own money—the U.S. National Academies of Sciences and Engineering and the Institute of Medicine asked more than 150 researchers to assess the nation's vulnerability to terrorist attack and to identify the technologies, research, and policy changes needed to boost defenses. A 24-member panel, led by former National Cancer Institute head Richard Klausner and science policy specialist Lewis Branscomb of Harvard University, distilled their advice into a 382-page report covering everything from safeguarding nuclear weapons and water supplies to improving air-filtration systems and chemical sensors.

There are seven ways the government can use existing technologies to enhance security, the panel concludes. They include deploying better systems for tracking and protecting nuclear and other materials—such as chlorine gas—that could be used as weapons, boosting the production of bioterror treatments, and improving communications among emergency personnel. A number of these efforts are already under way, the panel noted.

A list of areas in which research is "urgently" needed includes the development of a more resilient electric-power grid, better computerized tools for intelligence analysts and emergency officials, and new methods and standards for safeguarding and decontaminating buildings. The government also should fund more social science studies on how people respond to emergencies, says the report, and recruit "credible" spokespersons to keep the public informed.

Current efforts to coordinate counterterrorism research, the report found, are "not appropriately organized." One improvement would be a high-level research czar at the new department. Another would be the creation of a Homeland Security Institute, an independent nonprofit group that could hire specialists and carry out studies quickly. "The government needs greater access to expertise," says Klausner.

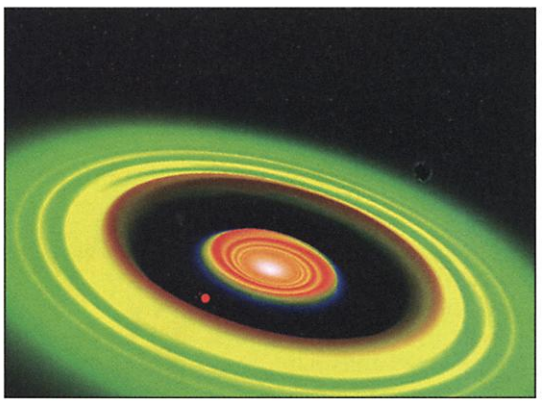
The first response to the report is likely to come from Congress, which is also getting advice from other scientists. The American Society for Microbiology, for instance, last week criticized the Administration's plan to give the proposed department authority over bioterrorism-related research and regulatory programs currently run by the National Institutes of Health and the Centers for Disease Control and Prevention. The extra layer of bureaucracy, the group says, would "create unpredictability … [and] divert monies from research." Both the White House and Congress have promised to complete work on the department before the end of the year.

–DAVID MALAKOFF

EXOPLANETS

Winking Star Unveils Planetary Birthplace

Astronomers want to know how we came to be, how a life-friendly chunk of rock came to form about our star. Lingering clues from our solar system are proving subtle and hard to read (*Science*, 31 August 2001, p. 1581). And disks of dust and gas spinning around other stars where planets might be forming today are still little more than fuzzy, unchanging patches of light in even the most powerful telescopes. But a group of astronomers has stumbled on a newborn star whose protoplanetary disk has fortuitously set up a monitor of its own innermost workings. By simply measuring the star's brightness, researchers are seeing how a protoplanetary disk works. It's the closest, most detailed look at the cauldron of planet formation anyone is ever likely to have.



Planetary pinwheel. Wave crests (red) churned by a growing body may block starlight.

CREDIT: GEOFFREY BRYDEN/JPL/NASA

As astronomers know from observing nascent stars, a star forms in the midst of a ball of dust and gas, the remainder of which can collapse into a spinning disk resembling the rings of Saturn. Planets could agglomerate in such disks, but the disks seen so far have been nearly featureless and unchanging on human time scales, with any protoplanets invisibly small. But in 1997, astronomy students led by astronomer William Herbst of Wesleyan University in Middletown, Connecticut, noticed one new star—just 3 million years old versus the sun's 4500 million years—that faded dramatically every few weeks to 4% of its normal brightness.

Something, it seemed, was periodically blocking the light of star KH 15D in the constellation Monoceros. After a recent international observing campaign organized by Herbst and graduate student Catrina Hamilton of Wesleyan, "now we're sure we can predict what it's going to do," Herbst said last week at the "Scientific Frontiers in Research on Extrasolar Planets" meeting in Washington, D.C.

