

## ANTHROPOLOGY

## The Cooking Ape

Andreas Keller

If we believe that the difference between humans and chimpanzees is more remarkable than the difference between leopards and cheetahs or that between nightingales and stonechats, then we need an evolutionary explanation for the rapid changes in our lineage. Explanations of “what makes us human” often focus on a single event or capacity and consider many human-specific behaviors and abilities to be a consequence of it. Among such proposed accelerators of biological and cultural change are opposable thumbs, bipedalism, language, and trade.

These arguments often include a bridge between culture and biology. Their basic structure involves a cultural accomplishment that can accelerate genetic changes by reshaping the selective forces. The genetic

changes improve cognitive abilities. Improved cognitive abilities drive cultural progress, which again alters the selective forces. This positive feedback loop between culture and genes could propel the cognitive abilities and behavior of humans away from those of the chimp. An inherent problem for these types of scenarios is that most major cultural accomplishments happened very recently, whereas biological changes that are the result of positive selection are generally believed to spread rather slowly (*1*).

Two new books by anthropologists Frances Burton and Richard Wrangham, released within weeks of each other, now argue that learning to control fire a few million years ago “made us human” or “ignited human evolution.” Each comes in a black dust-jacket with the title and author’s name written in white and yellow above the picture of a campfire. Each draws on evidence from anthropology, archaeology, and comparative

primatology to provide a fascinating account of how fire was first used and controlled. However, the similarities end there.

In *Fire: The Spark That Ignited Human Evolution*, Burton (University of Toronto) argues that the light from campfires extended the day for our ancestors and therefore decreased their melatonin levels. She discusses the effects of melatonin on cognitive abilities, reproduction, and other physiological processes, but she does not directly connect the light from a campfire to accelerated genetic changes. At the conclusion of her account, she describes the ultimate effect of light as “accelerating processes of mind, body, disease, and society in the transformation to us.”

Wrangham (Harvard University) presents evidence that it’s the heat and not the light of fire that was important. *Catching Fire: How Cooking Made Us Human* offers a convincing argument that cooking allowed us to do the work of chewing and digesting outside of our bodies. Wrangham presents evidence (sometimes strong and always interesting) that the energy our bodies saved by outsourcing digestion was redirected toward our brains. For example, he discusses the rapid evolution of the beaks in Galapagos finches in response to dietary changes, a self-experiment in which he determines that adding leaves to raw goat meat makes it easier for him to chew, and the food preferences of the gorilla Koko. (She likes her vegetables cooked.)

But is cooked food really energetically superior to raw food? It is intuitive that cooking reduces the time and energy necessary to chew and digest a potato or a steak. The potential advantages of cooking are less obvious, however, for foods such as bananas, eggs, or fish. Cooking also produces hard-to-digest protein compounds and destroys vitamins. When meats are heated, fat melts and drips off, reducing their caloric content.

Nonetheless, Wrangham concludes that cooking increases the amount of energy we can obtain from food. As evidence, he cites the weight loss in humans who shift to a diet



Fueling bigger brains?

consisting of mostly raw foods and the accelerated growth and increased milk production in cows that are fed cooked food. Furthermore, he informs us that all known human societies cook and that there are no reports of lost explorers or adventurers surviving on raw food for more than a few weeks.

If Wrangham’s arguments convince you that cooking increases caloric content, then it is easy to see that selection would favor anatomical and physiological adaptations to the new foods we created. Cooking would free more energy for the brain, which could then increase in size and advance culture. And so on through the positive feedback loop.

Along with this main thesis, *Catching Fire* presents other original ideas about the consequences of controlled fire on human evolution. Some of cooking’s consequences may be seen in human social relationships. One individual can cook for a group, and Wrangham claims that this led to the establishment of pair bonds between individual men and women in early societies. The importance of cooking in relationships is seen in hunter-gatherer societies in which “when a woman feeds a man, she is immediately recognized as being married to him.”

Fire, Wrangham acknowledges, has other uses than cooking. The one that receives the most attention from him is to keep predators away. He suggests that when our ancestors no longer needed to climb trees for protection at night but slept around a campfire, “natural selection rapidly favored the anatomical changes that facilitated long-distance locomotion and led to living completely on the ground.”

Because Wrangham does not mention potential effects of the lengthening of the day on human physiology, his and Burton’s books complement one another. Both books lead to testable hypotheses. Burton calls the question of whether a campfire produces enough light to affect melatonin levels the “crux” of her book. This suggests an experiment in which melatonin is assayed in subjects in a controlled environment with or without a campfire artificially prolonging the day. Wrangham, surprisingly, could not find a single study that compares human participants on controlled diets of food that is either eaten raw or cooked.

## Catching Fire

How Cooking Made Us Human

by Richard Wrangham

Basic Books, New York, 2009. 315 pp. \$26.95, C\$33.95. ISBN 9780465013623.

