Fellowships Offered for Japanese Language Study by Researchers in Science and Engineering, Part of NSF Japan Initiative

The National Science Foundation's Division of International Programs is offering fellowships to develop Japanese language skills to selected researchers in science and engineering. About 40 to 50 awards will be made each year primarily to researchers at the graduate or postdoctoral level. Senior researchers, including researchers in industry, are also encouraged to apply.

The fellowships are intended to help researchers acquire enough expertise in Japanese language and customs to be able to function independently in Japan and understand technical abstracts in their areas.

Application deadlines are **May 15, October 15,** and **December 15.** Contact:

Japanese Language Fellowships
Division of International Programs
National Science Foundation
1800 G Street NW
Washington, DC 10550
Telephone (202) 357-9558
Electronic mail: cwallace@note.nsf.gov

The language fellowships are part of NSF's recently launched "Japan Initiative" designed to increase the number of U.S. researchers doing work in Japan. Other parts of the initative will:

- Provide funds for long-term research stays in Japan. Recipients of these grants (6-15 months) will receive a monthly stipend, roundtrip airfare for themselves and up to three dependents, and a modest dependents' allowance. Although primarily aimed at scientists and engineers beginning their research careers, the program will also consider proposals from senior researchers for sabbaticals or other long-term research visits to Japan.
- Identify and secure opportunities for American researchers at Japanese research institutes, including corporate facilities.
- Fund survey teams to visit Japan. The teams will report on the state of the art in specific disciplines, with an emphasis on opportunities offered in Japan for U.S. researchers to advance their work.

For more information about the NSF Japan Initiative contact:

Division of International Programs
National Science Foundation
Washington, DC 20550
Attn: Japan Initiative
Telephone (202) 357-9558
Electronic mail: cwallace@note.nsf.gov
Ask for NSF brochure #87-67.

Ceramic Heat Exchanger for Solar Tower Power Station Reaches 1000 °C Coolant Temperature

A ceramic heat exchanger developed for a gas-cooled solar tower power station (CESA-1) in the southern Spanish province of Almeria has pushed the coolant temperature limit from 800 to 1000°C for the first time, taking German and Spanish researchers closer to the economical production of energy from solar radiation.

CESA-1, located at the Plataforma Solar solar test center, was built by the Spanish Instituto de Energias Renovables (Institute for Self-Regenerating Energies) as part of the implementation of GAST, a German-Spanish technology program financed equally by both countries. Deutsche Forschungs-und Versuchsanstalt für Luft-und Raumfahrt, DFVLR (German Aerospace Research Establishment) is the German partner.

The solar tower power station was developed to circumvent a crucial disadvantage to using solar energy economically—its low wattage per surface unit. Instead of lowering the cost for surface elements, e.g. solar collectors, the tower concept concentrates the incident radiation in mirrors, guiding it to a radiation receiver at the top of a tower 82 meters high.

In the past, a metallic heat exchanger was used as a receiver. With an operating pressure of 9.5 bar, the system provided air at 800°C which was used to produce electrical energy through gas turbo generators. The hotter the densified air used as a coolant, the more economical the operation of the gas generators.

The solar radiation collected by 300 mirrors with a combined reception surface of 11,800 m^2 can amount to more than 500 kW/m^2. Without sufficient cooling, this temperature would melt the metal in a short time. The new high-temperature heat exchanger, made of silicated silicon carbide, has pushed the temperature limit toward 1000°C. In several tests, densified air was heated up to 1000°C under the same system pressure as before and then introduced into the gas circuit of the 1 MW facility.

Investigations into the application of solar heat energy in chemical processes are now on the agenda for research at Plataforma Solar, as are studies concerning the possibility of coupling highly concentrated solar radiation directly with solid or liquid carriers of heat energy.

C. B. Duke to be Deputy Director at Battelle Northwest

Charles B. Duke will assume the duties of deputy director and chief scientist at Battelle Pacific Northwest Laboratories, Richland, Washington, in June of this year. First editor-in-chief of *Journal of Materials Research* (1985 and 1986). Duke had been with Xerox Corporation, Webster, New York, since 1972 in various capacities. He was most recently manager, Theoretical Physics and Chemistry Research and a senior research fellow of the Corporate Research Group.

