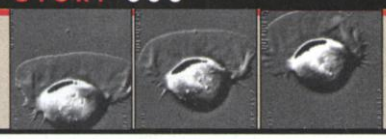
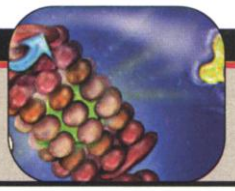




mal model would be a poor surrogate, Jahrling says that he expects to refine the model by testing lower doses and alternate infection routes. The Russian repository has won funding to ramp up its smallpox effort this year, and it too hopes to vet the monkey model.

Some countries are troubled by an open-ended research effort. "A final date for destruction should be determined, and no excuses should be given for further delay," says Sha Zukang, China's Permanent Representative to the United Nations in Geneva. But China, which is not on the governing board, is unlikely to find many allies to press that point. An Indian representative, for example, sat quietly throughout the discussion at the WHO board meeting, although his country had until recently advocated swift destruction of the stocks.

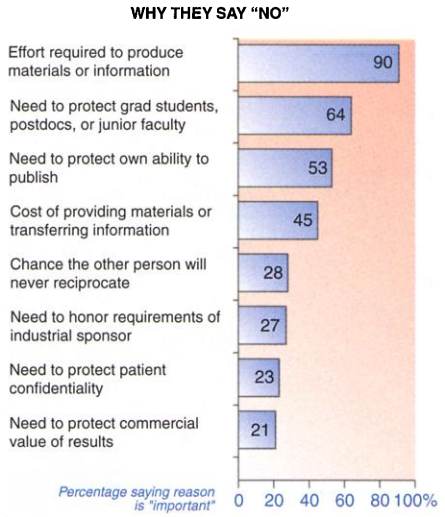
The heightened concern about bioterrorism has led some health experts to question the central tenet that stocks of any microbial killer should be destroyed once it is eradicated in the wild. But proponents of eradication say that steps are also being taken to address a bioterror threat. With respect to polio, "efforts have been under way for some time to inventory laboratory stocks and to develop a framework for specimen storage and future research," says James Hughes, director of the CDC's National Center for Infectious Diseases. The fact that the debate is taking place at all, however, represents another example of the expanding legacy of last fall's tragic events. **–RICHARD STONE**

PROFESSIONAL ETHICS

Data Hoarding Blocks Progress in Genetics

More than a quarter of U.S. geneticists say they can't replicate published findings because other investigators won't give them relevant data or materials. And the rejections are more than a breach of professional etiquette; they say that data hoarding actually retards progress in the field.

The results of a new survey, led by researchers at Massachusetts General Hospital in Boston, tarnishes what has traditionally been a badge of honor among scientists: the sharing of information that allows others to replicate or disprove the original finding. "That's a pretty big deal," says Robert Cook-Deegan, a science policy analyst at the Kennedy Institute of Ethics at Georgetown University in Washington, D.C. "And it's getting in the way of reliable science."



Too much trouble. The amount of effort required tops the list of reasons that geneticists don't share data.

The survey team, led by David Blumenthal and Eric Campbell of the hospital's Institute for Health Policy, compared the responses of 1240 geneticists with 600 other life scientists from the 100 universities that receive the most funding from the National Institutes of Health (NIH). The results appear in the 23/30 January issue of the *Journal of the American Medical Association*.

The survey explores a bread-and-butter issue: 84% of the geneticists report that they have asked another researcher to provide information, data, or materials related to published research. But almost half (47%) said that at least one request had been denied in the previous 3 years. The rejections had a significant impact on their work: 28% say that they had been forced to end a collaboration, and 21% had abandoned a promising line of research. The most likely requests to be thwarted were for biomaterials such as mice or viruses (35% had been denied such a plea), followed by sequence data (28%), findings (25%), phenotypes (22%), and lab techniques (16%).

Despite the widespread rejections, the survey found that naysayers were a distinct minority. Only 12% of geneticists reported that they had denied a request. This number may be an underestimate, Campbell explains, because researchers don't like to admit they resisted sharing their data. The most common reason cited for denying a request was the amount of effort required to produce the data (see table). Indeed, the more requests received, the more likely the scientist was to say no. Those engaged in commercial activities were also more likely to deny requests.

