National Conferences Explain SBIR Program to Businesses.

The federal Small Business Innovation Research (SBIR) program has received increased funding to over $700 million for fiscal years 1993 and 1994, an increase of 40% from 1992.

To inform small high-tech firms about the business opportunities offered by SBIR funding, the Department of Defense and the National Science Foundation scheduled a series of three conferences involving the 11 federal agencies that have SBIR funding.

National SBIR Conferences have already been held in Washington, DC on October 15–17, 1993 and in Seattle, WA on November 15–17, 1993; the next one is scheduled for Houston, TX on April 26–28, 1994. Each conference brings together government agency officials, high-tech management experts, and representatives from large companies. The agenda includes one-on-one meetings with corporate and government representatives plus seminars on topics related to SBIR and commercializing technologies.

For information, or to register for the next conference, contact: Foresight Science and Technology, Inc., SBIR Conference Registration Office, 9059 Baybury Lane, West Palm Beach, FL 33411; phone (407) 791-0720.

NMAB Announces Staff Changes, New Members

After more than 11 years with the National Materials Advisory Board (NMAB), Klaus Zwilsky has retired as its staff director. Prior to his Board work, Zwilsky served as chief of the Department of Energy's Materials and Radiation Effects Branch. Zwilsky is also well known for his work with technical societies to further the development of the discipline of materials science and engineering. He was involved with the MS&E study, published under the title, *Materials Science and Engineering for the 1990s: Maintaining Competitiveness in the Age of Materials*. Robert Schafrik will replace Zwilsky as director of the NMAB.

George Economos, who was responsible for the publication of about 30 studies during his 15-year tenure with the NMAB, has also retired. His studies included critical and strategic materials studies for the Federal Emergency Management Agency (FEMA), structural and electronic materials studies for the Department of Defense and the National Aeronautics and Space Administration, and studies for the Bureau of Mines, the Department of Energy, and the National Archives.

James C. Williams, general manager of General Electric Materials Technology Laboratories, has been reappointed to chair the NMAB until June 1995.

Reappointments include Robert Ray Beebe, consultant; Robert E. Green Jr., Johns Hopkins University; and Earl R. Thompson, United Technologies Research Center. Other members continuing on the Board are Melvin F. Kanninen, Southwest Research Institute; Donald R. Paul, University of Texas; and Maxine Savitz, Garrett Ceramic Components, Allied Signal Corporation.

Eight new members have been appointed to the Board: Bill R. Appleton, Oak Ridge National Laboratory; J. Keith Brimacombe, University of Vancouver; Kristina M. Johnson, University of Colorado; Lionel C. Kimerling, Massachusetts Institute of Technology; James E. McGrath, Virginia Polytechnic Institute and State University; Edgar A. Starke, University of Virginia; John Stringer, Electric Power Research Institute; and Kathleen C. Taylor, General Motors Corporation.

Thomas E. Munns has joined the NMAB as senior staff officer. Most recently, Munns worked at SFA, Inc., where he was a senior materials engineer supporting the Naval Research Laboratory. Robert M. Ehrenreich, NMAB staff officer, has been named editor of *Archeomaterials*, an international journal of artifact studies.

Martin Marietta Is New Contractor for Sandia

Martin Marietta Corporation was selected as the management and operating contractor for Sandia National Laboratories. The previous contract with AT&T expired October 1, 1993. AT&T had managed Sandia for 54 years, but reportedly decided not to renew its contract after disagreements with the Department of Energy (DOE) over product liability. Sandia Corporation was acquired by Martin Marietta and will remain the legal entity for Sandia National Laboratories.

Martin Marietta, a Fortune 500 company with 1992 sales of approximately $6 billion, manages more than $4 billion of government work annually. The company recently combined with General Electric Aerospace to form a corporation with total revenues of $11 billion.

Martin Marietta manages and operates DOE facilities at Oak Ridge National Laboratory, the Oak Ridge K-25 Site, the Oak Ridge Y-12 Plant, the Pinellas Plant in Largo, Florida, and Knolls Atomic Power Laboratory in Schenectady, New York.

