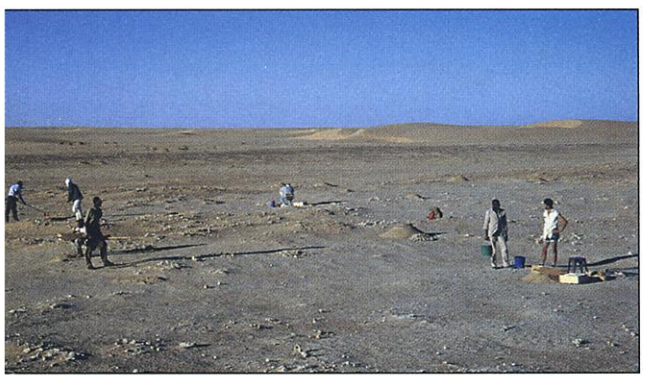
Brunet and his international team to assign them to a new genus and species, *Sahelanthropus tchadensis*. Nicknamed Toumaï, which means "hope of life" in the Goran language of Chad, it was found in beds where shifting sand dunes have exposed thousands of fossils of crocodiles, elephants, and other creatures. Brunet's team compared the mix of extinct species from the site to fauna at other reliably dated sites in Africa and concluded that the cranium is 6 million to 7 million years old, a date that is "apparently on solid ground," says White. That age pushes the limits of many molecular studies dating the split between the hominid and chimpanzee lineages to 5 million to 7 million years ago (*Science*, 15 February, p. 1217).



Desert treasure. Chadian and French researchers sift through rich fossil beds in the Djurab Desert.

In keeping with its age, the skull looks most like that of an ancient ape, with a brain the size of a chimpanzee's, large incisors, and widely spaced eyes like a gorilla's. But the shape and size of its canines and lower face resemble those of human ancestors that came later. When Lieberman first saw a cast of the skull, for example, he was stunned by the face. Chimpanzees and other apes have protruding lower faces. But this cranium shows "a short, vertical face" with less of a snout, says Lieberman. "These cranial features astonish me, because they are not present in many early australopithecines. It is in some respects more hominidlike than *Australopithecus afarensis*"—the species of the famed "Lucy" skeleton, dated to 3.4 million years ago and long considered an early human ancestor.

The teeth, too, are hominidlike. Although the team thinks Toumaï was probably a male because of its thick brow ridge, the canines are relatively small and unsharpened, unlike those of other great apes; many consider this trait one of the first to define hominids (along with bipedalism). This change might reflect a shift in social structure toward less competition for females, because big, sharp canines are found in males who compete furiously for mates, says Carol Ward of the University of Missouri, Columbia. Also like hominids, Toumaï has no space between its canines and incisors. "It is a dental hominid," says White.

The skull's unique mosaic of characters invites speculation about its relationships to the two other contenders for first hominid: *Ardipithecus ramidus*, which lived in Ethiopia 4.4 million to as early as 5.8 million years ago, and *Orrorin tugenensis*, which lived in Kenya about 6 million years ago. Brunet raises the possibility that Toumaï and *A. ramidus* might be "sister groups." White goes even further: "An argument could be made that [Toumaï] is an earlier species of the same genus." Comparisons are more difficult with *Orrorin*, which is so far known chiefly from teeth and limb bones rather than a skull, but *Orrorin*'s V-shaped canines are more chimplike than those of Toumaï and *Ardipithecus*.

Outside researchers do offer a caveat. If the new skull is from a female rather than a male, the canines are "less striking" and more in line with those of living and extinct apes, says Ward. Brigitte Senut of the National Museum of Natural History in Paris, co-discoverer of *Orrorin*, says, "When we saw the specimen, we thought, 'This is a female.' " She suggests that Toumaï might be an early gorilla rather than a hominid. This debate could be settled if Brunet's team finds skeletal bones that show that Toumaï was bipedal—and hence a hominid.

In the meantime, some researchers say, the skull is so different from that of other known apes that it might represent a sliver of great diversity of ancient hominids—most of which have not been found. "This fossil is a huge wake-up call," says Lieberman. "It reminds us that we're missing large portions of the fossil record."–ANN GIBBONS

CREDITS: (TOP TO BOTTOM) M. BRUNET; RON EDMONDS/AP

PUBLIC HEALTH

AIDS Researcher Named CDC Chief

Julie Gerberding, an infectious-disease researcher who rose to public prominence last fall as a spokesperson for the U.S. government's response to the anthrax crisis, has been named director of the Centers for Disease Control and Prevention (CDC) in Atlanta. Gerberding, 46, is a CDC insider. She was recruited to CDC in 1998 from the University of California, San Francisco (UCSF), to run a national program aimed at controlling hospital infections and medical errors and was promoted to her new job from acting deputy director for science.

