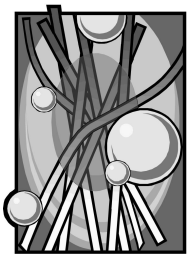
stranded natural gas reserves in Siberia and the Middle East.[18] But moving them to market requires huge investments. Coal use will also increase.[19] The world is said to have a two hundred year supply of coal. That will not be the case. As oil declines, coal usage must increase five-fold. A two hundred year supply is suddenly a forty year supply.

In the next few years, the world will face a severe oil shortage and substitutes are not identified. This is why the oil price has risen from $20/bbl to $45+/bbl in two years. We depend upon energy to provide us with potable water. We depend on it to make fertilizer, without which crop yields will fall. We depend upon it for transportation to move that food to us. A world with a perpetually falling oil production, which some say will begin in 2005,[20] will be a very different place technologically, calorically and politically. Countries like Russia, which have energy, will hold sway over those that soon will not—like Britain.

Literally this is a problem of feeding the hungry and bringing peace. What can we do? We need to commercialize hydrogen fusion. In 1% of the world's deuterium is 500 thousand times more energy than will be burned in all the fossil fuels combined.[21] But there is no sense of urgency among the governments of the world to solve this problem. There should be.

Notes

[1]G. R. Morton, "The Coming Energy Crisis," *Perspectives on Science and Christian Faith* 52, no. 4 (2000): 228.
[2]"Energy Drag 'Could wipe 20% off Pound,'" *Evening Standard*, Feb. 23, 2004, 34.
[3]Nassir Shirkhani, *Upstream* (Dec. 19, 2003): 8 and *BP Statistical Review of World Energy* (June 2003).
[4]*BP Statistical Review of World Energy*.
[5]Chip Cummins, "Data Cast Doubt on Oil Discoveries," *Wall Street Journal*, January 23, 2004, p. A2.
[6]It is not just charts and rumors at an oil industry conference which support such a pessimistic view of oil's future. See Jacqueline Dougherty, "Half Empty?" *Barron's* (March 15, 2004): 19, which says that we will need to place on stream 39 million barrels per day of *new* capacity by 2010.
[7]Rex Tillerson, President ExxonMobil (Dec. 8, 2004). www.tipro.org/TIPRO-Web/ppt/TillersonPresentation.ppt Meeting the Challenge accessed 1-9-05; James R. Katzer, Strategic Planner at ExxonMobil Research gives similar numbers, 110 million barrels per day demand in 2020. www.cosmos-club.org/journals/2002/ katzer.html
[8]Ivan Sandrea, "Deepwater Oil Discovery Rate May Have Peaked; Production Peak May Follow in 10 Years," *Oil and Gas Journal* (July 26, 2004): 20.
[9]Darius Snieckus, "Deepwater Technology Struggles to Catch Up," *Offshore Engineer* (Dec. 2003): www.oilonline.com/news/features/oe/20031203.Deepwate.12992.asp
[10]Shiv N. Dasgupta, "Reservoir Monitoring with Permanent Borehole Seismic Sensors: Ghawar Field Arab-D Reservoir," *74th Annual SEG International Exposition Expanded Abstracts* II (2004): 2247–50.
[11]Personal Communication, March 2004. For fear of hurting these men's careers, names will be withheld.
[12]Matt Simmons,"Saudi Arabia in Crisis," Hudson Institute (July 9, 2004): www.globalpublicmedia.com/transcripts/222.
[13]Sandrea, "Deepwater Oil Discovery Rate May Have Peaked."
[14]Jeff Gerth, "Forecast of Rising Oil Demand Challenges Tired Saudi Fields," *New York Times*, February 24, 2004, final edition, sec. A, p. 1.
[15]www.simmonsco-intl.com/files/Kuwait%20Talk.pdf
[16]Shirkhani, *Upstream*.
[17]David J. O'Reilly, Chairman of ChevronTexaco, "The New Energy Equation," *World Energy* 7, no. 3 (2004): 28.
[18]www.lngexpress.com/lngrev/intro_sglocs.asp. 450 trillion cubic feet is equivalent to 81 billion barrels of oil on an energy equivalent basis. That is a three-year replacement of the energy from oil.
[19]Rebecca Smith, "After Long Taking its Lumps, Coal Is Suddenly Hot Again," *Wall Street Journal*, April 1, 2004, p. 1.
[20]Kenneth Deffeyes, personal communication, Oct. 29, 2004.
[21]David Price, "Energy and Human Evolution," *Population and Environment: A Journal of Interdisciplinary Studies* 6, no. 4 (March 1995): 301–19. www.oilcrash.com/articles/energy.htm



Challenge of the Tangles: Re-evaluating Concepts of Life's Origins

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The current Chairman of the ASA's Commission on Creation, Robert C. Newman, has unfolded some persistent problems for holding a macroevolutionary view for origins of life.[1] In opposition to this, ASA Advisory Council Member Francis S. Collins has expressed his support for evolution,[2] a concept commonly conceived as a "tree of life." Now the explosion of new knowledge about the complexity of life has led to new challenges:

