bership in this field has burgeoned from 3803 to 9254 in the decade since 1979. The number of university faculty in condensed matter theory alone has increased by 100 in the past two years and reached 691 now. During this period, NSF's support of condensed matter theory has decreased in constant dollars, said Franz. "This has meant that the level of excellence required to get a proposal funded has become intolerably high," she stated, "so that prominent physicists with outstanding publication records are getting their proposals turned down." Her point was underscored by Albert Schindler, director of NSF's materials research division, who observed that the agency had funded only 25 of more than 250 proposals received this year in the exciting new field of high-T_c superconductivity.

Grad students in condensed matter theory at MIT, noted Robert Birgeneau, that school's department head, usually got the highest grades on the Graduate Record Examinations, and those in experimental condensed matter and in elementary-particle physics were tied for second. "But we can't seem to hold onto many of these high achievers," he continued. "One-third of the condensed matter experimentalists go into electrical engineering and want to wind up at Bell Labs or IBM." That's because they realize that's where the money is, explained James Wynn of IBM, one of the few industrial physicists at the conference. IBM now offers an annual salary of $57 000 to a PhD fresh out of the University of Chicago, he said, and even more for electrical engineers from MIT or Stanford. This remark led to a short discussion of the attraction of industrial labs, where young physicists do not take time out of their research work to write proposals and compete for grants as they would have to do in academe.

IBM and AT&T, it so happens, often choose their fellowship winners from among NSF fellowship winners whose grants run out before they have completed their PhDs, reported Terence Porter of the foundation's science and engineering directorate. The practice is a self-fulfilling prophecy. "The companies support the best of the best," said Porter, "for their own reasons, such as attracting bright stars to their research galaxy."

Eugene C. Loh of the University of Utah said interviews with physics students revealed that many were unsure of "making it." Loh found that students had no "clear-cut" idea about career opportunities. "Academic life is not rewarding. Our students listen to our grumbling more than we do," said Loh. "And they don't know how physicists fare in industry." What would help is to define physics and clarify career opportunities with the help of industry, he said.

That might be beneficial, claimed Robert Swenson of Montana State University. He criticized Birgeneau for arguing that if NSF would fully fund the nation's top ten physics departments all the problems would disappear. Swenson considered the statement elitist, particularly in light of the problems with attracting grad students from among women, minorities and the geographically dispersed. The wide distribution of PhD-granting physics departments is important, he said, in providing physicists to many newly formed companies. "The new jobs are coming from start-up high-tech firms, not the IBMs and Bell Labs," Swenson claimed. "Why, even Boseman, Montana, has five new laser optics firms with help-wanted signs for PhDs."

Swenson stated that he believes the US lacks a support system to steer the best and brightest into physics. In Britain, students take physics because they are interested in gravity, particle physics and astrophysics, he said. In Montana, he went on, "those interested in physics are encouraged in high school to go into engineering."

In the end, the conference passed three resolutions:

▷ Physics departments ought to review the curriculum requirements for PhD students with a view toward reflecting contemporary theory and research, for example in such fields as nonlinear phenomena and computational methods.

▷ In the light of the length of time required to obtain a PhD in physics, the American Institute of Physics, in cooperation with APS, AAPT and department heads, should undertake a study of the PhD program.

▷ PYI awards were established originally to provide scientists with external research support during the critical early stages of their careers. Recently NSF guidelines for the program have been changed so that established scientists transferring from industrial or government labs to academic settings are also eligible for the awards. The conference endorsed the original intent of the PYI awards and strongly supported a return to it.

—IRWIN GOODWIN

NEW DIRECTORS AT FERMILAB, OAK RIDGE AND LAWRENCE LIVERMORE

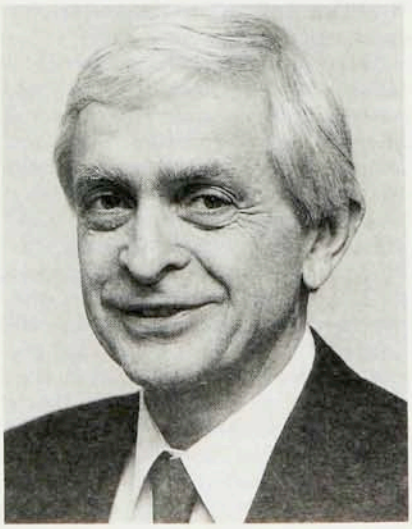
Shortly after Charles V. Shank was named this spring to succeed David A. Shirley as director of Lawrence Berkeley Laboratory (PHYSICS TODAY, May, page 68), it was announced that John Peoples Jr would succeed Leon Lederman as director of Fermi National Accelerator Laboratory. Meanwhile, Alvin Trivelpiece has taken over as head of the Oak Ridge National Laboratory, and John H. Nuckolls has settled in as director of the Lawrence Livermore National Laboratory.

