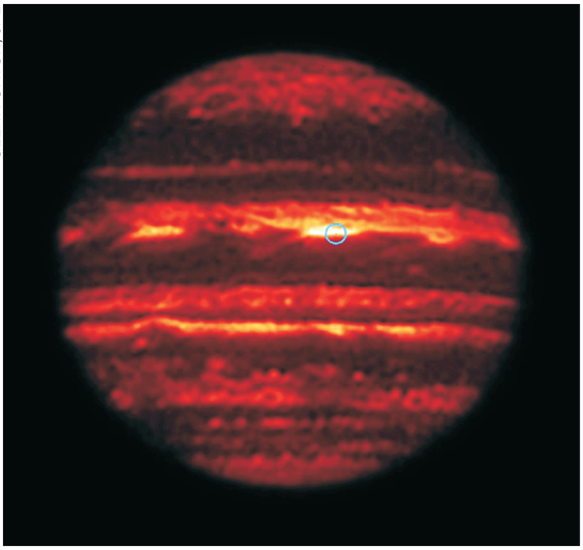

GLENN ORTON, JPL

Infrared imaging of Jupiter taken from the ground-based InfraRed Telescope Facility in 1995 revealed that NASA's Galileo probe descended into an atypical hot spot (blue circle), which radiates at 5 microns.

in the ring of small bodies orbiting the Sun beyond Neptune. "We can study comets in their nursery before they are kicked into the inner Solar System. But how can you explore the Kuiper Belt if you don't have a systematic survey of what's in it? You have to find [the objects] first, measure them, determine their orbits, and then plan missions." The LSST would do that, he adds. Another example is a probe that NASA sent to Jupiter. "It was a very good thing we had ground-based results," says the University of Arizona's Mark Sykes. "They showed that the spacecraft went into the one anomalous hot spot." By investing a very modest amount in ground-based planetary astronomy, Sykes adds, "NASA leverages a much greater return on far more expensive [space] missions."

S is for space

As it happens, NASA's Weiler says he doesn't plan to reduce support for ground-based planetary astronomy. But he's not convinced that the LSST should be a NASA project. And he's none too pleased at being told to take part in it by the Solar System exploration decadal survey. "Their charter was to provide scientific priorities. They went a step beyond that, and tried to give us implementation advice," says Weiler. If NASA pays for the LSST, he adds, "they've also got to tell me which space mission I should cut off to get that money. That's the kind of advice I'd like to get from advocates of the LSST." If he were given the money to build the LSST, would he want to? "No," he says, "I would still say NSF is the appropriate agency. The last time I checked, the *S* in NASA stood for space."

Complicating the LSST situation is PanSTARRS, a smaller project whose science goals overlap those of the LSST. PanSTARRS was awarded $40 million last fall from the US Air Force. "If we are interested in using taxpayer dollars wisely, is the LSST the best investment?" asks Weiler. For their part, LSST proponents view PanSTARRS as a warm-up exercise, though some do worry that it could throw a monkey wrench into raising money for the bigger project.

Nor does Weiler dispute that ground-based observations support space missions. But, he says, "I could probably write a proposal justifying any telescope on Earth as supporting NASA missions. I am drawing the line at direct mission support." That would include, for example, mapping out the orbit of Saturn's moon Titan or identifying guide stars to help point the Hubble Space Telescope. Historically, NASA needed to do some planetary astronomy for its missions, says Weiler. "But somehow that got translated to general curiosity-based science."

Weiler points to the so-called Augustine panel, which in 2001 advised the president against moving ground-based astronomy from NSF to NASA (see PHYSICS TODAY, November 2001, page 27). "I think that was the right decision," he says. "It's clear that NSF is the lead ground-based agency in this country, and we are the lead space-based agency in the country. There is no fuzz there."

Fuzzy support

But it is fuzzy for planetary astronomers. "If there is observational work that cannot be justified" as supporting space activities, says Sykes, "I can't think of anything. It's not like NASA is foreclosing any part of the Solar System to spacecraft investigation." The situation, adds Jewitt, "shows a senseless lack of cooperation between NASA and NSF that is working against the best interests of the US in this area of science."

