ohio), University of Toledo, University of California–Berkeley, and several other colleges. All hours were converted to quarter hours, and some classes are in process.

My review of my course work (over 1,000 quarter hours) completed at seven universities and five colleges conformed to my survey of my teaching experience. Except in courses devoted to evolution, the subject was rarely covered in science classes, although it occasionally came up in other classes (see Table 2). I found in my biology/natural science education, which entailed over eight years of full-time college, that Darwinism was rarely mentioned. For my graduate degree in biomedical science, it never came up either in class or in the textbooks except to note that a gene was “evolutionarily conserved,” meaning only that the gene sequence was very similar in most life forms, both advanced and so-called primitive.

Because this is a topic in which I was very interested when in college, whenever it came up in class I listened attentively and would have remembered if it was discussed in class. Based on a review of my detailed notes, even the course that I completed on evolutionary biology covered mostly the history of the creation-evolution conflict, genetics, animal breeding, and related topics. Darwinism was actually discussed more in behavioral science classes and textbooks compared to natural science classes—and in these cases it was often assumed to be true. The evolutionary worldview dominated, and Darwinism, including naturalism, was rarely questioned, even in my Bible as Literature class.

Dr. Scott Hanson also reviewed his course work at a major Canadian university, the results of which are in Table 3. His survey came to the same conclusion as my study. Adam S. Wilkins’ in the journal *BioEssays* flipped Dobzhansky’s claim, observing that

evolution occupies a special, and paradoxical, place within biology as a whole. While the great majority of biologists would probably agree with Theodosius Dobzhansky’s dictum that “nothing in biology makes sense except in the light of evolution”, *most can conduct their work quite happily without particular reference to evolutionary ideas*. “Evolution” would appear to be the indispensable unifying idea and, at the same time, a highly superfluous one (emphasis mine) (Wilkins 2000, p. 1051).

O’Leary adds that the reason why

evolution is “highly superfluous” is that, in reality, nothing in biology makes sense except in the light of biochemistry, which is what gives biology its place in the linked chain of sciences. Evolution is a form of history, a history that may or may not have happened as described in any current work on the subject (O’Leary 2004, p. 100).

Future Research

The sample size represents the experience of only two individuals, thus it has a limited scope and should be replicated by evaluating a large number of recent science textbooks. Furthermore, due the organized opposition to Darwin critics by evolutionists, in some of the more recent biology and earth science textbooks virtually every chapter has implied or openly taught an evolutionary view of the living world and universe. Evolution is now promoted more heavily than in the past and students report it is today more often a major emphasis of some professors, even in psychology classes where some students may be required to study evolutionary theories of development and write papers on the topic.

Conclusions

The message that Darwinists convey to the public is often very different from what they recognize as true among themselves. Although they state to the public that “nothing in biology makes sense except in the light of evolution,” most scientists can “conduct their work quite happily without particular reference to evolutionary ideas” (Witham 2002, p. 43). One “notable aspect of natural scientists in assembly [at conferences] is how little they focus on evolution. Its “day-to-day irrelevance is a great ‘paradox’ in biology” (Witham 2002, p. 43).

Nonetheless Darwinists often are “loath to display publicly their internal divisions.” An exception is a challenge by mathematicians at Philadelphia’s Wistar Institute of Anatomy and Biology that attracted “evolutionists of some note” as participants. The result of the conference was “the mathematicians and the biologists agreed to disagree” (Witham 2002, p. 37). In short, the mathematicians believed that, in contrast to the evolutionists, it “seemed improbable 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” (Witham 2002, p. 37). Witham added that presenting both sides may convince many students [that] to reject the Darwinist side is a major motivation for the almost fanatic efforts by Darwinists to ensure that only one side of the controversy is taught. Eugenie Scott, in contrast to the empirical literature (and the experience of most teachers), argues that only pure unadulterated evolution should be taught,

Table 2. Undergraduate and graduate sciences classes completed by Jerry Bergman at Wayne State University; Medical College of Ohio; University of California–Berkeley; University of Toledo; University of Wisconsin; Bowling Green State University and other colleges and universities.

