Does Nothing in Biology Make Sense Except in the Light of Evolution?

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The dean of American biology, Theodosius Dobzhansky (1900-1975), claimed that "evolution" is the cornerstone of biology and is central to an understanding of both living and extinct organisms. His statement that "nothing in biology makes sense except in the light of evolution" has been repeated in hundreds of articles arguing for a central place for Darwinism in all areas of science education, including medicine, agriculture and biotechnology (for example, see Antolin and Herbers, 2001, p. 2379). A Google.com search alone revealed over about 40,000 hits for this single quote. Consequently, Darwinists argue, 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" (1998, p. viii, emphasis mine). Why is this claim made? Prosser concludes that it is because

> The *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 (1959. p. 539).

Dawkins notes that without Darwinism

> biology is a collection of miscellaneous facts. Before they learn to think in an evolutionary way, the facts that the children 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? (2002, p. 58).

Although Darwinists often talk about the central importance of "evolution" in gaining a basic understanding of the natural world, my research reveals that the daily work of both scientific education (and in most scientific research), evolution is rarely mentioned or even a concern. This has been my own experience as a research associate involved in cancer research in the department of experimental pathology at the Medical College of Ohio and a college professor in the life and behavioral science area 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, in the world of science research on a day-to-day basis, 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 (2003. p. 1).

The renown carbene chemist, Professor emeritus Dr. Philip Skell of Pennsylvania State University, did a survey of his colleagues that were "engaged in non-historical biology research, related to their ongoing research projects" and found that the "Darwinist researchers" he interviewed in answer to the question "Would you have done the work any differently if you believed Darwin's theory was wrong?" found that the answers "for the large number" of those persons he questioned, "differing only in the amount of hemming and hawing" was "in my work it would have made no difference," and some added they thought it would for others (2003. p. 1). Of interest is Molecular, Cell and Development Biology majors at Yale University graduate school will no longer be required to take courses on evolution (Hartman, 2003).

A Survey of Textbooks

Having taught biology, psychology and related courses at the college level for the past 30 years, I evaluated this claim by examining the content of the major textbooks that we have used in teaching science courses. Most of the biochemistry/molecular biology, genetics, and cell

biology texts we have used never, or hardly ever, mentioned Darwinism. The only course that covers it in any detail is Biology 101 and Anthropology (and even in these classes, in my experience, many instructors skip this section). Even those chapters labeled "evolution" often spend much time covering 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 it in the microbiology texts we have used is the development of bacterial resistance (which is not a problem for creationists).

Table I: 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	
Biology (Sylvia Mader) McGraw Hill 6th edition 1998.	A total of 4 chapters cover evolution out of 51, occasionally mentioned in the other 47 chapters.
Life (Ricki Lewis, et al.) McGraw Hill 4th edition 2002.	One unit on evolution (5 chapters out of 45), occasionally mentioned elsewhere.
Essential Biology. Campbell, Reece, and Simon. Pearson 2004	Mentions Darwinism in almost every chapter, and one whole unit on evolution (unit 3, chapters 13 to 17 plus parts of chapter 18).
2. Anatomy and Physiology	
Anatomy and Physiology (Hole, et al.) McGraw Hill 10th ed 2003.	None.
Principles of Anatomy and Physiology (Tortora and Grabowski) Harper Collins. 1996.	None.
3. Biochemistry/molecular Biology	
Biochemistry, A Foundation (Peck Ritter) Brooks Cole. 1996.	A few sentences or very short paragraphs added, seemingly as an afterthought, in a few sections.
General, Organic, and Biochemistry (William Brown and Elizabeth Rogers) Brooks Cole 1987.	None.

General, Organic, and Biological Chemistry (Sally Solomon) McGraw Hill. 1987.	None.
Foundations of Life: An Introduction of General, Organic, and Biological Chemistry. Third Edition. (Feigl, Hill, and Erwin Boschmann) Macmillan. 1991.	None.
Fundamentals of General, Organic, and Biological Chemistry. 2nd Edition. (McMurry and Castellion) Prentice-Hall. 1996.	None.
4. Microbiology	
The Microbial Perspective (Nester, et al.) Saunders. 1982.	Mentioned only in relationship to bacterial resistance.
Microbiology (Jacquelyn Black) Wiley N.Y. 5th ed. 2002.	Microevolution briefly discussed (such as in the section of the development of bacterial resistance).
5. Genetics	
Human Genetics (Ricki Lewis) McGraw Hill 5th ed. 2003.	Parts of 1 chapter out of 22, a few sections elsewhere.
6. Zoology	
College Zoology (Richard Boolootian and Karl Stiles) Macmillan 10th edition. 1981.	One chapter (chapter 41, pp. 664-686); also mentioned in a few other places.
Zoology (Hickman et al.) McGraw Hill 12th edition. 2003.	Parts of 1 chapter and short sections in several other chapters out of 38 chapters.
7. Anthropology	
Anthropology (Ember and Ember) Prentice-Hall 5th edition. 2003	Parts of 5 chapters out of 22 chapters
Anthropology (Konrad Kottak) McGraw Hill 10th ed. 2003.	Major parts of 3 chapters and small sections of 2 other chapters out of 25 chapters
8. Chemistry	
Fundamentals of Chemistry (Ralph Burns) Prentice-Hall 4th ed. 2003.	None.

Chemistry and Society (Jones et al.) New York: Saunders 5th ed. 1987	None.
9. Geology	
Essentials of Geology (Chernicoff and Fox) Houghton Mifflin 2nd edition. 2003.	Rarely mentioned. Coverage mostly in last chapter.
10. Physical Science	
Physical Science Principles and Applications (Payne, Falls and Whidden) Dubuque, IA: Wm. C Brown. 1992.	None. (Mentioned only once on page 320 in reference to DNA.)

