extension, the genes encoding the proteins' designs) found in chimpanzees and humans were virtually identical. That left open the question of how these two species came to be so different (*Science*, 4 September 1998, p. 1432). Wilson suggested then that the key might be differences in gene expression, the rate at which messenger RNA and proteins are made from a gene. At long last, Pääbo and his colleagues have experimental evidence that supports this so-called regulatory hypothesis. Furthermore, notes Lawrence Grossman, a molecular biologist at Wayne State University in Detroit, the work "nicely supports the idea that in primates, the action in evolution [is in] the brain."

Pääbo and his team, including the Max Planck Institute's Wolfgang Enard and Philipp Khaitovich, collected brain, liver, and blood samples from humans, chimps, macaques, and orangutans that had died of natural causes. They isolated RNA from each sample and passed it over a gene chip with tags for 12,000 human genes. The more RNA registered for a gene, the greater that gene's activity. In a second experiment, they used a membrane-based array to look at about 6000 additional genes. In each experiment, the researchers studied RNA from chimps, humans, and one of the other primates.

As expected, the researchers found little difference among the species in the liver and blood samples. But in the brain, the species distinguished themselves. The team detected big differences in gene expression between humans and chimps, whereas gene expression in the chimps' and the other primates' brains was about the same.

By pairing these results with a look at the primate family tree, the team concluded that sometime in the recent evolution of humans, the human brain began evolving faster than those of other primates—faster even than that of the closest relative of humans, the chimp. Macaques and orangutans, which are more distantly related to chimps and humans than chimps and humans are to each other, helped put these rates into perspective. Because gene expression in chimp brains was similar to that in both macaque and orangutan brains, the big boost in brain evolution occurred after chimps and humans split off from their last common ancestor, the researchers report. "This is the first piece of evidence that humans may have a faster rate" of change in the regulation of gene expression, notes Caro-Beth Stewart, a molecular evolutionist at the State University of New York, Albany.

The researchers' next step is to figure out which genes matter. Based on their RNA studies and parallel work measuring protein concentrations, "we have begun to accumulate lists of genes that have changed their expression in human evolution so that we and others can now go and study those genes in detail," Pääbo explains.

One inference drawn by Pääbo and his team is prompting some debate. They speculate that the acceleration of changes in gene expression in the brain occurred during recent human evolution, which some anthropologists say could have been as recent as several hundred thousand years ago. But studies of brain morphology in chimps and australopithecines, human ancestors that lived millions of years ago, indicate that the brain had already taken on human characteristics by the time of these early hominids. The changes Pääbo's team sees in gene expression in the brain "could have happened at any time during the course of hominid evolution," says Ralph Holloway, an anthropologist at Columbia University in New York City.

Brainpower. Studies may show that rates of gene activity separate humans from chimps, but in this movie matchup, Pierre the Chimp is definitely getting the better of actor Jerry Lewis.

CREDIT: BETTMANN/CORBIS

Despite the controversy, Pääbo's group deserves a lot of credit for showing that human evolution involves unusually rapid changes in gene expression, says Stewart, who calls the work "an important advance in our thinking." But others are not surprised that genes are expressed differently in humans than in other primates. As Edwin McConkey, an emeritus molecular biologist at the University of Colorado, Boulder, says, "If no differences had been found, then we should all have to take a course in metaphysics, and religious fundamentalists would be dancing in the streets."

–ELIZABETH PENNISI

ScienceScope

Separate But Equal U.S. researchers who want to work on new, unapproved human embryonic stem (ES) cell lines need not flee to privately funded labs, federal officials clarified last month. They can stay in their academic labs, as long as they follow existing accounting rules for what can and can't be charged to federal grants.

Last August, the National Institutes of Health (NIH) began reviewing rules that ban mixing federal and private funds after President George W. Bush limited federal funding for ES cell research to 60-odd lines. In anticipation of Bush's decision, some stem cell researchers had moved their studies to special off-campus buildings. But after lengthy analysis, NIH says that's not necessary.

