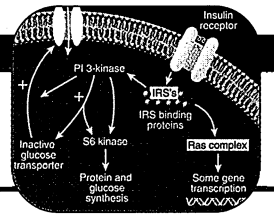


known as the Six Cities Study, on long-term deaths and PM levels in cities.

Still, NMMAPS raises as many questions as it answers. "The issue now is, why is there this heterogeneity across the country?" says Sverre Vedal, a toxicologist at the University of British Columbia. One possibility is that PM in the Northeast contains more sulfate than in the West, due to coal-burning power plants. Figuring out which components of PM—sulfates, metals, acids, or ultrafine particles—inflict harm, and how they do so, is critical for determining what sources EPA should regulate. Lab researchers are now attacking those issues with "a huge wave of mechanistic work," notes Samet, who expects some answers soon. **–JOCELYN KAISER**

ASTROBIOLOGY

Ames's Proposal for Lab Triggers Battle at NASA

Just east of California's sprawling Silicon Valley sits Moffett Field, home to NASA's Ames Research Center. The 800-hectare former Navy base also includes an airfield, abandoned wind tunnels, and plenty of open space, the last a rare and valuable commodity in this booming region. Ames officials would like to trade the use of part of that land for a new building largely dedicated to NASA's nascent astrobiology program, the core of which is a 2-year-old virtual institute based at Ames (*Science*, 20 March 1998, p. 1840). Although some scientists applaud the idea, stiff opposition from other researchers and from officials at NASA headquarters could well sink it.

The fracas began last year, when Ames managers decided to cash in on their prime real estate and their proximity to a rich supply of intellectual capital. "We want to create a research park with university, government, and industry partners," says Bill Berry, Ames deputy director. "And we can make land available to our partners to further NASA's research agenda." Ames officials envision a 32-hectare site with a 10,000-square-meter lab, primarily dedicated to astrobiology. Built by the potential partners, it would cost NASA about $15 million to outfit and another $15 million a year to operate. NASA Administrator Dan Goldin is intrigued by the idea, which Ames officials say has attracted the attention of local companies.

It has also drawn criticism. Some researchers and officials at NASA headquarters argue that a brick-and-mortar project defeats the purpose of a virtual institute, and that a building would divert money from science. "There's no compelling reason to do this," says David Black, director of Houston's Lunar and Planetary Institute. Adds one NASA manager: "This is not an obvious slam dunk, so why do it?"

Faced with such conflicting views, NASA appointed an 11-person panel last fall to conduct an independent review of the proposed facility. Although its report is not due until September, NASA last month asked the chair, Stanford geologist Donald Lowe, for a preliminary summary to inform its planning for the 2002 budget cycle. The 10-page document, obtained by *Science*, says that the facility "represents an opportunity to establish a unique national laboratory." In particular, the panel suggested that the facility could be used to design and test astrobiological experiments; to simulate the environments of other planets, comets, or asteroids; and to provide computational capability for everything from understanding planetary formation to the self-assembly of living systems. "I think it's a pretty good idea," says panelist David Deamer, a biophysicist at the University of California, Santa Cruz. At the same time, the document warns that start-up and operating funds should not come out of the hide of other NASA science programs.

Out there. NASA's "Highway to the Stars" program depicts one focus of the astrobiology institute at Ames.

The Lowe panel's findings rattled opponents of the new lab. According to NASA sources, Anne Kinney, the NASA headquarters official who leads the parent Origins program, wanted the Astrobiology Task Force—a group of a dozen outside researchers—to consider the findings. On 9 June, just 3 days after Lowe submitted his preliminary report, the researchers discussed the document in a teleconference; the next day they submitted a letter to Kinney. In it, task force chair Charles Beichman, an astronomer at the Jet Propulsion Laboratory in Pasadena, California, opines that the three research areas outlined by the Lowe panel are not compelling enough to warrant a new facility. "We do not agree that it is necessary to establish a national laboratory," the letter states.

Task force members say it wasn't a close call. "To spend $15 million a year on this when researchers are struggling along with $50,000 grants is not a good balance," one member explains. Black also casts doubt on some of the plans themselves. The idea of creating an environmental simulation facility, for example, "is nuts. ... You can't simulate the gravity on a comet," he says.

Next week the battleground shifts to Washington, D.C., when Beichman briefs NASA's space science advisory committee. Lowe is out of the country and will not attend the meeting, although another panel member might speak on his behalf. That arrangement infuriates the lab's supporters, who feel that NASA headquarters has ears only for the critics. Last week Ames's director, Henry MacDonald, wrote to Ed Weiler, NASA space science chief, to complain about how the Lowe report has been handled.

