terrorism Preparedness and Response Act (H.R. 3448; energycommerce.house.gov) will require tighter laboratory security, government registration, and background checks for scientists and others handling more than three dozen potential bioterror agents identified by the government. The $4.6 billion measure, which addresses everything from food and water supply safety to prescription drug testing, also calls for more money for research, upgrading labs, and developing better systems for tracking and detecting threats to human health and agriculture. "Congress did a good job of providing clarity to researchers about their responsibilities," says George Leventhal, a lobbyist with the Association of American Universities in Washington, D.C. But "the development of sound regulations will be extremely important," adds Janet Shoemaker of the American Society for Microbiology, also in Washington.

United front. HHS Secretary Tommy Thompson, far right, joins legislators from both parties at briefing on bioterrorism bill.

CREDIT: THE COMMITTEE ON ENERGY AND COMMERCE/HOUSE OF REPRESENTATIVES

The anthrax letters triggered an immediate reaction from Congress, including calls to bar all non-U.S. citizens from working in labs that handle dangerous agents. The research community mobilized quickly against such extreme measures and gained time to make its case after the bill became bogged down over disagreements on food-safety and drug-testing provisions.

The final version reflects some of the researchers' input. It avoids a blanket ban on foreign scientists, as well as an earlier one-size-fits-all approach to regulating the 42 viruses, organisms, and toxins on the list of dangerous "select agents" compiled by the federal Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia (*Science*, 16 November 2001, p. 1438). Instead, it gives regulators with the Department of Health and Human Services (HHS, CDC's parent agency) "flexibility to impose different levels of security requirements on different select agents," according to a report accompanying the bill. The U.S. Department of Agriculture (USDA) must develop its own list of potential agroterror agents that will be subject to regulation; it will have similar leeway. Violators face fines and jail terms of up to 5 years.

The new law also calls on HHS and USDA to "minimize disruption" of existing research by setting realistic regulatory timetables. It requires "prompt" government screening of researchers and technicians working with select agents and offers an appeals process for workers who say they were improperly placed into a barred category, such as drug user or felon. But a definition of "prompt" must still be written, notes Leventhal.

The new law sets a 6-month timeline for implementing the rules, which will take effect just as the National Institutes of Health (NIH) makes a new set of awards to combat bioterrorism. With that in mind, the legislative report urges NIH officials to remind grant seekers "to begin the registration and screening process ... so as not to delay this important research."

The bill also approves $600 million over the next 2 years for CDC to address "extreme disrepair" at its laboratories and $415 million for USDA to improve agricultural security. CDC is expected to get at least $20 million to boost lab inspections and to set up a national database to help track stolen or misplaced agents back to their source. An effort to study antibiotic resistance receives $50 million. Congress has already agreed in separate bills to provide money for most of these projects.

–DAVID MALAKOFF

NEUROSCIENCE

Redrawing the Brain's Map of the Body

One of the more distinctive images taught in introductory biology or psychology courses is the motor homunculus: a deformed map of the body drawn on the primary motor cortex, a part of the brain that guides movements. Lots of neurons in this region help control the hands and face, so these features of the homunculus are exaggerated, the lesson goes. In contrast, less nimble body parts, such as the torso, look relatively scrawny.

As is often the case, experts knew that reality was somewhat more complicated; for instance, the areas representing different body parts weren't as well defined as the picture implies. But new findings go even farther, suggesting that the role of the primary motor cortex might be fundamentally different than originally thought. Rather than simply controlling different parts of the body, it might direct a host of body parts to assume complex postures. What's more, the map appears to be organized not just according to muscle groups but by the positions in space where

ScienceScope

Stem Cell Hostage? Final approval of the European Union's flagship research program has become entangled in the politics of embryo research. Several countries this week threatened to hold the $17 billion Framework program hostage to demands for stricter prohibitions on human embryo research. The 6th Framework, a 4-year program slated to begin this fall, rules out research on reproductive cloning and the creation of embryos for research. But four E.U. members—Germany, Austria, Ireland, and Italy—were hoping to add prohibitions against therapeutic cloning and the derivation of new human embryonic stem cell lines, on the grounds that such work is not permitted in their countries. Together the four would have enough votes to block the Framework's approval in the E.U. Council, which still must approve the program. But the coalition appeared to be unraveling as *Science* went to press; if it does, say officials in Austria and Germany, they will continue to push for more-restrictive language in ongoing budget debates.

