York. The search for a science chief is still on, he says, adding that his goal is to build a team with complementary skills.

Marburger adamantly rejects speculation by some analysts that the White House dictated the changes at OSTP. "I was under no pressure to do this," he says. "It was not suggested by anyone in the Administration."

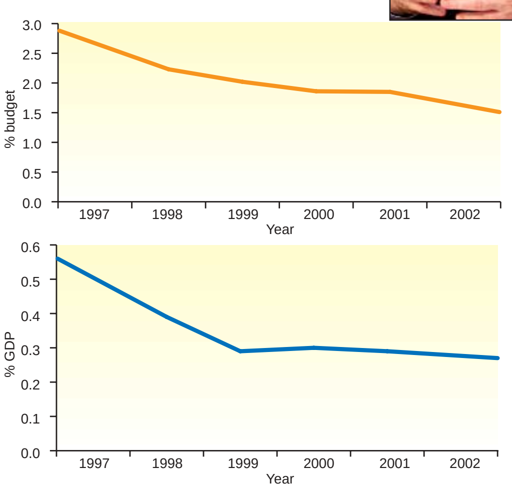
–ANDREW LAWLER

FORMER SOVIET UNION

Cautious Optimism, But Progress Is Slow

LONDON—When he learned a few years ago that a molecular biology lab run by GlaxoSmithKline was due to close, Ivan Gout of the Ludwig Institute for Cancer Research in London made sure none of its equipment ended up on the scrap heap. Instead, with crucial support from Peter Campbell of the Federation of European Biomedical Societies, he shipped the surplus equiptment—along with DNA and protein sequencers donated by the Ludwig—to the Institute of Molecular Biology and Genetics in Kyiv, Ukraine. This high-tech bonanza helped persuade a colleague in the United States, Valery Filonenko, to return to run the newly outfitted lab as a joint project with the Ludwig. "There are so many people who would go back to Ukraine if they could have even 10% of the capability of U.S. labs," says Gout. "We have to build on the idea that scientists need to repatriate."

A short time ago, that idea would have been unthinkable. The dissolution of the Soviet Union in 1991 spurred a mass exodus of scientists, some fleeing persecution, others fleeing subsistence salaries, aging equipment, and poorly stocked libraries. Russian science "suffered the most precipitous decline in financial support known in modern history," according to Loren Graham, a historian of Russian science at the Massachusetts Institute of Technology. That prompted some observers to augur the death of Russian science, but "we now know that these predictions were false," says Graham.



Ever more anemic. Ilya Klebanov now has sole control over science, but R&D funds are dwindling.

Indeed, at a meeting here last week on international support for Russian and Ukrainian science, there was cautious optimism about the future. Graham and Irina Dezhina of the Institute for the Economy in Transition in Moscow pointed out that after years of short-changing researchers, the Russian government fully paid institute budgets and salaries in 2000 and 2001, while graduate student enrollment in the natural sciences rose during the turbulent '90s. And the ranks of scientific staff in Russia have stabilized at roughly 500,000, about a third of the total 20 years ago.

Some of the credit for saving science in Russia and other former Soviet states must go to "perhaps the largest program of scientific assistance the world has ever seen," says Gloria Duffy, board chair for the U.S. Civilian Research and Development Foundation (CRDF). In the past decade, the International Science Foundation launched by financier George Soros, the CRDF, the European Union's International Association for Cooperation with Scientists from the former Soviet Union program, and scores of other players ploughed more than $3 billion into research in the region.

But recent developments could still undermine the optimism voiced in London. For example, at its annual meeting next month, the Russian Academy of Sciences (RAS) is expected to reelect Yuri Osipov to a third 5-year term as president, suggesting that there will be no change in its policy of keeping all its 325-odd institutes running, whatever the cost. "The hopes of the more radical reformers have turned out to be unrealistic," says Graham. Putting the RAS's glacial pace of change in vivid relief are the rapid strides by the Chinese Academy of Sciences to cull deadwood and embrace peer review. "China is going ahead from a very low level at great speed," says Sir Brian Heap, Foreign Secretary of the Royal Society, which hosted the London meeting with the Virginia-based CRDF. "Looking at Russia, there's just no comparison at the moment."

