T. Takagi Celebrates Retirement, Honored by Japanese Government

Prof. Toshinori Takagi was honored at a commemorative ceremony attended by about 300 people at the Miyako Hotel, Kyoto, Japan on September 11, 1988.

The event not only marked his retirement from Kyoto University but also celebrated his having received the Purple Ribbon Medal, which was conferred on him in April 1988 on behalf of the Emperor of Japan by Prince Akihito. The prize was awarded in recognition of Takagi's "remarkable achievement in both the study of film formation utilizing extremely low energy beams and the development of the ionized cluster beam technique."

Takagi has been professor of Kyoto University for 23 years and the director of the Ion Beam Engineering Experimental Laboratory for 10 years. He has led a wide range of research on ion beam techniques including ion sources, ion transport, ion surface interaction, and ion-assisted deposition for film formation. It was in 1972 that he proposed the ionized cluster beam technique for film formation.

At the celebration, Takagi delivered a lecture entitled "A Point of View About the Development of Original Research Based on Ion Engineering—Focused on the Development of New Materials and Functional Devices." After his talk, festivities for both commemoration and celebration began. He received the title of Professor Emeritus of Kyoto University and becomes a consultant for government associations and professor of private universities. He continues to involve himself in activities promoting ion beam engineering.

I. YAMADA
Kyoto University

University of Connecticut Receives Grant for Surface Science Equipment

The State of Connecticut Department of Higher Education has awarded a matching grant to the University of Connecticut for the purchase of two surface science spectrometers at a total cost of $500,000.

The equipment, funded under the Connecticut High Technology Project and Program Grant competition, will aid the investigations of Steven L. Suib of the Department of Chemistry and Jeffrey T. Koberstein of the Department of Chemical Engineering. Both are members of the Materials Research Society.

The purchase includes a scanning Auger microscope and an x-ray photoelectron spectrometer. The Auger system will be used to study surfaces of metals, thin films, and coatings for ceramics and materials characterization. The x-ray photoelectron spectrometer will be used primarily to study polymeric materials.

"Natural" Technology May Enable Safe Waste Burial

Using nature to mitigate environmental problems, scientists at Los Alamos National Laboratory (LANL) are demonstrating that careful design of soil and vegetation cover over trenches can result in the safe disposal of certain types of nuclear and chemical waste.

Instead of trying to control surface erosion and water seepage through the waste by engineering structures, the LANL approach relies on natural controls. In experiments that began in 1981, Tom Hakonson, leader of the Environmental Sciences Group, and his colleagues have shown that good trench-cover design must consider the steepness of the cover surface, the type and thickness of soil cover, and the kind of vegetation planted on the cover.

The research team is using several "garden plots" up to one-third acre to refine the design. The test plots don't contain waste. Precipitation, runoff, erosion, and movement of water through the soil are all carefully measured. That information is then compared with computer simulations to see how they can predict what the precipitation will do and, consequently, how waste may migrate.

Because the cover design uses only natural soil, rock, and vegetation, Hakonson says it is cost effective and may last for several hundred years. The technology, soon to be tested on waste sites at several military bases, is a particularly effective way to close waste sites in arid and semi-arid areas.

C.T. Liu Receives Lawrence Award for Contributions to Atomic Energy

Chain T. Liu, a metallurgist at Oak Ridge National Laboratory (ORNL), received $10,000 and a gold medal on September 20 for his contributions to atomic energy.

Liu received the Ernest Orlando Lawrence Memorial Award in recognition of his contributions to the establishment of scientific principles for the design of ordered intermetallic alloys and for the successful application of those principles to the development of new alloy systems. A member of the Materials Research Society, Liu was a meeting chair at the 1988 MRS Spring Meeting in Reno, Nevada.

The Ernest Orlando Lawrence Memorial Awards, presented this year in a public ceremony by Secretary of Energy John S. Herrington, were established in 1959 in memory of the scientist who invented the cyclotron and established the two major laboratories at Berkeley and Livermore, California, that now bear his name. The annual awards recognize U.S. citizens who are at relatively early stages in their careers, and who have made recent meritorious contributions to the development, use, or control of atomic energy. The work can be in any area of science related to atomic energy, including medicine and engineering.

ASTM to Write Standards for Sputtering Targets and GaAs Test

The American Society for Testing and Materials is seeking participants to develop two sets of standards—one for sputtering targets and the other for a standard ion implant/anneal test for gallium arsenide.

