Los Alamos Announces Progress on Acoustic Heat Engines

The simplicity and reliability of a series of experimental acoustic heat engines have led researchers at Los Alamos National Laboratory to begin seeking practical applications.

Like their precursors, the Los Alamos engines rely on two simple principles understood for centuries: the nature of how sound vibrates and the fact that changing temperatures make materials expand and contract. They convert heat to work or use work to pump heat in a way similar to conventional refrigerators and steam turbines. But until recently, the engines tended to be complex mechanical machines requiring a lot of maintenance. The Los Alamos engines are much simpler in design, can be smaller than an adult's arm, and have no moving parts.

According to Greg Swift, the Los Alamos researcher spearheading the project, the engines are little more than pieces of metal or fiberglass tubing, resembling a sawed-off piece of an organ pipe. At their heart is a series of tiny parallel metal or glass plates that act as a heat exchanger.

One type of engine converts the heat to sound. Air passing over the hot end of the plates warms and expands, and then cools and contracts about 400 times per second when it reaches the other side. Following a similar process, another engine converts sound from a radio speaker into cool temperatures.

At its current stage of development, the heat engine is not as powerful as gasoline or electrically powered engines, but the advantages of simplicity and reliability might make it ideal for powering satellites or for being the energy source behind submarine sonar systems. It's this type of acoustic heat engine (except larger and using different materials) that Swift says might become the grandfather of future "cryo-coolers" for reliably cooling superconductors.

Discovery Astronauts Manufacture Metal Alloys in Experiments Funded by Grumman Corporation

Hoping that space will provide economic advantages in the manufacture of certain expensive-to-produce metals and alloys, astronauts aboard the space shuttle Discovery in October melted ingots of manganese bismuth—a process which produces stronger magnets.

The experiment, called "Orbital Processing of Aligned Magnetic Composites," was sponsored by Grumman Corporation in an ongoing effort to reduce the expense of producing high quality electronic materials on earth.

Small ingots of a MnBi compound were melted. Each ingot was 80 mm long and 5 mm in diameter and weighed less than 20 g. The furnace they were melted in had heating elements programmed to move along the length of the ingot at certain speeds. As the ingot was heated and cooled, tiny MnBi rods were formed as magnetic particles embedded within the composite material. The magnet's strength is determined by the pattern, size, and composition of these rods. Rods formed in a finer, more uniform pattern should produce a stronger magnet.

Astronaut George Nelson, who led the experiments, conducted similar procedures during earlier shuttle flights. A large body of data on MnBi has been produced, not only from the shuttle missions, but from earth experiments and from short space flights aboard sounding rockets. For further information contact Miriam Reid, Grumman Corporation, Bethpage, NY 11714, telephone (516) 575-3999. Source: *Electronic Materials Technology News*, October 1988, p. 3.

AIP/AAPT Survey Identifies Shortcomings, Needs of High School Physics Programs

Only about 20% of U.S. high school students enroll in physics classes—though nearly all of them have access to such programs. That is one finding in a recent report on secondary schools issued by the American Institute of Physics (AIP) in collaboration with the American Association of Physics Teachers (AAPT).

The study, *Physics in the High Schools: Findings from the 1986-87 Nationwide Survey of Secondary School Teachers of Physics*, provides detailed information on schools, and on the training, experiences and attitudes of the nearly 20,000 high-school-level physics teachers. The study's objective was to furnish findings that would be relevant to the daily classroom needs of those teachers as well as to contribute to current discussions concerning the scientific literacy of the nation's workplace and citizenry.

Among the findings:

- In the spring of 1987, 623,000 students were enrolled in high school physics in the U.S.
- Although 96% of all high school students attend schools where physics is available, only about 20% of all high school graduates actually take physics.
- Approximately one-third of the teachers surveyed have their initial training in physics. Another third began their careers in a different field, but have taught physics regularly throughout their teaching career. The remaining third can be classified as "draftees," with training in other fields and little previous experience in the teaching of physics.

The report concludes that three sets of factors appear to have the greatest impact on the presence and robustness of physics programs in high school. They are:

1. school size, geographic location, and urban or rural setting;
2. the demographic character of the student body, especially its socioeconomic and racial composition; and
3. the level of commitment of the school administration to rigorous science education, as measured by such variables as years of science required for graduation, level of funding provided for physics classes and laboratories, and level of administrative support perceived by teachers.

A number of factors conspire to keep physics enrollment from increasing, according to the study. One is the scarcity of trained teachers. Another is low minimum graduation requirements in science (which in a large majority of states is still only one or two years) combined with the continued tradition of teaching science: biology first, chemistry second, physics last. Even schools with formal programs to increase enrollment—15% of the national total—appeared to be making little headway in attracting more students to physics.