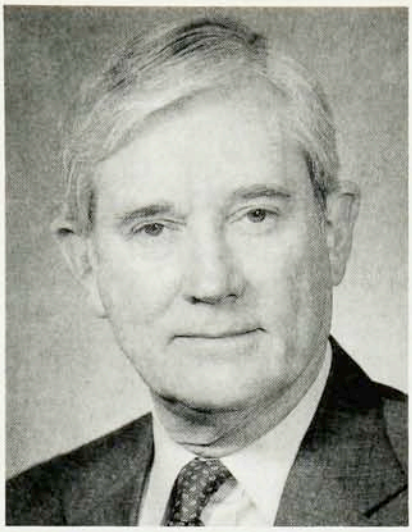
Nuckolls, Trivelpiece and Peoples each assume reponsibility for laboratories that are facing unique challenges. Nuckolls heads a lab that has been subject in recent years to the vicissitudes of the Strategic Defense Initiative, even as LLNL staff have exchanged charges and countercharges about how the lab's work on missile defenses is represented to the public. Trivelpiece takes over at Oak Ridge as the lab is seeking new directions, having seen its traditional mission—the development of advanced nuclear technologies—undercut by slumping prospects for nuclear energy. Peoples, fresh from the Superconducting Super Collider's somewhat troubled magnet development program, will be running a lab that had tied its destiny strongly to the SSC.

Nuckolls

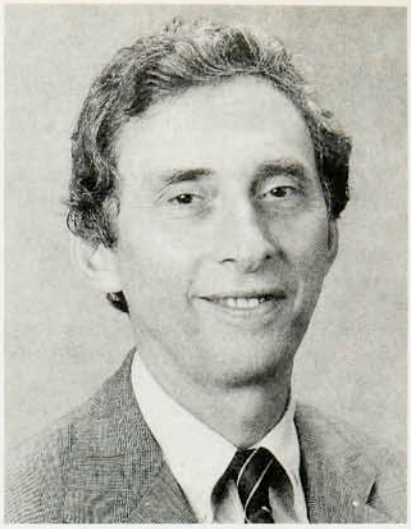
Nuckolls, a physicist, earned a BS (1953) at Wheaton College and a

John Nuckolls





Alvin W. Trivelpiece



John Peoples Jr

master's degree (1955) at Columbia. He joined Lawrence Livermore in 1955, and in 1965 he became associate division leader of the A Division, responsible for nuclear weapons design. From 1975 until 1983 he was associate program leader in the laser fusion program, and from 1980 until 1983 he was X division leader, responsible for inertial fusion target design. From 1983 until 1988 he was associate director for physics. Nuckolls was a member of the Defense Science Board's missile vulnerability task force from 1969 to 1972.

Nuckolls took office in April 1988 at a time when Lawrence Livermore was beginning to come under unprecedented public scrutiny. In 1985 William J. Broad of *The New York Times* published a book, *Star Warriors* (Simon and Schuster), which presented a fascinating but also rather critical portrait of the talented young scientists in Lowell Wood's O Group, the team responsible for theoretical support of the nuclear x-ray laser (and, more recently, the development of "brilliant pebbles," the latest plan for space-based rocket interceptors).

Then in 1987 Roy D. Woodruff, a senior staff scientist at the lab, charged that he had been demoted after he complained that Wood and Edward Teller had misrepresented the lab's work on the x-ray laser program to the President, to Congress and to the public. Upon winning a personnel dispute, he was made head of the lab's verification program. An inquiry by the US General Accounting Office did not sustain Woodruff's charges, but that report still is in dispute. A House subcommittee headed by Michigan Democrat John Dingell is investigating the Woodruff affair.

