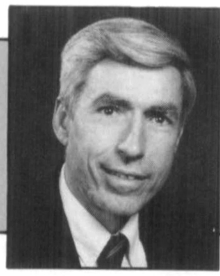
Picraux Among E.O. Lawrence Awardees



Tom Picraux

S. Thomas Picraux, manager of the Surface, Interface and Ion Beam Research Department at Sandia National Laboratories, was one of six scientists to receive the Ernest Orlando Lawrence Memorial Award, one of the U.S. Department of Energy's top awards for scientific achievement.

Established in 1959 to honor Dr. Ernest Orlando Lawrence who invented the cyclotron, the award is given to U.S. citizens who are relatively early in their careers and have made recent meritorious contributions to the development, use, or control of atomic energy. The work may be in any area of science related to atomic energy, including medicine and engineering.

Picraux was selected for his work with new ion beam channeling techniques that have led to advances in materials sciences and better microscopic understanding of materials. Among Picraux's achievements in this area are the discovery of a new ion channeling phenomenon and the application of this and related techniques to the study of strained-layer superlattices and other artificially structured materials.

Picraux joined Sandia in 1969 after receiving MS and PhD degrees in engineering science and physics from the California Institute of Technology. He is a Fellow of the American Physical Society and chairs the Materials Physics Topical Group of the APS Steering Committee. A member of several professional societies, Picraux has served the Materials Research Society as a symposium organizer, meeting chair, and committee chair. He is currently an MRS councillor.

The other E.O. Lawrence Award recipients were John J. Dorning, James R. Norris, Wayne J. Shotts, Maury Tigner, and F. Ward Whicker.

Dorning, a nuclear engineer and Whitney Stone Professor of Nuclear Engineering, professor of engineering physics, and a member of the Center for Advanced Studies at the University of Virginia, Charlottesville, was selected for his outstanding contribution to the development of advanced numerical and computational methods for solving practical problems in fission reactor statics and kinetics, neutron transport, and fluid dynamics. Dorning was also recognized for exceptional leadership in nuclear engineering education and for instilling in his students high standards of professional excellence.

Norris, who is a chemist and holds joint appointments at Argonne National Laboratory and the University of Chicago, was selected for providing new insights and an improved level of understanding of the dynamics and mechanisms of electron transfer in photosynthesis through the coupling of innovative magnetic resonance techniques with x-ray crystallographic studies of single-crystal photoreaction centers.

Shotts, an applied physicist and deputy associate director for military applications at Lawrence Livermore National Laboratory, was selected for his contributions to the research and development of advanced nuclear weapons, and his innovative approach to improving diagnostic methods that have aided in solving some of the most pressing problems in nuclear explosive designs.

Tigner, a high energy physicist and professor of physics at Cornell University, was recognized for his contributions to high energy accelerator technology, including the design of the Cornell Electron Storage Ring, the development of superconducting radio frequency cavities, and the direction of the conceptual design of the Superconducting Super Collider.

Whicker, a radiation biologist and professor, Department of Radiology and Radiation Biology at Colorado State University, was cited for his broad contributions to understanding distribution of radionuclides in the environment, for his role in the education and training of radio-ecologists, and for his development of the Pathway model to predict ingestion of radionuclides.

Chicago Teachers Academy for the Study of Science and Mathematics Gets DOE, NSF Support

The U.S. Department of Energy is providing initial funding of $215,000 and technical assistance to the new Academy for Mathematics and Science Teachers dedicated to improving the teaching and learning of mathematics and science in the Chicago Public Schools.

In collaboration with DOE, the National Science Foundation will also award a planning grant of approximately $200,000. Major DOE funding is planned with the passage of the FY 1991 federal budget, when the Department plans to provide $2 million to the Academy. Other supporting partners are the state of Illinois, city of Chicago, Chicago School, Board, and the "Leadership for Quality Education" project, representing corporate sector support.

The Academy's goal is to train 15,000 public school teachers to prepare Chicago's 410,000 students for the business and high technology world of the 21st century. The Academy's program will integrate math and science, concentrate on hands-on science participation, and provide teachers with first-hand experience at DOE national laboratories and other science and technology centers.

Education staff at both Argonne and Fermi National Laboratories provided technical support for the Academy during the planning stages. Research physicist Gordon Berry, on loan from Argonne, will serve at the Academy's acting director. Nobel laureate Leon Lederman, director emeritus of the Fermi National Accelerator Laboratory and science adviser to the governor of Illinois, initiated the Academy concept and will chair the Academy's steering committee.