Studies have shown that although most other countries retain a much smaller proportion of their students in secondary school, those who are retained face much more rigorous standards than in the U.S. In many countries, science requirements typically extend across all years of the grades equivalent to our high school, and physics is one of the courses required of all students. In fact, in many developed countries a substantial proportion of students take two years of physics, compared to just one percent of U.S. high school students who do so. Even more startling: performance tests recently administered to this small number of second-year or advanced-placement physics students—the "cream of the crop" of this country's high school physics programs—showed that the Americans placed near the bottom of the international ladder in their knowledge of physics.

Using the data acquired in this survey, AIP plans to issue future reports on specific aspects of high school physics, such as the status of women teachers, schools with

If you're involved in superconductor research, a valuable **FREE** brochure offering over 100 specialized products is now available to you from Johnson Matthey/AESAR. You'll find aluminum, barium, bismuth, calcium, copper, lanthanum, strontium, thallium and yttrium metals and compounds in various purities – the most frequently requested items for superconductor research – and they're available for immediate shipment. In addition, the **FREE** brochure explains Johnson Matthey's unique fabrication service for confidential development and engineering of customized research materials. Get your **FREE** copy today – Call **800-343-1990** (in NH 474-5511).

Superconductor Research Materials FREE Brochure

Call **800-343-1990**
(in NH 474-5511) or complete this coupon and mail to: Johnson Matthey/AESAR, P.O. Box 1087, Seabrook, NH 03874

Name

Title Mail Stop

Company/Organization

Address

City State Zip

( ) - - Ext
Telephone Number

Johnson JM Matthey
ÆSAR®

2050

https://doi.org/10.1557/S0883769400053835 Published online by Cambridge University Press

heavy minority enrollments, and parochial schools. Finally, in order to continue monitoring changes in physics programs and among the ranks of teachers, a new round of data collection is planned for 1989-90.

Copies of the current survey are available from the AIP Division of Education and Employment Statistics, 335 East 45th Street, New York, NY 10017-3483. For more information, contact AIP at (212) 661-9260, ext. 326 or AAPT at (301) 345-4200.

Editor's Note: See Posterminaries in this issue for some additional opinions on physics education.

Lewis, Argonne Sign Agreement for Joint High T_c Effort

NASA's Lewis Research Center and Argonne National Laboratory have signed an agreement to begin a joint research effort to develop high temperature superconductivity (HTS) materials and technology. Both parties said the program could provide significant economic benefits and maintain a world leadership role for the United States in this field.

The objective of the agreement is to exploit recent rapid advances in HTS technology for significant space and aeronautical applications. Research and technology development will be undertaken for applications where HTS could be an enabling technology or substantially improve existing systems.

Initially, research will concentrate on advanced studies and critical exploratory experiments to identify the most promising applications for further development. Among the first candidate applications will be superconducting magnetic energy storage, space electromagnetic propulsion, microwave power transmission, aeropropulsion applications, and electromagnetic launch systems.

D.M. Gruen Named Inventor of Year

Dieter M. Gruen, associate director of the Materials Science Division at Argonne National Laboratory and a member of the Materials Research Society, was recently named Inventor of the Year by the Patent Law Association of Chicago.

Gruen is holder or co-holder of 14 patents for analytical instrumentation, surgical devices, heat pumps, and high T_c superconductive current carriers. He has additional patent applications on file.

Gruen is sole inventor of a new technology for making superconducting wire. It recently became the first superconducting technology transferred by a government laboratory to private industry when Argonne licensed it exclusively to American Superconductor Corp., Boston, Massachusetts. [See "Argonne and American Superconductor Sign" in this section.]

Gruen also helped develop SARISA (surface analysis by resonance ionization of sputtered atoms), a laser-based system that can detect surface impurities as small as 500 parts per trillion in the outer atomic layer of semiconductors, metals, and metal oxides. Unlike some other widely used detection methods, it does almost no damage to a material's surface.

Another invention Gruen helped to develop is the excimer laser technique used in such intraocular surgery as repairing detached retinas and lensectomies. Unlike other lasers used inside the eye, the xenon-chloride excimer laser cuts tissue with little, if any, burning. It uses fiberoptics, glasslike fibers 1 mm or smaller in diameter to deliver the laser beam to a precise point inside the eyeball.

Gruen's contributions to research leading to advances in other laser technologies were cited in October when he and three fellow Argonne chemists received the Materials Sciences Research Award from the U.S. Department of Energy. [See report in the December MRS BULLETIN, p. 20.]

Gruen worked on the Manhattan Project at Oak Ridge, Tennessee during World War II and joined Argonne in 1947. In addition to MRS, he is a member of the American Chemical Society and is author or co-author of more than 250 publications. Born in Waldorf, Germany, Gruen holds a bachelor's degree in chemistry from Northwestern University and a doctorate in chemical physics from the University of Chicago.

Argonne and American Superconductor Sign First Public-to-Private High T_c Agreement

A new technology for making superconducting wire is the subject of an exclusive licensing agreement announced recently by Argonne National Laboratory and American Superconductor Corp., Cambridge, Massachusetts.

The agreement is the first to license superconducting technology from a government laboratory to private industry. The technology was developed at Argonne and licensed exclusively to American Superconductor.