ScienceScope

Statistical Victory The Supreme Court has successfully waded through another census-related statistical morass. In a 5–3 decision last week, the justices declared that the statistical technique known as "hot-deck imputation" is constitutionally acceptable in creating congressional districts. The ruling protects a mainstay method of the modern U.S. census and slaps down an effort by Utah to claim a seat that had been awarded to North Carolina.

Two years ago, Census Bureau officials announced that Utah was 900 citizens shy of getting a fourth seat as part of the decadal legislative reshuffling. Utah then sued the bureau, contending that its use of hot-deck imputation, which allows counters to fill in missing or inconsistent data, fell afoul of a 1999 Supreme Court ruling that outlawed statistical "sampling" to apportion congressional seats (*Science*, 1 February, p. 783). But a court majority found that the hot-deck method is distinct from sampling, so the census result stands.

Many statisticians say the court did the right thing. A census conducted without hot-deck imputation, they note, would require a statistical assumption, something the court was trying to avoid in the first place.

Name That Ship Canada has agreed to spend $24.5 million to turn an icebreaker into the country's first Arctic research vessel. It's one of nine infrastructure awards, totaling $130 million, announced last week by the Canada Foundation for Innovation to help the nation's scientists participate in international projects.

The retrofit of the 42-berth ship will add current meters, biological sonars, sediment traps, and a multibeam system to scan the bottom of the Arctic Ocean, allowing climate change researchers from around the world to conduct studies. One planned mission will be to assess the ecological impact of a reduction in the McKenzie Ice Shelf. Scientists would also like to rechristen the ship, now named for the famously unlucky Arctic explorer Sir John Franklin, who in 1847 led two ships and a crew of 134 on a search for a Northwest passage but disappeared. "That's why we want to change the name," laughs principal investigator Louis Fortier, an oceanographer at the University of Laval in Quebec.

Other projects include one to transform the Sudbury Neutrino Observatory in Ontario into an international lab for underground science and a beamline at the Spallation Neutron Source being built at Oak Ridge National Laboratory in Tennessee.

then they "mailed" the particle to blood vessels feeding tumors in mice.

"It is a very provocative paper, which I think will become a landmark in angiogenesis research," says antiangiogenesis pioneer Judah Folkman of Children's Hospital in Boston. Adds Philippe Leboulch, a gene therapist at Harvard Medical School in Boston: "They achieved tumor regression—and they started with tumors [that were] quite large for mice." Despite their enthusiasm, however, researchers are treading gingerly around the landmines in cancer treatment, where hopes have been raised and dashed many times.

The study, reported on page 2404 and led by vascular biologist David Cheresh of the Scripps Research Institute in La Jolla, California, draws on research in a number of fields. In the mid-1990s, Cheresh and others found signatures specific to different types of blood vessels that they used as target "zip codes." One of these, belonging to a class of membrane proteins called integrins, is apparently always present on angiogenic, or newly growing, blood vessels but rarely on established ones. The integrin, $\alpha v\beta 3$, has another quality that would turn out to be convenient: It can propel viruses or other small particles into cells.

Meanwhile, various teams had become intrigued by cascades of molecular signals that seem critical to new blood vessel growth. One molecule central to several of these cascades is known as Raf. Inhibiting the *Raf-1* gene in mice prevents blood vessels from forming and halts embryonic development. "Our goal was to identify a common theme that all angiogenic pathways must pass through," says Cheresh about this line of research. "That is *Raf-1*."

Cheresh's team, assisted by organic chemist and radiologist Mark Bednarski of Stanford University, designed a lipid-based nanoparticle that would target new blood vessels. The nanoparticle's surface is studded with molecules that bind to $\alpha v\beta 3$ and embedded with copies of a mutant form of the *Raf-1* gene that disrupts Raf's normal activity.