Legal Threat The Pasteur Institute in Paris faces a potentially expensive day of reckoning. For a decade, the Pasteur and the Association France-Hypophyse, an endocrinology group, have been at the center of a controversy over cases of the fatal brain-wasting condition, Creutzfeldt-Jakob disease (CJD), linked to the use of contaminated human growth hormone (HGH). Several scientists are under criminal investigation for their roles in preparing HGH derived from cadavers tainted with aberrant prion proteins implicated in CJD. The hormone stocks were prescribed to children in 1984 and 1985, before France switched to recombinant growth hormone (*Science*, 30 July 1993, p. 543).

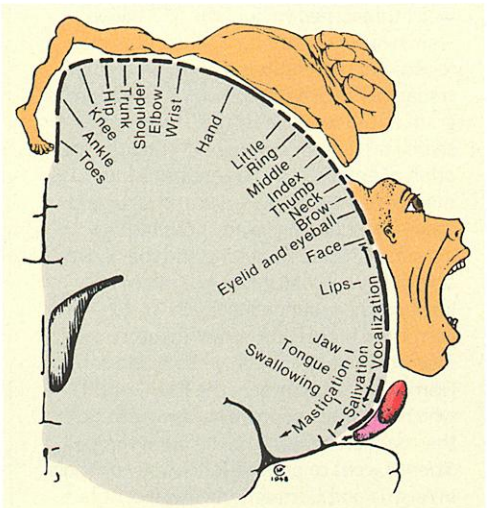
The French government has offered the families of 81 CJD victims, out of 1200 at-risk individuals, compensation of $250,000 each. But the family of Pascale Fachin, who died last June at age 30, is seeking greater damages—$800,000—from Pasteur and the association. A civil court will rule on its claim on 9 July.

The exact wording of the ruling will be critical. According to a Pasteur spokesperson, the institute's insurance would not cover a judgment finding it responsible as the manufacturer of the tainted preparation; but a ruling that it was merely the supplier of the raw materials would be covered. Either way, a judgment against Pasteur could spur litigation by other families.

Contributors: Gretchen Vogel, Barbara Casassus

the animal's movements conclude.

The research, reported by Michael Graziano and colleagues at Princeton University in New Jersey in the 30 May issue of *Neuron*, might mean that the "map of motor cortex will have to be redrawn," says neuroscientist Larry Abbott of Brandeis University in Waltham, Massachusetts. "It will be a much more deep map than just this picture of a body."



Goodbye, homunculus? This textbook depiction of the primary motor cortex's responsibilities might need to be refined.

The Princeton team uncovered the new map by electrically stimulating neurons in the primary motor cortex of monkeys, as other researchers had done, but in these experiments they used longer durations. A 50-millisecond stimulation—the same duration used in 1950 and earlier to trace the motor homunculus—causes brief muscle twitches. But Graziano and his team then tested how the neurons respond to pulses lasting a half-second or so, about as long as neurons in this part of the brain are active during natural movements.

The results were "pretty spectacular," says Abbott, who's seen the team's videos of monkeys responding to the stimulation. Rather than just twitching a muscle, the monkeys carried out coordinated, well-timed, determined movements. For instance, stimulation to one spot in the primary motor cortex caused a monkey to clench its fingers, move its hand near its face, and open its mouth. It didn't matter where the monkey's hand started out—every stimulation of the same cortical spot caused the monkey to assume the same final position. Of 324 stimulation sites in two monkeys, some 86% evoked a distinct posture.

The team found some evidence for a rough body-centered map of the motor cortex that matches the traditional motor homunculus. Certain regions often directed the hand and arm, whereas others largely caused movements of the legs or face. But the researchers found a more systematic pattern superimposed on the brain region, this one of locations in space. Zapping certain spots made the monkey reach its hand down and to one side, say, whereas nearby neurons led the hand to a slightly higher position or slightly closer to the middle of the body.

And in yet another blow to textbook descriptions of the motor system, the researchers found that their newfound neural map of space extended from the primary motor cortex to the nearby premotor area—a region that in other respects works quite independently.

Neuroscientists are both intrigued and mystified by these findings. "The challenge is to figure out just what this tells us about the organization of the cortex," says cognitive neuroscientist Larry Snyder of Washington University in St. Louis, Missouri.