| Number | Course Title (credits) | Darwinism Content |
|------------------------|--|--|
| <i>Biology/Science</i> | | |
| BIO 0161 | Anatomy & Physiology I (5) | None |
| BIO 0162 | Anatomy & Physiology II (4) | None |
| BIO 0151 | General Biology I (6) | Some in chapter II of text (Kimball) |
| BIO 0152 | General Biology II (6) | All of chapter VII (pp.540–614) but was not covered in class |
| BIO 0507 | Genetics (4) | Mentioned briefly (the professor often mocked creationists) |
| BIO 0220 | Introduction to Microbiology (4) | None |
| BIO 0271 | Comparative Vertebrate Zoology (6) | Almost none |
| BIO 0509 | Evolution (4) | Topic of class, mostly covered history, genetics, and other topics that did not review evidence for the theory |
| BIO 137 | Surface Phenomena in Physical and Biological Systems (4) | None |
| PSY 0330 | Psychophysiology (4) | None |
| HYG 0281 | Individual Hygiene (3) | None |
| PER 0172 | First Aid (4) | None |
| SCE 3561 | Science in the Elementary Schools (4) | None |
| GEG 0652 | Field Study (4) | None |
| GEG 0390 | Directed Study (2) | None |
| PHY 0191 | Physics and Astronomy (4) | None |
| GSC 0156 | Physical Science/Chemistry (4) | None |
| GEO 0110 | World and Regional Geography (4) | None |
| GEO 0210 | Elements of Geography (4) | None |
| U420-100 | General Geology (4) | None |
| U640-100 | Meteorology (3) | None |
| U736-101 | Introduction to Philosophy (5) | Discussed very briefly in several units |
| U224-103 | General Chemistry I (4) | None |
| U224-104 | General Chemistry II (4) | None |
| CHM 698.0 | Organic Chemistry (3) | None |
| CHM 698 | Topics in Biochemistry Technology (3) | None |
| 20.879 | Basic and Advanced Light Microscopy (4) | None |
| PSY 0490 | Biology of Learning (4) | None |
| BIO 2805 | Substance Abuse (3) | None |
| U694-132 | Nutrition Today (4) | None |
| NV 0502 | Topics in Nutrition (8) | None |
| BIO 0332 | Nutrition and Health Habits (3) | None |
| BIO 0523 | Studies in Literature (Biological Evolution) (4) | Topic of class |
| BIO 0507 | Evaluation Concepts and Methods (Eugenics) (12) | Topic of class |
| BIO 0508 | Biometry (12) | None |
| BIO 0515 | Human Development (Brain and Communication) (8) | None |
| BIO 0521 | Holism, Concept: Its Origins and Implications (4) | None |
| BIO 0522 | Ecology (4) | None |
| BIO 0523 | Health and Healing Perspectives (4) | None |
| BIO 0507 | Parasitology (4) | None |
| BIO 0573 | Neuroscience (4) | None |
| BIO 0503 | Cell Ultrastructure (4) | None |
| BIO 0502 | Cell Biology (4) | None |
| MM 0311 | Materials and Methods (3) | None |
| MM 0512 | Doctoral Supplement Materials and Methods (1) | None |
| IS 0542 | Ph.D. Diss. (noninvasive biology research/diagnostic tech.) (12) | None |
| 10.651 | Basic Science Interdepartmental Seminar (1) | Mentioned briefly |
| 03.521 | Recombinant DNA Methodology (2) | None |
| 156898.02 | Computed Tomography (4) | None |

Table 2 (continued).