But lab supporters may be fighting a losing battle. The head of the astrobiology institute, Nobel Prize–winning biologist Baruch Blumberg, has refused to take sides in the disagreement and did not return calls seeking comment. His silence, along with a lack of support from Weiler and the advisory committee, could doom any land-for-space deal.

–ANDREW LAWLER

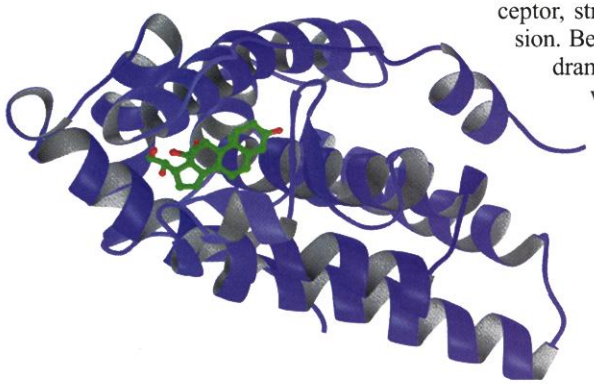
HYPERTENSION

Mutation Points to Salt Recycling Pathway

One in five Americans and Europeans has high blood pressure, a dangerous disorder whose numerous genetic causes are only beginning to be revealed. Now a team of researchers at Yale Medical School has uncovered a piece of the puzzle: a gene mutation that leads to early-onset hypertension that may point the way to causes for more common forms of high blood pressure.

CREDIT: NASA

On page 119, the Yale group reports finding a new mutation in the so-called mineralocorticoid receptor, a protein in kidney cells that is involved in the body's handling of salt. The receptor has long been thought to play a role in regulating blood pressure, but this is the first work to demonstrate how alterations in it could give rise to hypertension. In particular, the findings may explain why some women experience a sharp rise in blood pressure during pregnancy. "It's a genuine tour de force," says nephrologist Friedrich Luft of the Max Delbrück Center for Molecular Medicine in Berlin, Germany. "It uncovers new and unexpected mechanisms for hypertension" in humans, he says, that could one day lead to better treatments and new diagnostic tools for the disorder.



Pressure point. Region of mineralocorticoid receptor binding to steroid (green). A mutation in the receptor results in high blood pressure.

Moreover, the work produced a major, unexpected bonus: The researchers discovered a key mechanism that the entire class of steroid hormones—such as estrogen and thyroid hormone—appears to use to trigger the receptors they dock into. That finding could aid the design of drugs for conditions from breast cancer to congestive heart failure. "It's a beautiful example of a clinical investigation taken to a molecular level," says molecular biologist Christopher Glass of the University of California, San Diego, School of Medicine.

That investigation began about 2 years ago, when the Yale team, led by geneticist Richard Lifton, began systematically screening patients with hypertension for variants in a suite of genes they had previously linked to blood pressure abnormalities in humans. As part of that study, Lifton's group analyzed blood from a 15-year-old boy with severe hypertension that had been shipped to them by doctors at Albert Einstein College of Medicine in New York City.

The boy, the Yale team discovered, had a mutation in the mineralocorticoid receptor. When activated by the steroid hormone aldosterone, this receptor normally triggers a cascade of molecular events that cause kidney cells to absorb salt and water for release back into the blood. This can help prevent dehydration on a hot summer day, but it also raises blood pressure.

Lifton, postdoc David Geller, and their colleagues then found that this boy's mutation—a single changed DNA base pair—caused hypertension before age 20 in all the boy's relatives who had inherited it. They went on to discover why: The researchers detected activity from the mutant receptor in cultured cells—which had been engineered to glow when the receptor was activated—even in the absence of aldosterone. It appeared to be permanently stuck in the "on" position.

To their surprise, they also found that progesterone, which gums up the normal receptor, strongly stimulated the mutant version. Because progesterone levels increase dramatically during pregnancy, Lifton wondered whether the hormone would exacerbate blood pressure problems in pregnant women who have this mutation. It seemed to: Worsening hypertension had plagued all five of the pregnancies of two women carrying the mutated receptor.

Although Lifton does not think this particular mutation will turn out to be common, he says the findings suggest that the salt recycling pathway in which the mutant receptor acts could be important in hypertension. They also suggest that hormones like progesterone might in some cases overstimulate the pathway. The Yale team is now working to identify milder mutations in the mineralocorticoid receptor, and in other proteins in the pathway, that might lead to more common forms of hypertension, including some brought on by pregnancy.