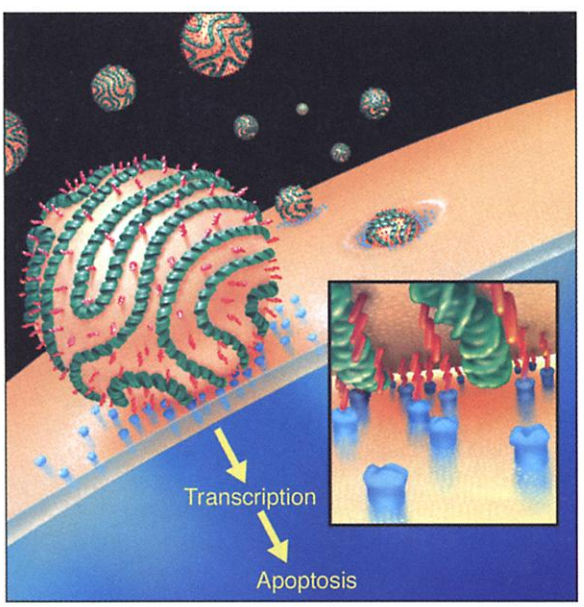
The researchers infused a dose of these particles into the tails of mice that had been injected earlier with malignant cells. A single treatment erased tumors 400 cubic millimeters in size—1/40 the size of the mouse, or the equivalent of a 2-kg tumor in an 80-kg person—in about 6 days. Animals with metastases to the lungs or liver also saw most of their tumors disappear. In contrast, mutant mice without the $\alpha v\beta 3$ beacon molecules to guide the nanoparticles died after a day or two.

Examining the tumors under a microscope, the researchers saw the expected dead blood vessel cells, which self-destructed after the Raf mutant shuttled inside them. But the team also saw evidence of concentric rings of apoptosis, or programmed cell death, among tumor cells near each dead blood vessel. This illustrated a point already known, although rarely so visible: Each blood vessel cell supports 50 to 100 tumor cells, according to Folkman, and when vessel cells die, tumor cells crumble in a ring around them.

Others agree that the work has several advantages over other antiangiogenesis approaches and experimental cancer therapies. It targets the inside of the blood vessel cell rather than its surface, as other angiogenesis inhibitors appear to do. And the mutant *Raf* genes are packaged in a nanoparticle, not a virus, as is common in cancer gene therapy studies. This means there's less chance that the body will develop antibodies to the treatment.

At the same time, "one of course has to prove it," says Leboulch. Inder Verma, a geneticist at the Salk Institute for Biological Studies in La Jolla, wonders whether the treatment does, as predicted, leave healthy cells alone. Scripps and Stanford are both applying for patents on the technology, which is currently licensed to Merck KGaA in Darmstadt, Germany, says Cheresh. In the meantime, the researchers have their fingers crossed that this cancer cure in mice won't be one of the many that, in Verma's words, "never sees the light of day"—or at least the fluorescent lights of the cancer unit.

–JENNIFER COUZIN



Bull's-eye. Nanoparticles packed with targeting molecules (red) anchor to integrins (blue) on the outside of a tumor blood vessel cell before shuttling mutant DNA (green) inside.

CREDITS: (TOP TO BOTTOM) NASA; ILLUSTRATION: C. SLAYDEN

ScienceScope

Station Plea Biologists, materials scientists, and physicists from Arizona to Japan are flocking to sign an unusual petition to NASA Administrator Sean O'Keefe. Their plea: Reverse current plans to trim the international space station's crew and scientific instruments and end what they see as discrimination against academic science.

The letter to O'Keefe (www.desc.med.vu.nl/ISS) complains that NASA is failing to capitalize on its immense investment in the station and that cuts in crew and equipment will undermine efforts to produce good orbiting research. In particular, it warns that peer-reviewed science has "become rare, routinely taking a back seat to commercial/NASA center priorities" for the limited slots available on the space shuttle.

The plea struck a chord: Within hours of being posted on the Internet last week, more than 150 scientists had signed. Organizer Millie Hughes-Fulford, a former astronaut and biologist at the Veterans Administration Medical Center in San Francisco, says the drive allows potential station users to "speak with a global, unified voice." Researchers have until 3 July to add their names.

A Second Blow More belt-tightening could be in store for the Consultative Group on International Agricultural Research (CGIAR) if Japan goes ahead with a planned cut in its contribution.

Last year Japan reduced its support to the 16 agricultural institutes by 48%, to about $15 million, as part of a deficit-shrinking 10% cut in its overall foreign aid budget, called Official Development Assistance (ODA). As an optional program, CGIAR absorbed a heavier blow than most, as Japan stepped up aid to Afghanistan and honored commitments to U.N.-related agencies. "This really does not indicate any negative evaluation of CGIAR's activities," says an official at the Ministry of Foreign Affairs.

The Finance Ministry is contemplating ing another 10% cut to ODA for fiscal year 2003, which begins next April, and the foreign affairs official says, "We will have to carefully watch what that means for the optional international organizations." The agricultural institutes last year received some $336 million from 58 member contributors.

Contributors: Charles Seife, Wayne Kondro, Andrew Lawler, Dennis Normile