In a 29 March Web posting, NIH says that researchers can derive or use unapproved cell lines "in your university-supported laboratory" as long as they don't bill the federal government for the work and the university "has in place a method of separating" overhead costs. "Many people were nervous" about how to proceed, says stem cell researcher George Daley of the Whitehead Institute in Cambridge, Massachusetts. "This is reasonable and very helpful."

One More Down Another top official at the Smithsonian Institution has resigned. Dennis O'Connor, undersecretary for science and acting director of the National Museum of Natural History, last week said he is moving to the University of Maryland, College Park, because academia offers greater intellectual rigor. He is the sixth director to leave since the controversial tenure of Smithsonian secretary Lawrence Small began less than 3 years ago (*Science*, 13 July 2001, p. 194).

O'Connor's surprise departure leaves the museum leaderless for the second time in a year. The lack of stable leadership has become "a major issue," says Jeremy Sabloff, who heads a commission that is evaluating Smithsonian science. Officials had planned to postpone a search for a permanent head until next year. Now, Sabloff's group plans to map out a hiring strategy next week.

One likely candidate is already out of the running: Former National Oceanic and Atmospheric Administration chief James Baker is moving to the Academy of Natural Sciences in Philadelphia. And sources say recently appointed museum deputy director Ira Rubinoff isn't a likely pick.

Some museum scientists blame Small for the upheaval. Says one critic: "It is time to end this experiment of running this institution as a business and ... return to the Smithsonian's traditional scholarly roots."


letters to nature

Transgenic DNA introgressed into traditional maize landraces in Oaxaca, Mexico

brief communications

Suspect evidence of transgenic contamination

Insufficient evidence. *Nature* says its paper on transgenes in corn lacks data to justify publication.

Greenpeace demanded that the government ban all transgenic maize (the moratorium covers only planting maize, not selling or eating it), "develop an emergency plan" for "de-contamination" of Oaxaca, and sue all companies responsible for "transgenetic organisms." Headlines about the "Mexican maize scandal" appeared worldwide. As the media pressure mounted, the Mexican Congress unanimously demanded in December that President Vicente Fox forbid the import of transgenic maize.

To identify transgenic DNA, Quist and Chapela had used the polymerase chain reaction—a standard procedure, but one that is prone to false positives. Almost immediately, other molecular biologists wrote critical letters to *Nature*. "I knew as soon as I read the paper that something was wrong," says biologist Wayne Parrott of the University of Georgia in Athens. Even greater skepticism greeted the report of transgenic instability. "Nobody has ever observed anything like it in years of working with corn," says UC Berkeley biologist Peggy Lemaux. These and other criticisms are spelled out in the two letters *Nature* is publishing.

In a highly unusual move, *Nature* asked Chapela and Quist to come up with further data to "prove beyond a reasonable doubt that transgenes have indeed become integrated into the maize genome." Using another technique, "dot blotting," the two scientists produced data that in their view did just that. But the results did not convince a *Nature* referee, which led editor Philip Campbell to decide that "the evidence available is not sufficient to justify the publication of the original paper." *Nature* is, however, publishing Chapela and Quist's response, including their new data, along with the critical letters, to "allow readers to judge the science for themselves."

Surprisingly, all sides agree that transgenic maize is probably growing in Mexico. Thousands of government-subsidized stores sell low-cost staples, including the maize kernels used to make tortillas. Much of the maize is imported from the United States; preliminary government tests indicate that up to 40% is transgenic. Because the kernels can be planted, it is widely assumed that some small farmers have done so. In consequence, the dispute is less over the likely presence of transgenic maize than whether Chapela and Quist actually demonstrated it, and whether foreign DNA is as widespread and unstable as they claim.