To determine why progesterone triggers the mutant receptor, Lifton's group teamed up with Yale structural biologist Paul Sigler to model the mineralocorticoid receptor on a computer, based on the known structure of the progesterone receptor, a close cousin. In the model, they confirmed that aldosterone interacted with its receptor using a precisely positioned hydroxyl group, which progesterone lacks. In its tête-à-tête with the mutant receptor, however, progesterone seemed to work by bringing two of the receptor's protein helices in contact with each other. "That suggested this interaction might be key to progesterone's ability to activate the receptor," Lifton says. His team then proved that's the case by altering the receptor to prevent its helices from touching: Progesterone could no longer activate it.

The Yale group then examined the crystal

CREDITS: (LEFT TO RIGHT) D. GELLER *ET AL.*; NRC

ScienceScope

Research Rescue After years of neglect, the Canadian government is giving the National Research Council (NRC) $75 million worth of attention as part of a $475 million helping hand to the country's beleaguered Atlantic provinces.

The NRC funding will go toward a new NRC Institute of e-Business/Connectivity in New Brunswick; an expansion of offshore oil and aquaculture engineering research at the existing NRC Institute of Marine Dynamics (right) in Newfoundland; and magnetic resonance imaging research at a new brain repair center at Dalhousie University in Halifax, Nova Scotia.

"It's a good start ... and it will, I hope, remove some of the doom and gloom we had earlier in the year," says NRC president Arthur Carty. "If we can make this work, the government should jump at the opportunity to help us do it elsewhere."

The Atlantic development strategy also includes $205 million for universities and research institutes to meet matching requirements under the federal research infrastructure and research chairs programs.

Rays of Hope French physicists may soon have their most fervent wish granted. *Science* has learned that Research Minister Roger-Gérard Schwartzenberg is expected to announce shortly that France will build a new, third-generation synchrotron radiation facility either in the Paris suburbs or in Lille to the north. The facility would replace one that the previous government cancelled more than a year ago when it decided to throw in with the British on a new synchrotron near Oxford (*Science*, 17 March, p. 1899).

Ironically, British officials are expected to be on the dais with Schwartzenberg, who took office in March, to announce their intention to share the cost of the $200 million, 2.5-GeV machine. Spain and Belgium are also interested in becoming partners.

Although Schwartzenberg has been lobbied by regional officials from all over France, a scientist close to the French-British negotiations puts his money on Lille. "It would be a lot easier for [the British] to get to," he says.

In the Slammer Jacques Crozemarie, the former head of the French Association for Cancer Research, was jailed in Toulon on 1 July after losing an appeal of his 4-year sentence for dipping into the charity's coffers (*Science*, 22 October 1999, p. 655). The court said Crozemarie, 74, was a flight risk.

structures of other steroid hormone receptors. They saw interplay of the two protein helices in activated forms of every member of the family, including the estrogen and glucocorticoid receptors, suggesting that this point of contact has broad functional significance. The researchers are now trying to block this interplay in each steroid receptor to see if that does indeed prevent the receptor from being activated. If so, the insight might help researchers design drugs to block aberrant effects of any or all of these hormones. In particular, the mineralocorticoid receptor is considered a hot target for novel congestive heart failure treatments as well as new blood pressure drugs.

And if the work helps pinpoint causes for common forms of high blood pressure, it might eventually lead to earlier identification of people at risk for the disorder, enabling preventive measures to be taken. Genetic insights might also help doctors make more informed choices when prescribing from the "Chinese menu" of blood pressure drugs, Lifton says: "In the long run, we'd like to tailor our medications to the specific underlying abnormality of each patient."