Sandia National Laboratories operates facilities in Albuquerque, New Mexico; Livermore, California; Tonopah Test Range, Nevada; and the Kauai Test Facility, Hawaii. Total funding for Sandia National Laboratories for fiscal year 1994 is projected to be $1.35 billion.

Martin Marietta will reportedly inject $9.5 million in new capital into the laboratory. In addition, Martin Marietta will help establish a venture capital fund to help commercialize technology developed at the laboratory. The company plans to gather an initial pool of $30 million in conjunction with venture capitalists.

Al Narath will continue as Sandia's director. James A. Tegnilia, a Martin Marietta employee and former deputy director of the Defense Advanced Research Project Agency, will serve as executive vice president and deputy laboratory director.

SI Diamond Patents Doping Process

SI Diamond Technology, Inc. has received the first patent granted in the United States for a general method to controllably dope diamond with virtually any material.

The method incorporates dopant atoms into diamond by implanting low-energy ions during growth in an attempt to produce n-type semiconducting diamond. Various dopants are currently being evaluated for their suitability for n-type diamond material.

"Although the ultimate breakthrough in this area will be the ability to produce both n-and p-type semiconducting diamond, we hope that initially, under this patent, we can develop diamond-based semiconductors for applications where nothing currently available can work, such as sensors or amplifiers that operate in extremely high-temperature areas like car engines and rocket thrusters, and in very harsh environments like nuclear reactors and space satellites," said Robert H. Gow, SI Diamond president.

SI Diamond Technology recently received two federal Small Business Innovation Research grants to commercialize new applications of its diamond electronics technologies. A grant from the Advanced Research Program Agency will be used to improve methods for low-cost construction of flat panel displays. The other grant will be used to evaluate the use of ion beam technology to directly interconnect wires on high-density electronic packaging modules.

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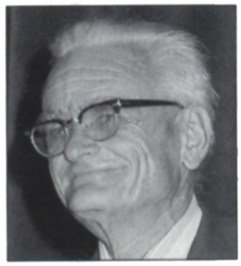

Clarence M. Zener, a world-renowned physicist and 1982 MRS Von Hippel Award recipient, died on July 3, 1993 at the age of 87.

Zener was a professor in the physics department at Carnegie Mellon University, Pittsburgh, Pennsylvania. His work, which expanded the theoretical study of solid-state physics, was often years ahead of its technological applications.

The Zener diode, a voltage regulator developed in the 1950s and used in modern computer circuitry, resulted from an article Zener published in 1934 explaining the breakdown of electrical insulators.

"He was very well known for early work he did on the properties of solid materials. . . some of which led to the Zener diode," said John Fetkovich, associate head of Carnegie Mellon's physics department and assistant to the president of the university. "The most remarkable thing about him is how he could be given a problem he hadn't faced before and, with speed and accuracy that is very rare, come to understand it. . . and see the way to deal with it."

Zener was credited with helping to develop geometric programming. Responsible for pioneering the concept of ocean thermal energy conversion, he was also internationally recognized for introducing a field of scientific study with his work on internal friction.

Before teaching at Carnegie Mellon, Zener had been dean of science at Texas A&M University. He joined Texas A&M after retiring from Westinghouse Electric Corp. Research Laboratories, where he was director of research and director of science.

During his career, Zener was a physics instructor at Washington University in St. Louis, and at the City College of New York. He was also an associate professor at Washington State University and taught at the University of Chicago.

He was the author of more than 125 papers and books and a member of the National Academy of Science. His honors include the Bingham Award of the Society of Rheology, the Wetherill Medal of the Franklin Institute, the Albert Souveur Achievement Award, and the Gold Medal of the American Society for Metals. In 1982, the Materials Research Society presented the Von Hippel Award to Zener, characterizing his contributions to the physics of metals and to mathematics as "among the most fundamental and original of any 20th century scientist."

A native of Indianapolis, Zener graduated in 1926 from Stanford University and received his doctorate in physics in 1929 from Harvard University. He also studied at the University of Leipzig.