Under a separate agreement, American Superconductor will provide $100,000 to fund Argonne research on other superconducting technologies. The licensing and research agreements are part of the firm's existing program to develop and market high T_c superconductors in usable form.

Under the license agreement, American Superconductor has exclusive rights to develop and market a technology, developed by Argonne scientist Dieter Gruen [See "D.M. Gruen Named" in this section], that involves coating a wire with the right proportions of yttrium, barium, and copper, then heating the wire in the presence of oxygen to oxidize the coating. The process, on which a patent is pending, yields a wire coated with yttrium-barium-copper oxide. Tests of this approach at Argonne have shown promise, but more work is needed before the process yields a practical superconducting wire. The licensing agreement, which will allow American Superconductor to continue that work, is only the beginning of Argonne's potential to commercialize inventions in the area of superconductivity, according to laboratory officials.

The other agreement involves Argonne's investigations of "sputter-deposited" and "bonded" high T_c superconductors. American Superconductor will fund research to apply superconductors to surfaces of other materials in hopes of making composites that combine desirable electrical properties of superconductors with practical physical properties of underlying materials. In return the company will expand its access to key research personnel at Argonne, where some 100 staff members perform basic and applied research on new superconductive materials. Argonne's is the largest publicly funded superconductivity research program in the United States.

NASA Lewis Receives R&D Awards

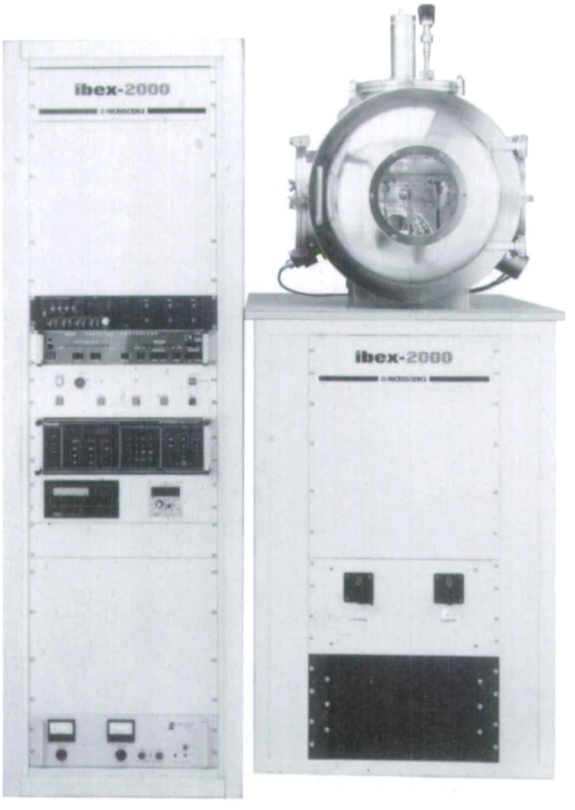
NASA's Cleveland-based Lewis Research Center recently received two R&D 100 Awards, one for a long-life nickel-hydrogen cell and the other for a microprocessor-based system to detect and accommodate sensor failures in control systems. The awards are given annually by *Research & Development* magazine for the 100 most significant technological developments of the past year.

Lewis received the first award for the Advanced IPV (individual pressure vessel) Nickel-Hydrogen Cell, Yardney Whittaker Model YNHC-050-12. Hughes Aircraft Company, Malibu, California, was the joint recipient of this award. The primary function of the cell is to provide electrical energy storage for long-term low Earth orbit spacecraft missions. Improvements in the cell involve cycle life; thermal, electrolyte, and oxygen management; and nickel

ibex-2000

THIN FILM RESEARCH SYSTEM

for the new thin film technologies - ECR, DLC, HTc...



APPLICATIONS:

- RF and DC Magnetron Sputtering
- Ion Beam Sputtering
- Reactive Sputtering
- Surface Modification
- Surface Cleaning
- Ion Milling
- Evaporation
- Ion Implantation
- Reactive Ion Beam Etching
- UHV Hybrid Systems with in-Situ Surface Analytical Capability

MODULARITY

The IBEX 2000 is a modular research system for the fabrication, modification and analysis of thin solid films. The chamber design allows for maximum flexibility in mounting substrate holders, magnetrons, targets, ion and plasma beam sources. The chamber is available in UHV or high vacuum configurations and can be adapted to accept load locks and analytical stations.

The IBEX 2000 is suitable for research into many areas of thin film technology including new areas such as:

- Diamond like films
- Superconducting films
- Ion and plasma enhanced deposition techniques.

MICROSCIENCE, INC.

Microscience has since its founding been dedicated to providing new and innovative equipment to scientists and engineers in the field of materials research. Other products available from Microscience include:

- Surface Science Components
- Scanning Tunnelling Microscope
- ECR Plasma stream sources and Systems
- R&D scale MBE system
- RF Plasma Systems for RIE & PECVD
- Sub-Micron Mechanical Properties Analyser
- Diamond Scratch Tester

MICROSCIENCE
We deliver innovation.

