also mean higher expenses for some research facilities. And some scientists see the pending legal battle as simply the latest tactic in a long campaign by activists to eliminate the use of all animals in research. But observers on both sides of the dispute agree that the lawsuit—announced Tuesday at a Washington, D.C., forum on the issue organized by the National Academy of Sciences*—represents the most serious legal challenge ever to the 27-year-old rules.

The controversy centers on a clause in the Animal Welfare Act (AWA), the nation's flagship animal protection law, which directs the Secretary of Agriculture to define as animals any "warm-blooded animal as the Secretary may determine is being used, or is intended for use, for research." Although the law specifically includes dogs, monkeys, hamsters, and other animals in the definition—and specifically excludes farm animals—it is silent on the status of rats, mice, and birds bred for research. In 1972, USDA declared the three creatures nonanimals. That definition exempted researchers from a host of AWA regulations, including annual facility inspections and the need to consider alternatives when designing experiments.

Over the last decade, however, animal rights activists have stepped up efforts to change the department's interpretation of the act. In 1994, the Washington-based Humane Society of the United States and the Petaluma, California–based Animal Legal Defense Fund (ALDF) won a federal court ruling that USDA's exclusion was legally "strained and unlikely." But that ruling was thrown out by an appeals court because the groups couldn't demonstrate that their members have been directly harmed by the regulations. This time, however, even some USDA officials concede that the plaintiffs are likely to vault over that hurdle because several have a financial stake in USDA's definition. The list includes a Pennsylvania group that funds the development of nonanimal research methods and the president of InVitro International, an Irvine, California, company that sells nonanimal lab tests.

Last April, the same parties had petitioned the USDA to change its animal definition. On 28 January, the agency signaled it was taking the request seriously by publishing the petition, along with its own comments, in the *Federal Register* (www.access.gpo.gov/su_docs/fedreg/a990128c.html) and requesting public comments by 29 March. But the next day the petitioners decided to sue. The move, says attorney Andrew Kimbrell of the Washington-based International Center for Technology Assessment, who is preparing the suit with the ALDF, was based on USDA's comments, which Kimbrell believes suggested that the agency was preparing to reject the petition. "They first need to acknowledge that they have this obligation—then we can discuss solving some of their funding problems," he says.

News of the suit surprised USDA officials. "It is unfair to suggest that we have already decided what we are going to do," says W. Ron DeHaven, deputy administrator for animal care with USDA's Animal and Plant Health Inspection Service. However, a 1990 study concluded that USDA would have to carve out an estimated $3.5 million from its $9 million enforcement budget to handle the additional oversight. DeHaven says the cost to researchers is unknown at this time.

Some scientists are worried that any change in the definition could doom animal use in smaller labs, particularly those involved in undergraduate education, by requiring costly new facilities. And they note that publicly funded biomedical scientists must already consider substitutes under guidelines issued by the Public Health Service. The coalition's "objective is to eliminate the use of animals in research; [the alternatives argument] is a pigtail," says L. Gabriel Navar, a physiologist at Tulane University in New Orleans, Louisiana, and president of the American Physiological Society.

Kimbrell disagrees and says researchers would be better off joining animal activists to seek the necessary resources for broader regulation. The sooner USDA "starts obeying the law," he argues, the sooner animal rights lobbyists can fight for the money USDA will need to regulate its newfound wards.

–DAVID MALAKOFF

* Regulation of the Care and Use of Rats, Mice, and Birds (2 February 1999).

PHYSICS

First Light for a Gamma Ray Flashbulb

The first laser had hardly beamed its world-changing needle of red light in 1961 when theorists began realizing just how far this new technology could conceivably go. One way was upward through the spectrum, from visible light to the higher energy ultraviolet and x-ray ranges and even into the territory of gamma radiation—the ultimate "light," energetic enough to blow missiles out of the sky or simulate conditions near stars.

More easily dreamed than done. But for nearly 40 years, a small research community has set its course toward that goal. And in the 25 January *Physical Review Letters*, a team of a dozen researchers from five different countries has moved a step closer by showing that a form of hafnium-178 extracted from accelerator waste can release energy stored in its nuclei as a blast of gamma photons, at energies more than 1.3 million times those of the red photons of the world's first laser.

The gamma rays that emerged from the

ScienceScope

Pluto Plea Leave Pluto alone! That's the message astronomers all over the world are sending the International Astronomical Union (IAU). A recent discussion about whether Pluto should be cataloged as the 10,000th entry in the list of minor bodies in the solar system rather than the ninth planet (*Science*, 8 January, p. 157) has alarmed planetary researchers, who worry that the public would see the move as a demotion for Pluto.