DMI/Hitachi to Develop c-BN Thin Film Technology

Diamond Materials, Inc. (DMI) and Hitachi Metals Ltd. have agreed to jointly develop cubic boron nitride thin film coatings for advanced tooling applications including aerospace and automotive uses. The products will complement diamond tools currently under development by other companies worldwide.

Structurally equivalent to diamond, c-BN has high thermal conductivity and is extremely hard, but it must be synthesized. This has been accomplished using a proprietary DMI-developed plasma technology and equipment.

Because of c-BN's atomic makeup, c-BN cutting tools are chemically compatible with a broader range of materials than diamond, most notably tool steel. This will enable c-BN cutting tools to fit market needs not accessible to diamond. These needs range from cutting ferrous or iron containing metals to thermal heat sinks for semiconductors, as well as the fabrication of diamond transistors.

Other products under development by DMI include a diamond powder co-invented with researchers at Pennsylvania State University, and diamond thin films

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that are being used to produce semiconductor devices through a licensing agreement with MIT/Lincoln Laboratories.

University of New Mexico, Sandia Form Joint Materials R&D Laboratory

Officials at the University of New Mexico and Sandia National Laboratories recently announced the formation of the UNM/SNL Materials Research and Development Laboratory to be housed in the new University Research Park on UNM's south campus. The jointly operated laboratory, an unclassified, free-access research facility, will promote education in science and engineering and foster technology transfer to industry.

Sandia and UNM researchers will work together in a single laboratory with their industrial counterparts on long-term projects that are of mutual interest. A budget of $570,000 for fiscal 1991, funded equally by Sandia and UNM, will provide facilities for 30 personnel.

A challenging research agenda has already been drafted. Initial projects, which involve the advanced processing of polymer, metal and ceramic materials, include high-temperature crystal growth of refractory borides, structural analysis of colloids, and aerosol generation of ultrafine particle ceramics.

The laboratory's organization will provide privacy of results for industry-connected research and also make it easier to accommodate visitors from private companies who want to learn firsthand about the latest developments in advanced materials. Significant involvement is expected by industry researchers selected for the Department of Energy's Industrial Internship Program. This program permits researchers from other institutions nationwide to work on projects of mutual interest with their counterparts in the DOE national laboratories.

First Appointments to Distinguished Professorship Program

UNM and Sandia also announced the first eight appointments to the UNM/SNL Distinguished Professorship Program, a collaborative project through which Sandia and UNM share the cost of bringing scientists into the classroom. The eight professors from Sandia are Marshall Berman, Robert S. Blewer, C. Jeffrey Brinker, Olden Burchett, L. Ralph Dawson, Michael J. Forrestal, Clifford W. Mendel Jr., and John Shelnutt. The three-year appointments allow Sandia scientists and engineers to work at Sandia and also to teach courses, participate in research projects, and supervise graduate students at UNM.

Fusion Research Facility Dedicated in Washington State

The Large S Experiment (LSX), a $15 million magnetic fusion research facility built with Department of Energy funds by Spectra Technology, Inc., was recently dedicated in Bellevue, Washington.

Expected to become fully operational this fall and to eventually reach temperatures of 5 million degrees Celsius, LSX will be a central facility for magnetic fusion research, with scientists from the University of Washington, Los Alamos National Laboratory, and Osaka University collaborating in the experiments.

The LSX facility is based on successful experiments performed by Spectra Technology and Los Alamos National Laboratory in the mid-1980s. The LSX relies on natural adjustments of the core plasma to form a magnetic field shape desirable for fusion. A key scientific question is whether this natural shape remains stable, or can be made stable, when the device is large relative to the size of the orbits of the fuel particles in the plasma (this condition is called Large S).

ATR Appoints Vice President, Plans Construction of Two Incubators

John O. Hunter, president of Alfred State College, was recently appointed vice president of Alfred Technology Resources, Inc. (ATR), a nonprofit corporation created to oversee the development of the ceramic incubators in Corning and Alfred. New York State College of Ceramics at Alfred University and Corning Incorporated are partners in the venture, which is funded by a $10 million state Urban Development Corporation grant.

The University and Corning, Inc. are proceeding with plans to build two incubators, one on Alfred State College property and the other adjacent to Corning Incorporated's Sullivan Research Park in Ervin, NY. Each incubator will be designed to provide a home for at least 10 new industries.

The Alfred facility will be a two-story building with about 30,000 square feet, and the Corning incubator will be about 40,000 square feet. Construction on both sites is slated to start this fall.