Microscience Inc., 41 Accord Park Drive, Norwell MA. 02061 Tel-(617) 871 0308

https://doi.org/10.1557/S0883769400053835 Published online by Cambridge University Press

electrode expansion.

The second award recognizes the DIA1 Sensor Failure Accommodator, a device that detects and isolates the occurrence of sensor failures and accommodates for this failure in control systems. Lewis received this award jointly with Pratt & Whitney Aircraft, Commercial Products Division, East Hartford, Connecticut, and Systems Control Technology, Palo Alto, California. The DIA1 is based on analytical redundancy, which uses a detailed mathematical model of a process to interrelate the "normal" readings of different sensors. The device determines whether the indication of a given sensor is consistent with those of other sensors, within prescribed limits.

The DIA1 algorithm consists of three elements: (1) logic for detection of hard failures; (2) logic for detection of soft failures; and (3) the accommodation filter, which contains the mathematical system model and produces estimates of process outputs.

All the inventions receiving an R&D 100 Award are described in the October 1988 issue of *Research & Development* magazine.

U.S. Defense Department Announces New Graduate Fellowship Program

The U.S. Department of Defense (DOD) recently announced plans to award approximately 150 new three-year graduate fellowships in April 1989 under the National Defense Science and Engineering Graduate (NDSEG) Fellowship Program.

The $10 million program reflects concern that a declining number of U.S. citizens have been pursuing advanced degrees in science and engineering fields that are important to national defense. In engineering, for example, more than 50% of U.S. doctoral degrees are now awarded to foreign citizens. The new program will more than double the number of DOD science and engineering graduate fellowships to be awarded in 1989. In addition to the 150 NDSEG fellowships, about 140 fellowships will be awarded in 1989 through existing programs.

The fellowships will go to students who intend to pursue doctoral degrees in mathematics, computer science, physics, biosciences, chemistry, chemical engineering, toxicology, geosciences, cognitive, neural and behavioral sciences, materials science, manufacturing sciences, electrical engineering, mechanical engineering, naval architecture and ocean engineering, aeronautical and astronautical engineering, and oceanography.

Only U.S. citizens or nationals are eligible. Applications are encouraged from women and minorities, and persons with disabilities. Ten percent of the awards will be set aside for members of ethnic minority groups under-represented in the advanced levels of U.S. science and engineering.

Applications are available from Battelle-Columbus Division, Graduate Fellowship Program, P.O. Box 12297, Research Triangle Park, NC 27709; telephone (919) 549-8291. Applications must be filed by **March 1, 1989.**

Conference Offers Opportunity for Involvement in Pre-College and Public Science Education

The Fourth National Technological Literacy Conference, February 3-5, Washington, DC, offers an opportunity for MRS members to become personally involved in issues surrounding pre-college and public science education. This topic found its way into many presentations at the 1988 MRS Fall Meeting in Boston, including the Plenary Address by Lester Thurow and Prof. Merton Flemings' report on the National Academies' Materials Science and Engineering Study.

During the Washington conference some 1,500 teachers, professors, science policy experts, and public interest groups are expected to discuss all aspects of the interaction of science and technology with society.

Dr. George Bugliarello, president of Polytechnic University of New York, will coordinate sessions on education as a technology which solves society's problems.

Dr. James Rutherford, head of education for AAAS and former assistant director of both the National Science Foundation and U.S. Department of Education, will present the results of a national study on "What Every American Should Learn about Science and Technology."

Prof. Rustum Roy, Pennsylvania State University, will coordinate a science policy session on setting priorities for R&D. Invited speakers include Congressmen George Brown and Don Ritter, GM research vice president Robert Frosch, and Oak Ridge National Laboratory director Alvin Trivelpiece. These speakers and many others are expected to be involved

https://doi.org/10.1557/S0883769400053835 Published online by Cambridge University Press

PRELIMINARY PROGRAM
INDUSTRY-UNIVERSITY
ADVANCED MATERIALS CONFERENCE

MARCH 6-9, 1989 EMBASSY SUITES HOTEL DENVER, COLORADO

SPONSORED BY: ADVANCED MATERIALS INSTITUTE*
COLORADO ADVANCED TECHNOLOGY INSTITUTE
MATERIALS RESEARCH SOCIETY

The conference has two themes: To review current materials research; to create opportunities for interactions among participants from industry, government and academia. Organized by topical area, each will be introduced by a prominent keynote speaker describing future research needs and directions required.