The Committee of the Division for Planetary Sciences (DPS) of the American Astronomical Society joined the chorus last week in a statement forwarded to the IAU, arguing that there is no compelling reason for the celestial body's declassification. "For now at least, nothing should be done," says DPS chair Don Yeomans of NASA's Jet Propulsion Laboratory in Pasadena. Most solar system researchers agree, says Alan Stern of the Southwest Research Institute in Boulder, Colorado. Although Pluto is by strict definition a trans-Neptunian object, dozens of which have been found in the past decade, Stern sees no reason why it can't be called a planet, too.

The IAU isn't about to make a decision anytime soon. But it now knows how strongly some people feel about the subject. Says Yeomans: "There are nine planets, period."

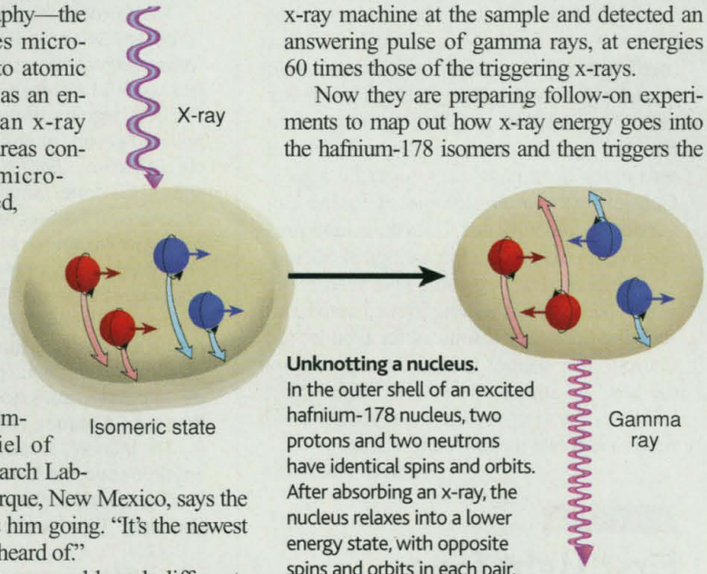
Going Megaglobal Delegates to the Megascience Forum, a 6-year experiment in stimulating international cooperation among science policy–makers sponsored by the Paris-based Organization for Economic Cooperation and Development (OECD), have recommended extending the forum's shelf life past its expiration date. At their final meeting last week, delegates offered to reincarnate themselves as a Global Science Forum that would add a new voice to perennial debates over issues such as climate change, land use, and food production. OECD ministers will consider the proposal in June.

The forum gathers research officials and top scientists into working groups on international scientific issues; its successes include sounding an early alarm about the dangers posed by commercial encroachment into bandwidths of interest to radioastronomers and a pending proposal to set up a global biodiversity information facility.

CREDIT: DAVID HARDY/PHOTO RESEARCHERS

thin, crusty, plastic-encased film of hafnium were not coherent—their waves were not synchronized, which is a hallmark of a true laser. "This is more like a gamma ray flashbulb," remarks laser expert Paul Kepple of the Naval Research Laboratory in Washington, D.C. But he and physicist Carl Collins of the Center for Quantum Electronics at the University of Texas, Dallas, the group's leader, think that if researchers can unravel and control the complicated movement of energy within the nuclei, they could be on their way to the ultimate laser. Says Kepple: "Who knows where it is going to go?"

Even if it falls short of a laser, the phenomenon the researchers have observed, called induced gamma emission, could find plenty of uses. A tabletop gamma machine, with its supershort wavelengths, could push photolithography—the process that traces microcircuit patterns—to atomic dimensions, serve as an energy source for an x-ray laser, or sterilize areas contaminated by microorganisms released, for example, by terrorists. Says Collins: "You could set off something the size of a match head" to do the job. But team member Paul McDaniel of the Air Force Research Laboratory in Albuquerque, New Mexico, says the science is what has him going. "It's the newest physics that I have heard of."



Unknotting a nucleus. In the outer shell of an excited hafnium-178 nucleus, two protons and two neutrons have identical spins and orbits. After absorbing an x-ray, the nucleus relaxes into a lower energy state, with opposite spins and orbits in each pair, and emits a gamma photon.

