

University of California at San Diego, examined the quality of 82 DOE contracts, comprising 171 separately funded projects in high-energy physics—107 experimental projects and 64 in theory. Its main conclusion is that the DOE-funded program of university research in high-energy physics "continues to be of very high quality and well focused on central issues of present-day particle physics." Even so, TACUP found that corrective actions are indicated for about 15% of the projects.

**Sensitive reviews.** The TACUP study happens to be the first full-fledged post-research evaluation of scientific projects. In the past, whenever a Federal agency has sought to conduct a peer review of research in progress or recently completed, it has run into objections by scientists. Thus, when NSF, at the direction of the Senate Committee on Appropriations, employed the National Academy of Sciences a few years ago to explore ways of judging the outcomes of research, the scientists concluded that postperformance evaluation was best done in the course of peer reviews of proposals to renew research grants and should not be done in any other way. Among the many difficulties inherent in assessing ongoing research, the group wrote in its 1982 report, "The Quality of Research in Science," is that "the quality and significance of scientific work cannot always or even usually be estimated with certainty right away"—especially for so-called "off-beat" or "long-shot" projects "that do not fit accepted paradigms in the field."

Sensitive to the problem, TACUP members decided nonetheless to perform the review. It was clear that a review of 171 activities could not be done by a single group; so eight panels were appointed—five to cover experimental work and three for theoretical projects. Each panelist rated the quality of the approach and results, the competence of the principal investigator and research team and the cost-effectiveness of the effort. The panels then reviewed the findings of the members and this, in turn, was reexamined by the panoply of experimental or theoretical panels to apply a uniformity of standards and avoid significant disparities.

The good news, claims TACUP, is that given the funds available for high-energy physics, "the apportionment... to the various program elements appears to us to be reasonable. At least, we do not believe that a different distribution would predictably produce more physics.... The DOE funding policies encourage a research program which arises from the perceptions of physicists active in the field. The funding of the program components thus adjusts itself through

the 'marketplace of ideas.'"

The bad news in the field, says the report, is that many of the physicists interviewed have some doubt that the particle-physics facilities scheduled to come on line in the late 1980s can long sustain a vigorous US program. "The number of 'spigots' where front-rank experiments can be deployed has been decreasing steadily," the committee warns. With only three collider interaction regions in development—two at Fermilab's Tevatron I and the other at Stanford's SLC—more US physicists plan their experiments in Western Europe. "Many university scientists are concerned that the shrinking research opportunities foreseen in the 1990s will discourage young scientists from committing their research careers to the field," says the Ticho committee. Accordingly, the committee urges DOE to develop "frontier facilities" in the US for the 1990s, though in a letter accompanying the report Ticho observes that the committee's recommendations were adopted before DOE's HEPAP issued its report supporting R&D on a Superconducting Super Collider, which, if all goes well, could be operating by the mid-1990s.

Another concern centers on overall funding of university research in high-

energy physics, which has decreased in constant dollars since the early 1970s. In the meantime, overhead costs and the complexity of research have increased. "On the theory side, funding shortages impede the training of students and postdoctorals and restrict travel and visitor exchanges," says the TACUP report. "On the experimental side, the infrastructure at universities has deteriorated; very few universities can maintain a stable group of engineers and technicians, and much of the apparatus is no longer up to date. These trends should be reversed." Accordingly, TACUP recommends a significant increase in theory funding over the next few years as well as more funds for equipment modernization and support of R&D projects not directly tied to approved experiments by university groups.

Finally, TACUP calls for DOE to organize panels to study the needs of high-energy theory groups for advanced computers and to evaluate various approaches to a national computer network for the high-energy community. "DOE should plan at least one VAX computer (or its equivalent) per medium-size research team, plus one located at the experiment and shared by the collaborators," states the panel. —IG

## NAS studies major materials facilities

At the request of George A. Keyworth II, President Reagan's science adviser, the National Research Council of the National Academy of Sciences has formed a committee to review existing government-supported facilities available for materials research and set priorities for establishing major new centers and instruments costing more than \$5 million. Keyworth is keen on getting advice from a wide range of materials scientists ever since his proposal early last year to create a National Center for Advanced Materials at Lawrence Berkeley Laboratory received a hostile reception (PHYSICS TODAY, June, page 17). Before the uproar subsided, the Department of Energy had appointed two committees to examine the technical and programmatic aspects of NCAM and evaluate the need for an advanced light source that was intended to cover the energy range from 0.1 to 5000 eV—from infrared to soft x rays. Both committees pooh-poohed the light source, leading DOE to scale back the NCAM concept. It is now called the Center for Advanced Materials, reflecting its more modest operation.

Interestingly, the new Research Council committee has several outspoken critics of NCAM among its 22 members. Some of them raised embar-

assing questions about DOE's priorities for materials science in letters and testimony last spring to the House Science and Technology Committee, which is responsible for authorizing the department's R&D budget. One of the persistent complaints, expressed best by William Brinkman of Bell Laboratories, who is not on the Research Council study, concerned the ease of funding "big science" in Washington to the

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detriment of more productive smaller programs, often supported by the National Science Foundation. As it happened, Brinkman had been one of the first to blow the whistle on NCAM when details on the 1.3-GeV storage ring for the proposed LBL synchrotron light source came before the Research Council's Solid State Sciences Committee, which he now heads.