For the most part, planetary astronomers are not worried about their field's immediate future. And they're all pleased by the 3% increase in NASA's research and analysis budget—which, for planetary astronomy, covers mostly individual grants. "I'm not worried right now," says Sykes. "But what I am worried about is whether NASA understands the need for doing [ground-based observing as] the necessary homework to get the most out of mission investments."

As for NSF, Wayne Van Citters, who heads the agency's astronomy division, says, "If NASA were to decrease funding for planetary astronomy, we would do our best to respond to the increased proposal pressure." But, Van Citters adds, "I doubt we could respond fully without additional funds, which could take some time to develop."

Still, for planetary astronomers, the worry about NASA's bailing out is exacerbated by the nagging fear that "no" is the answer to a key question: Would NSF really pick up the slack?

Toni Feder

New APS Ethics Guidelines Address Research Misconduct and Professional Responsibilities

Scientific fraud incidents at Lawrence Berkeley National Laboratory and Bell Labs have ended the "innocent thinking" that marked the society's earlier ethics guidelines.

Stunned by two recent high-profile cases of scientific misconduct by physicists, the American Physical Society council has adopted "updated and expanded" ethics guidelines that clarify the responsibilities of coauthors of scientific papers, urge a stronger emphasis on ethics education, and call for all research institutions to follow the Federal Policy on Research Misconduct. The new guidelines, developed by the ethics subcommittee of the APS panel on public affairs, are much more direct than the previous 1991 guidelines in addressing the issues of scientific misconduct and fraudulent research.

Development of the new guidelines was prompted by two investigations—one at Bell Labs, Lucent Technologies, and the other at Lawrence Berkeley National Laboratory—that determined two physicists, in unrelated cases, had misrepresented and fabricated data. The physicists, Victor Ninov of LBNL and Jan Hendrik Schön at Bell Labs, were dismissed for misconduct (see PHYSICS TODAY, September 2002, page 15, and November 2002, page 15).

APS President William Brinkman, a former Bell Labs executive, noted that many in the physics community "were a little innocent in our thinking in terms of fraud. We really, for a long time, assumed that that wasn't going on." Such innocence was reflected in the 1991 APS guidelines.

James Tsang, an IBM physicist who heads the public affairs panel, said the old guidelines "indicated a number of things that a physicist should do in the course of his or her professional life. You should hang on to your data, you should respond to inquiries from other scientists, and you should be responsible as a referee. But we were a membership organization and never thought we'd be in the position to enforce behavior, so we never said anything about what would happen if somebody transgressed on these norms."

The new guidelines, approved on 10 November, come in several parts. A policy statement on how to handle allegations of research misconduct defines misconduct as "fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results. . . ." Such behavior is termed an "egregious departure from the expected norms of scientific conduct" that "can lead other scientists along fruitless paths." It also "diminishes the vital trust that scientists have in each other," and undermines public confidence in science. The statement goes on to say, "It is imperative . . . that the institutions responsible for the funding and performance of scientific research, as well as the relevant professional societies, take appropriate steps to discourage such conduct and have policies and procedures in place to deal with allegations of misconduct."

Federal policy cited

The APS council cites the Federal Policy on Research Misconduct, created in December 2000, as "a cornerstone of efforts in the United States to maintain the integrity of the scientific literature." The policy, which applies to federal agencies that fund research, "defines research misconduct, delineates responsibilities of the involved organizations and provides procedural guidelines for dealing with allegations of misconduct in federally funded research," the APS statement noted.

Widespread implementation of the federal misconduct policy, a three-page document that can be found at http://www.ostp.gov/html/001207_3.html, would be "a significant advance in ensuring the proper treatment of allegations of research misconduct," the council said. Even research institutions that don't receive federal funds should develop policies consistent with the federal guidelines, the council noted.