| Number | Course Title (credits) | Darwinism Content |
|------------------------|---|--|
| <i>Biology/Science</i> | | |
| 03.673 | Research in Biochemistry (14) | None |
| 03.657 | Readings in Biochemistry (2) | None |
| 03.672 | Current topics in Biochemistry (3) | None |
| 03.672 | Current topics in Biochemistry (2) | None |
| 20.886 | Transmission Electron Microscopy (5) | None |
| 15.889.09 | Radiology: Magnetic Resonance Imaging (4) | None |
| CHM 698 | Separation Science (3) | None |
| 20.611.01 | Human Genetics (3) | None |
| 15.898.02 | Computer Tomography (4) | None |
| 20.673 | Research, Biomedical Science (4) | None |
| 50.699 | Thesis Research (8) | None |
| 50.699 | Thesis Research (4) | None |
| 10.672 | Current Topics in Pathology (Cancer) (4) | None |
| IND1 500 | Structure and Function of Normal Body (12) | None |
| IND1 699 | Thesis Research (10) | None |
| CHM 699.7 | Research in Chemical Education (1.5) | None |
| NERS 856 | Readings in Neural Science (1.5) | None |
| DENT 656 | Readings in Oral Biology (1.5) | None |
| PUBH 689 | Independent Study in Environment Health (4) | None |
| CHM 698.M | Risks and Choices (5) | None |
| OCCH 501 | Occupational Health (4) | None |
| CHM 699V | Industrial Chemistry follow-up (1.5) | None |
| PUBH 601 | Public Health Epidemiology (4) | None |
| OCCH 673 | Research in Occupational Health (4) | None |
| PUBH 603.01 | Advanced Epidemiology (4) | None |
| CHM 698.P | Foods and Flavors (3) | None |
| CHM 698.T | Science of Pyrotechnics (3) | None |
| PUBH 698 | Capstone Seminar (4) | None |
| HEAL 6600 | Health Behavior (4) | None |
| PUBH 605 | Introduction to Environmental Health (4) | None |
| PUBH 696 | Public Health Internship (3) | None |
| CI 5950 | Foundations of Grant Writing (4) | None |
| PATH 620.10 | Principles of Toxicology (4) | None |
| PUBH 696 | Public Health Internship (1) | None |
| CHM 689 | Microscope (4) | None |
| PUBH 604 | Public Health Administration (4) | None |
| PUBH 515 | Principles of Environmental Health (4) | None |
| PUBH 550 | Public Health Microbiology (4) | None |
| CHM 629 | Chemical Aspects of Forensic Science (4) | None |
| CHM 628c | Pharmacology (4) | None |
| HEAL 6640 | Issues in Public Health (4) | None |
| OCCH 561 | Physical Agents (4) | None |
| OCCH 689 | Independent Study (Mutations) (4) | None |
| OCCH 510 | Human Systems and Occupational Diseases (3) | None |
| OCCH 640 | Environmental and Occupational Health Law (3) | None |
| CHM 689 | Safety (2) | None |
| CHM 689 | Artful Chemistry (3) | None |
| OCCH 505 | Principles of Occupational Safety (3) | None |
| OCCH 520 | Air Monitoring and Analytical Methods (4) | None |
| CHM 627 | Chemistry Research (5) | None |
| CHM 689 | Chemistry of Corrosion (3) | None |
| OCCH 699 | Thesis Research (4) | None |
| OCCH 535 | Human Factors and Ergonomics (3) | Several sections alluded to evolution as being a reason for back and other health problems |

Table 2 (continued).