Discussion

Judging by these textbooks, Darwinism is often totally ignored in most science classes. Judging by my review of new textbooks, the content in especially introductory textbooks is increasing, probably in response to the intelligent design and creationist movements. Because I have much interest in the subject, I usually cover it in more depth than, in my experience, is usual. Many of the instructors at the colleges where I have taught totally ignore the sections on evolution, partly because there is too much other material that *must* be covered and *something* has to be cut—and most elect to skip evolution because it is one of the least-important subjects in most majors. How many health care workers need to understand Darwin theories? (No concern exists over development of antibody resistance, something I stress in my microbiology class.) In short, at least judging by the major textbooks used, the often repeated claim about Darwinism being central to natural science is not true.

If, as Dobzhansky stated, "*nothing* in biology makes sense except in the light of evolution" (1972 emphasis added), why is it rarely, if ever, mentioned in most natural and physical science books? And we usually use the *leading* college texts in each area (for example, the A&P text we use is the 10th edition of Hole, a standard text). And why is it a minor topic even in most introductory to biology books that cover the subject in more depth than most all other courses except formal classes on evolution? Also, while developing a college-level course on evolution, I surveyed most 4-year colleges and universities in Ohio and many in Michigan. I found that, for biology majors, at most only *one* class in evolution was required (and all schools

surveyed used the same text, that by Freeman and Herron, a fairly good text that I also considered for my own class, which is now being developed).

Coverage of Darwinism in my Science College Course Work

I also reviewed all of my graduate and undergraduate college course work in science to determine the amount of time spent on Darwinism. I found that during my biology/natural science education, which entailed over 8 years of full-time college, Darwinism was rarely mentioned. For my graduate work in biomedical science, it *never* came up except to note that a gene was "evolutionary conserved" (meaning only that the gene sequence is very similar in most life forms, both advanced and primitive). Because this is a topic in which I am very interested, whenever it was discussed, I listened attentively and would have remembered if it was discussed in the class. Even in the course that I took on evolution (I still have detailed notes taken in this class so can verify this) covered mostly the history of the creation evolution conflict, genetics, animal breeding and related topics.

The review includes course work taken at Wayne State University, Medical College of Ohio, Bowling Green State University, University of Wisconsin, Miami University (Oxford, OH), University of Toledo, University of California, Berkeley, and several other colleges. All hours were converted to quarter hours, and some classes are in process.

Number	Course Title (Credits.)	Darwinism content
	Biology/Science	
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 (p. 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	None

	Biological Systems (4)	
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 & 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 Techniques) (12)	None
10.651	Basic Science Interdepartmental Seminar (1)	Mentioned briefly
03.521	Recombinant DNA Methodology (2)	None

156898.02	Computed Tomography (4)	None
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
20.877	Scanning Electron Microscopy (4)	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
IND1500	Structure and Function of Normal Body (12)	None
IND1699	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
PUBH689	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	Intro 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
OCCH 525	Chemistry of Hazardous Materials (3)	None
MAT 0151	Comparative Mathematics (4)	None
ELE 3315	Methods & 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
ER 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 other course work, mostly of which is in the behavioral science area, in the same way as done above.

Psychology

EER 9669	Introduction to Psychology (4)	mentioned in several chapters
PSY 0340	Developmental 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 Psy. (6)	none
CP 6831	Intro. 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 Dev. in Children (4)	none
PSY 0508	Behavior Pathology I (5)	none
PSY 0509	Behavior Pathology II (5)	none
PSY 0440	Social Issues in Child Dev. (4)	none
PSY 0580	Psy 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

Sociology

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 biological crime theory 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 U.S.A. (4)	none
SOC 0550	Marriage & 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	Educational Sociology (3)	none

7621		
EDS 7623	Intergroup Rel. Comm. & School (4)	none
POL 0511	Public Opinion & 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 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 crime theory.
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 Social Psychology (4)	none
SOC 0680	Police and Community (4)	none
SOC 0580	Social Gerontology (4)	none
SOC 0580	World Poverty (4)	none
SOC	Theories of Social Problems (4)	none

0580		
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

Education/Library Science

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
ELE 4312	Student Teaching (Elementary) (16)	none
SSH 4572	Student Teaching (Secondary) (16)	none
SPE 5404	Diagnostic Speech Improvement (3)	none
ELE 3317	Methods & Materials of Lang. Arts Ed. (4)	none
EDP 3601	Introduction to the Philosophy of Ed. (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

History

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

Other Coursework

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

Total 45

Again, the review of my own course work completed at 7 universities and 5 colleges conforms to my teaching experience. Except in courses devoted to evolution, such as my class titled evolution, the subject was rarely covered in science classes but was covered in other class, often it was assumed to be true and this world view dominated. Darwinism including naturalism was rarely questioned even in my Bible as literature class, but was assumed to be true.

Conclusion

My review agrees with Adam S. Wilkins, as published in the journal *BioEssays*, who flips Dobzhansky's quote completely upside down. In Wilkin's words

> The subject of 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 indispensible unifying idea and, at the same time, a highly superfluous one (2000, p. 1051, emphasis mine).

Many Darwinists are aware of the fact that Darwinism is largely ignored in science instruction. One example is provided by Dawkins:

> After lunching with the teachers I was invited to join their afternoon deliberations. Almost to a man and woman, they were deeply worried about the A-level syllabus and the destructive effects of exam pressure on true education. One after another, they came up to me and 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' (2003, p. 58).

This statement is ideologically only, not factual. Biology makes perfect sense without ever mentioning Darwinism. 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 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).

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