PLENARY SESSION
Dr. Albert I. Schindler, Director, Division of Materials Research, NSF
"Directions of U.S. Materials Science Research in the 1990's"

INTERFACIAL PHENOMENA IN ELECTRONIC MATERIALS
Chairman: Dr. C. W. Wilmsen, Colorado State University
Keynote: Dr. L. J. Brillson, Xerox Webster Research Center
"Progress in Understanding and Controlling Metal-Semiconductor Interfaces"
Seven Contributed Papers

INTERFACIAL PHENOMENA IN NON-ELECTRONIC MATERIALS
Chairman: Dr. T. E. Furtak, Colorado School of Mines
Keynote: Dr. J. R. Smith, General Motors Research Lab
"Universal Features of Interatomic Interactions at Interfaces"
Six Contributed Papers

MATERIALS FOR HIGH-SPEED ELECTRONIC DEVICES I
Chairman: Dr. A. Majerfeld, University of Colorado
Keynote: Dr. V. G. Keramidas, Bell Communications Research
"Photonic and Electronic Materials: A Current Perspective"
Seven Contributed Papers

MATERIALS FOR HIGH-SPEED ELECTRONIC DEVICES II
Chairman: Dr. B. Sabacky, AMAX, Inc.
Keynote: Dr. A. Podell, Pacific Monolithics
"What do we do with this stuff, now that we've made it?"
Five Contributed Papers

METAL AND CERAMIC MATRIX COMPOSITES
Chairman: Dr. J. Mote, University of Denver
Keynote: Dr. S. G. Fishman, Program Manager Materials Division, Dept. of Navy
"Research on Composite Interfaces"
Seven Contributed Papers

AMORPHOUS MATERIALS I AND II
Chairman: Dr. J. Trefny, Colorado School of Mines
Keynote: Dr. R. Crandall, SERI
"Current Ideas Concerning Metastable Defects in Amorphous Silicon"
Fourteen Contributed Papers

CERAMICS
Chairman: Dr. G. DePoorter, Colorado School of Mines
Keynote: Dr. J. D. Katz, LANL
"Microwave Processing of Ceramics"
Seven Contributed Papers

POLYMERIC MATRICES IN COMPOSITES
Chairman: Dr. J. K. Stille, Colorado State University
Keynote: Dr. K. Lau, Lockheed Aeronautical Systems Co.
"Trends in High Performance Polymer Materials"
Seven Contributed Papers

SUPERCONDUCTIVITY I AND II
Chairman: Dr. R. Kamper, Nat'l. Inst. of Standards & Tech.
Keynote: Dr. A. Clark, Nat'l. Inst. of Standards & Tech.
"Superconductivity Scene in Europe"
Thirteen Contributed Papers

MATERIALS AND DEVICES PROCESSING
Eight Contributed Papers

POSTER SESSION
Twenty-five Papers

*AMI is a consortium of four Colorado universities, state government, and nine corporations including Adolph Coors Company, Advanced Forming Technology, AMAX, Ball Aerospace Systems Group, Digital Equipment, Gates Rubber Co., IBM, Manville Sales, and Martin Marietta Corp.

For further information: Advanced Materials Institute, Colorado School of Mines, Golden, CO 80401, (303) 273-3852.

https://doi.org/10.1557/S0883769400053835 Published online by Cambridge University Press

such issues as "big" science vs. "little" science, basic vs. applied science, and how to redistribute funding among disciplines.

MRS members are invited to attend and contribute. For information contact: National Association for Science, Technology, and Society, 117 Willard Building, Pennsylvania State University, University Park, PA 16802. Call (814) 865-9951 for information on registration and housing.

Applications Due for SPIE Educational Grants and Scholarships

Applications are being accepted by the International Society for Optical Engineering (SPIE) for $58,000 in 1989 scholarships and grants ranging in size from $500 to $5,000.

The SPIE Education Committee will judge applications on the basis of their potential for long-range contributions to optics and optical engineering. Awards will not be made on the basis of need.

Applications will be considered for any activity in the field of optics. A course of study in optics or optical engineering and student travel to meetings of professional and technical societies are appropriate uses for scholarship and grant awards. Requests for the purchase of equipment, while less suitable, will also be considered.

Applications must be received at SPIE headquarters by **April 25, 1989.** The recommendations of the Education Committee will be acted upon by the Board of Governors during the annual SPIE meeting in San Diego August 6-11, 1989. Candidates will be notified of the outcome shortly after.

When requesting forms, applicants should specify whether they are students or representatives of a college or university because each requires a different form. For further information contact Warren J. Smith, Chairman, SPIE Education Committee, SPIE, P.O. Box 10, Bellingham, WA 98227-0010; telephone (206) 676-3290, fax (206) 647-1445.

NSF Funds Center for Advanced Cement-Based Materials at Northwestern

A Center for Advanced Cement-Based Materials will be established at Northwestern University with a $1.75 million grant from the U.S. National Science Foundation. The award is for the first year of a five-year program expected to total about $10 million.

Northwestern scientists, in collaboration with researchers at the University of Illinois at Urbana-Champaign, the University of Michigan, Purdue University, and the National Institute of Standards and Technology, will develop the scientific knowledge to design the next generation of cement-based materials with improved properties.

The goal is to design stronger, lighter and less costly materials that are more energy efficient. The materials would be used in new construction and in restoration and repair of existing structures, including highways, bridges, power plants and waste disposal systems.

The center will bring together such disciplines as civil engineering, materials science, chemistry, physics, electrical engineering, and geology to develop the fundamental scientific knowledge.