Currently chairman of the MRS Publications Committee, Duke has to his credit more than 250 technical publications in nuclear physics, semiconductor physics, organic chemistry, molecular physics, quantum field theory, surface science, and technology assessment. He is also the author of *Tunneling in Solids* (Academic Press, 1969). A member of the Materials Research Society, Duke is also an honorary member of the American Vacuum Society, a Fellow of the American Physical Society, and a member of the American Institute of Physics.

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NAS Elects 61 New Members, MRS Represented

The National Academy of Sciences announced the election of 61 new members and 15 foreign associates from eight countries in recognition of their distinguished and continuing achievements in original research. Election to membership in the Academy is considered one of the highest honors that can be accorded an American scientist or engineer. Those elected bring the total number of current members to 1,540. Foreign associates, nonvoting members with citizenship outside the United States, now total 257.

George D. Watkins, Sherman Fairchild Professor of Physics at Lehigh University and a member of the Materials Research Society, was among the Academy members elected this year.

U.S. and Italy Sign Joint Communique on Fossil Energy R&D and SSC Collaboration

U.S. Secretary of Energy John S. Herrington and Gianni Ravaglia, Deputy Minister of Industry, Commerce and Handicrafts of Italy and also a member of the Italian Parliament, signed a joint communique on energy research and development. The communique affirms the value of past energy policy and energy R&D between the United States and Italy, and the intent to extend such collaborations in the future, particularly regarding fossil energy and the Superconducting Super Collider. Collaborations for the SSC could include U.S./Italian magnet development and production in addition to Italian scientific and technological participation in the design, construction, manufacturing and utilization phases of the project.

R. Krishnan Joins New Delhi Ministry of Defence

Dr. Rangachari Krishnan, a member of the MRS BULLETIN International Advisory Board, has moved from his previous position with the Naval Chemical and Metallurgical Laboratory in Bombay. Effective March 1, 1988, he assumed the role of chief controller of research and development in the Defence Research and Development Organization, Ministry of Defence, New Delhi, India. His new address is:

Dr. R. Krishnan
Chief Controller, R&D
Defence Research and Development Organization
Ministry of Defence
New Delhi 110011
India

NAE Elects Officers and Councillors

Members of the National Academy of Engineering have elected a new foreign secretary and named two new members to the NAE's governing council. In addition, they re-elected chairman John F. Welch Jr., chairman and chief executive officer of General Electric Co., Fairfield, Connecticut; vice president Ralph Landau, consulting professor of economics at Stanford University, California; home secretary Alexander H. Flax, president emeritus, Institute for Defense Analyses; and councillor Holt Ashley, professor in the departments of aeronautics/astronautics and mechanical engineering, Stanford University, California.

Gerald P. Dinneen, vice president for science and technology at Honeywell Inc., Minneapolis, Minnesota, will become the Academy's foreign secretary. During his three-year term, he will oversee the international activities of the NAE and coordinate its contacts with engineering academies in other countries.

Newly elected to the NAE council for three-year terms were Thomas E. Everhart, president of the California Institute of Technology, Pasadena, California; and Mary L. Good, president, engineered materials research, Allied-Signal Inc., Des Plaines, Illinois.

R.C. Sundahl Joins Intel Corporation

Robert C. Sundahl has joined Intel Corporation, Chandler, Arizona, as manager of technology development for new package development and assembly engineering. In this capacity he will direct the development of materials, processes and structures to be used in Intel's next generation of packaging and interconnect technology.

Prior to joining Intel, Sundahl was director of materials science at Allied Signal Engineered Materials Research Center, where he directed development efforts relating to polymers, structural ceramics, sensors, nondestructive evaluation, and superconducting materials. Previously, he was at AT&T Bell Laboratories, where he contributed to a wide range of development efforts in electronic and optical materials and devices.

Sundahl is a member of the Materials Research Society and the American Ceramic Society. He co-chaired the MRS Symposium on Electronic Packaging Materials Science at the 1987 MRS Fall Meeting and was recently appointed to the Technical Editorial Board of the MRS BULLETIN.

Special Computer Developed to Study Processing of Silicon and Other Electronic Materials

Researchers at AT&T Bell Laboratories have built a special-purpose computer that is more efficient than current "supercomputers" for modeling the behavior of materials at the atomic level. ATOMS, the AT&T Optimized Materials Simulator, was designed specifically to study the interatomic forces in materials used in electronic devices. The computer can also be programmed to model other kinds of physical systems.

