Evolving: The Human Effect and Why It Matters

by Daniel J Fairbanks

reviewed by Rebecca L Cann

This sweeping summary of why the general public should understand the recent evidence for human evolution is an ambitious stab at rectifying the pitiful state of science teaching currently masquerading as modern biological education in many of our schools and universities. Fairbanks endorses the traditional explanations for why our place in nature must be better understood (that is, we must have a clear vision of what it means to be a human on this planet in order to alleviate poverty, cure illness, and combat destructive social systems that promote the extinction of biodiversity), but he probes even deeper. Fairbanks attempts to frame his view of evolution in a predictive and more nuanced portrayal of genomic insights because, as he states, “Right now is the best time in history to be a scientist” (page 291). He appears to want to convince readers that, although considerable debate about whether or not the Human Genome Initiative delivered on all its promises to revolutionize medicine, changes in genome technology that make acquisition of sequence data cheaper, faster, and simpler will make good on these promises.

There are instances within this volume when the author just shines. One is his description, toward the end of the book, concerning the importance of the work of the Russian geneticist Nikolai Vavilov for our understanding of domestication centers of animal and plant species and the threat posed by the “genetic erosion” of our food supplies (a term he uses to explain why monocropping is an ultimately bad idea for anyone concerned with food security). Few Americans know the history of the brave scientists at Vavilov’s institute during the siege of Leningrad during World War Two, and their heroic efforts to keep agricultural genetics alive during a time of privation and death. Most of the individuals whose work Fairbanks recounts here gave their lives for the protection of seeds gathered and banked from Vavilov’s eight centers of domestication around the world. To read about their efforts, placed in a modern perspective of DNA barcoding and the industrialized world-wide epidemic of obesity, may dissuade us from oversimple reactions to GMO debates concerning food labeling.

A second example of Fairbanks's far-reaching insights comes in his description of the differences between the human and chimpanzee genomes, including the fine-scale that we can now compare them with, given advances in methods of DNA sequencing and bioinformatic analyses. Many of us have become complacent in hearing the numbers summarizing the similarities between the average common chimpanzee and the average modern human's base pair scorecard. Fairbanks takes on this lineup, pointing out which chromosomes in particular are different, what repetitive DNA elements have to tell us about particular gene events, and how our genomes are continuing to evolve new sequences and functions. His
summary of pseudogene evolution is one of the best I have read for a non-specialist audience, in that he takes specific examples from both the field of infectious diseases and developmental biology and explains how evolutionary insight are essential to understanding the structure and function of these sequences.

Less satisfactory is his description of the sequence of events surrounding the AIDS epidemic, and how comparing the DNA diversity of different HIV strains helps us understand how this modern tragedy unfolded. Nowhere in the text does he explain the role colonialism played during the 1920s in central-west Africa, where forced labor camps to build rail networks created population centers of predominantly displaced male workers, or the parenteral viral amplification made possible by use of poorly sterilized syringes employed by health care workers there attempting to treat the workers' infectious diseases. He further ignores the role that big pharmaceutical companies played in facilitating the spread from Africa of HIV strains, detailed in Jacques Pepin's *The Origins of AIDS* (2011). In their boom years, blood banks scrambled to find commercial sources for plasma necessary for blood products. Blood was often taken from paid donors in the Caribbean, including many immigrants from central Africa—and with it came AIDS. As a result, Haitians were unjustly stigmatized as a population. After a period of chaos following independence from Belgium in the early 1960s, many Europeans left the Congo, replaced by over 1000 teachers and technicians from Haiti hired by UNESCO to perform essential services. Many of these temporary workers later returned to Haiti, at a time when corruption under the Duvalier regime was rampant. A political ally of François Duvalier (Papa Doc), a man named Luckner Cambronne, formed the Hemo-Caribbean plasmapheresis center in Port-au-Prince, exporting 6000 liters of plasma to the US per month. The plasma was sold to primarily four companies here, Dow Chemical, Cutter Laboratories (now AG Bayer), Dade Reagents, and Armour Pharmaceutical, where multiple drug products were produced using pooled lots of plasma product.

I also did not agree with Fairbanks's unquestioning acceptance of the estimated time scales for the spread of different human populations based on molecular divergence of different maternally and paternally inherited DNA sequences. These estimates come with rather large confidence intervals that are constantly debated and rehashed as new data appear and new calibration points are chosen. It is likely that culturally and biologically modern human populations pulsed out of homelands in Africa, the Middle East, and South Asia prior to the times currently heralded, and the flux of groups occupying contested crossroads probably will obscure the reconstruction effort to identify specific DNA arrangements or haplotypes with modern populations in or near these regions. Here the drive to obtain and analyze ancient DNA samples is ultimately the bottom line.

Overall, this book is a slow read in places and a great read in others. It goes into greater details of molecular biology than Marlene Zuk's *Paleofantasy* (2013), and is more comprehensive in its vision to show how evolution is central to modern biology and empirical medical science. The author expresses considerable dismay at the failure of individuals to understand and incorporate lessons learned, citing examples from his own life and that of his family. It is often the personal story that emerges the strongest from his telling, flavoring and humanizing the medicine as it goes down. This book is uneven and pedantic in places, energizing and uplifting in others. For me, the most profound message that came through was his optimism that we as a species will retain the biological capacity to adapt
and change to whatever stupidity we bring upon ourselves, whether from our failures to
vaccinate children for preventable diseases, or our misuse of pesticides and herbicides. As
long as there is diversity in the gene pool, he maintains, we still have a fighting chance.

**REFERENCES**


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