Human Genealogy: 
How Wide & Deep Do Our Genetic Connections Go?

Most children and even newborn babies recognize their parents and closest caring relatives. Most adults ponder and search for their ancestral family roots (“micro-genealogy”). For the enlightened and inquisitive members of the human species, particularly students and the younger generation, it is highly appropriate to ask, beyond parents and ancestral family roots, how wide and deep is our genetic link with the past and with other species on Earth (“macro-genealogy”). In other words, are we isolated as a species with 6 billion members or are we interconnected with other species? What is our genetic makeup? When and how did our species originate? Where did we come from? These are timely questions in view of the just-completed initial sequence of the chimpanzee genome (The Chimpanzee Sequencing and Analysis Consortium, 2005). It is a good time to remind ourselves that our genetic roots run very deep as we hear more and more from intelligent design proponents. This occurs at the same time that a top advisory panel, convened by the National Academy of Sciences, warns of an erosion of our competitive edge in science (Broad, 2005). It is a well-known fact that math and science scores of U. S. high school students continue to fall below the average of 21 other countries. Compared to U. S. students, most high school students in China, for example, take at least two years of biology, chemistry, higher math and physics. One result is that last year China and India produced 600,000 and 350,000 engineers, respectively, while the United States produced only 70,000 (Broad, 2005). The purpose of this piece is both to summarize the support of recent genome sequencing projects for modern evolutionary theory and to contrast these achievements with the deteriorating status of science education in the United States. It is hoped that the recent spectacular advances in the biological sciences will bolster the status of evolution in the science curriculum and stimulate a renewed interest in, and commitment to, science education by our schools, educators, and students.

The complete DNA sequence of the human genome, completed in 2001 (Lander et al., 2001), revealed human DNA to be approximately 3 billion nucleotides long. This DNA contains approximately 32,000 genes coding for proteins. The just-completed sequencing of the chimpanzee genome reveals it also to be approximately 3 billion nucleotides long and 98% identical to the human genomic sequence. Like the human genome mega-project, sequencing the chimpanzee genome was a major scientific undertaking that involved the combined efforts of 67 scientists from 24 different research institutions in five different countries using state-of-the art technology developed for the Human Genome Project. This achievement confirmed another testable prediction of the evolution theory, i.e., that the humans and chimpanzees are extremely close relatives. This is yet another milestone in the puzzle of human evolution and is compelling evidence in support of Darwin’s theory of the evolutionary relatedness of different species.

It was first demonstrated a little over 50 years ago that DNA was responsible for transferring genetic characteristics from one bacterial cell to another and therefore was the carrier of genetic information. A complete DNA sequence of the common intestinal bacterium Escherichia coli, a model organism for genetic studies, revealed that its DNA is only 4 million nucleotides long with approximately 4,000 protein-coding genes (Blatner et al., 1997). The human immunodeficiency virus (HIV), on the other hand, contains 9,749 nucleotides with only nine protein-coding genes, thus requiring it to co-opt host proteins to reproduce (Madigan & Martinko, 2006, Chapter 9).

Only during the last decade has it been conclusively determined that our most recent non-sapiens ancestors (Homo erectus) still existed in Ethiopia as recently as 160,000 years ago (Asfaw et al., 2002). On the other hand, primitive single-celled bacteria and archaea originated over 3 billion years ago under extreme environmental conditions on an Earth uninhabitable by humans and other higher organisms (Woese, 1998). Only after the availability of free oxygen, carbon dioxide, and carbohydrate nutrients produced by early bacterial respiration and photosynthesis were the many millions of different species of microscopic organisms, plants, and animals, including humans, able to evolve on the Earth as