The current version of ATOMS operates about 30% faster than a powerful commercial supercomputer. The next generation, scheduled for completion in the first half of 1988, will calculate atom movements four times faster than a supercomputer. "We were able to achieve this speed by using parallel processing to solve the molecular dynamics problem," said Joseph Condon, of the Computer Research Center at AT&T Bell Laboratories.

The new computer will be particularly useful in determining how to reduce defect introduction during crystal growth and processing of silicon. AT&T scientists have already used the computer to study the motion of atoms that occurs during melting and recrystallization of silicon, and the formation of a thin film on the surface of a silicon wafer. [Taken from *Electronic Materials Technology News*, April 1988, p. 1.]

Tactile Sensor Demonstrated for Robots

A tiny sensor to give robots a better sense of touch has been developed and demonstrated at Sandia National Laboratories. The sensing area of the digital tactile sensor (DTS) is only one-half inch square. Its 256 piezoresistive sensing elements, made from a commercially available thick-film piezoresistive polymer, are arranged in a 16 by 16 array. The array can sense forces ranging from one ounce to about 1,000 lb, making it potentially useful for a wide range of applications.

The tactile sensor is contained inside a package that is eight-tenths of an inch square by one-quarter of an inch deep. The package includes a microcircuit that is the same size as the sensor. The microcircuit scans the 256-element sensor array and provides digital output ready to be analyzed by a microprocessor or other computer.

The DTS is still being studied, and further development is necessary before a production model can be designed.

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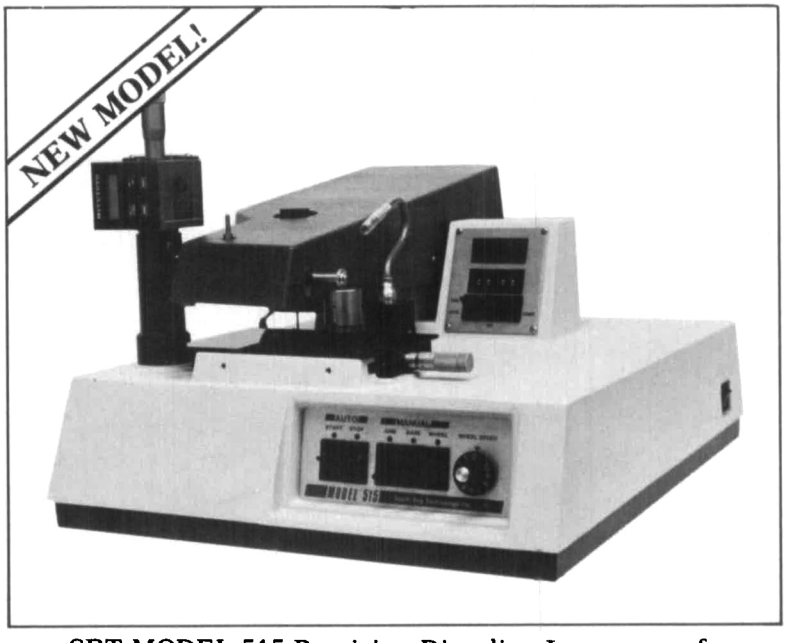

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Superconducting Thin Films Made from Thallium Compound

Sandia National Laboratories researchers have made thin films from new thallium-based superconducting materials. A Sandia news release credits the polycrystalline films with zero resistance at 97 K and current densities of 110,000 A/cm² at liquid nitrogen temperature without observable resistance. Also reported is the indication from preliminary tests that the critical current has a much lower sensitivity to magnetic fields than previous polycrystalline materials. According to Venkatesh Narayanamurti, vice president for research at Sandia, all this "suggests that the coupling within the superconducting grains in these new materials is significantly different from the widely studied polycrystalline 1-2-3 superconductors."

About 7 Å thick, the films are thallium-calcium-barium-copper oxide, nominal composition $Tl_2CaBa_2Cu_2Oy$, made by sequential electron beam evaporation. The films are deposited on single-crystal substrates of yttrium-stabilized cubic zirconia, ZrO_2. Sandia researchers say the key to making the material successfully is to carefully control the thallium content of the film during annealing, which is done twice.

The development is considered a significant step toward the use of new superconducting materials in a broad range of microelectronics applications. The thallium-based thin films are expected to have a wide range of applicability due to compatibility with a variety of substrates.

The first superconducting materials containing thallium were reported by the University of Arkansas in late January 1988 on bulk ceramics. Transition temperatures of up to 125 K in these materials were subsequently reported by Sandia, IBM, and other laboratories. Sandia researchers David S. Ginley, James F. Kwak, Ronald P. Hellmer, Richard J. Baughman, Eugene L. Venturini, and Bruno Morosin submitted a report on their discovery to *Applied Physics Letters* on April 28.

