supply, for example, by cutting back on feeding lard and fish meal to cattle and pigs.

Whether such steps are reasonable will depend on whether the report passes muster with skeptical outside scientists. Several who spoke with *Science* asserted that the new worker studies of cancer effects are inconclusive. Even to those who have closely watched EPA's new analysis, the 10-fold increase "is a lot more than anybody expected," says Dennis Paustenbach, a risk assessment consultant with Exponent in Menlo Park, California. "It's going to require a lot of discussion before there's widespread acceptance."

That scrutiny will come in the form of public comments, a review by an outside science panel in late July, and another review by the SAB in September. Farland is urging scientists to take a close look at the report and the new data before passing judgment: "We'll have to see what they think after they've read the document." **–JOCELYN KAISER**

CANADA

New Virtual Institutes For Biomed Research

OTTAWA—A prominent Canadian cancer researcher has taken on the job of leading a new biomedical research institution that is modeled after the U.S. National Institutes of Health—but which reflects 21st century practices and priorities.

Last week Alan Bernstein, 52, was named president of the Canadian Institutes of Health Research (CIHR). The new entity, which officially opened its doors on 7 June, replaces the Medical Research Council as the country's primary source of extramural grants for basic biomedical, clinical, population-based, and health systems research. It's been given a $39 million budget increase, to $330 million, for the fiscal year beginning in April, and the promise of $72 million more in 2001–02 (*Science*, 26 February 1999, p. 1241). But instead of presiding over a leafy campus and a massive infrastructure, Bernstein will be midwife to a national network of a dozen or so "virtual" research institutes, grouped by scientific theme, that will weave together work in each field. He must also decide the proper scope of the CIHR, working in tandem with a 19-member governing council of senior academics and health care officials also appointed last week.

A real leader. Alan Bernstein will add flesh and blood to the virtual nature of the new institutes.

"This is a great challenge and a great opportunity," says Bernstein, who this week sat down here with 40 of the country's leading scientists to gather suggestions for the council's first meeting later this month. "It's really a bold and unique vision for funding, organizing, and stimulating health research." The appointment of Bernstein, who since 1994 has been director of the Samuel Lunenfeld Research Institute at the University of Toronto's Mount Sinai Hospital, is seen by scientists as a sign of the government's commitment to basic biomedical research.

The structure of CIHR is expected to closely follow the recommendations of an interim council, which released its final report last week. The group strongly suggested forming institutes in eight areas: cell function and cancer; aboriginal and indigenous people's health; immunity and infection; musculoskeletal health and fitness; nutrition, hormones, and metabolic health; cardiovascular and respiratory health; mental health, addiction, and the brain; and health systems: care, healing, and recovery. The council debated but didn't reach a conclusion on whether to create as many as four institutes to handle work in two other areas—the social, environmental, and genetic influences on health; and human development and health throughout life. Although the final roster is up to the new council, Bernstein says that he hopes the debate doesn't steal time from getting CIHR up and running: "We have to operationalize this bold vision, not go back and start from scratch."

Each institute will be headed by a scientific director and an independent advisory board that will oversee a pot of money to support networking initiatives, training grants, workshops, and what one official calls "cutting-edge thinking." Scientists will continue to apply to the CIHR itself, which will operate a centralized review system, but they will be asked to designate the institute with which they wish to affiliate.

Still unresolved is the management of $105 million worth of health research programs administered by two existing granting councils in the natural and social sciences. Bernstein says that he doesn't favor a hostile takeover of the health components of the two granting councils, although the CIHR has already swallowed Health Canada's $40 million national health R&D program. "I want researchers now served by other agencies to feel at home in the CIHR," he says. "But I would encourage those communities to adopt CIHR as their first home, because we have the broadest mandate."

Bernstein plans to take a practical approach to resolving the issue. "My guideline is: Does this make sense? Is it the best way to organize science and get the best science done for the least amount of bucks?" The answer, he adds, should also help the country meet Prime Minister Jean Chretien's vow, in announcing the CIHR, to make Canada "the place to be in the 21st century." **–WAYNE KONDRO**

Wayne Kondro writes from Ottawa.