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American Vacuum Society Elects First 20 Fellows

The American Vacuum Society (AVS) has elected 20 members to become Fellows of the Society. This recently established membership level recognizes AVS members who have made outstanding and sustained technical contributions in research, engineering, technical advancement, academic education, or managerial leadership for at least 10 years. The following MRS members are among the 20 Fellows named to the Society: Leonard J. Brillson, Paul H. Holloway, J. Thomas Dickinson, Shyam P. Murarka, Robert P.H. Chang, Buddy D. Ratner, Gary Rubloff, and Pradip K. Roy.

Mercury-Based HTS Compound May Reduce Processing Cost

The most recently identified mercury-based high-temperature superconducting compound may be attractive for commercial applications because it doesn't need to undergo a costly process to align the particles that make up the compound.

According to University of Illinois materials science professor Jennifer Lewis, the significance of this new material lies in the potential to produce long wires or tapes with optional properties, without needing to align individual particles with respect to each other.

Particles of the new superconductor, which also contains barium, copper, and oxygen, were embedded in an epoxy matrix. The researchers used a magnetic field to align the particles. Once the epoxy set, x-ray diffraction confirmed that a high degree of alignment had been achieved. An extremely sensitive device measured the magnetic properties of the superconductor. Researchers found that in very low magnetic fields, the superconductor's properties depended on the crystal orientation of the particles. However, this was not a factor in the higher-energy fields employed more typically when superconductors are used. The group's results have been accepted for publication in *Physical Review B*.

USC Study Finds Acid Rain Has Little Effect on Building Materials

Acidic air pollution in the South Coast Air Basin does little damage to common building materials such as latex house paint, galvanized steel, nickel, aluminum, and nylon fabric, according to a study conducted by University of Southern California scientists Ronald C. Henry and Florian B. Mansfeld.

By accurately weighing samples, the two scientists estimated air pollution damage and, except for aluminum, found the levels low. For example, galvanized steel showed an average corrosion rate of 0.4 microns per year, compared to values between 1.6 and 2 microns per year found in studies at sites in North Carolina, New Jersey, and northern California. The exception, aluminum, corroded faster in southern California than elsewhere.

In contrast to studies in other areas, the southern California samples underwent most of their corrosion damage during the summer months. Researchers believe

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this resulted from small quantities of nitric acid forming when sunlight energizes the oxidation of nitrogen-oxygen compounds found in gasoline engine exhaust.

Experimental Lasers Use Quantum-Well Structures to Achieve Speed

An experimental single-mode laser, developed at AT&T Bell Laboratories, emits light at a single wavelength and turns on and off 22.5 billion times a second. A recently developed multimode laser, which emits light over several wavelengths, operates at 25 billion cycles a second.

The experimental lasers, which can be used for optical-fiber transmission, are the first telecommunications lasers incorporating quantum-well structures to achieve such high speeds. Both lasers are made of gallium-indium-arsenide-phosphide alloys grown on an indium-phosphide substrate.

Single-mode lasers allow transmission up to tens of kilometers and are expected to be used for local distribution systems. At ultra-high data rates, multimode lasers are suitable only for short distances, a few hundred meters.

The lasers operate at a wavelength of 1.55 microns, which is in the infrared spectrum. This matches the wavelength of optical-fiber amplifiers, which are used to boost lightwave signals in modern optical-fiber transmission systems. This is the wavelength of minimum loss in optical fiber, allowing signals to travel the maximum distance before attenuation.

The single-mode laser speed of 22.5 GHz or 22.5 billion on-off cycles per second, represents a significant jump for these lasers, where progress toward higher speeds had reached a plateau at 16-18 GHz almost five years ago.

The multimode lasers operate at 25 GHz, and are the first quantum-well telecommunications lasers to achieve this speed. The best conventional multimode lasers in research laboratories have achieved 24 GHz at an operating wavelength of 1.3 microns.

1.65 T Magnetic Field Reported for High T_c Coil

Using a coil of bismuth-based oxide superconductor, Intermagnetics General Corp. (IGC) and Argonne National Laboratory have produced a magnetic field of 1.65 T, higher than previously generated by a coil of high-temperature superconductor.