> Yet ill winds are blowing. To everyone's surprise, discoveries made in the past few years have begun to cast serious doubt on some aspects of the tree, especially on the depiction of the relationships near the root.[3]

Lateral gene transfer has uprooted a single-trunked tree of life. The roots are tangled and so are the branches.[4]

Jennifer A. Marshall Graves has extended the analogy two steps further to include a tangle of the "twigs" of the tree of life and the obscuring nature of the leaves. The increasing understanding of so-called "junk" nucleic acids is adding to the complexity of present problems (see Figure 1). Graves bequeaths to future generations the problems of untangling evolutionary complexity. She further prophesies that evolution not only will be used to answer the "how does it work" questions but also "those of ultimate concern to humans," namely the "why" questions.[5]

Evolutionary difficulties are recognized in many fields. "The fossil record of avian evolution [is] … a tangled wing."[6] See R. H. Thomas for arthropod controversies.[7] Genomic comparisons of apes and humans may not be

in the widely accepted similarity range of 95–99% but 10% lower.[8] How humans could have evolved upright walking "is still a great mystery … there are still many more questions than answers"[9] "The new discoveries—'Toumai,' the 'Millennium Ancestor,' the 'Rootstock ground ape,' and the 'Kenya Flat-face'—render our own evolutionary progress through an ever-bushier thicket substantially more complex."[10]

While I was a graduate student in the Department of Zoology at the University of Massachusetts in the early 1950s, George Gaylord Simpson gave a fascinating presentation on the evolution of horses, showing a beautiful and convincing diagram of a linear series from *Eohippus* to the modern *Equus.* But today this captivating concept lies in the graveyard of "beautiful theories" destroyed by "ugly" facts!

In his last great book, Harvard's Stephen Jay Gould emphasized that horse evolution, at best, is not linear but "bush"-like. It represents another tangle of the branches. Gould pointed out:

> [Biologists are looking for] exemplars of triumphant evolution. We take this only extant and labyrinthine path through the phyletic bush, use the steamroller of our preconceptions to linearize such a tortuous route as the main pathway, and then depict this straggling last gasp as the progressive thrust of a pervasive trend.[11]

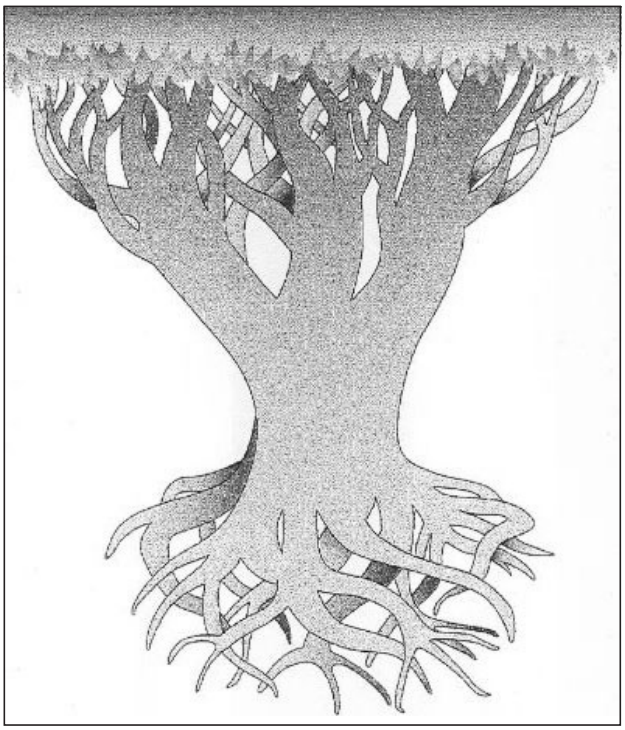

Figure 1. Diagrammatic representation of the tangled "tree of life" showing a tangle of the roots and branches and with leaves adding more obscurity to the tangle of the twigs. Reproduced from Maher[4] with permission from *The Scientist* and from the illustrator, Ned Shaw.

Today it appears that the fog associated with Darwinism is becoming increasingly denser than ever before, thus challenging biologists to reconsider what frequently has been called "the *fact* of evolution." *Theory* is a preferable term.[12] As early as 1960, G. A. Kerkut reported that "relationships and affinities are difficult to determine" for a large number of distinct animal groups. He recognized this condition to be consistent with a concept of separate origins (discontinuity).[13]

Regarding the confusion resulting from increasing uncertainties imposed by the evolutionary tangles, I am reminded of an incident related by the late anthropologist Loren Eiseley, with his characteristic wit and insight. He and his doctorate advisor, Frank Speck, were strolling in the Philadelphia Zoo. They discovered a beautifully patterned wood duck paddling in a pond.

"Do you believe unaided natural selection produced that pattern?" asked Speck.