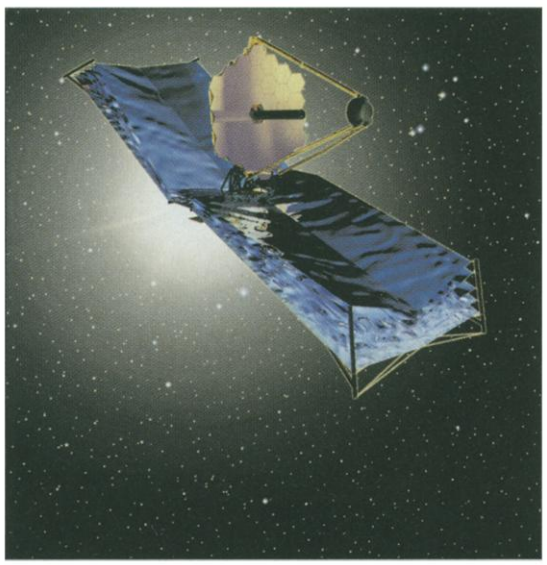
ASTRONOMY

Test Flight Added for Future Space Telescope

ROCHESTER, NEW YORK—Last month, a national panel of astronomers picked the proposed Next Generation Space Telescope (NGST) as the field's top priority during the next 10 years (*Science*, 26 May, p. 1310). Now, it appears that researchers will have to wait nearly the full decade for the Hubble Space Telescope's successor to take wing. NASA officials have decided to test NGST's demanding technology in a small-scale version, described here last week at a meeting of the American Astronomical Society, before forging ahead with the real thing. The technological delays that led to the shakedown mission will push the launch of the full telescope back another year to 2009 at the earliest.

Astronomers believe that NGST will extend their vision to the era when galaxies first formed and will expose new details of how stars and planets arise in our own galaxy. Its mirror will be about 8 meters across, more than three times as wide as Hubble's and rivaling the largest optical telescopes on Earth. Such a mirror is too big and heavy to launch in one piece, so engineers must devise a way to deploy a segmented mirror in space. Moreover, NGST will orbit around a gravitationally stable point in space about a million kilometers from Earth, beyond the reach of space-shuttle repair missions. Teams from Lockheed Martin and TRW/Ball Aerospace are developing competing plans for the telescope, and NASA will select the winning design by the end of 2001.

The contractor will then have 3 years to prepare a $200 million prototype called "Nexus," which will fly to the distant orbit



Son of Hubble. One preliminary design for the Next Generation Space Telescope, now scheduled for launch in 2009, calls for a honeycombed 8-meter mirror behind a thin shield that blocks the sun.

and mimic NGST's technology on a one-third scale. NASA added Nexus to its lineup this spring after setbacks with prototypes of the telescope's systems convinced mission planners that it was too daring to build NGST without testing its folding mirrors, solar heat shield, and other unproven technology in space. "We're not quite ready to pursue the aggressive schedule we had before," says project scientist John Mather of NASA's Goddard Space Flight Center in Greenbelt, Maryland. The costs for Nexus, Mather says, are part of the technology development budget for NGST and will not increase the telescope's $1.3 billion price tag.

Nexus will employ three small mirrors that unfold to a diameter of 2.8 meters—wider than Hubble's glass eye, but with less collecting area because the segments won't fill an entire circle. Although Nexus will be a powerful telescope in its own right, it will carry just one simple camera to verify that it can view the heavens sharply. "The goal is not science," says mission leader Richard Burg of NASA Goddard. "Nexus is an engineering pathfinder for NGST to reduce and eliminate risk."

The mirrors in particular will stretch the ingenuity of opticians. They must be exceedingly lightweight and adjustable so that the segments align precisely after they unfold, and their mechanical systems must operate at a frigid 50°C above absolute zero. Several groups at universities and optical laboratories are working on 10 possible designs. Mirrors based on beryllium, silicon carbide, and thin layers of glass each have shown promise, says optical physicist H. Philip Stahl of NASA's Marshall Space Flight Center in Huntsville, Alabama. Still, the teams have faced cracking, warping, and other hazards of pushing materials to their limits. "Progress has been slower than we hoped," Mather acknowledges.