And the attitude of the Russian government toward science continues to be capricious. Earlier this month, the government abruptly dissolved the post of science minister, leaving vice premier Ilya Klebanov in complete control of federal science policy. He's expected to continue a year-long tilt toward applied research. "The government wants science to provide not only new knowledge, but knowledge useful to industry," explains Mikhail Alfimov, director of the Russian Foundation for Basic Research. The challenge is to build up high-tech industry on anemic government support for R&D (see chart). "The most important enemy of science in our country is the Ministry of Finance," says physics Nobel Prize–winner Zhores Alferov, director of the Ioffe Physico-Technical Institute in St. Petersburg.

Lack of funding to replace and upgrade aging equipment continues to be a serious problem. "Everything we have—telescopes and other large equipment—was constructed during the Soviet period," says Yaroslav Yatskiv, director of Ukraine's Main Astronomical Observatory. And the Western system of competitive grants and peer review has been slow to take root. Peer review "has been adopted to a very limited degree," says Heap. There is, however, at least a glimmer of hope that the RAS may be warming to peer review: A new academy program allots a sliver of its budget to competitive projects in 11 priority areas.

All that suggests that reversing the brain drain of the past decade is still an unlikely prospect. Western agencies say they would rather build infrastructure than fund repatriation grants, banking on the hope that well-equipped labs will lure homesick talent. Sharing that sentiment is the Ukrainian government, which is considering setting up a fund for supporting top-gun expats. That's one indication, at least, that the worst is over. "The time for bailing out science in Russia and Ukraine has ended," says CRDF president Gerson Sher. But the long rebuilding process has only just begun.

–RICHARD STONE

ASTROPHYSICS

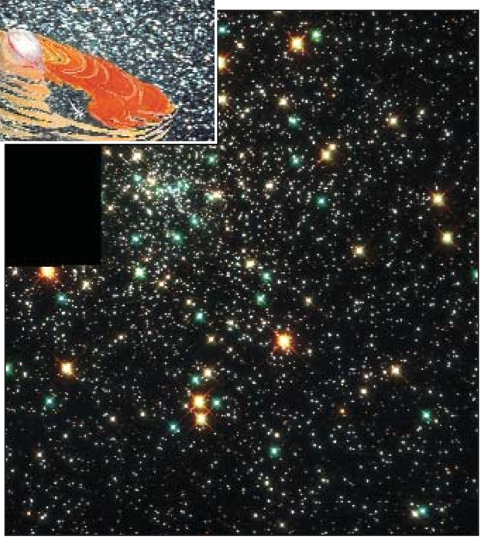
Pulsar Pulls Mass From Distorted Companion

The astrophysical zoo contains a dizzying variety of pulsars, spinning neutron stars that flash radio beams across the galaxy. Among the rarest of these dense stellar corpses are the "millisecond pulsars," which can whirl hundreds of times per second. Now, astronomers may have spied one of these exotic beasts at a critical point in its development: It's locked in a dance with a bloated star that may have just finished revving up the pulsar to a breakneck pace.

Data from an Australian radio telescope

CREDITS: (LEFT TO RIGHT) SOURCE: RUSSIAN FEDERAL MINISTRY OF EDUCATION; MAXIM MARMUR/AP PHOTO and images from the Hubble Space Telescope (HST) suggest that the pulsar, called PSR J1740-5340, distorts its companion so severely that gas overflows the star's gravitational confines. Some of this gas may have swirled onto the neutron star in the recent cosmological past, accelerating its once-leisurely spin to 274 revolutions per second. "If that's true, it would be extraordinary," says astrophysicist Deepto Chakrabarty of the Massachusetts Institute of Technology in Cambridge.