The NSF-funded center will be based at the Technological Institute, Northwestern's school of engineering and applied science. Surendra P. Shah, professor of civil engineering at Northwestern, will be director, and J. Francis Young, professor of engineering at the University of Illinois, will be associate director. Shah and Young are both members of the Materials Research Society. Young was a co-chair for the 1988 MRS Fall Meeting just held in Boston.

The Center for Advanced Cement-Based Materials is one of 11 Science and Technology Centers recently established by the NSF. Total funding for all the centers is approximately $24.7 million during the first year of the NSF awards.

Los Alamos and Argonne National Labs Receive Multiple R&D Awards

Los Alamos National Laboratory and Argonne National Laboratory together received 12 of the 1988 R&D 100 Awards presented recently by *Research and Development Magazine*. The awards were known formerly as IR-100 Awards.

Los Alamos National Laboratory

Los Alamos received awards for the following achievements:

- Nuclear material solution assay system, which accurately measures the mass of uranium 235 in a small sample of a uranium-bearing solution.
- Photoinjector, an optically pulsed injector for rf linear accelerators, which generates current densities 30 times higher than those of conventional injectors, and uses a laser to produce an electron beam of extreme brightness.
- High-temperature molten salt reference electrode, the first reproducible design to provide a reliable method of monitoring and controlling molten salt processes.
- Lattice gas algorithm, a new, extremely fast, efficient, parallel software for solving complicated fluid dynamic flow problems. The algorithm is a public-domain program, available free from the principal investigator or *Argonne.*
- 32SMART, an intelligent, programmable, self-checking 32 stepper-motor position controller that occupies one-tenth the space and is one-tenth the cost of current units.
- Oriented, highly anisotropic conducting polymers that are lightweight and flexible with copper-like conductivity.
- Mobile beryllium monitor, which provides the simple, rapid, on-site, and sensitive method of measuring beryllium particles collected by air sampling filters.
- Optical microrobot single-cell manipulator and analysis system that accurately transports, sorts, and analyzes single cells by using a laser.

Argonne National Laboratory

Argonne's winning developments in 1988 include:

- Linear predictive spectral analysis (LPSPEC) software, which compensates for the limitations of fast Fourier transform (FFT) analysis.
- Fourier transform electron paramagnetic resonance (FTEPR) spectrometer, which measures the weak magnetic properties of a material's most energetic electrons, recovering all the frequencies in a signal.
- pH sensor for high-temperature/high-pressure aqueous environments that features unattended, trouble-free operation and a thermodynamically well-defined measurement of chemical composition.
- Neutron stress monitor, which permits rapid, accurate calculation of internal stresses in composite materials as affected by temperature or external load. Measurements can be made in air, a vacuum, or special gaseous environments. Among the principal investigators for the monitor are two MRS members, Saurin Majumdar and John Faber.
- Compact helium-dilution refrigerator, providing a reliable, quiet, and inexpensive device for achieving temperatures near absolute zero.

Space Shuttle Superconductivity Testing Slated for 1990

The United States plans to synthesize organic superconductors in a gravity-free state as part of its International Microgravity Laboratory materials test project (IML-1) aboard a space shuttle beginning in 1990. On a separate shuttle, to be launched in 1991, researchers will synthesize alloy superconductors as part of the First Material

How to make light work of your toughest specimen preparation challenges.

Keeping pace with the increasing pace of change. Demands on materials researchers are growing exponentially. Yet, while the pace of change increases, there still isn't any more time in a day. And less room for error than ever.

South Bay Technology is the solution. We've helped keep research professionals just ahead of the pace of change since 1964.