Because of the political stakes, the debate has not been purely scientific. Chapela has charged that some of the criticism was fomented by biotech firms that feared the discovery would derail plans to end the European Union's de facto ban on agricultural biotechnology. On 19 February the Institute for Food and Development Policy (Food First) released a letter from 140 groups decrying "the use of intimidatory tactics to silence potentially 'dissident' scientists." Three days later, more than 100 scientists responded with a statement "in support of scientific discourse" (*Science*, 1 March, p. 1617).

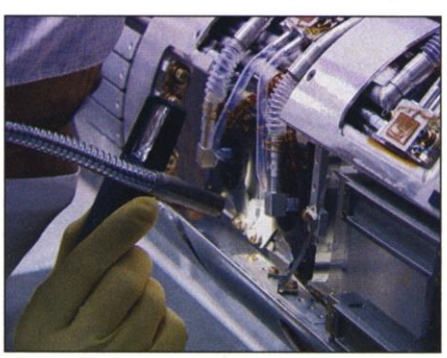
Unsurprisingly, the latest exchange hasn't ended the dispute. The Competitive Enterprise Institute, a pro-market advocacy group in Washington, D.C., hailed the reversal as proving that "antibiotechnology activists often rely on faulty data." Meanwhile, the antibiotech ETC Group charged that *Nature*'s "flip-flop" is "just an obfuscation of the real issue … that a Centre of Crop Genetic Diversity has been contaminated, and no one is doing anything about it."

—CHARLES C. MANN

U.S. EXPORT CONTROLS

Rules Eased on Satellite Projects

The U.S. State Department last week loosened its export rules on scientific satellite projects and told the university community that those regulations aren't intended to stifle scientific research. Researchers, who have campaigned for 3 years to ease the irksome restrictions, say that they are



Hands on. New satellite rules make room for foreign scientists.

CREDITS: (TOP TO BOTTOM) *NATURE* PUBLISHING GROUP; MARK LENNIHAN/AP; STANFORD UNIVERSITY, GRAVITY PROBE B

ScienceScope

Earthman Cometh There is rejoicing at Columbia University's Earth Institute (EI). Last week, after 3 years without a permanent director, the New York City institute snagged renowned Harvard economist Jeffrey Sachs (below) to be its chief. Sachs, a specialist on post-Soviet economies and adviser to United Nations (U.N.) chief Kofi Annan, is interested in the economic effects of disease in poor countries (*Science*, 29 June 2001, p. 2420). He plans to add two centers to the EI complex: a U.N.-based Center on Globalization and Development, to work on poverty-alleviation goals; and what he informally dubs CDCDC—a Center for Disease Control in Developing Countries—at Columbia Presbyterian Medical Center.

Sachs starts his new job in June and says he's boning up on its scientific aspects. Geochemist Wallace Broecker of Columbia's Lamont-Doherty Earth Observatory says he's "delighted." The 47-year-old Sachs, he says, has "the personality and energy" to fulfill the promise of EI, started in 1994 with the aim of combining earth, biological, and social sciences in charting the planet's future.

Job Confusion A court ruling threatens to throw a wrench into ongoing attempts to reform Italy's National Research Council (CNR), the nation's main basic research agency. An administrative tribunal this week rejected CNR's pick to head an astrophysics institute, saying that the agency ignored the qualifications of another candidate, who went to court to challenge the process.

Giovanni Bignami, science chief at the Italian Space Agency, alleged that CNR unfairly rejected his application to become director of the Institute of Astrophysics in Rome. The job was one of 101 directorships that CNR was filling under a plan to overhaul its infrastructure. An administrative tribunal backed Bignami, ruling that a CNR panel had "neglected" to consider his managerial skills. It annulled the appointment of another researcher to the post.

CNR officials are still grappling with the implications of the decision, with some officials fretting that it could expose the agency to further such challenges. The governing board will assess the potential fallout at a regular meeting next week.

Contributors: Jocelyn Kaiser, Elizabeth Pennisi, Constance Holden, Adam Bostanci