Eiseley affirmed his belief in evolution bolstered by modern genetics but added regarding evolution that in situations like this "something seems to go out of focus, as though we are trying too hard, trying, it would seem, to believe the unbelievable."[14]

The popular "tree of life" has become an almost unanticipated and ambiguous tangle of roots, branches, and twigs. Are many scientists "trying too hard" to find large scale evolutionary "relationships and affinities?" Is it necessary, as Graves has suggested, to bequeath the problems of the tangles to future generations? Minimally it appears that all evolutionary biologists will need to become much more cautious and flexible about their current interpretations. Maybe the time is ripe for mainline scientists (including Christians) more seriously to appraise other models of origins involving discontinuity of groups, rather than evolutionary continuity.[15]

Acknowledgments

For suggestions regarding this paper, I am grateful to Jerry Bergman, Linda Doll, Betty Frair, Jim Jekel, and William T. Snyder.

Notes

[1]Robert C. Newman, "Some Problems for Theistic Evolution," *Perspectives on Science and Christian Faith* 55, no. 2 (2003): 117–28.
[2]Francis S. Collins, "Faith and the Human Genome," *Perspectives on Science and Christian Faith* 55, no. 3 (2003): 142–53.
[3]W. Ford Doolittle, "Uprooting the Tree of Life," *Scientific American* 282, no.2 (2000): 90.
[4]Brendan A. Maher, "Uprooting the Tree of Life," *The Scientist* 16, no.18 (2002): 26-27; and John Whitfield, "Born in a Watery Commune," *Nature* 427, no. 6976 (2004): 674–6 (reference to "scrambled phylogenies," p. 675).
[5]Jennifer A. Marshall Graves, "The Tree of Life: View from a Twig," *Science* (editorial) 300, no. 5626 (2003): 1621.
[6]Pat Shipman, *Taking Wing*: Archaeopteryx *and the Evolution of Bird Flight* (New York: Simon & Schuster, 1998), 273.

[7]Richard H. Thomas, "Wingless Insects and Plucked Chickens," *Science* 299, no. 5614 (2003): 1854–5.

[8]Tatsuya Anzai, et al., "Comparative Sequencing of Human and Chimpanzee MHC Class I Regions Unveils Insertions/Deletions as the Major Path to Genomic Divergence," *Proceedings of the National Academy of Sciences* 100, no. 13 (2003 June 24): 7708–13. In July 2003 (personal communication), researchers at the Institute of Physical and Chemical Research (Riken) in Tokyo, Japan, reported finding a 15% difference between human and chimpanzee genes.

[9]Jonathan Kingdon, *Lowly Origin: Where, When, and Why Our Ancestors First Stood Up* (Princeton, NJ: Princeton University Press, 2003), 2.

[10]Ibid., 346.

[11]Stephen Jay Gould, *The Structure of Evolutionary Theory* (Cambridge, MA: Harvard University Press, 2002), 908. Other papers presenting geological challenges regarding a "tree" of life are Michael J. Benton, "Finding the Tree of Life: Matching Phylogenetic Trees to the Fossil Record through the 20th Century," *Proceedings of the Royal Society of London,* B 268, no. 1481 (2001): 2123–30; and D.-G. Shu, et al., "Head and Backbone of the Early Cambrian Vertebrate *Haikouichthys*," *Nature* 421, no. 6922 (2003): 526–9. A book expressing a host of evolutionary enigmas is Roderic D. M. Page, ed., *Tangled Trees: Phylogeny, Cospeciation, and Coevolution* (Chicago, IL: University of Chicago Press, 2003). Dealing mainly with the "evolution" of hosts and their parasites, most of the authors intrepidly endeavor to deal with their "jungles," "interpretations," "mysteries," "difficulties," and "complexities."

[12]Peter J. Bowler, *Evolution: The History of an Idea,* 3rd ed. (Berkeley, CA: University of California Press, 2003), 380–1.

[13]G. A. Kerkut, *Implications of Evolution* (New York: Pergamon Press (now with Elsevier Science Publishing, 1960), 17.

[14]Loren Eiseley, *All the Strange Hours: The Excavation of a Life* (New York: Charles Scribner's Sons, 1975), 93–4.

[15]Richard V. Sternberg, "On the Roles of Repetitive DNA Elements in the Context of a Unified Genomic Epigenetic System," *Annals of the New York Academy of Sciences* 981 (2002): 154–88. Sternberg believes that the rampant hypothesized evolutionary "parallelisms and reversals" can result from forcing "non-hierarchical data into a tree-like structure"; Frank L. Marsh, *Evolution Creation and Science* (Washington, DC: Review and Herald, 1944); ——, "The Genesis Kinds in Our Modern World," *Journal of the American Scientific Affiliation* 12, no. 2 (1960: 4–8, 11, 13); Wayne Frair, *Biology and Creation* (St. Joseph, MO: Creation Research Society Books, 2002); James P. Gills and Tom Woodward, *Darwinism under the Microscope* (Lake Mary, FL: Charisma House, 2002); David P. Cavanaugh and Richard V. Sternberg, "Analysis of Morphological Groupings Using ANOPA, A Pattern Recognition and Multivariate Statistical Method: A Case Study Involving Centrarchid Fishes," *Journal of Biological Systems* 12, no. 2 (2004): 1–31. This involves a procedure which can distinguish phylogenetic continuity or discontinuity as well as morphospace diversification trajectories.