| Number | Course Title (credits) | Darwinism Content |
|--|---|--|
| <i>Biology/Science</i> | | |
| OCCH 525 | Chemistry of Hazardous Materials (3) | None |
| MAT 0151 | Comparative Mathematics (4) | None |
| ELE 3315 | Methods and Materials in Mathematics (4) | None |
| PSY 0310 | Statistical Methods (4) | None |
| EER 6660 | Field Studies in Research (4) | None |
| EER 9666 | Directed Research (4) | None |
| EER 7661 | Evaluation and Measurement (4) | None |
| EER 7664 | Fundamental Research Skills (4) | None |
| EER 9668 | Advanced Research and Experimental Design (4) | None |
| EER 7663 | Fundamentals of Statistics (4) | None |
| EER 8663 | Advanced Problems in Measurement (4) | None |
| EER 7665 | Computer Use in Research (4) | None |
| EER 8664 | Variance and Co-Variance Analysis (4) | None |
| EER 9666 | Research Problems (4) | None |
| EER 9669 | Doctoral Research (Evaluation and Research ((45) | None |
| Total hours | | 549 |
| In my experience, Darwinism is often discussed in non-science classes. For this reason I also evaluated my non-science course work, mostly in the behavioral science area. | | |
| <i>Psychology</i> | | |
| PSY 0251 | Introduction to Psychology (4) | Mentioned in several chapters |
| PSY 0340 | Development Psychology (4) | Briefly mentioned |
| PSY 0305 | Psychology of Perception (4) | None |
| PSY 0335 | Theories of Personality (4) | None |
| PSY 0310 | Statistical Methods Psychology (4) | None |
| PSY 0460 | Social Psychology (4) | Briefly mentioned |
| EDP 3731 | Introduction to Study of Child (4) | Briefly mentioned |
| PSY 0330 | Psychology of Adjustment (4) | None |
| PSY 0430 | Abnormal Psychology (5) | None |
| PSY 0111 | Industrial Psychology (3) | None |
| EDP 5745 | Child Psychology (3) | None |
| EDP 7735 | The Learning Process (3) | None |
| CP 7830 | Environment and Child Psychology (6) | None |
| CP 6831 | Introduction to Psychological Testing (3) | None except eugenics was covered unobtrusively |
| EDP 7741 | Human Developmental Psychology (4) | Briefly mentioned |
| EDP 5741 | Mental Hygiene and Education (3) | None |
| EDP 7731 | Advanced Educational Psychology (6) | None |
| EDP 5742 | Juvenile Delinquency and Schools (3) | None |
| EDP 5745 | Adolescent Psychology (3) | None |
| EGC 7701 | Role of the Teacher in Guidance (3) | None |
| EGC 7704 | Case Problems in Guidance (3) | None |
| EGC 7705 | The Counseling Process (3) | None |
| EDP 7749 | Terminal Master Dissertation (4) | Was encountered in my research |
| PSY 0303 | Intro to Experimental Psychology (6) | Briefly mentioned |
| PSY 0562 | Psychology of Influence (4) | None |
| PSY 0628 | Psychoanalytic Theory (4) | None |
| PSY 0330 | Psychophysiology (4) | Briefly mentioned |
| PSY 0480 | Concept Development in Children (4) | None |
| PSY 0508 | Behavior Pathology I (5) | None |
| PSY 0509 | Behavior Pathology II (5) | None |
| PSY 0440 | Social Issues in Child Development (4) | None |
| PSY 0580 | Psychology of Chiliastic Movements (4) | None |
| REH 0567 | Community Approach to Counseling (4) | None |
| PSY 0682 | Issues in EEOC Compliance (3) | None |
| REH 0558 | Psychosocial Aspects of Disability (3) | None |
| Total | | 137 |

Table 2 (continued).

| Number | Course Title (credits) | Darwinism Content |
|----------------------------------|--|---|
| <i>Sociology</i> | | |
| SOC 0251 | Introduction to Sociology (4) | None |
| SOC 0514 | Social Stratification (4) | None |
| SOC 0541 | Juvenile Delinquency (4) | Covered briefly |
| SOC 0202 | Social Problems (3) | Discussed in connection with the biological theories of crime |
| SOC 0506 | The Family (4) | Covered in class, not in textbook |
| SOC 0600 | Methods in Social Research (4) | None |
| SOC 0616 | Industrial Sociology (4) | None |
| SOC 0508 | Race Relations in the USA (4) | None |
| SOC 0550 | Marriage and Family Problems (4) | None |
| SSC 0151 | Foundation of Modern Society, I (4) | Covered briefly |
| SSC 0152 | Foundation of Modern Society, II (4) | Covered briefly |
| EDS 7621 | Educational Sociology (3) | None |
| EDS 7623 | Intergroup Rel. Comm. and School. (4) | None |
| POL 0511 | Public Opinion and the Political Process (4) | None |
| POL 0151 | American Government (5) | None |
| SOC 0460 | Social Psychology (4) | None |
| ECI 0251 | Basic Economics (5) | Social Darwinism covered briefly |
| ANT 0210 | Introduction to Anthropology (5) | Covered rather extensively in both reading and lectures |
| SOC 0612 | Community (4) | None |
| SOC 0680 | Women and Institutions (4) | None |
| SOC 0670 | The Sociology of Homosexuality (4) | None |
| SOC 0540 | The Sociology of Education (4) | None |
| SOC 0561 | Corrections (4) | Discussed in connection with biological theories of crime |
| SOC 0599 | Master's Thesis (10) | None |
| SOC 0590 | Juvenile Delinquency (4) | None |
| SOC 0544 | Deviant Behavior (4) | None |
| SOC 0682 | Issues in Criminology (4) | None |
| SOC 0570 | Studies in Suicide (4) | None |
| SOC 0652 | Collective Behavior (4) | None |
| SOC 0504 | Development of Modern Sociology (4) | None |
| SOC 0680 | Ethnic Groups in America (4) | None |
| SOC 0562 | Criminal Law (4) | None |
| SOC 0523 | Sociology of Organization (4) | None |
| SOC 0525 | Demography (4) | Covered as related to population problems |
| SOC 0535 | Proseminar in Society Psychology (4) | None |
| SOC 0680 | Police and Community (4) | None |
| SOC 0580 | Social Gerontology (4) | None |
| SOC 0580 | World Poverty (4) | None |
| SOC 0580 | Theories of Social Problems (4) | None |
| SOC 0580 | Sociology of Sport (4) | None |
| SOC 0580 | Applied Social Research (4) | None |
| SOC 0502 | Modern Social Theory (4) | None |
| SOC 0460 | Family and Sex Roles (4) | None |
| SOC 0660 | Theories of Criminology (4) | None |
| SOC 0670 | Male Sex Roles (4) | None |
| SOC 0660 | Myth and Myth Making (4) | Some coverage as related to world myths |
| Total | | 191 |
| <i>Education/Library Science</i> | | |
| ED 3015 | Schools and Society (4) | None |
| SSE 4571 | Methods Social Stud. Ed. (4) | None |
| SSE 4572 | Student Teaching Seminar—High School (4) | None |
| ELE 3321 | Literature for Children (4) | None |