Geneticists say this proprietary behavior is having a negative impact on their field. Some 73% felt that withholding of data slowed progress in genetic research in general, and 58% said it had limited their own work. About the same fraction reported that it hindered the training of students and postdocs. More than twice as many scientists (35% to 14%) thought that withholding had risen rather than fallen over the last decade, although a bare majority (51%) said they hadn't noticed any change.

Campbell and his colleagues suggest that researchers might be more forthcoming if funding agencies provided money to defray the costs of meeting requests. Another step, they say, would be to make material transfer agreements more user friendly. "It's a legitimate cost of doing research," agrees Wendy Baldwin, NIH's deputy director for extramural research, adding that researchers could either list the cost in their grant application or apply for a supplemental award.

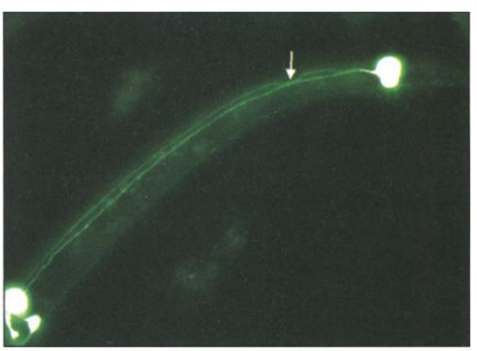
NIH could also put more pressure on researchers to behave civilly, says Cook-Deegan, including a better system to track who's being uncooperative. "There's no shaming strategy available here," he says.

–ERIK STOKSTAD

NEUROSCIENCE

Genes Keep Neurons' House in Order

As any homeowner knows, timely maintenance is vital for keeping a building functioning properly long after construction is finished. The same is evidently true for the complex architecture of the nervous system



Out of line. Axons in *Caenorhabditis elegans* stray from their proper places (arrow) when ZIG proteins are missing.

CREDITS: (TOP TO BOTTOM) SOURCE: E. CAMPBELL *ET AL.*, *JAMA* 287 (4), 1 (2002); O. AURELIO AND O. HOBERT/COLUMBIA UNIVERSITY

—at least in the roundworm. On page 686, neuroscientists Oliver Hobert, Oscar Aurelio, and David Hall describe a new family of proteins that help keep the wiring of the worm's nervous system tangle free.

Scientists have spent decades teasing apart the complex signals that guide axons—the long extensions that allow neurons to communicate with distant cells—to their correct destinations and help them make the right connections. But the discovery of a separate, later-acting maintenance mechanism is "really quite surprising," says neuroscientist Joseph Culotti of the Samuel Lunenfeld Research Institute at Mount Sinai Hospital in Toronto. Developmental neuroscientist Barry Dickson of the Institute of Molecular Pathology in Vienna says the find makes sense. "You don't just have to make sure you wire up the nervous system properly in the first place, but you also have to make sure that the wires don't get tangled up as the animal grows and moves about," he notes.

Hobert and Aurelio of Columbia University and Hall of the Albert Einstein College of Medicine, both in New York City, did not set out to look for the worm's maintenance molecules. Rather, they were examining the expression patterns of unknown genes in the so-called immunoglobulin superfamily, several members of which are known for their roles in neural development. Six genes stood out in the screen. They appeared on the scene later than others—in the larvae and the adult, after the upheaval of embryonic development is complete. "They're expressed after all the excitement is over," Hobert says.

The genes, which the team dubbed the *zig* genes, are expressed in a neuron called PVT in the larval worm's ventral nerve cord. This neuron plays a central role in the nervous system's development. It has an axon that is among the first to blaze a trail through the developing worm. The axon extends the entire length of the worm's body and secretes proteins that help guide other axons to the correct place in the growing nervous system. But most developmental biologists assumed that the neuron's guidance tasks were complete once the worm reached the larval stage.

The timing of the appearance of these newfound guidance-like molecules prompted the team to question that assumption. Aurelio used a laser to kill PVT neurons in early-larval-stage worms. When he examined the animals' nervous systems 2 days after surgery, he found that in nearly a third of the treated worms, axons had wandered across the worm's midline to the wrong side of the nerve cord.

To check whether the *zig* genes keep axons in place, the team examined a strain of worms that lacks *zig-4*. In those worms, the team found, development is normal during the embryonic stage, but once the worm develops into a larva, a subset of axons wanders across the midline—resembling the aberrant axons in the surgically treated worms.