Making the announcement on 3 July, Sec-

ScienceScope

Blood Saga The 14-year French court battle over the contamination of an estimated 4000 hemophiliacs and blood transfusion recipients with HIV took two new twists last week. But there's still no end in sight.

On 4 July, an appeals court dismissed all charges—including accusations of "poisoning"—against 30 doctors, researchers, and public health officials who allegedly had failed to protect the victims from infection with the AIDS virus during the early days of the epidemic in France. But 5 days later, prosecutors announced that they would take the case to the final appellate level.

The list of those still awaiting their fate include respected scientists such as cell biologist François Gros and epidemiologist Jean-Baptiste Brunet (*Science*, 16 June 1995, p. 1563). Colleagues complain that the government has little basis for an appeal but is merely trying to prolong their legal torment. "This was a politically correct" decision, says immunologist Jean-Claude Gluckman of the St. Louis Hospital in Paris.

No Litmus Test National Institutes of Health (NIH) director Elias Zerhouni says that White House officials vetting his appointment never asked him about his views on human embryonic stem (ES) cells. Meeting last week with reporters for the first time since he took office 6 weeks ago, the former Johns Hopkins radiologist says that he is ready to argue for loosening Bush Administration rules that limit ES cell studies to 70-some lines if the science supports that position. But "the science is barely out of the gate," he adds. As for congressional proposals to ban therapeutic cloning, "that's a political question, not a scientific question," he said.

On other topics, Zerhouni says that NIH "needs to look into" a recent National Academy of Sciences suggestion that it find a way to fund worthy research on combating bioterrorism more quickly. He also plans to "review the effectiveness" of NIH, with input from a forthcoming academy study examining the agency's structure. His short-term priorities include filling five vacant NIH directorships.

a cell, the RNA translates itself into a large protein, which is then cleaved to produce a cluster of smaller ones. Those proteins attack critical cells such as neurons in the central nervous system.

The researchers—Jeronimo Cello, Aniko Paul, and Eckard Wimmer of the State University of New York, Stony Brook—built an almost perfect replica of the virus, reading the recipe available in a public database of the letters that make up the virus's chemical code. Because RNA is chemically unstable, the scientists converted the RNA sequence to DNA, replacing every uracil base with a thymine. Then they ordered short stretches of carefully arranged bases from one of the many companies that churns out such piecemeal DNA. Cello took about a year to layer these fragments together to form the first third of the virus. Once he established that these stretches stayed oriented correctly, he hired a DNA synthesis company to assemble the remaining portion, which it did in 2 months. To distinguish the synthetic virus from natural strains, the group inserted 19 markers, minor mutations that weren't expected to alter polio's behavior.

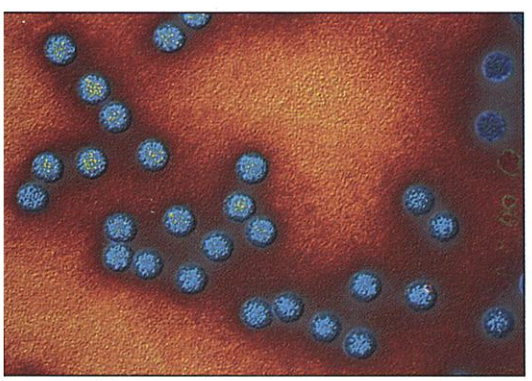
DNA in hand, the researchers immersed it in enzymes to convert it back to the RNA at polio's core. The artificial poliovirus acted much like its natural counterpart: It multiplied, and antibodies could block it from entering cells. Mice injected with the synthesized virus became paralyzed after about a week, as did animals infected with normal poliovirus. But the artificial version was less lethal: Between 1000 and 10,000 times more virus was needed to kill an animal. The team suspects that one or more of the 19 markers are hobbling the virus.