Obituary

Prof. Sekyu Michael Ohr, chairman of the Materials Science and Engineering Department, State University of New York at Stony Brook, passed away on May 16, 1988 after a brief illness. Prior to joining the university in January 1986, Prof. Ohr completed a 22-year career at Oak Ridge National Laboratory. A memorial scholarship fund has been established in his name at the university.

Robot Installed in Plutonium Glovebox

Los Alamos National Laboratory engineers have designed and installed a robot to help handle plutonium at the laboratory. The computer-guided system, which can move plutonium within the confines of a sealed glovebox, has also become a testbed for designing other robots to manipulate radioactive materials.

Los Alamos processes plutonium-238 isotope and fashions it into 60 g heat sources, the heat eventually converted to a small amount of electricity. The heat output of each heat source must be verified before it is used, a routine and time consuming process that had been done by technicians working through lead-lined gloves in sealed gloveboxes.

The robot takes the plutonium heat sources one by one from a tray of 12 and places them in a calorimeter, which measures their heat output for one to three hours. The robot and the plutonium stay inside the glovebox, away from direct human contact. After the plutonium is measured, the robot retrieves it, returns it to the tray, and repeats the procedure for other heat sources.

Los Alamos worked with a private firm to modify a commercially available robot arm to prevent radiation damage. Modifications included using all aluminum parts, removing electronic components from the robot's arm, creating a smooth seal to keep out plutonium particles, and permanently sealing electrical cables running to the robot from the computer.

W.H. Hu and N. Johnson Receive Humbolt Award

William Hsun Hu and Noble Johnson, two members of the Materials Research Society, are recent recipients of the Senior Distinguished Scientist Award of the Alexander von Humboldt-Stiftung Foundation of the Federal Republic of Germany. This international award is presented to scientists in the United States who have distinguished themselves through their teaching and research, and is designed to promote scientific cooperation between research institutions in Germany and the United States.

Hu, a research professor at the University of Pittsburgh's Department of Materials Science and Engineering, is currently conducting research at the University of Gottingen and at the Institute for Physics and Metallurgy in Aachen. Hu joined the University of Pittsburgh in 1983 following a career in private industry, most notably as a senior research consultant at the U.S. Steel Research Laboratory and at the Westinghouse Research Laboratories. An authority on the nature, property and behavior of certain metals, Hu has published extensively and has lectured worldwide. Military and commercial applications of his work include advances in grain-oriented electrical steel, deep-drawing steels, and steel armor plates. Hu is a Fellow of the American Society for Metals and editor/founder of the international journal *Texture of Crystalline Solids.*

Johnson, who will carry out research of his own choice at the University of Erlangen-Nurnberg, joined the Xerox Palo Alto Research Center in 1976. He is currently a principal scientist in the Electronic Materials Laboratory and has received several awards from the Xerox Corporation for his contributions in science and technology. Johnson has conducted experimental research on the electronic properties of materials and solid-state devices, with emphasis on electronic defects in semiconductors. Currently a Councillor (1986-1988) of the Materials Research Society, Johnson has chaired two popular MRS symposia, Energy Beam-Solid Interactions and Transient Thermal Processing (1983 Annual Meeting) and Microscopic Identification of Electronic Defects in Semiconductors (1985 Spring Meeting). He was also a Meeting Chair for the first MRS Spring Meeting, held in Albuquerque, New Mexico, in 1984.

Academies Dedicate West Coast Study Center

Official dedication ceremonies for the Arnold and Mabel Beckman Center of the National Academies of Sciences and Engineering in Irvine, California, were held on April 16, 1988. The new West Coast headquarters for the Academies will provide conference facilities for national meetings on science and technology topics and for many of the more than 950 National Research Council and Institute of Medicine study committees in operation each year.

Construction of the 48,000 ft² building was made possible by a gift of $20 million from the Arnold and Mabel Beckman Foundation. In addition, the Irvine Company deeded the seven acres of land on which the center is built. The site is adjacent to the University of California, Irvine.

Further information about the Beckman Center and about an inaugural series of meetings to be held there are available from the Office of News and Public Information, National Academy of Sciences/National Academy of Engineering, 2101 Constitution Avenue, Washington, DC 20418; (202) 334-2138. □

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