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The coil, which is actually 10 coils stacked together and connected electrically, is wound with about 475 m of a high T_c superconductor. Each of the 10 smaller coils is made of five lengths of single-filament superconducting tape 9.5 m long. Each contains 51 turns around a 2.5-cm-diameter center bore and has an external diameter of about 10 cm. The superconductor is made from bismuth-lead-strontium-copper oxide powder. The powder is encased in a silver tube and, after further processing, the tube is extracted into a flexible, single-filament tape.

In tests, the coil stack carried 255 A of current at 4.2 K and produced a magnetic field of 1.65 T.

IGC and Argonne are in the midst of a two-year collaboration to develop ways to make practical lengths of superconducting wire and tape and to transfer the technology to industry.

Auto Consortium to Develop Applications for Parallel Supercomputers

Chrysler, Ford, and General Motors plan to cooperate on the development of high-performance computer sytems for four automotive applications: fluid dynamics, including fuel flow and aerodynamics; structural mechanics, focusing on composites; computer grid-generation technology; and visualization of computer simulations.

A key challenge will be the development of portable software programs that can easily be set up and run on high-performance parallel computers by automotive design engineers.

Increased use of parallel supercomputing will help shorten the time needed to bring new automotive designs to market, speed design of new and more efficient engines to meet environmental standards, and boost the use of advanced materials.

The new consortium has asked five Department of Energy laboratories (Argonne National Laboratory, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, and Sandia National Laboratories) and the University of Michigan to take part in the initial phases of the program.

NMAB to Study High-Temperature Semiconductor Materials

The Department of Defense and the National Aeronautics and Space Administration have requested that the National Materials Advisory Board (NMAB) undertake a study on materials for high-temperature semiconductors. The study will assess national and international efforts to develop these materials, identify technical barriers to their development and manufacture, determine criteria for successfully packaging and integrating these materials into existing systems, and recommend future research priorities and additional applications. Materials requirements for high-temperature device operation will be specifically addressed.

Other Studies Are Under Way. The following NMAB studies are currently under way:

Materials Research Agenda for the Automotive and Aerospace Industries;

New Sensor Technologies: Materials and Applications;

Microwave Processing Materials: An Emerging Industrial Technology;

Synthetic Hierarchical Structures; and

Application of Expert Systems to Materials Selection During Structural Design.

For information about any of these studies, contact: NMAB, 2101 Constitution Avenue, Room HA 262, Washington, DC 20418; phone (202) 334-3505.

Morton/NIST CRADA to Develop On-Line Monitoring for CVD Systems

Morton International's Advanced Materials business has joined in a cooperative research and development agreement (CRADA) with the National Institute of Standards and Technology's (NIST) Chemical Science and Technology Laboratory to design a system to identify and measure metalorganics flowing into a chemical vapor deposition (CVD) reactor.

Based on Fourier transform infrared spectroscopy, the system will enable reactor operators to monitor and adjust the CVD system for optimal quality, and so improve quality control and reduce defects during manufacture.

American Superconductor Demonstrates Prototype High T_c Acoustic Transducer

American Superconductor Corporation (AMSC) announced that it has successfully tested a prototype acoustic transducer using high-temperature superconducting coils. The prototype, developed in collaboration with the Naval Undersea Warfare Center (NUWC), was designed for sonar applications.

The acoustic transducer converts electric power into acoustic power with high efficiency. The superconducting sonar device enables more sophisticated signal processing and, in return, "signature recognition"—the ability to identify objects by means of distinctive sonar echoes.

The device also incorporates an advanced magnetostrictive material that allows the converting of electric power into acoustic power. Magnetostrictive materials change length when exposed to a changing magnetic field. The combination of high T_c coils, which create the magnetic field, with an advanced magnetostrictive material yields acoustic performance in a range of power and frequency not previously accessible.

AMSC and NUWC reported that they were able to successfully test the system in water at depths up to 100 feet.

The U.S. Navy is striving to develop lightweight, high-energy-density acoustic sources, and expects this research to benefit its efforts. The transducer's applications include surveillance, ocean mapping, and oil exploration.

Design, fabrication, and testing of the device was funded by the Navy's Small Business Innovation Research (SBIR) program and the Office of Naval Research.

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