The research might throw a wrench into polio eradication plans. "It erodes the underpinning of the whole eradication concept," says Peter Jahrling, a smallpox researcher at the U.S. Army Medical Research Institute of Infectious Diseases in Fort Detrick, Maryland. Last month the World Health Organization (WHO) announced that it had erased the disease from the European continent, and, according to Bruce Aylward, WHO's coordinator of the Global Polio Eradication Initiative in Geneva, "the goal is to stop immunization" once the disease is fully eradicated. But given the possibility of recreating the virus, researchers who favor continued immunization, such as Donald A. Henderson, an adviser to the U.S. government on bioterrorism policies, hope that WHO will reconsider its stance.

Then there's the question of whether one could reconstruct other pathogens whose sequences are publicly available. Smallpox, among the most feared bioterror agents, is far more massive than polio at 185,000 bases and far more complex. LeDuc, for one, doesn't believe that rebuilding it is imminently doable. But given the new results, others aren't so sure. "In principle, yes, [it's] possible to synthesize smallpox," says Vadim Agol, a virologist at the Russian Academy of Medical Sciences in Moscow.

Despite such nightmarish scenarios, scientists have no plan to stop posting new genetic sequences online. Wimmer says that no concerns were raised to him about publishing the paper. As Cello says, "By releasing this you alert the authorities ... [about] what bioterrorists could do." —JENNIFER COUZIN

CREDITS: (TOP TO BOTTOM) GRC/NASA; GELDERBLOM/EYE OF SCIENCE/PHOTO RESEARCHERS INC.



According to plan. Poliovirus reconstructed from its genetic sequence is indistinguishable from the original, shown here.

EMBRYONIC STEM CELLS

Stem Cells Not So Stealthy After All

Human embryonic stem (ES) cells get no free pass from the immune system, contrary to some researchers' early hopes. As the cells differentiate, they express increasing levels of the telltale tags the body uses to distinguish between native and foreign cells. The findings, published online this week by the *Proceedings of the National Academy of Sciences*, confirm that a patient's immune system would be likely to reject transplanted tissues derived from ES cells. Scientists hoping to use the cells to treat Parkinson's disease, diabetes, and other maladies will therefore have to find ways to reconcile the body's defense system with the transplanted cells.

Earlier evidence from human embryos raised the slim but tantalizing possibility that ES cells might be "immune privileged," unrecognizable by the body's defenses against foreign cells. One study reported that the embryo cells that give rise to ES cells do not express the so-called MHC proteins that help the immune system identify an invader; another produced inconclusive results. That led some researchers to hope that transplanted tissue derived from ES cells might remain under the radar of the immune system.

Although the new results are not unexpected, they lay that hope to rest, says Hugh

ScienceScope

Pasteur Loses A French civil court has found the Pasteur Institute in Paris to be responsible for a woman's death last year from Creutzfeldt-Jakob disease (CJD). Pascale Fachin contracted the brain-wasting disease in 1985 from contaminated human growth hormone (HGH) prepared by Pasteur scientists (*Science*, 31 May, p. 1587). The Montpellier court in southern France ordered Pasteur and the endocrinology group Association France-Hypophyse to pay nearly $800,000 in damages to the family of the 30-year-old Fachin, half of it immediately.

The institute plans to appeal, arguing that it could not be responsible for the contamination because it was "of a biological nature." The institute's insurance company has refused to cover the damages because it considers Pasteur to be the producer, not supplier, of HGH—a question the court ruling does not resolve. A defeat at the appellate level could unleash a flood of similar claims against the institute from other families of CJD victims.

Space Fantasy Russia's space industry has fallen on hard times since the breakup of the Soviet Union. And even its former competitors, the United States and Europe, are scrambling to pay for current projects such as the international space station. But last week, Russian officials made headlines around the world when they said that they have begun talks with European and U.S. space officials on a 2015 flight to Mars involving a six-person crew.

Nikolay Anfimov, R&D director of the Institute for Machine Building, and Vitaly Semenov, head of the Rosaviakosmos Keldysh Center, laid out a proposal for a 440-day flight—and a 2-month tour of the Red Planet—at a Moscow space conference. They estimated that the mission would cost a mere $20 billion. If true, that would be a real bargain, as the U.S. Apollo project cost $100 billion in deflated, 1960s dollars.

Not surprisingly, Western officials are skeptical. "NASA has received no plans or proposals," says one agency official, who adds that Russia has enough trouble meeting its obligations for the space station without bankrolling a trip to another planet.

Contributors: Michael Balter, Jocelyn Kaiser, Barbara Casassus, Andrew Lawler