**Maintaining balance.** Another critic arguing forcefully for increased support of small materials laboratories is Theodore H. Geballe of Stanford, who led a panel of the Academy's Committee on Science, Engineering and Public Policy to that finding in a report issued last year. Geballe observes that materials research, because of the diversity of disciplines involved, flourishes when it is cultivated in many places. The report, prepared for Keyworth's office, says: "Choices must be made between emphasis on large national facilities versus small institutional-based research. Both are essential, but the balance must be continuously monitored. The ability to develop and bring large-scale facilities to fruition must be maintained even at the expense of phasing out or reducing the scope of still valuable facilities that are no longer competitive in producing exciting new science."

At the committee's first meeting on 20-21 January, Keyworth made it clear he did not want the members to tangle with the obviously controversial issue of big versus small materials research facilities. Instead, he expects them to concentrate on the research needs in the next five or ten years for such facilities as pulsed and steady-state neutron sources, vacuum ultraviolet and x-ray synchrotron light sources and high-voltage electron microscopes, while bearing in mind the virtues and defects of such existing facilities as the High Flux Beam Reactor at Brookhaven, which has been used for neutron-scattering applications over the past 20 years, and the Intense Pulsed Neutron Source at Argonne, used for experiments since 1981.

The study is expected to run nine or ten months, so as to be useful to DOE and NSF in preparing their budget requests for fiscal 1986—which begins 1 October 1985. During the course of the study, the committee will consider the following:

- ▶ Importance and usefulness of existing facilities for "frontier research" in materials science, atomic physics, biology, chemistry, earth sciences and medicine
- ▶ Availability of less capital-intensive alternatives for achieving comparable scientific and educational goals
- ▶ Quality of scientific leadership and skilled technical support staff at various facilities, as well as the personnel and equipment available in other de-

partments of the laboratory or university for use in materials research

▶ Access to a facility and ease of use by both academic and industrial scientists, along with the potential for training new scientists as well as producing significant research in various fields

▶ Capability of existing and proposed facilities for applied research and technology to advance the nation's economic growth and defense requirements.

The committee chairman is Frederick Seitz, former NAS president and president emeritus of Rockefeller University, and vice-chairman is Dean E. Eastman of IBM Thomas J. Watson Research Center. The other members are Richard B. Bernstein of UCLA; Robert J. Birgeneau and Mildred S. Dresselhaus of MIT; Jerome B. Cohen of Northwestern University; Harry G. Drickamer of the University of Illinois; Donald Engelman of Yale; Peter Jesson of duPont; Walter Kohn of the Institute

for Theoretical Physics at the University of California, Santa Barbara; William D. Nix of Stanford; Ed Rubenstein of the Stanford Medical Center; John J. Rush of the National Bureau of Standards; Albert I. Schindler of the Naval Research Lab; William P. Slichter of Bell Labs; Joseph V. Smith of the University of Chicago; Richard Stein of the University of Massachusetts; H. Guyford Steyer of the Universities Research Association (which operates Fermilab); and John M. White of the University of Texas at Austin.

Two members have headed DOE panels on NCAM and light sources, respectively: Peter Eisenberger of Exxon Research & Engineering and Albert Narath of Sandia. Another member, David Lynch of Iowa State University and Ames Laboratory, was chairman of a Research Council study on the status of synchrotron radiation research, published last year. —IG

## Chicago provost to be Smithsonian chief

Robert McCormick Adams, provost of the University of Chicago, was named on 22 January as the next secretary of the Smithsonian Institution, having been selected by a search committee from among 300 nominees in a process that began last May. An anthropologist and archeologist who has spent his entire academic career as student, professor, director of the Oriental Institute and provost at the University of Chicago, Adams became a serious candidate for the Smithsonian post only three weeks before he was chosen. Once his name was put forward, says William G. Bowen, president of Princeton University and head of the 18-member search committee, "Adams was the flat first choice of each of us." The vote by the Smithsonian's Board of Regents was also described as unanimous.

Upon the retirement of S. Dillon Ripley on 17 September, Adams will become the ninth secretary in the 137-year history of the Smithsonian, the world's largest complex of museums. Besides the 13 museums around the Mall in Washington, D.C., which attracted some 25 million onlookers last year, the institution operates several research facilities, including the Harvard-Smithsonian Astrophysical Observatory, Smithsonian Environmental Research Center and Woodrow Wilson International Center for Scholars. All told, the Smithsonian has a staff of 4700 and an annual budget of \$292 million in combined Federal and private funds.

Adams is described by Hanna Holborn Gray, president of the University of Chicago, as "a distinguished scholar of great range and imagination, con-

cerned with the basic questions of the humanities and sciences and interested in the public understanding of those issues." He is an authority on early agricultural and urban societies of the Near and Middle East. A council member of the National Academy of Sciences, Adams has been active in affairs of NAS and its National Research Council. Between 1978 and 1982 he was vice chairman and acting chairman of the NAS Committee on Science and Public Policy. He is married to the former Ruth Salzman Skinner, editor of *The Bulletin of the Atomic Scientists*. —IG

RIPLEY (LEFT) AND ADAMS