The millisecond pulsar is one of a dozen unveiled within the last year by a sensitive new survey at the Parkes radio telescope in New South Wales, Australia. Radio astronomers are hunting for the faint radio blips of millisecond pulsars from swarms of stars called globular clusters. The clusters are nurseries for exotic pulsar systems because the tightly packed stars interact, often forming close binary pairs. Such pairs give birth to all millisecond pulsars, astrophysicists believe, as gas from one star spirals into the deep gravitational pit of the neutron star and spins it up until some unknown trigger switches on the powerful, coherent radio beacons characteristic of a pulsar. Their spins are so rapid and stable that the pulsars can shine for billions of years. However, astrophysicists have never gotten close to seeing this theorized process happen.



Binary blip. Pulsar in globular cluster NGC 6397 appears to pull gas from a distended stellar partner.

CREDITS: (LEFT TO RIGHT) BOLOGNA ASTRONOMICAL OBSERVATORY; F. SEPINSKY *ET AL.*/VILLANOVA UNIVERSITY/NASA; PALLAVA BAGLA

In a pair of papers in the 1 November issue of *Astrophysical Journal Letters*, an international team reports that PSR J1740-5340 may offer that chance. Radio astronomer Nichi D'Amico of the Bologna Astronomical Observatory and his colleagues analyzed the pulsar's radio signature and found that it disappears nearly half the time, presumably eclipsed by a thick shroud of gas from its companion. Moreover, radio signals from the rest of the pulsar's 32-hour orbit around its neighbor are sketchy, as if the pulsar never fully exits the cloud of debris. Orbital calculations suggest that the companion has about 20% the mass of our sun—big enough to be a small star in its own right. In contrast, all other eclipsing millisecond pulsars found to date circle tiny objects, such as white dwarfs.

To learn more about the companion, astronomer Francesco Ferraro, also at Bologna, led an analysis of previously obtained HST images of the pulsar's host globular cluster, NGC 6397. The team found an unusually red star close to the pulsar's radio position. The star's brightness appears to flutter in synch with the pulsar's orbit, as if the star is so physically distorted that it appears first larger, then smaller, as it rotates.

The team concludes that the star has bloated into and beyond its entire "Roche lobe," a teardrop-shaped region of space within which matter is bound to the star. "This is the first system in which both the companion overflows the Roche lobe and the millisecond pulsar is alive," says team member Andrea Possenti of Bologna. The pulsar's powerful radio waves prevent more gas from accreting onto it, Possenti notes, but enough gas streams from the companion to blot the pulsar's signal.

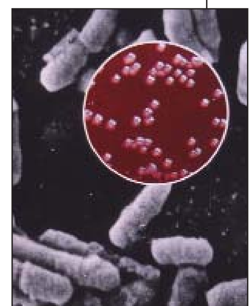
Others find the logic compelling. "They have convincingly argued that the star is filling its Roche lobe, which hasn't been seen before," says radio astronomer David Nice of Princeton University in New Jersey. However, Nice and Chakrabarty observe that more optical studies of the companion are essential to confirm its properties—and to verify that it is indeed bound to the pulsar.

Debate already is brewing about the system's origins. The Italians tilt slightly toward a scenario in which the pulsar is nearly newborn, having fed upon a whirlpool of gas from the companion that still orbits it. In that case, the gas started flowing onto the neutron star as the other star evolved and began to swell, sacrificing its outer layers to the neutron star's pull. Another idea, also put forward in the team's reports, holds that matter from a third star may have spun up the pulsar long ago in the globular cluster's crowded core. That donor star then became a dense white dwarf. Later, in a gravitational "exchange interaction," the white dwarf was ejected and replaced by an ordinary star, which is now puffed up by the pulsar's intense radiation.