–INGRID WICKELGREN

SPACE SCIENCE

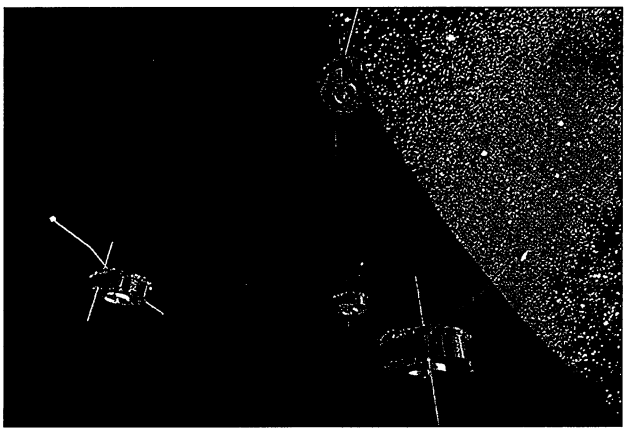
'Cluster' Prepares to Make a New Stand

Scientists who were at the Kourou space center on 4 June 1996 will never forget watching Cluster die. One moment, the mission—four identical satellites carrying 11 instruments designed to produce the first three-dimensional (3D) maps of the magnetic fields and plasmas surrounding Earth—was lofting skyward over French Guyana. Then the rocket carrying it exploded, turning one of the European Space Agency's (ESA's) most ambitious scientific projects into fireworks. "We were in shock," recalls principal investigator Nicole Cornilleau-Wehrlin of the Centre d'Étude des Environnements Terrestre et Planétaires in Vélizy, France (*Science*, 14 June 1996, p. 1579).

Dismayed scientists doubted whether ESA could muster the will, or the funds, to start over (*Science*, 28 June 1996, p. 1866). But Cluster is poised to fly again. If all goes well, four Cluster II spacecraft, built entirely from scratch, will reach orbit two at a time in mid-July and early August.

"I applaud ESA's determination to fly it again," says Cluster co-investigator Patricia Reiff of Rice University in Houston. "This is science that is not being done in any other mission before or in planning."

Credit for squeezing the Cluster II project into ESA's already tight science budget belongs to ESA's science director, Roger Bonnet, says principal investigator Donald Gurnett, a space scientist at the University of Iowa in Iowa City. "Bonnet really did a great job in convincing the European Community that they should be falling in," Gurnett says. John Ellwood, Cluster's project manager at the European Space Research and Technology Centre (ESTEC) in Noordwijk, the Netherlands, agrees. "We didn't have the money initially," he says. "It took us a year to get the mission going again."



Lofty pyramid. Cluster II satellites will orbit in tetrahedral formation to make 3D maps of Earth's magnetosphere.

To come up with 318 million euros needed for Cluster II, ESA siphoned some funds from the operations budget of the first mission, rescheduled other missions, and took advantage of improved technology. Higher capacity memory chips alone saved millions of euros, Ellwood says, by enabling the new satellites to download data to one ground station instead of two. To economize on launch costs, ESA teamed up with STARSEM, a joint venture between Arianespace and the Russian Space Agency, which will launch the quartet of Cluster II satellites on two Soyuz rockets from the Baikonur Space Center in Kazakhstan. Soyuz, the old workhorse of the Soviet Union, is considered the most reliable launcher available, with a success rate of over 98.5% in 1600 launches. At 30 million euros per launch, it is also a bargain. "Two Soyuz cost less than an Ariane 4," says Philippe Escoubet, Cluster's project scientist at ESTEC.

During their planned 2 years of operation, the satellites will fly in a tetrahedral formation—the optimal configuration for 3D imaging. Ground controllers will vary the distances among the satellites in order to observe different parts of the magnetosphere, such as the polar cusps and the magnetotail. "If we have a perfect injection into orbit by Soyuz, some fuel will be left over, and we will be able to extend the project for a third year," Escoubet says. One benefit of the delay is that the mission will be active when the sun reaches maximum activity later this year or next year.

Among scientists, expectations are high. Says principal investigator Hugo Alleyne of the University of Sheffield in the United Kingdom: "In terms of understanding the solar wind, magnetospheric boundaries, and interactions, it will be a quantum jump."

–ALEXANDER HELLEMANS

Alexander Hellemans writes from Naples, Italy.

PLANT SCIENCE

New European Group Lobbies for Support

COPENHAGEN—Reeling from budget cuts and public doubts about genetically modified foods, European plant scientists are mounting an ambitious effort to persuade European Union (E.U.) officials to plow more money into their field. But their blueprint for change, intended to prevent them from falling farther behind their global counterparts, has so far failed to win any promises from E.U. commissioner and science chief Phillippe Busquin.

The plan was drawn up by the fledgling European Plant Science Organization (EPSO), an independent body that represents 30 leading labs from 20 European countries. The group was set up in February, and last month it presented Busquin with the 10-year plan. "There is an acute need to organize the research effort and to increase funding for plant science if Europe wants to stay competitive in this field," says the group's chair, plant geneticist Marc Zabeau of the University of Ghent in Belgium.

EPSO's top priorities include boosting funding for basic plant science and co-

Speaking up. Belgium's Marc Zabeau says European plant science is imperiled by funding cuts.

CREDIT: (TOP) ESA