## Fire

The Spark That Ignited Human Evolution

by Frances D. Burton

University of New Mexico Press, Albuquerque, 2009. 245 pp. \$34.95. ISBN 9780826346469.

The reviewer is at the Laboratory of Neurogenetics and Behavior, Rockefeller University, 1230 York Avenue, Box 63, New York, NY 10021, USA. E-mail: keller@mail.rockefeller.edu

Such experiments together with the evidence and the innovative ideas Burton and Wrangham present would help us better understand what made us who we are today.

## References

1. G. Cochran, H. Harpending, *The 10,000 Year Explosion: How Civilization Accelerated Human Evolution* (Basic Books, New York, 2009).

10.1126/science.1176069

## RESEARCH MISCONDUCT

# Neglecting the Crucial "Why?"

Donald Eigler

The "outliers"—the data points that deviate far from the norm—invariably draw our attention. We know from statistical analysis that they should be there, yet we somehow are never fully at ease to accept them as belonging to part of the whole. I suspect this comes from a deeply rooted need to create order in our world through classification schemes that not only allow us to differentiate normal from deviant behavior but also predispose us toward being inclusive of the former and exclusive of the latter. Nowhere is this more true or more deeply rooted in our psyche than in our response to human behavior.

Human behavior at this normal-deviant boundary has been the grist of great literature. Shakespeare was drawn here. Dostoyevsky's masterworks, *Crime and Punishment* and *The Brothers Karamazov*, drew from this font. It was then with high expectations and the hope of some valuable insight into perplexing questions regarding deviant human behavior in the scientific community that I began to read Eugenie Samuel Reich's *Plastic Fantastic*—a book about an outlier.

Reich (a Boston-based science journalist) chronicles the case of scientific fraud committed by Jan Hendrik Schön, the golden boy of Bell Laboratories at the turn of the millennium. I was disappointed to find that her book does little more. I say this because I wanted it to do more. Schön's fraud had dominated the "scandal du jour" entrée of physicists'

**Plastic Fantastic**  
How the Biggest Fraud in Physics Shook the Scientific World

by Eugenie Samuel Reich

Palgrave Macmillan,  
London, 2009. 270 pp.  
\$26.95, C\$29.95, £15.99.  
ISBN 9780230224674.

The reviewer is at the IBM Almaden Research Center, Department K-10/801, 650 Harry Road, San Jose, CA 95120-6099, USA. E-mail: eigler@almaden.ibm.com

lunch-time conversation menu for a very long time. Whereas so many of these conversations revolved around questions of what Schön had done, I was always drawn to the more disturbing questions of psychomechanics: how and why had Schön destabilized. What lessons could be learned?

I had high expectations of *Plastic Fantastic* for another reason. Long ago, I had read a transcript of Irving Langmuir's classic 1953 talk "Pathological Science" (1), in which Langmuir addressed the topic of how a scientist can be fooled, especially by himself. As the Schön affair unfolded, I repeatedly consulted Langmuir to see if I could extract understanding. I could not. The reason for this, in retrospect, is that Langmuir was addressing the questions of how one gets fooled or how one fools oneself, whereas the questions I harbored about Schön were largely about how and why he came to commit and justify fraud. I was interested in how he went astray. Reich doesn't go after these meaty questions.

Instead, her avowed purpose is to examine the widely held belief that science is "self-correcting." She barely does this, and only in the epilogue.

*Plastic Fantastic* is by and large a history—sometimes anecdotal, sometimes mixed with smatterings of critical examination—of the Schön affair. Unfortunately, it is repetitive and poorly organized, vacillating back and forth in time and topic. The editing, spelling, and grammar are a constant irritation, e.g., "Schon" instead of "Schön," "silicone" instead of "silicon."

At times, the book seems to have been written for the general public. The author makes an admirable attempt to explain everything from transistors to composite fermions to her audience. The unfortunate professional who

reads these descriptions should be warned: prepare to cringe. Her explanations are often wrong and sometimes horribly botched. The curious lay reader should be cautioned to seek an understanding elsewhere.

At other times, the book seems targeted at the scientific community. This is no more apparent than in the book's epilogue when Reich at last turns to her *raison d'être*, the question of whether science is self-correcting. Her tone here is more of someone wanting to grind an axe (and grind it against scientists) rather than to illuminate or understand.

In all, *Plastic Fantastic* disappointed me. The book is not what I had hoped for, an insightful study of the mechanisms through which a scientist's ethics can be corrupted. Nor does it provide a thoughtful examination of the self-correcting nature of science, what Reich claims her book is all about.

## References

1. I. Langmuir, *Phys. Today* **42**, 36 (1989) [transcribed, Ed., R. N. Hall].

10.1126/science.1175487