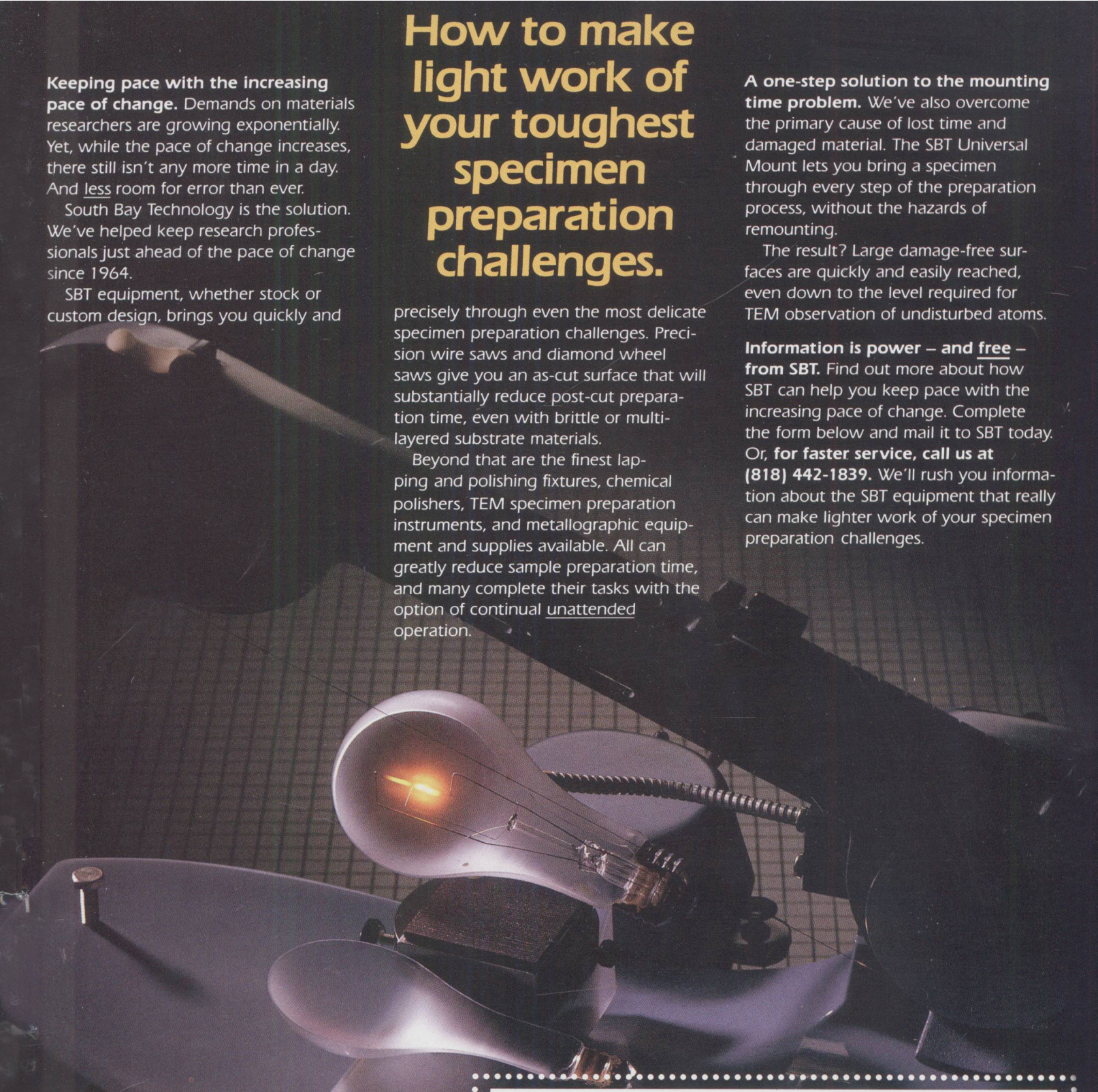
SBT equipment, whether stock or custom design, brings you quickly and precisely through even the most delicate specimen preparation challenges. Precision wire saws and diamond wheel saws give you an as-cut surface that will substantially reduce post-cut preparation time, even with brittle or multi-layered substrate materials.

Beyond that are the finest lapping and polishing fixtures, chemical polishers, TEM specimen preparation instruments, and metallographic equipment and supplies available. All can greatly reduce sample preparation time, and many complete their tasks with the option of continual unattended operation.

A one-step solution to the mounting time problem. We've also overcome the primary cause of lost time and damaged material. The SBT Universal Mount lets you bring a specimen through every step of the preparation process, without the hazards of remounting.

The result? Large damage-free surfaces are quickly and easily reached, even down to the level required for TEM observation of undisturbed atoms.

Information is power – and free – from SBT. Find out more about how SBT can help you keep pace with the increasing pace of change. Complete the form below and mail it to SBT today. Or, **for faster service, call us at (818) 442-1839.** We'll rush you information about the SBT equipment that really can make lighter work of your specimen preparation challenges.



SBT SOUTH BAY TECHNOLOGY inc.

International Headquarters
5209 Tyler Avenue
Temple City, California 91780-3698
(818) 442-1839

With offices serving researchers around the world..
Australia/New Zealand, Austria/West Germany, France, Japan, China, Korea, Eastern Europe and the United Kingdom

TELL ME MORE about the South Bay Technology products I've checked below. We currently ☐ do ☐ do not use SBT equipment.

- ☐ Slicing Instruments
- ☐ Lapping and Polishing Fixtures
- ☐ TEM Sample Preparation Equipment
- ☐ Other _____
- ☐ Orientation Instruments
- ☐ Wafer Mounting Fixtures
- ☐ Sample Preparation Supplies
- ☐ Complete Product Catalog

Name _____ Title _____

Field/Specialization _____

Company _____ Div./Dept. _____

Address _____

City _____ State _____ ZIP _____

Phone _____

Processing Test (FMPT) project.

In the IML-2 project, the United States will rent a laboratory in a space shuttle to another country, and scores of experiments are planned. Japan has proposed an experiment on the growth of organic metal crystals, including organic superconductors. Ishikawajima-Harima Heavy Industries will build an experimental organic metal growth system to make organic superconductors in the IML-1 program and an electric continuous heating furnace to produce superconducting alloys as part of the FMPT project.