Table 2 (continued).

| Number | Course Title (credits) | Darwinism Content |
|----------------------------------|--|--|
| <i>Education/Library Science</i> | | |
| ELE 4312 | Student Teaching (Elementary) (16) | None |
| SSH 4572 | Student Teaching (Secondary) (16) | None |
| SPE 5404 | Diagnostic Speech Improvement (3) | None |
| ELE 3317 | Methods and Materials of Language Arts Education (4) | None |
| EDP 3601 | Introduction to the Philosophy of Education (4) | Covered both in the text and in class |
| LIB 0101 | Introduction to Library (4) | None |
| LIB 0103 | Introduction to Audio-Visual Material (5) | None |
| IT 5761 | Technology in Education (4) | None |
| Total | | 72 |
| <i>History</i> | | |
| HIS 0201 | American Democracy to 1815 (4) | None |
| HIS 0202 | American Democracy 1815–1885 (4) | None |
| HIS 0110 | The World and the West—Foundations (4) | Covered briefly |
| HIS 0120 | The World and the West 800–1700 (4) | Covered rather extensively in both the text and classroom lectures |
| HIS 0130 | The World and the West—Modern (4) | Covered in relation to the Scopes trial |
| Total | | 20 |
| <i>Other Course Work</i> | | |
| DRT 0111 | Lay Out Drafting (4) | None |
| DRT 0112 | Production Drafting (4) | None |
| ENG 0205 | Composition and Literature (4) | None |
| ENG 151 | English I (4) | Covered indirectly |
| ENG 152 | English II (4) | Covered indirectly |
| ENG 261 | Public Speaking (4) | Not covered |
| GER 0090 | German Ph.D. Reading Requirement German (6) | Not covered |
| GRK 0101 | Elementary Greek (4) | Not covered |
| ENG 0234 | English Bible as Literature (4) | Covered in class discussions |
| ART 0156 | Art Appreciation (4) | Not covered |
| PE 0134 | Handball (1) | None |
| PE 0135 | Archery (1) | None |
| PE 0136 | Bowling (1) | None |

and should be taught as fact, because “using creation and evolution topics for critical-thinking exercises in primary and secondary schools is virtually guaranteed to confuse students about evolution.” Her real concern is that teaching both sides may lead students to “reject one of the major themes of science,” i.e., Darwinism (Witham, 2002, p. 23). In this conclusion she is correct.