The standards for sputtering targets are being addressed by a new task group on Metallic Materials, a subcommittee of ASTM standards writing Committee F-1 on Electronics. The group has already developed standards for sputtering targets of aluminum, gold, and refractory silicides. New standards are being prepared for platinum, chromium, and silver. Contact Robert W. Gersitz, AT&T-ME, 555 Union Boulevard, Allentown, PA 18103, telephone (215) 439-6439; or S. Kauffman, ASTM, 1916 Race Street, Philadelphia, PA 19103, telephone (215) 299-5599.

Standards for the gallium arsenide test are being addressed by the Subcommittee on Gallium Arsenide. Contact Fred Doerbeck, Texas Instruments, 13510 North Central Expressway, Dallas, TX 75243, telephone (214) 995-0938; or S. Kauffman at ASTM.

Both groups will meet January 30-February 2, 1989 during the standards development meetings of Committee F-1 in San Diego, California on Electronics.

J. Ma. Rincon Elected General Secretary of Spanish Glass and Ceramic Society

Jesus Ma. Rincon, a senior researcher at the Instituto de Ceramica y Vidrio, CSIC, Madrid, Spain, was recently elected general secretary of the Spanish Glass and Ceramic Society (SGCS). Founded in 1960, the organization sponsors meetings, seminars, and courses, and publishes research on traditional and advanced glasses and ceramics.

The new general secretary is also editor in chief of *Bol. Soc. Esp. Ceram. Vidr.*, a scientific bulletin that SGCS publishes in Spanish. Rincon has proposed establishing an international editorial board and also publishing papers in English in order to increase the publication's visibility in the scientific community.

Rincon, who for 15 years has conducted electron microscopy research on ceramic and glass materials, is the author of three monographs and 80 papers in Spanish and English publications. A member of both MRS and E-MRS, he worked in the Department of Materials Science and National Electron Microscopy Laboratory at the University of California-Berkeley dur-

ing 1984-1985. There he collaborated with G. Thomas in microstructure and microanalysis (AEM and HREM) characterization of zirconia/mullite ceramics.

Japan's Superconductivity Center Names Laboratory Directors

Japan's International Superconductivity Technology Center (ISTEC), which opened recently, has appointed directors for several of its research laboratories and is continuing toward its goal of employing more than 100 scientists. If that figure is reached, officials of Japan's Ministry of International Trade Industry (MITI) believe it will make ISTEC the world's largest research body concentrating on superconductivity. Currently, the largest program—with some 75 employees—is headed by Dr. Paul Chu at the University of Houston.

According to a report in *Superconductor Week* (September 5, 1988), six of ISTEC's laboratories are in Tokyo and one is in Nagoya, central Japan. Izumi Hirabayashi, the first appointee, was chosen in September to manage the Nagoya lab. More recent appointments include:

Hisao Yamauchi, in charge of seeking new oxide materials. A graduate of the University of Tokyo and Northwestern University, he was formerly a professor at the University of Windsor in Canada.

Yuh Shiohara, who will take care of the chemical process of superconductor production. He graduated from Waseda University and was an assistant professor at MIT. Shiohara is a member of the Materials Research Society.

Tadataka Morichita, who is responsible for researching the physical process of superconductor manufacturing. Morichita graduated from Waseda University and worked for the Science and Technical Research Laboratories and the Japan Broadcasting Corporation.

Yoshihisa Tshiguro, in charge of the superconductor database. A graduate of the University of Tokyo, Tshiguro served as an inquirer at the minister's secretariat at MITI.

Superconductor Week also reported that ISTEC will seek a budget appropriation of about $6.5 million for fiscal year 1989—twice the earlier estimates. In addition to MITI support, ISTEC relies on more than 100 Japanese and foreign organizations to contribute to its efforts. Of those organizations, 45 companies, all Japanese, have agreed to the more expensive hands-on research membership.

The funding of ISTEC is evidence of MITI's stepped-up commitment to superconductor research. Agency funding for high T_c superconductivity research in general is expected to significantly exceed the 1988 budget. MITI also plans to increase funding for the so-called Moonlight Project, a 70 MW superconductive power generator. Meanwhile, MITI hopes to coordinate efforts with the U.S. Department of Commerce to develop standards in the high T_c superconductor field.

Congress Passes Superconductivity Legislation

President Reagan has signed H.R. 3048—the National Superconductivity and Competitiveness Act of 1988, which mandates a five-year national program for high T_c superconductivity.

The legislation establishes a Superconductivity Action Plan to be coordinated by the White House Office of Science and Technology Policy (OSTP) with assistance from the National Critical Materials Council. The plan is to be sent to Congress nine months after the President has signed the bill into law. Thereafter, OSTP will submit an annual evaluation of the plan's progress, describing the amount of funds expended in the previous year by all federal departments and agencies involved with superconductivity.