Astrophysicist Steinn Sigurdsson of Pennsylvania State University, University Park, views the second scenario as more likely, because computer simulations suggest that slingshot-like encounters deep within globular clusters churn out many

ScienceScope

Revisiting a Plague India is taking a fresh look at a 1994 plague epidemic in an effort to determine the cause of the outbreak. The inquiry into the 1994 episode, which killed 56 people in Surat and surrounding areas, will address persistent rumors that it was linked to a small-scale germ warfare experiment.



The investigation was announced Monday by India's health minister, C. P. Thakur, at a New Delhi conference on biochemical terrorism. He says experts will gather later this month for a day-long review of scientific findings, including preliminary studies suggesting that the Surat plague doesn't match known natural strains. But microbiologist H. V. Batra of the Defense Research and Development Establishment in Gwalior told *Science* that more study is needed to nail down the strain's origins.

Flying Solo? Fifteen Japanese research institutes face an uncertain future in the wake of the pending privatization of their affiliated national universities.

Under the privatization scheme, government officials must reorganize facilities such as the National Astronomical Observatory (NAO) in Mitaka, the National Institute of Genetics in Mishima, and the Okazaki National Research Institutes. Options include grouping them together under a nonprofit entity like Germany's Max Planck Society, or making each one independent. The government must also decide if it will fund the institutes directly or through an intermediary body that would also review their performance.

Norio Kaifu, NAO's director-general and head of a task force pondering these issues for the institutes, says that the group hopes to present its recommendations to the government by the end of the year, in time to influence the final decision due next spring. Kaifu believes that greater independence should benefit the institutes so long as the government provides adequate cash. But he admits that "change is scary."

Contributors: Eliot Marshall, Andrew Lawler, Ben Shouse, Pallava Bagla, Dennis Normile

such pairings between neutron stars and ordinary stars. Still, he won't disregard the fascinating possibility that PSR J1740-5340 is a cosmic newborn. "It may or may not be knowable," he says. "But they've done very good detective work so far just to find it."

–ROBERT IRION

RADIO ASTRONOMY

Japan and Korea To Link Networks

TOKYO—Japan and Korea are teaming up to create an Asian network of radio telescopes that will match the capabilities of existing arrays in the United States and Europe. Last month scientists from both countries announced their first joint observations using two antennas, the forerunner of what they hope will be a string of 10 dishes operating in unison by 2005. The observations mark a scientific coming of age for Korea in very long baseline interferometry (VLBI), which combines signals from two or more radio antennas into an image equivalent to what would be captured by a single antenna spread over the entire area.

"This is really a big step forward for Korean astronomy," says Se-Hyung Cho, director of the Taeduk Radio Astronomy Observatory, one of two telescopes making the initial observations. "We hope this leads to more opportunities for our community to make important contributions."

In VLBI, the wider the spacing of the antennas, the better the resolution. The United States currently operates the 10-station U.S. Very Long Baseline Array that stretches nearly 13,000 kilometers from Hawaii to the Virgin Islands, and the 18-station European VLBI Network covers an even larger region.

The Asian array, although smaller, is expected to be ideal for investigating silicon monoxide masers, sources of coherent radiation produced when energy from an expanding star excites silicon monoxide molecules within a surrounding dust cloud. These excited molecules release powerful radio waves, just as excited molecules within a laser release coherent light waves. Silicon monoxide masers are believed to eject mass from very old stars.