In the FMPT project, Japanese astronauts will conduct tests involving 22 materials and 12 life sciences topics. Among other things, the astronauts are expected to make homogeneous superconducting alloys in weightlessness and bring them down to earth to make them into cable and tape-type conductors.

In the coming decade, the IML-1 and FMPT projects are scheduled to launch three or four missions apiece, each lasting at least nine days. Following these projects, the United States, Japan, the European Community, and Canada will perform tests in a total of four experimental modules to be built on a space station. Japan will own one of those modules.

—Information from *Superconductor Week*, October 3, 1988

M.L. Mecartney Receives Packard Foundation Fellowship

Martha L. Mecartney, assistant chemical engineering and materials science professor at the University of Minnesota, will receive a five-year, $500,000 Fellowship in Science and Engineering from the David and Lucile Packard Foundation. The award will support Mecartney's research on the structure of ceramic materials, especially the role of defects in controlling their properties.

Mecartney, a member of the Materials Research Society, joined the faculty at the University of Minnesota in 1985. She is one of only 20 university researchers nationwide to receive the award.

The Packard fellowship program is intended to spur the careers of young scientists and engineers and encourage them to stay in a university setting. The award, a $100,000 grant annually for five years, is intended to support expenses such as scientific instruments, research supplies, and scholarships for graduate research assistants. The Packard Foundation, located in Los Altos, California, plans to give 20 more fellowships each year until 1992, when it will reach its goal of supporting 100 science and engineering faculty members.

Modifying Plastics for Biomedical Applications

Researchers at Los Alamos National Laboratory (LANL) and the University of New Mexico (UNM) School of Medicine are studying chemical infusion and graft polymerization as ways to improve polyurethane for use in human implants. The investigations, part of the Biocompatible Materials Research Project, were summarized at the recent American Chemical Society Meeting in Los Angeles by Debra Wrobleski, a chemist in LANL's Materials Science and Technology Division and a member of the Materials Research Society.

Polyurethane is potentially valuable for implanting in the body, but it can cause blood clots and bacterial infections. Researchers are trying to improve the material by altering its surface so it does not react adversely with blood or other fluids.

The infusion technique allows new chemicals to be incorporated into the surface of the material, retaining the material's strength and flexibility while reducing its tendency to react with blood or other fluids. The graft polymerization process involves attaching a new substance to the surface of the polyurethane, "so a different polymer is actually being presented to the fluid," according to Wrobleski.

The researchers are using a variety of infusing and grafting materials for the project. Differences in the treated samples are probed to measure their "wetability," a surface property that can indicate biocompatability. Testing and evaluation of both methods of treating the surfaces will continue for several months.

The researchers are also studying the effect of incorporating antibacterial agents into the material. Bacterial infection has been a persistent problem in artificial hearts that have been implanted so far. The research could be important in other biomedical applications, such as implanting catheters that supply medication or replacing arteries.

https://doi.org/10.1557/S0883769400053835 Published online by Cambridge University Press

Modified Instrument Can Improve Chemical Analysis

A commercial instrument modified at Los Alamos National Laboratory may lead to an improved way to analyze the complex chemicals found in genetic material and in the environment.

The device, an ion-trap mass spectrometer, is unusual because, despite its compact size, it can identify the types and amounts of complex chemical molecules found in living organisms.

The spectrometer could be used to analyze the complex chemicals found in fossil fuels, a necessary step before researchers can develop synthetic fuels. In addition, it could be used to detect trace amounts of environmental pollutants.

The instrument's modified electrode assembly consisting of three stainless steel electrodes which trap the chemicals to be analyzed. The modified assembly is half the size of the original one—a paradoxical advantage in that the smaller the electrode assembly, the better it is at trapping the large molecules found in living organisms, fossil fuels, and chemically complex pollutants. Although some commercial spectrometers have this broader capability, none is as compact as the LANL version, which is about the size of a personal computer.

Solar Turbines, Inc. to Test Advanced Particle Collection Device

Under a U.S. Department of Energy contract, Solar Turbines Inc., San Diego, California, will test a way of capturing fly ash particles so small that *five million* of them would barely cover a dime.

Solar Turbines will team with Manufacturing and Technology Conversion International, Inc. (MTCI) of Sante Fe Springs, California to build and test an "acoustically enhanced cyclone collector." The cleanup device will use high-intensity sound to cause small particles to stick together in a snowball effect. Eventually they will become large enough to be captured by a conventional particle collection device.

The use of sound waves to overcome this problem was most recently explored by Gerhard Reethof at Pennsylvania State University's High Intensity Sound Laboratory under a prior DOE contract. Scientists found that oscillating sound waves (150-160 dB at 1,000-3,500 Hz) cause the gas to vibrate. Very small particles are caught up in the waves, while large ones are less affected. The vibrating small particles collide with each other and agglomerate with the larger ones to form clusters that can be collected with commercially available equipment. □

https://doi.org/10.1557/S0883769400053835 Published online by Cambridge University Press