Opponents of the legislation, including Secretary of Energy John S. Herrington, said that it duplicates existing federal mechanisms already charged with coordinating superconductivity research. Herrington supported a less comprehensive bill sponsored by Senator Pete Domenici of New Mexico.

Among provisions of H.R. 3048:

- The Secretary of Defense is asked to emphasize fundamental research involving superconducting materials, to systematically define the engineering parameters for high Tc superconducting materials, and to conduct the development, engineering, and operational prototype testing appropriate to the DOD mission.
- The Defense Advanced Research Projects Agency must "augment, as appropriate, basic and applied superconductivity research conducted in other federal agencies and industry" and "develop criteria for operational prototype testing within the DOD."
- The Secretary of Energy must conduct a program in superconductivity R&D, and submit legislation within 180 days of the law's enactment, and each year for the next two years, on technology transfer activities relating to the Stevenson-Wydler Technology Innovation Act of 1980.
- The National Institute of Standards and Technology (formerly NBS) is to promote fundamental materials research and standards to accelerate the application of new superconducting materials, and will utilize the Superconductivity Center Focusing on Electronic Applications at NIST in Boulder, Colorado.
- NASA is mandated to use existing programs in "technology transfer, aeronautics and space technology, and space commercialization to promote the commercial applications of high temperature superconductors, including applications relating to thin film technology, communications technology, sensors, space power and propulsion."

—Information from *Superconductor Week*, October 31, 1988

Italy Authorizes Research Microelectronics Laboratory

The Italian government agency overseeing scientific research, Consiglio Nazionale delle Ricerche (CNR), has authorized a new microelectronics laboratory to be located in Catania, Italy.

The Institute for Microelectronic Methods and Technology will be devoted to fundamental and applied research and production in areas such as ion beam processing, epitaxial growth, contacts and silicides, and diagnostics. Equipment and capabilities of the laboratory will include a high energy accelerator, medium current implanter, focused ion beam capacity, rapid thermal annealing, epitaxial reactors, XPS, SIMS, and electron microscopies.

Directed by Emanuele Rimini, a professor at the University of Catania and a member of the Materials Research Society, the institute will be staffed by some 60 scientists, technicians, and administrative personnel. Several MRS members will provide scientific and technical guidance, including professors S.U. Campisano, G. Foti, S. Pignataro, and O. Puglisi of the University of Catania.

In announcing the agreement, CNR president L. Rossi Bernardi and R. Gaspari, an Italian government minister, pointed out that the institute will be located near SGS-Thomson, a silicon power device factory under the management of P. Pistorio. Also nearby is a large R&D laboratory formed through a consortium between SGS-Thomson and the University of Catania. Officials said the successful collaboration which led to the creation of the the consortium and the R&D facility contributed to the decision to locate the new microelectronics laboratory in Catania.

The consortium is directed by Prof. G. Rodolico and the R&D laboratory is directed by Prof. G. Ferla, a member of E-MRS. *S.U. Campisano*

NAE Announces New International Prize

The U.S. National Academy of Engineering recently announced the establishment of a major new international award for achievement in engineering and technology. The award, a gold medal and $350,000 in prize money, is endowed by the Charles Stark Draper Laboratory of Cambridge, Massachusetts, and recognizes engineering and technology achievements "contributing to the advancement of human welfare and freedom."

Named for the engineer who invented and developed the technology of inertial guidance systems now universally used in aircraft, submarines, missiles, and space vehicles, the first Charles Stark Draper Prize will first be awarded in October 1989. Subsequent awards will be made every two years.

The recipient will be selected by a committee appointed by the NAE and chaired by Robert C. Seamans Jr., senior lecturer, Department of Aeronautics and Astronautics, Massachusetts Institute of Technology. Seamans is also former U.S. Secretary of the Air Force and a former president of the NAE.

Nominations of candidates for the prize will be solicited from "members and foreign associates of the NAE, National Academy of Sciences, Institute of Medicine; members and foreign associates of academies of engineering worldwide; members of recognized U.S. and international engineering societies; and other individuals deemed eligible by the NAE."

The award can be given to any living individual or group of individuals from any country for either a specific engineering/technology achievement or for a body of work extending over a period of years. Work within all engineering disciplines will be eligible.

For information about nominations contact: Robert C. Seamans, Jr., Chairman, C.S. Draper Prize Committee, National Academy of Engineering, 2101 Constitution Avenue NW, Washington, DC 20418.