Sharma Selected for Congressional Fellowship

D.K. Sharma, associate program manager for the Electric Power Research Institute in Palo Alto, California, was recently selected by the Institute of Electrical and Electronics Engineers (IEEE) to serve a one-year Congressional Fellowship in Washington, DC beginning January 1991. His role will be to provide scientific and technical assistance to legislators.

A 10-year veteran of EPRI, Sharma helps manage the Underground Transmission Program for EPRI's Electrical Systems Division. One of his key accomplishments has been the publication of a 15-volume reference series that details the internal workings of an electric power plant and provides solutions to commonly encountered problems.

Sharma, who holds MS and PhD degrees in engineering from Rensselaer Polytechnic Institute, also received a bachelor of technology with honors from the Indian Institute of Technology and an MS in applied science from the University of Windsor, Ontario. Sharma is an IEEE Fellow, registered professional engineer, a member of the Materials Research Society, and vice chairman of IEEE's Electric Machinery Committee.

Electrochromic Rearview Mirror in Pilot Manufacture

Schott Glaswerke's electrochromic glass is almost ready for application in rearview mirrors for cars.

Development engineers in Mainz, Germany have successfully used tungsten trioxide to make a glass that darkens and lightens automatically. They first coated normal glass with extremely thin layers of electrochromic material. The two outermost layers serve as electrodes, and the electrochromic tungsten trioxide is embedded between them.

"In this way we've practically applied a thin-film battery to the glass," says Thomas Gambke, head of the Schott Glaswerke's development department. "When a potential difference is applied, charge carriers from the electrochromic material migrate to a storage layer, and when the polarity is reversed they migrate back." As a result of the change in charge distribution, the transparency of the glass changes; it darkens. A light sensor then regulates the electrode potential according to the incident light.

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This simple sounding principle was difficult to put into practice. First, electrode material had to be both transparent and conductive, two properties which are difficult to unite physically. The use of a mixed oxide of indium and tin solved this problem.

The second problem was the application of layers, each just a fraction of a micron thick. Because one tiny dust particle could short-circuit the electrodes, which are separated only by the extremely thin electrochromic layer, the electrochromic glass is manufactured in clean rooms. Special extraction devices and protective clothing for the workers ensure no more than three dust particles per liter of air during production.

The individual layers, electrode material, and electrochromic oxide are vacuum evaporated on 10 x 15 cm planes of glass. The panes rotate slowly in the vaporizer to guarantee a uniform coating. The process is terminated automatically when the desired thickness is achieved. An additional pane of glass is attached to protect the apparatus against mechanical and chemical damage so the electrochromic system is encased between two protective sheets of glass.

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Coal Scrubber Project Uses Fiberglass, Converts Sludge to Gypsum

A scrubber system being demonstrated at Georgia Power Co.'s Plant Yates removes sulfur dioxide and fly ash at potentially half the cost of conventional scrubbers now used on modern coal burning power plants.

Costs are lower because corrosion-resistant fiberglass rather than stainless steel is used in the scrubber vessel. The resulting high degree of reliability eliminates the need for a spare absorber vessel, and because the scrubber can also collect fly ash particles, no further particulate removal device is needed.

The demonstration scrubber also eliminates the need to handle wet sludge wastes produced by older devices. A chemical reaction within the scrubber unit converts the wet material to dry gypsum, which can be stored and potentially sold for wallboard or cement production, or used as a soil conditioner.

The project is part of the DOE's clean coal technology program, and the DOE is contributing almost half of the project's $35.8 million total cost. Initial results from the advanced scrubber's operations are expected in 1994.

12.5 K Reported for Organic Superconductors

Chemists at Argonne National Laboratory report achieving a record high transition temperature of 12.5 K for an organic superconducting compound of carbon, hydrogen, and sulfur familiarly known to researchers as "ET."

The 12.5 K transition temperature is only about one-tenth as high as transition temperatures reached with the ceramic high-temperature superconductors, but research leader Jack Williams points out that the two materials are very different and that the progress in organic superconductors has been much steadier.

"Superconductivity was first reached with a similar material at about 1 K about 10 years ago," says Williams. "Since then there has been a steady progression in transition temperature." The last record high for organic superconductors, sometimes called synthetic metals, was 10 K, reached by a Japanese laboratory three years ago.

Office of Naval Research Awards Superconductivity Research Contract to MCC

The Office of Naval Research has awarded the Superconductivity Program of the Microelectronics and Computer Technology Corporation (MCC) of Austin, Texas a three-year, $1.9 million Department of Defense Advanced Research Projects Agency (DARPA) contract to develop a fabrication process for high temperature superconductor tunnel junctions.

