

# Cooking Up Bigger Brains

Our hominid ancestors could never have eaten enough raw food to support our large, calorie-hungry brains, Richard Wrangham claims.

The secret to our evolution, he says, is cooking BY RACHAEL MOELLER GORMAN

**R**ichard Wrangham has tasted chimp food, and he doesn't like it. "The typical fruit is very unpleasant," the Harvard University biological anthropologist says of the hard, strangely shaped fruits endemic to the chimp diet, some of which look like cherries, others like cocktail sausages. "Fibrous, quite bitter. Not a tremendous amount of sugar. Some make your stomach heave." After a few tastings in western Uganda, where he works part of the year on his 20-year-old project studying wild chimpanzees, Wrangham came to the conclusion that no human could survive long on such a diet. Besides the unpalatable taste, our weak jaws, tiny teeth and small guts would never be able to chomp and process enough calories from the fruits to support our large bodies.

Then, one cool fall evening in 1997, while gazing into his fireplace in Cambridge, Mass., and contemplating a completely different question—"What stimulated human evolution?"—he remembered the chimp food. "I realized what a ridiculously large difference cooking would make," Wrangham says. Cooking could have made the fibrous fruits, along with the tubers and tough, raw meat that chimps also eat, much more easily digestible, he thought—they could be consumed quickly and digested with less energy. This innovation could have enabled our chimp-like ancestors' gut size to shrink over evolutionary time; the energy that would have gone to support a larger gut might have instead sparked the evolution of our bigger-brained, larger-bodied, humanlike forebears.

In the 10 years since coming on his theory, Wrangham has stacked up considerable evidence to support it, yet many archaeologists, paleontologists and anthropologists argue that he is just plain wrong. Wrangham is a chimp researcher, the skeptics point out, not a specialist in human

evolution. He is out of his league. Furthermore, archaeological data does not support the use of controlled fire during the period Wrangham's theory requires it to.

Wrangham, who first encountered chimps as a student of Jane Goodall's in 1970, began his career looking at the way ecological pressures, especially food distribution, affect chimp society. He famously conducted research into chimp violence, leading to his 1996 book *Demonic Males*. But ever since staring into that fire 10 years ago, he has been plagued with thoughts of how humans evolved. "I tend to think about human evolution through the lens of chimps," he remarks. "What would it take to convert a chimpanzee-like ancestor into a human?" Fire to cook food, he reasoned, which led to bigger bodies and brains.

And that is exactly what he found in *Homo erectus*, our ancestor that first appeared 1.6 million to 1.9 million years ago. *H. erectus*'s brain was 50 percent larger than that of its predecessor, *H. habilis*, and it experienced the biggest drop in tooth size in human evolution. "There's no other time that satisfies expectations that we would have for changes in the body that would be accompanied by cooking," Wrangham says.

The problem with his idea: proof is slim that any human could control fire that far back. Other researchers believe cooking did not occur until perhaps only 500,000 years ago. Consistent signs of cooking came even later, when Neandertals were coping with an ice age. "They developed earth oven cookery," says C. Loring Brace, an anthropologist at the University of



## RICHARD WRANGHAM

**FLAME ON:** Argues that the practice of cooking food, beginning with *Homo erectus*, ultimately enabled the human brain to evolve to its current large size.

**INTO THE FRYING PAN:** His theory has many skeptics because only scattered signs of fire use by *H. erectus* exist. One example: a Chinese site where *H. erectus* may have spat hackberry seeds into early campfires (producing spectacular sparks).

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Michigan at Ann Arbor. “And that only goes back a couple hundred thousand years.” He and others postulate that the introduction of energy-rich, softer animal products, not cooking, was what led to *H. erectus*’s bigger brain and smaller teeth.