A gamma ray laser would work differently from existing laser types, which all pump electrons in some gaseous, liquid, or solid lasing medium to an excited state and then stimulate them to emit radiation coherently as they relax to their ground state en masse. The only way to get atoms to emit gamma-caliber photons is to achieve the same trick with their *nuclei*, pumping a large population of them into deformed, excited states called isomers and getting them to relax to their normal shapes all at once.

With most nuclei, the gamma-emitting isomers give off their energy too quickly for a large population to develop, no matter how fast more energy is pumped in. But isomers of some isotopes are much longer lived. Collins and colleagues had first managed to coax gamma emission from tantalum-180, a naturally occurring isotope with a proportion of its nuclei fixed in an excited isomeric state. A blast of x-rays triggered the tantalum-180 nuclei to relax into their ground-state arrangement and emit their stored energy.

The photons that emerged from the tantalum had about the same energy as the triggering x-ray photons, but an accelerator-produced isomer of hafnium-178 can emit gamma photons many times more energetic. The isomer normally leaks its energy over a half-life of 31 years. But calculations by Collins's team had shown that ordinary x-rays could discharge that pent-up energy, by triggering the complex nuclear rearrangements needed for the nuclei to relax to their ground states.

Two years ago French researchers reported that they had succeeded in triggering the hafnium-178 emission. They have not provided further details, however, and some researchers are skeptical. Now Collins and his colleagues have tested their own sample of hafnium-178, a waste product of the production of radioisotopes for medicine. Working in Dallas, the researchers aimed a dentist's x-ray machine at the sample and detected an answering pulse of gamma rays, at energies 60 times those of the triggering x-rays.

Now they are preparing follow-on experiments to map out how x-ray energy goes into the hafnium-178 isomers and then triggers the excited nuclei to relax. Collins says it could be just the beginning of a new research area some are calling quantum nucleonics, marked by precise manipulation of nuclear structure. Not to mention a step toward the ultimate laser beam.

—IVAN AMATO

Ivan Amato is a science reporter for National Public Radio and the author of *Stuff*.

CELL BIOLOGY

Trigger for Centrosome Replication Found

At the turn of the century, a European biologist named Theodor Boveri suggested that a small body near the cell nucleus might be a key to cancer. Called the centrosome, it replicates before cell division and then, via the protein cables that radiate from it, helps pull the duplicated chromosomes apart into the daughter cells. Boveri proposed that errors in this process could derange cells. Over the following decades, however, his idea got lost, as researchers concentrated on understanding the specific gene malfunctions that lead to cancer. New findings, some of which are described in this issue, may now help revive interest in Boveri's notion.

On page 851, Greenfield Sluder and his colleagues at the University of Massachusetts Medical School in Worcester report that they have identified a trigger that helps tell the dividing cell to copy its centrosome. It's a new role for a familiar character: an enzyme called Cdk2, already known to help drive cells through the division cycle when activated by another protein, known as cyclin E. Later this month, another team, led by cell biologist Tim Stearns of Stanford University, will publish similar findings in the *Proceedings of the National Academy of Sciences*. "It's a key discovery," says William Brinkley, a cell biologist at Baylor College of Medicine in Houston. "The biochemistry of how centrosomes replicate is beginning to come into view."

By helping explain how the cell cycle and centrosome replication are linked so that the centrosome is copied just once and at just the right time, the finding may help researchers figure out how the replication might go awry, with potentially disastrous consequences. Because "the balance in the genome is maintained through the [centrosomal] machinery," as Robert Palazzo, a cell biologist at the University of Kansas, Lawrence, puts it, a centrosome that replicates too often, or fails to replicate at all, can leave the daughter cells with abnormal chromosomal compositions. They might lose a tumor suppressor gene, for example, or acquire extra copies of growth-promoting oncogenes—conditions that predispose cells to cancer. Indeed, researchers have recently found that cancer cells, even in their earliest stages, have abnormal numbers of centrosomes.

The two teams succeeded in identifying a trigger for centrosome division because they came up with assays for studying centrosome replication outside living cells. "The ability to assay that is a significant achievement that should not be underestimated," comments Palazzo.

Both assays use extracts of frog eggs. In a test tube, the DNA and centrosomes in these extracts can still replicate just as they do in intact eggs. Normally, both activities are coordinated so that they occur at roughly the same time in the cell cycle. But Sluder's group found that a chemical inhibitor blocks DNA synthesis in the egg extracts yet somehow does not affect centrosome replication. With the cell cycle thus stalled out, the researchers could monitor how various substances affect centrosome duplication without worrying about the normal blocks to the copying that