Last summer the California state assembly enacted budgetary legislation for the University of California with a rider attached recommending that the university exercise increased oversight over the Livermore and Los Alamos laboratories. The rider was introduced by Tom Hayden, the 1960s radical leader who now is chairman of the assembly's education committee. The legislation was signed into law by Republican Governor George Dukmejian in July 1988, and the university currently is recruiting staff to strengthen oversight.

Commenting on the challenges facing him at Livermore, Nuckolls said: "The laboratory's programs address . . . the deterrence of major wars, the development of inexhaustible energy sources, avoiding potentially disastrous environmental changes such as the greenhouse effect, and enhancing our nation's economic strength. Livermore has major programs in nuclear weapons, inertial and magnetic fusion, laser isotope separation, free electron laser and charged particle beam weapons, and smart missiles. The fast paced, extremely successful uranium laser isotope separation program is on a track leading to the building of a full-scale production plant by the mid-1990s. . . . The lab is now highly diversified: Approximately 40% of the billion-dollar-a-year annual budget is devoted to nuclear weapons and a third to laser projects; the remainder includes programs in applied biomedical, environmental, atmospheric and geological sciences."

Trivelpiece

Trivelpiece took office 1 January as the director of Oak Ridge and vice president of Martin Marietta Energy Systems, the subsidiary that manages ORNL and four other facilities for the US Department of Energy. He had been executive officer of the American Association for the Advancement of Science since 1987, and from 1981 until 1987 he was director of DOE's office of energy research.

A plasma physicist, Trivelpiece earned his BS at California Polytechnic State College (1953), and his MS (1955) and his PhD (1958) in electrical engineering at Caltech. He joined the electrical engineering faculty at the University of California, Berkeley, in 1959. In 1966 he was named a professor of physics at the University of Maryland, College Park. From 1976 to 1978 he was vice president for engineering and research at Maxwell Labs, San Diego, and from 1978 to 1981 he was corporate vice president at Science Applications Inc in La Jolla, California.

From 1973 until 1975 Trivelpiece was assistant director for research in the Atomic Energy Commission's Division of Controlled Thermonuclear Research. His main research interests have been in plasma physics and controlled thermonuclear fusion, particle accelerators, microwave devices and electromagnetic waves.

Commenting on the challenges facing him, Trivelpiece said they included "the need to meet or exceed new standards regarding health, safety and the environment at a facility such as Oak Ridge. Its old hot cells and related equipment are a major challenge. Opportunities include trying to get started on construction of the Advanced Neutron Source, getting the High Flux Isotope Reactor operating, increasing the level of research on toxic and hazardous substance waste management and mitigation, improving supercomputer access and use, enhancing fusion and fission research, and so on. I came to the laboratory because I thought it would be a challenging job. I may have underestimated just how challenging now that I look over the landscape."

Peoples

At Fermilab, Peoples succeeds Leon Lederman, who leaves the lab this summer to become the Frank L. Sulzberger Professor of Physics at the University of Chicago. Lederman has been director of Fermilab since 1979, when he replaced the founding director, Robert R. Wilson. In addition to providing scientific, technical and organizational leadership to the lab, Wilson is remembered for his contributions to the laboratory's architecture, sculpture and landscaping, and Lederman for his promotion, locally, regionally and nationally, of pre-collegiate education programs.

Lederman, expressing satisfaction with the appointment of Peoples, said that Peoples will have to "maintain the artistic, educational and ecological concerns which have made Fermilab unique among Federal installations, or else suffer the pain of being haunted by both his predecessors."

Peoples earned a bachelor's degree in electrical engineering from the Carnegie Institute of Technology in 1955. For the next four years he worked for the Martin Aircraft Company in Middle River, Maryland, where he helped design autopilots and inertial guidance systems for missiles. He entered Columbia University as a graduate student in physics in 1959, and received his master's degree in 1961 and his doctorate in 1966. His doctoral research resulted in what was at that time the most precise measurement of the positron energy spectrum associated with muon decay, and in the course of the research he improved and adapted the sonic spark chamber as a tool for high-energy physics.