It seems the molecular restraints of the ZIG proteins might be crucial during the early larval stage, when the worms' movements might jostle the still-fragile alignment of axons: When the scientists placed larval worms lacking PVT on a substance that paralyzes them, they observed no wayward axons. Hobert isn't sure what *zig* genes do in the adult worm, but he suspects that they keep axons in place in other parts of the body.

Dickson predicts that similar maintenance molecules will turn up in other animals—perhaps even in humans. "It could be that this only applies to a few axons in the worm nerve cord that are in particular danger of being jostled about as the worm writhes along," he says. "But you can bet it is going to be a lot more general than that. If keeping the wires neat and tidy matters for a worm, it's going to matter for higher animals, too."

–GRETCHEN VOGEL

CREDIT: (TO TO BOTTOM) LESLIE E. KOSSOFF/AP; RICK KOZAK

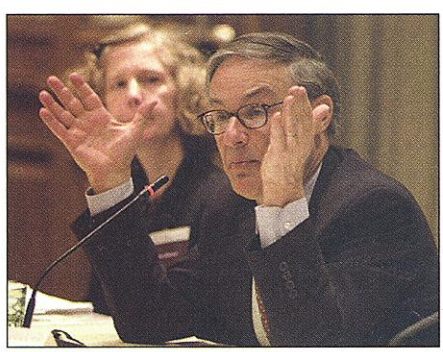
HUMAN CLONING

Report Backs Ban; Ethics Panel Debuts

Cloning and stem cells are once again on the nation's front burner after a 4-month hiatus in the aftermath of 11 September. Last week the National Academy of Sciences (NAS) released a report* calling for a legal ban on human reproductive cloning, and the president's new Council on Bioethics held its first meeting.

The academy panel, led by adult stem cell researcher Irving Weissman of Stanford University, confined itself to scientific and medical issues raised by reproductive cloning. It concluded that the high rate of abnormalities and other problems with animals cloned since Dolly the sheep was in 1997 indicate that such an effort in humans

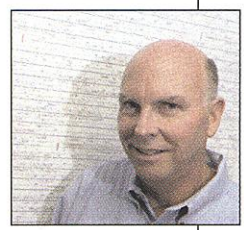
* *Scientific and Medical Aspects of Human Reproductive Cloning*, National Academies (www.nap.edu/catalog/10285.html)



Ethical choices. Chair Leon Kass holds forth at the council's first meeting.

ScienceScope

Overboard Scientist-entrepreneur J. Craig Venter (below) made another big splash this week: He abruptly quit Celera Genomics in Rockville, Maryland, the company he created less than 4 years ago with a goal of sequencing the human genome. The parent firm, Applera Corp. of Norwalk, Connecticut, issued a terse note on 22 January saying that Venter had "stepped down as president" but would "continue his affiliation" as chair of Celera's scientific advisory board. He will have no management authority, however. One visitor to Celera's corporate suite reports that Venter's photos and memorabilia have already been removed. Celera's stock dropped about 6% on the day of the announcement.



Venter could not be reached for comment. But an Applera release says that Venter intends "to spend more time fulfilling my role as Chairman of the Board of the Institute for Genomic Research (TIGR)," a nonprofit research center in Rockville founded by Venter in 1992. TIGR's president, Claire Fraser, is Venter's wife.

Applera chief executive Tony White explained in a telephone interview that Venter and other company officials concluded "just within the last week" that it was time for Venter to leave. "For several months," White explained, "we've been wrestling with the problem" of how Celera could become a "really serious drug discovery and development company." There was no falling-out with Venter, White adds: "I'm not saying I couldn't work with Craig. We made a strategic decision to pursue a business strategy, and implicit in that decision is that you've got to have the right kind of people in charge."

White says that heated discussions within Celera about the release of the company's mouse genome data had "nothing to do with" Venter's departure. There was "a discussion between Craig and a few members of our board of directors," White said, and the board approved the release.

Venter's departure marks the end of a contentious and highly competitive era in human genome sequencing, in which Venter confounded his critics by producing a draft in record time. But his departure may be a sign that the sun is setting on the reign of the gene kings.