Diamond Found in Explosive Detonation

Scientists at Los Alamos National Laboratory became the first to discover the formation of diamonds in a high-explosive detonation.

For about two years, a team has been studying the chemistry of carbon in high explosives in order to improve the hydrodynamic modeling of the explosives, and to better understand how the chemical properties of carbon are involved. What apparently happened in the latest round of experiments was that in the explosion's intense heat and pressure—more than 5,000°F and about 250,000 times normal atmospheric pressure—the detonation chemistry formed carbon clusters into diamond.

Project leader J.D. Johnson, a theoretical physicist in the Mechanics of Materials and Equation-of-State Group said computer modeling had not predicted that diamond would be found in the detonation soot. He expects future research to focus on the soot and the energy released when the soot is formed.

Collaborating with Johnson are Roy Greiner, a physical chemist in the Analytical Chemistry Group, and David Phillips, a materials scientist in the Materials Technology: Metallurgy and Ceramics Group.

Using common explosives comprised of carbon, oxygen, nitrogen, and hydrogen, the team triggered explosions using argon gas as a cushion to prevent the explosive products from hitting the sides of the container, then collected the soot for analysis. Phillips, a member of the Materials Research Society, used an electron microscope to confirm the presence of diamonds in the detonation soot. Although the soot consisted primarily of carbon, analysis of faint, unexplained rings in the diffraction patterns confirmed that about 20% of that carbon had been turned into diamond.

Argonne Chemists Receive DOE Award for Laser Research

Pioneering work in using lasers to study material surfaces has earned a group of chemists at Argonne National Laboratory the Materials Sciences Research Award from the U.S. Department of Energy. The award is granted annually by DOE's Office of Basic Energy Sciences to recognize research that has both led to new scientific understanding and been rapidly applied to practical problems.

Recipients were Michael J. Pellin, Charles E. Young, Wallis F. Calaway, and Dieter M. Gruen, group leader and a member of the Materials Research Society.

The research recognized by DOE includes:

- Laser-induced fluorescence of desorbed species, which uses lasers to identify and measure concentrations of atoms knocked off material surfaces, and which the Argonne group has applied to fusion energy research.
- Multiphoton resonance ionization, which the group has used for ultrasensitive detection of trace impurities in semiconductor materials for electronic applications, and to measure particles that contaminate vacuums by escaping from

vaccuum chamber walls.

■ Second harmonic generation from surfaces using picosecond laser techniques, which has been used to study the ability of experimental films to inhibit corrosion and other chemical reactions on material surfaces. It has recently been used to study growth processes and structures of metal-oxide films formed in air atmospheres.

NAE Cites Career-Long Education as Key to Engineering Productivity

It is just as important for competitive employers to maintain the quality of their intellectual resources—especially their engineering work force—as it is to continually upgrade manufacturing technology. And the key to maintaining that quality is career-long education.

That's the consensus of a National Academy of Engineering committee which recently published a report, *Focus on the Future: A National Action Plan for Career-Long Education for Engineers*. Citing evidence that knowledge gained through a formal education in engineering becomes obsolete within three to seven years, the report calls on individual employers, engineering schools, government agencies, and professional engineering societies to make more concerted efforts to encourage improvements in career-long engineering education.

Among other recommendations, the committee calls for creation of a nationwide coalition to fill the current leadership vacuum at the national level. The coalition would require participation from industrial, governmental, and academic officials, and would "coordinate, monitor, urge, and advocate action for career-long education for engineers."

Among the committee's findings:

■ Numerous studies have documented large increases in productivity from participation in on-the-job engineering training courses. Motorola, for example, experienced a 30:1 payoff in revenue during the year such training occurred. AT&T found that the combination of training and computer-aided design facilities produced a fivefold increase in productivity of its design engineering staff over 10 years.

■ Many companies can probably profit from—and afford—an investment of more than the typical 2% of their engineering budget in education, according to a specially commissioned paper by Charles W. Hoover, Jr. included in the committee's report.

■ Education programs for adults must be tailored to adult needs, according to another commissioned paper by Pamela H. Atkinson. That includes the tendency of adults to place greater value on their time than on money or effort required.

■ Successful continuing education programs are those visibly supported by upper management that involve company engineers and managers in design and implementation and do not penalize participants for time spent on education during working hours.

Copies of the report are available from: Program Office, NAS 050, National Academy of Engineering, 2101 Constitution Avenue NW, Washington, DC 20418; (202) 334-1544.