So Wrangham did more research. He examined groups of modern hunter-gatherers all over the world and found that no human group currently eats all their food raw. Humans seem to be well adapted to eating cooked food: modern humans need a lot of high-quality calories (brain tissue requires 22 times the energy of skeletal muscle); tough, fibrous fruits and tubers cannot provide enough. Wrangham and his colleagues calculated that *H. erectus* (which was in *H. sapiens*’s size range) would have to eat roughly 12 pounds of raw plant food a day, or six pounds of raw plants plus raw meat, to get enough calories to survive. Studies on modern women show that those on a raw vegetarian diet often miss their menstrual periods because of lack of energy. Adding high-energy raw meat does not help much, either—Wrangham found data showing that even at chimps’ chewing rate, which can deliver them 400 food calories per hour, *H. erectus* would have needed to chew raw meat for 5.7 to 6.2 hours a day to fulfill its daily energy needs. When it was not gathering food, it would literally be chewing that food for the rest of the day.

To prove that cooking actually does save energy, Wrangham partnered with Stephen Secor, a University of Alabama biologist who studies the evolutionary design of the digestive system. They found that the python—an animal model with easily studied gut responses—expends less effort breaking down cooked food than raw. Heat alters the physical structure of proteins and starches, thereby

making enzymatic breakdown easier.

Wrangham’s theory would fit together nicely if not for that pesky problem of controlled fire. Wrangham points to some data of early fires that may indicate that *H. erectus* did indeed tame fire. At Koobi Fora in Kenya, anthropologist Ralph Rowlett of the University of Missouri–Columbia has found evidence of scorched earth from 1.6 million years ago that contains a mixture of burned wood types, indicating purposely made fire and no



*In contemplating the question of what stimulated human evolution, “I realized what a ridiculously large difference cooking would make,” Richard Wrangham says.*

signs of roots having burned underground (a tree struck by lightning would show only one wood type and burned roots). The discoveries are consistent with human-controlled fire. Rowlett plans next to study the starch granules found in the area to see if food could have been cooked there.

Still, most researchers state that unless evidence of controlled fire can be regularly confirmed at most *H. erectus* sites, they will remain skeptical of Wrangham’s theory. Moreover, other food-based theories can explain the body and brain expansion without flames. One is the expensive tissue hypothesis, proposed in 1995 by Leslie C. Aiello, professor emeritus of biological

C. LITTLE zefar/Corbis

anthropology at University College London, and physiologist Peter Wheeler of Liverpool John Moores University in England. The main idea of the hypothesis—that smaller guts correlate with bigger brains in primates—fits with Wrangham's theory, but Aiello and Wheeler think that energy-dense animal-derived foods, such as soft bone marrow and brain matter, were the reason humans developed these characteristics, not cooking.

Lacking the proof for widespread fire use by *H. erectus*, Wrangham hopes that DNA data may one day help his cause. "It would be very interesting to compare the human and *Homo erectus* genetics data to see when certain characteristics arose, such as, When did humans evolve improved defenses against Maillard reaction products?" he says, referring to the chemical products of cooking certain foods that can lead to carcinogens.

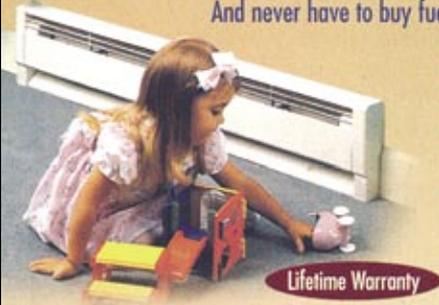
Even without such evidence yet, some think Wrangham's theory is just the thing to shake up the field of human evolution. "It doesn't matter who develops these ideas," says Aiello, who is also president of the Wenner-Gren Foundation, which supports anthropological research. "You have to listen to what Richard is saying because he has some very interesting, original data. Sometimes the most creative ideas come from unexpected places." She points to Goodall, who surprised the world by proving that humans were not the only tool-makers. "It's one of the best illustrations I know of the value of primate research informing our knowledge of human evolution and adaptation," Aiello says.

If Wrangham's strange ideas turn out to be true, we can thank an early hominid Emeril Lagasse who picked a charred tuber out of a campfire and swallowed it. Without that person, we might never have been able to examine our origins—or enjoy a good grilled steak—in the first place. ■

*Rachael Moeller Gorman is a writer based in Boston. A Q&A version of her interview with Wrangham is at [www.SciAm.com/ontheweb](http://www.SciAm.com/ontheweb)*

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