Many scientists are aware of the fact that Darwinism is largely ignored in science instruction. One good example provided by Dawkins was in an after-lunch discussion with the teachers at a school he visited. He concluded that almost every teacher confided that, much as they would like to, they didn't *dare* to do justice to evolution in their classes. This was not because of intimidation by fundamentalist parents (which would have been the reason in parts of America). It was simply because of the A-level syllabus. Evolution gets only a tiny mention, and then only at the end of the A-level course. This is preposterous, for, as one of the teachers said to me, quoting the great Russian American biologist Theodosius Dobzhansky

... ‘Nothing in biology makes sense except in the light of evolution’ (Dawkins 2003, p. 58).

The fact is virtually everything in biology makes perfect sense without ever mentioning Darwinism. Likewise, Shanks' (2004, p.228) claim that “evolutionary biology is the veritable glue that holds all the disparate branches of biological inquiry together and gives common focus to their collective endeavors” could hardly be true if it is not covered in most science classes. Shanks argument, that if you remove evolution “the biological sciences would degenerate into an incoherent collection of rudderless ships,” is irresponsible because evolution is often not in either the course work or the textbooks. The problem is, as recounted in *The Harvard Crimson*:

Although the postmodern era questions everything else—the possibility of knowledge, basic morality and reality itself—critical discussion of Darwin is taboo. While evolutionary biologists test Darwin's hypothesis in every experiment they conduct, the basic premise of evolution remains a scientific Holy of Holies, despite our absurd skepticism in other

Table 3. Undergraduate and Graduate Biological Sciences Classes Completed in the University of Guelph Honors Program

| Course Title | Darwinism Content |
|---|--|
| Fundamental Chemistry | None |
| Organic Chemistry | None |
| Biochemistry | None |
| Introductory Zoology | Darwinism discussed or implied in text, at best a minor part of the course |
| Comparative Vertebrate Anatomy | Text contained some discussion of evolution, assumed to be true |
| Biophysics I | None |
| Biophysics II | None |
| Calculus | None |
| Advanced Calculus | None |
| Introductory Statistics | None |
| Genetics | None |
| Electives | None |
| Preveterinary Year (Major course work only) | |
| Health Management I | None |
| Health Management II | None |
| Animal Nutrition | None |
| Veterinary Embryology | None |
| Year One, Doctor Veterinary Medicine, Ontario Veterinary College, University of Guelph | |
| Veterinary Biochemistry | None |
| Veterinary Anatomy | None |
| Veterinary Physiology | None |
| Veterinary Histology | None |
| Veterinary Bacteriology | None (did mention antibiotic resistance) |
| Veterinary Virology | None |
| Veterinary Parasitology | None |
| Veterinary Medicine I | None |
| Veterinary Genetics | None |
| Health Management I | None |
| Clinical Medicine I | None |
| DVM Year Two | |
| Health Management II | None |
| Veterinary Pathology | None |
| Clinical Medicine II | None |
| Theriogenology | None |
| Veterinary Anesthesiology | None |
| Principles of Veterinary Surgery | None |
| Veterinary Epidemiology | None |
| DVM Year Three | |
| Clinical Pathology | None |
| Food Animal Medicine and Surgery | None |
| Bovine Medicine and Surgery | None |
| Equine Medicine and Surgery | None |
| Small Animal Medicine and Surgery | None |
| Surgical Exercises | None |
| Clinical Medicine III | None |
| Exotic Animal Medicine and Surgery | None |
| Veterinary Clinical Rotations | None |
| Veterinary Internship | None |

areas. Oxford zoologist Richard Dawkins writes: “It is absolutely safe to say that, if you meet somebody who does not believe in evolution, that person is either ignorant, stupid, or insane.” Biologists continue to recite the worn credo, “the central, unifying principle of biology is the theory of evolution.” But where would physics be if Einstein had been forced to chant, “the

central unifying principle of physics is Newtonian theory,” until he could not see beyond its limitations? (Halvorson 2003, p. 4).

In conclusion, my research agrees with University of California Ph.D. cell biologist Jonathan Wells, who also concluded the claim that “nothing in biology makes sense except in the

light of evolution” is demonstrably false. A person can be a first-rate biologist without being a Darwinist. In fact, 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 (Wells 2000, p.247).

Much of the problem, as an article in *Life* magazine said, is “for all its acceptance as the great unifying principle of biology, Darwinism, after a century and a quarter, is in a surprising amount of trouble” (Hitching 1982, p.48).

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