Peoples was a faculty member at Columbia from 1966 until 1969, when he joined the physics department at Cornell University. He first started to do research at Fermilab in 1971, in an experiment he proposed involving a search for heavy leptons and massive vector bosons in high-energy photon–nuclear collisions. In 1973 he became head of the Proton Lab, and from 1975 until 1980 he served as head of Fermilab's research division. He returned to research in 1980 and worked on a number of major projects including the construction of the main detector (the CDF detector) for the Tevatron and the conceptual design of an antiproton source based on electron cooling.

Peoples served as deputy head of the accelerator division from January 1987 until October 1987, when he took a one-year leave to manage the magnet R&D program for the SSC.

Other Fermilab changes

In a separate development, Gerald Dugan has been named the new head of Fermilab's accelerator division. He succeeds Helen Edwards, who will head the accelerator systems division for the SSC (see PHYSICS TODAY, March, page 123).

Dugan earned a BS degree (1967) at Iona College and a PhD (1973) at Columbia. He was a research assistant at Columbia from 1972 until 1976 and an assistant professor from 1976 until 1982, when he joined the staff at Fermilab. —WILLIAM SWEET

AIP SURVEY ANTICIPATES SHORTAGES OF PHYSICISTS IN THE 1990s

Despite the projected demand for physicists in the 1990s, AIP's *1987–88 Survey of Physics and Astronomy Bachelor's Degree Recipients* shows no significant increase in either the number of students who earn bachelor's degrees in physics or in the number of those who decide to go on to graduate study in physics.

"The news media have publicized this need for physicists, but students and physics bachelors are not responding, " said Susanne D. Ellis, author of the survey report. "We find this very surprising."

Consistent with the general trend of the past five years, 30% of those earning bachelor's degrees in physics in 1988 decided to pursue graduate studies in physics, while 21% chose to attend graduate or professional school in other disciplines. Of those entering physics graduate programs, 76% were fully supported by assistantships and fellowships funded by the universities or government agencies, as opposed to only 47% of those pursuing graduate studies in other fields.

Of the physics bachelors who chose employment directly following graduation, 20% regarded their employment as a one-year interruption in their studies; 50% were less precise about whether they would resume their study of physics but expressed a desire to do so at some future date. Only 25% specified "no interest in graduate studies as long as their employment remains challenging." Among astronomy students as well, the report states, it is increasingly common to work for one or two years before entering graduate school.

The employment outlook for new physics bachelors in the summer of 1988 was about the same as that for the previous year: 17% of those seeking work had received multiple job offers at graduation and 67% one job offer. In the early 1980s a larger percentage of graduates reported multiple offers.

Fewer of those who accepted full-time employment reported taking jobs in which they use their physics training. A higher percentage than ever before, about 25%, accepted jobs in the service industry, including banks and insurance companies.

College graduates employed by high schools, colleges and universities reported using physics extensively in their new jobs, but they constituted only a small proportion of the employment-oriented bachelors. According to the survey report, fewer graduates than ever are attracted to a high school teaching career, due to the low salaries.

Median monthly starting salaries paid by employers ranged from $1550 offered by high schools to $2380 paid to women in manufacturing industries.

In answer to a new question on the survey, more than three-fourths of the new physics bachelors reported that their interest in physics was sparked in high school or earlier. Of those who chose to continue the study of physics in graduate school, 25% said they initially became interested in physics even before high school, while 17% of the employment-oriented bachelors reported such an early interest. Astronomy bachelors responded even more strikingly to the question: The majority answered "prior to high school."

The 1987–88 survey of bachelor's degree recipients is available free of charge from Susanne Ellis, Education and Employment Statistics Division, American Institute of Physics, 335 East 45 Street, New York NY 10017. —PAT JANOWSKI

ARMSTRONG IS IBM VICE PRESIDENT FOR SCIENCE

John Armstrong has been named vice president for science and technology at IBM. His appointment coincides with the retirement of Ralph E. Gomory as senior vice president for science and technology. Gomory has become president of the Sloan Foundation in New York.

Armstrong earned his BA (1956) and his PhD in applied physics (1961) at Harvard University. He joined the research staff at IBM in 1963 and became director of physical sciences in 1976; in 1981 he became manager of materials and technology development in East Fishkill, New York. He returned to the research division as vice president in charge of logic and memory in 1983, and he became director of research in 1986.

Armstrong is succeeded as director of research by James C. McGroddy. Paul Horn has replaced Praveen Chaudhari as head of the physical sciences at Yorktown Heights, following a year as acting director. ■