"If we can construct high temperature tunnel junctions with low temperature characteristics, we could see more convenient and portable electronic systems and devices that will not require the more bulky liquid helium," said a Program spokesperson.

MCC's Superconductivity Program helps its participants speed development of commercial applications of superconductive materials. MCC will transfer the tunnel junction technology to DARPA as well as to participants in the MCC Superconductivity Program. Any of the participants could pursue commercialization of the devices or processes developed during the contract.

MCC will subcontract part of the research to the University of Texas at Austin through a collaboration with Dr. Alex de Lozanne, professor of physics. □

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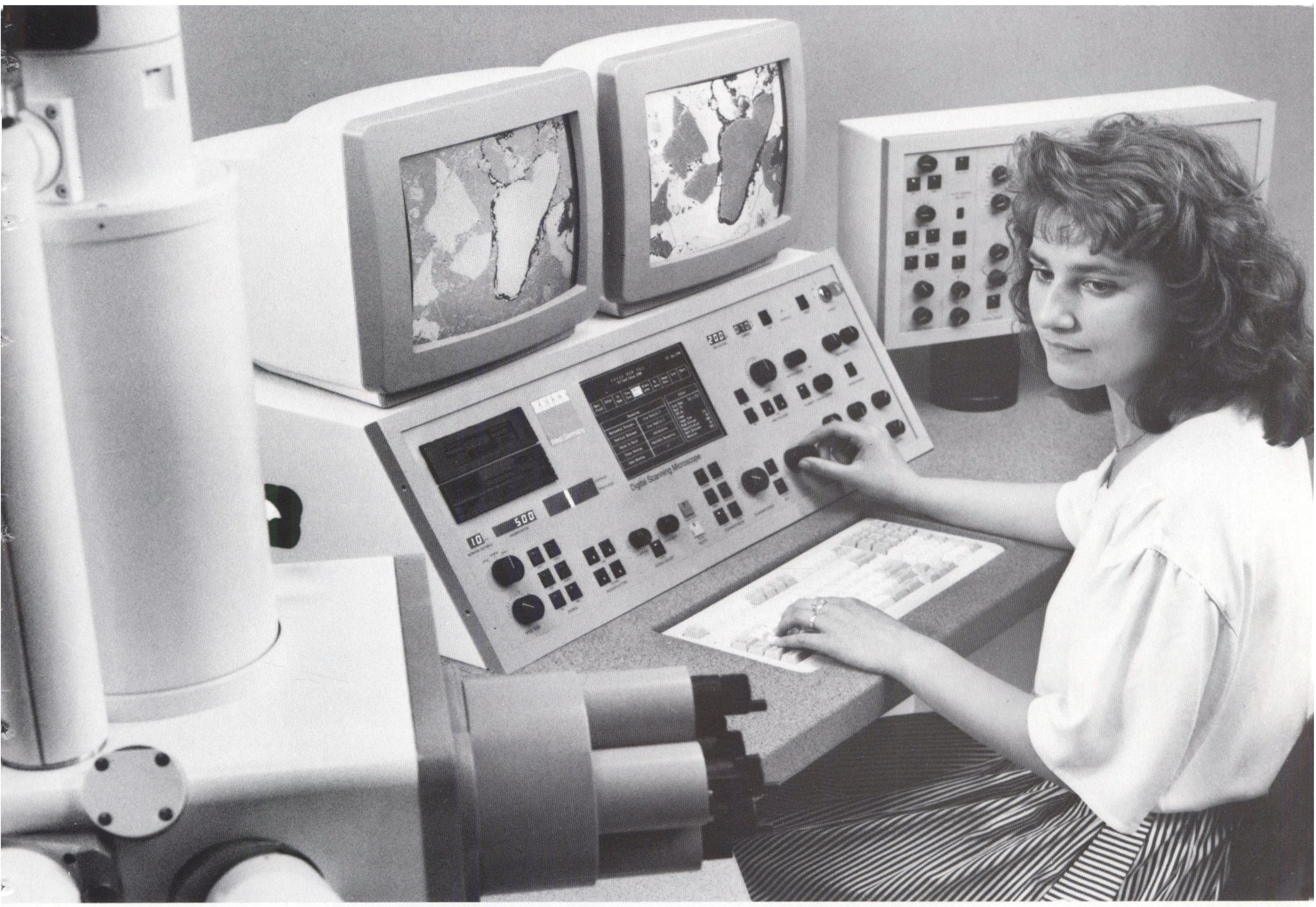

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