One possibility, suggests neuroscientist Peter Strick of the University of Pittsburgh, is that two systems coexist in the primary motor cortex. Brief stimulation might directly activate spinal cord neurons in a way that matches the traditional view of the motor homunculus, whereas longer pulses might pull in more complicated neural circuits. But as difficult as it might turn out to be for neuroscientists to agree on what the primary motor cortex is doing, the textbook illustrators are going to have the even tougher job of depicting it.

–LAURA HELMUTH

COSMOLOGY

Best Big Bang Pictures Show New Wrinkles

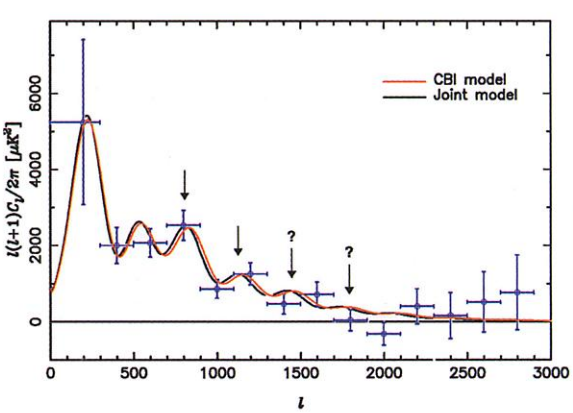
ARLINGTON, VIRGINIA—The data were so hot that bootlegged versions had been circulating for months. Even so, their official release here on 23 May has set cosmologists abuzz. The measurements, taken by the Cosmic Background Imager (CBI), a telescope in the Atacama Desert of Chile, give scientists their sharpest view yet of the infant universe.

"The instrument is extremely exciting," says Max Tegmark, a cosmologist at the University of Pennsylvania in Philadelphia. CBI is sensitive to very small features in the cosmic microwave background that other microwave background observatories such as DASI, BOOMERANG, and even the new Microwave Anisotropy Probe (MAP) satellite can't see. "This is the one experiment that is not going to get eclipsed by MAP," Tegmark says. Indeed, Tegmark was so eager to get his hands on the CBI researchers' data that he used a digital camera to snap a photo of one of their overheads at a lecture—a photo that quickly made the rounds of the cosmological community.

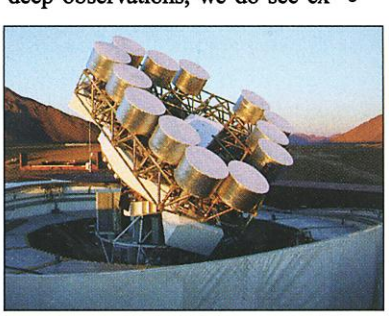
The new CBI results show details of a surface that existed about 300,000 years after the big bang, when the universe was a roiling ball of plasma. Theory says that plasma was ringing with sound waves, which caused ripples in the cosmic microwave background. This "acoustic" model predicts that these still-visible ripples should be of characteristic sizes, just as a musical instrument produces sound waves of characteristic frequencies.

Last April, BOOMERANG and DASI released observations revealing the first and second "peaks" in the microwave background spectrum—akin to hearing the fundamental and first overtone of a musical instrument—and gave hints of a third peak (*Science*, 19 January 2001, p. 414). CBI, with its extra sensitivity to higher overtones, appears to have spotted the third and fourth peaks and might even have glimpsed the fifth and sixth peaks as well. Comparing the data with theoretical models gives scientists an independent measure of the budget of matter and energy in the universe. "The CBI data allows us to have a completely new test" of cosmological models—and the models are passing the test, says Alan Guth, a cosmologist at the Massachusetts Institute of Technology. For example, the "volume" of the overtones is diminishing, as the acoustic model predicts. "You see it starting to damp out as it should," says John Carlstrom, a cosmologist at the University of Chicago who is associated with the CBI team.

Even though the peaks are getting smaller, the CBI team has noticed that there is more "volume" at small scales than the acoustic model can account for. "In these deep observations, we do see ex-



Ripple effect. Extra "peaks" in the distribution of cosmic background radiation, seen by CBI (*right*), might shed light on the universe's history and composition.



CREDITS: (TOP) FROM W. PENFIELD AND T. RASMUSSEN, *THE CEREBRAL CORTEX OF MAN* (MACMILLAN, 1950); (BOTTOM) CBI/CALTECH/NSF