The new APS Guidelines for Professional Conduct, described as "minimal standards of ethical behavior," are fairly straightforward and note that "physicists have an individual and collective responsibility to ensure that there is no compromise with these guidelines." Four basic areas are covered:

▶ **Research results.** Research results should be recorded and maintained in a form that allows analysis and review. The data should be immediately available to collaborators and, following publication, should be retained for a reasonable period so as to be available promptly and completely to responsible scientists. The fabrication or selective reporting of data with the intent to mislead is an "egregious departure from the expected norm."

▶ **Publication and authorship practices.** Authorship "should be limited to those who have made a significant contribution to the concept, design, execution, or interpretation of the research study." Individuals who have contributed to the study "should be acknowledged, but not identified as authors." The guideline states that "plagiarism constitutes unethical scientific behavior and is never acceptable. Proper acknowledgement of the work of others used in a research project must always be given."

▶ **Peer review.** Describing peer review as an "essential component of the scientific process," this guideline states that, "although peer review can be difficult and time-consuming, scientists have an obligation to participate in the process." Reviewers "should disclose conflicts of interest resulting from direct competitive, collaborative, or other relationships with any of the authors." The guideline also states that "privileged information or ideas that are obtained through peer review must be kept confidential and not used for competitive gain."

▶ **Conflict of interest.** Although acknowledging that "many professional activities of physicists . . . have the potential for a conflict of interest," this guideline recommends that "when objectivity and effectiveness cannot be maintained, the activity should be avoided or discontinued." The guideline also states: "It should be recognized that honest error is an integral part of the scientific enterprise. It is not unethical to be wrong, provided that errors are promptly acknowledged and corrected when they are detected."

Coauthor responsibility

One of the thorniest issues in developing the new guidelines was defining the responsibility of the coauthors on a research paper. Brinkman noted that the 1991 APS ethics guidelines and other similar guidelines don't deal with the coauthor problem very effectively. "The National Academy of Sciences guideline said authors should delineate their roles in the footnotes, but nobody ever does that," he said. Brinkman also pointed to the Deutsche Forschungsgemeinschaft (DFG), a quasi-governmental German research funding agency, whose policy statement says, "Authors of scientific publications are always jointly responsible for their content." That is not workable, Brinkman said, because scientists often contribute specific expertise to part of a project but are not involved in the detailed research.

The "great debate" the APS council had on the issue centered on an undergraduate or a junior scientist "far down the chain" in a research project, Brinkman said. A lower-level person who does a significant piece of research that contributes to a project should get listed as a coauthor, Brinkman said, "but is that person responsible for the total content of the paper? Most people's view is, of course not."

Tsang said the earlier APS guidelines had single-author papers in mind, whereas the new ones point out "that there are a number of different factors that need to be balanced in papers where there are coauthors. Every author doesn't have to have a copy of every piece of data in the paper. But it is also true that it is not a good practice where every author only knows about their own result."

Both Tsang and Brinkman said ethics issues must become more ingrained in new physicists, and the new guidelines include an education statement that says, "It is part of the responsibility of all scientists to ensure that all their students receive training which specifically addresses [professional ethics]."

"People are taking this seriously now, but I don't know if that will be the case in five years," Tsang said. "That's why we'd like to see more attention paid to the education aspect."

Jim Dawson

NRC and NAPA Endorse Federal Funding of Smithsonian Science Centers

Direct federal funding of the Smithsonian Astrophysical Observatory (SAO) and five other science research centers operated by the Smithsonian Institution should continue, according to reports from the National Research Council and the National Academy of Public Administration. The reports resulted from a request that the Office of Management and Budget included in the Bush administration's fiscal year 2003 budget proposal.

OMB officials were concerned that direct funding of the Smithsonian centers circumvented the competitive funding processes most scientists must go through and suggested that research funds going to the Smithsonian should be transferred to NSF. Research appropriations to the Smithsonian in FY 2002 totaled about $111 million.

The NRC committee on Smithsonian scientific research, chaired by Cornelius Pings, president emeritus of the Association of American Universities, made specific findings for each of the centers, but in general found that "the research programs at the Smithsonian Institution provide essential support to the museums and collections, make substantial contributions to the relevant scientific fields, and fulfill the broader Smithsonian mission to increase and diffuse knowledge."