Meanwhile, a previously scheduled test of NGST's protective shade will occur as planned in October 2001. Space shuttle astronauts will unfurl a one-third scale model of the thin shield called ISIS, for "inflatable sunshade in space." The test will reveal the stability and thermal properties of the shade, which must cool the telescope but not jiggle it. Indeed, NGST will have to point at its distant targets with an accuracy of less than a millionth of an angular degree, making a motionless shield essential.

Researchers who hope to use NGST think Nexus and the resulting delay are wise. "It's a very good decision," says astronomer Pierre Bely of the Space Telescope Science Institute in Baltimore, Maryland. "Nexus is insurance to make sure we understand the problems in going from Hubble to NGST." Outside observers are also watching with keen interest. "They've got real technical challenges," says Paul Vanden Bout, director of the National Radio Astronomy Observatory in Charlottesville, Virginia. "If they pull all that off, it's a huge step."

–ROBERT IRION

IMMUNOLOGY

A New Way to Keep Immune Cells in Check

To avoid being killed by friendly fire from the body's immune system, normal cells carry a white flag of sorts—proteins on their surfaces that mark them as "self." Until now, researchers have identified only one type of white flag: so-called class I major histocompatibility complex (MHC) proteins—also known as transplantation antigens—that are present in abundance on the surface of most healthy cells. But new findings have broken the MHC proteins' exclusive hold on the self marker business.

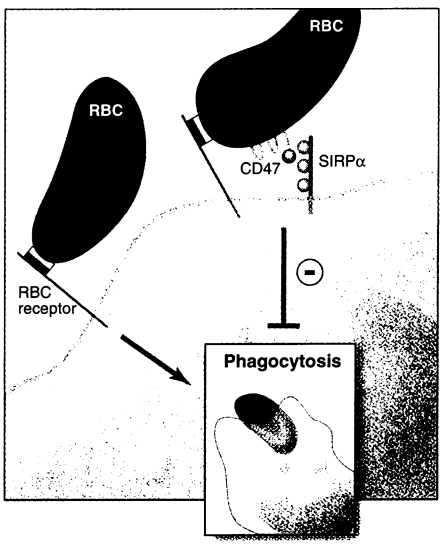
The MHC proteins deliver a peaceful "everything is fine" signal to natural killer (NK) cells, a caste of immune warriors that primarily destroys cells that have turned cancerous or have been infected by a virus and, as a result, carry abnormally low amounts of MHC molecules. Now, on page 2051, a team led by Frederik Lindberg at Washington University School of Medicine in St. Louis, Missouri, reports that macrophages, the immune system's scavenger cells, recognize a different inhibitory signal—a protein called CD47.

Lewis Lanier of the University of California, San Francisco (UCSF), says that the new findings demonstrate that "negative regulation permeates the immune system much more broadly than just NK cells." Indeed, adds Marco Colonna of the Basel Institute of Immunology in Switzerland, CD47 may only be the tip of the iceberg. "Chances are," he predicts, "that a lot more self markers will pop up in the future."

The new findings also shed light on the role of CD47, a surface protein present on basically every cell type—and long a molecule in search of a function. Lindberg and colleague Eric Brown, now at UCSF, cloned the CD47 gene in the early 1990s and then inactivated or "knocked out" the gene in mice in an effort to pin down its function. But to Lindberg's disappointment, the resulting animals were almost normal. They "didn't really give us any hint as to [the gene's] function," he recalls.

But a discovery last year did. Scientists found that CD47 binds to SIRPα, a protein present in high concentrations on many white blood cells. SIRPα's structure suggests that it might be an inhibitory receptor similar to the ones on NK cells that bind MHC proteins, so Lindberg and his colleagues decided to find out if CD47 binding to SIRPα might also lead to immune cell inhibition.

To test this, the researchers used red blood cells (RBCs) on which CD47, but not class I MHC proteins, normally abound. When they transfused fluorescently labeled normal RBCs into either their CD47 knockouts or normal mice of the same strain, the cells persisted. But CD47-lacking RBCs from the knockouts were rapidly destroyed in normal mice. "After 1 day there was nothing left," says Lindberg. That indicated that



Self identifier. By binding to SIRPα, CD47 on red blood cells (RBCs) can prevent phagocytosis by macrophages.

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