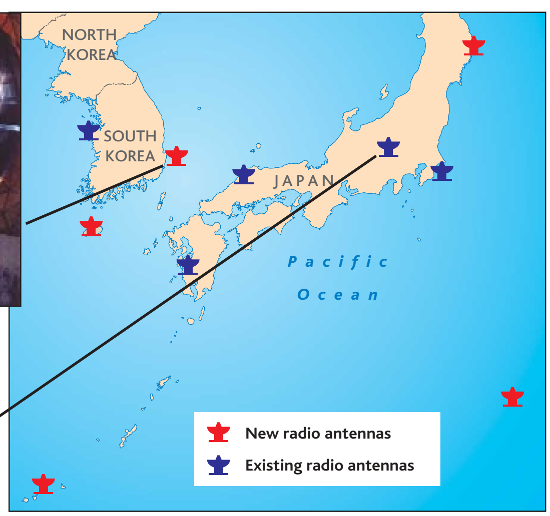
But widely spaced arrays are too powerful to image the entire maser, which are in our galaxy and, thus, relatively close. Katsunori Shibata, a radio astronomer at Japan's National Astronomical Observatory, Mitaka, compares it to training a very powerful telescope on a distant house and seeing only a section of wall instead of an outline of the entire building. "The 1000 kilometers separating Taeduk and Nobeyama is ideal for observing these masers," explains his colleague, Hideyuki Kobayashi. Scientists hope that the observations will shed light on how the masers form and what drives them.

The larger network will incorporate a new array of four, 20-meter antennas scattered throughout Japan, as well as three, 20-meter diameter radio antennas being built in Korea (see map). On its own, the $58 million Japanese array, called VERA (VLBI Exploration of Radio Astrometry) and expected to come online next year, will try to pinpoint the location of masers throughout the Milky Way. In doing so, it will also plot the movement of the galaxy's spiraling arms. The $16 million Korean VLBI Network, to be completed in 2005, hopes to study active galactic nuclei and star-forming regions as well as being part of the larger array.

The Korean and Japanese observatories will also give a boost to the Asia-Pacific Telescope, an informal framework for cooperation among radio observatories throughout the Pacific Rim. "It makes a lot of sense to build in collaborations among regional neighbors as early as possible," says David Jauncey, a radio astronomer at the Australia Telescope National Facility, Canberra, one of 21 observatories in 10 countries that belong to the consortia.

–DENNIS NORMILE

With reporting by Mark Russell in Seoul.



Asian Array. Japan and Korea will link up new and existing radio telescopes into one instrument for observing masers.

CREDITS: (TOP TO BOTTOM) TRAO; NAO

BIOMEDICAL RESEARCH

Tritium Lab to Close After Loss of NIH Funds

BERKELEY, CALIFORNIA—Long a target of local activists, a government-funded tritium labeling facility here is shutting down next month. Federal officials say the 19-year-old facility has outlived its usefulness, but supporters see it as a victim of political pressure founded on scientific ignorance.

The National Tritium Labeling Facility (NTLF) at Lawrence Berkeley National Laboratory develops reagents for biomedical researchers to label molecules with tritium, a radioactive hydrogen isotope used to trace the movements, activities, and binding sites of existing and potential drugs. Local officials have twice passed a resolution urging the government to shut it down for fear that its emissions of tritium gas and tritiated water pose a health hazard, and local Representative Barbara Lee (D–CA) has raised the issue with officials at the National Institutes of Health (NIH). But NIH officials say the facility is safe and that fiscal and scientific shortcomings, not politics, led to its decision to end funding.

"I did not consider the NTLF among our highest priorities in view of … resources needed for genomics," says Judith Vaitukaitis, director of NIH's National Center for Research Resources (NCRR), which has supported the facility since its inception. "It was never mentioned during our workshops to set priorities for biomedical technology." The NTLF also had become "too much of a service facility for industry," she adds. Figures show that it has provided a total subsidy to users of $97,000 over the last 2 years. Michael Marron, NCRR's director of biomedical technology, says that the primary reasons for closure were low publication rates, inadequate service to NIH grantees, and failure to fill a safety position.

Supporters of the center question that explanation and accuse NIH of caving in to outside pressure. They cite a 1999 NIH review laced with effusive praise that gave the center an exceptional score and say that the subsidy is a small part of a $1-million-a-year budget. "It's an extraordinary example of a bunch of extremely ill-informed and antiscience people destroying a precious scientific lab," says Elmer Grossman, a professor emeritus at the University of California, San Francisco, and chair of Berkeley's Community Environmental Advisory Commission.