The NAPA report focused on how efficiently the Smithsonian was running its research programs and whether Smithsonian scientists had a competitive advantage over other researchers because of direct federal funding. The NAPA report concluded that the Smithsonian "currently receives most of its funds for research projects through competitive processes" and found "no persuasive evidence that Smithsonian researchers have a consistent competitive advantage over others."

The NRC report looked directly at how federal money flows to the SAO in Cambridge, Massachusetts, and found that, of the observatory's $83.9 million research expenditures in FY 2001, $24.9 million was in the form of direct federal appropriations. Of that amount, $7 million was for "major construction of scientific instrumentation" at the Multiple Mirror Telescope in Arizona and the Submillimeter Array in Hawaii. The direct federal research grants total only about 30% of the budget because SAO receives about 59% of its total budget from federal contracts and grants, the report said, which are "obtained through competitive peer review."

The NRC report cited several significant projects that originated at SAO, including the redshift survey, which allowed the three-dimensional study of the large-scale structure of the universe; the Chandra X-ray Observatory, which is still operating; pioneering work in very-long-baseline interferometry; and the early promotion of direct gamma-ray astronomy.

"The suite of SAO accomplishments has been made possible by steady support from direct federal appropriations, and many would not have been possible if the programs had to depend on the 3-year funding cycles of such agencies as NASA and NSF. . . ." the NRC report said.

"We feel that the OMB made a mistake in its understanding of research at the Smithsonian," said Marc Davis, an astronomy and physics professor at the University of California, Berkeley, who served on the NRC committee. "It's not as though each of these [research centers] is perfection on Earth, but the notion that you could transfer their funding to the NSF was ludicrous." NRC committee chairman Pings concluded that "withdrawing federal support would likely lead to the demise of much of the institution's research. . . ."

OMB officials haven't commented on the reports, but political observers in Washington, DC, said that, as a result of the two studies, transferring the Smithsonian's research money to NSF is unlikely.

In addition to the SAO, the Smithsonian research centers include the National Museum of Natural History, National Zoological Park, Center for Materials Research and Education, Environmental Research Center—all located in the Washington, DC, area—and the Tropical Research Institute, with several facilities in Panama.

Jim Dawson

UK Science Spending on Course to Double

Ian Halliday suddenly has money to play with. The UK's Particle Physics and Astronomy Research Council (PPARC), which Halliday heads, has had a tight budget for years. But now the UK can become a real player in planning the next big particle accelerator, he says. "And we'll most likely join LIGO"—the Laser Interferometer Gravitational Wave Observatory in the US.

Halliday's newfound financial freedom is a result of the heftiest hike in the UK's science and education budget in a decade. By 2005–06, this funding will grow by £1.25 billion ($1.97 billion), the Treasury announced last summer. Of that, £350 million is tagged for university research, and £900 million will go to PPARC and the six other research councils, to swell their combined annual funding to £2.9 billion. The new money keeps science spending on course to double in the eight-year period beginning in 1997, when Tony Blair became prime minister. "The allocations are extremely good news for science," says John O'Reilly, chief executive of the Engineering and Physical Sciences Research Council (EPSRC). Details of the money's distribution were released in December.

The main physics funding agencies, PPARC and EPSRC, will get an extra £73.7 million and £105.8 million, respectively, by 2005–06, which increases their annual budgets by about 23% and 25%. Those figures include money for cross-cutting programs, such as the continuation of genomics and e-science—the linking via Internet of data and analysis within and across scientific fields—and new research focusing on stem cells (with an investment of £40 million), sustainable energy (£28 million), and rural economy and land use (£20 million). On top of the earmarked programs, the new money gives the research councils more flexibility this go-around, says Halliday. "We [at PPARC] can do what we like with about £25 million of it."

Across the sciences and engineering, PhD and postdoctoral pay will increase by £4000 or more, to an average of £13 000 and £17 000 a year, respectively. Those stipends will then be on a par with the low end of salaries in the industrial sector, says Peter Cotgreave, director of the lobby group Save British Science. The pay raises are intended to make science careers more attractive.

Grass-roots protests against de-