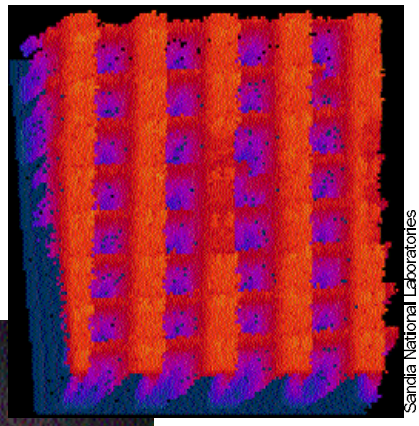
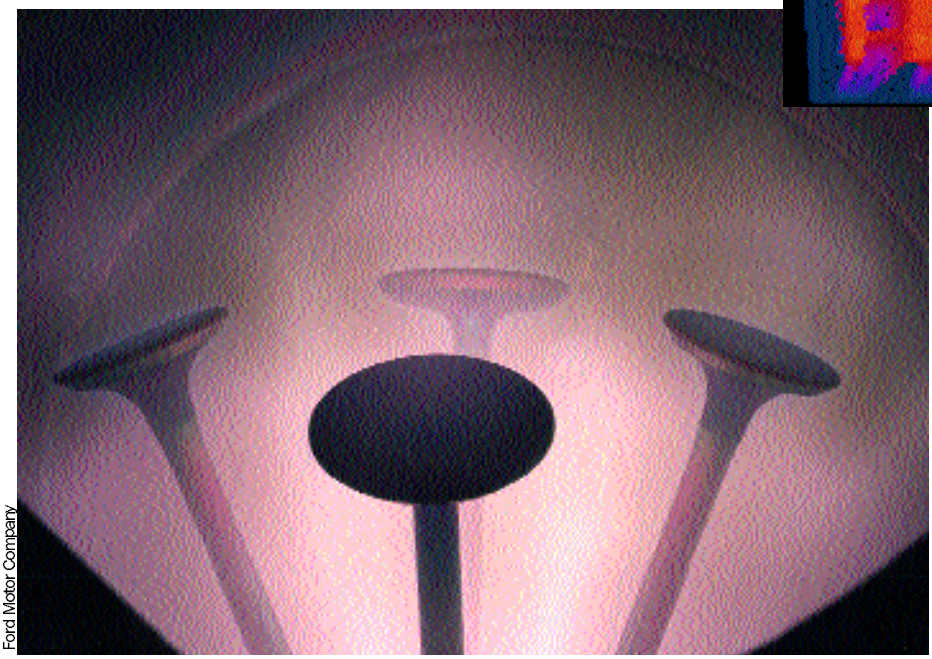
Answering Industry's Needs



Sandia National Laboratories



Ford Motor Company

Michael Tamor initiated a program at Ford to develop ultrahard amorphous hydrogenated carbon coatings, which reduce wear and friction on valves, gears, and camshafts. Barney Doyle invented an array of ion-beam techniques for microscopy at Sandia National Laboratories; a radiation effects microscope image of a static random access memory is shown at top right.

Ten members of the Forum on Industrial and Applied Physics (FIAP) are among the newly elected Fellows of the American Physical Society (APS). The society annually honors a select group of its members from industry, academia, and government with the prestigious title in recognition of their outstanding contributions to physics. To nominate someone as a Fellow go to www.aps.org and click Fellowship.

Michael Alan Tamor's research career has ranged from basic to applied physics and exemplifies the opportunities open to industrial physicists. Tamor, now manager of vehicle electronics and systems at the Ford Research Laboratory (Dearborn, MI), has earned laurels in two distinct fields—diamondlike coatings and hybrid electric vehicles (HEVs).

Tamor began his career at Ford working on the optical properties of semiconductor alloys and then initiated a program to develop ultrahard amorphous hydrogenated carbon coatings, which reduce wear and friction on automotive components such as valves, gears, and camshafts. With the advent of the Partnership for a New Generation of Vehicles, the joint government–industry program to develop a family sedan that gets 80 miles per gallon of gasoline, Ford tapped Tamor to lead its successful HEV project.

"Mike's team designed the preproduction HEV from the ground up to meet customer demands for performance, roominess, and affordability and the goals of the Partnership for superior fuel economy and low emissions," says L. Craig Davis, manager of the physics department at the Ford Research Laboratory. "Typical of physicists, Mike can see through a problem and reduce it to the fundamentals." Ford plans to put its first HEV into production in 2003.

Two scientists from IBM's Almaden Research Center (ARC) in San Jose, California, were named APS Fellows. **Joseph Grover Gordon, II**, was honored "for his pioneering contributions to the study of electrified interfaces through the development and application of techniques for in situ vibrational spectroscopy and structural characterization."

Gordon, manager of the technical staff at ARC, is a creative surface scientist and co-developer of several analytical techniques used in interface research. These include surface plasmon spectroscopy, extended X-ray absorption fine structure, the immersed oscillating quartz–crystal microbalance to study metals, and electrodeposition and surface reconstruction at metal–electrolyte interfaces. Gordon has also innovatively applied existing techniques to research problems, including surface-enhanced Raman spectroscopy, Fourier transform infrared spectroscopy to measure molecular structure at metal–electrode interfaces, and X-ray photoelectron spectroscopy to study molecular structure and surface films.

These methods, together with scanning probe microscopes, lie behind the revolution in the understanding of solid–liquid interfaces. Gordon's work has addressed some of the most important issues in the field of physical electrochemistry, particularly his studies of metal deposition on surfaces, surface reconstruction, and the structure of water on metal surfaces. Most recently, he has directed a search for new low-power emissive and reflective display technologies.

APS commended **Robert A. Scranton** "for leadership in the development and commercialization of the magnetoresistive effect and the giant magnetoresistive effect in hard-disk drives, enabling unprecedented advances in the density of magnetic data storage."

Scranton, who now directs ARC's recording heads research, led the IBM team that conquered the challenges of applying the magnetoresistive (MR) effect to hard-disk

drives. His group solved such issues as magnetic biasing and instability, process control of thin films, and reliability problems caused by corrosion, transient thermal heating, electrostatic discharge, and smearing. The company's introduction of MR heads in 1991 enabled the historic rate of areal density to double from 30% per year to 60%, which led the entire disk-drive industry to eventually convert to MR heads.

With the success of MR heads, Scranton went on to manage the IBM development team that implemented the giant magnetoresistive (GMR) effect in disk-drive heads. As a result, areal density jumped from 60% per year to 100%, and all hard-disk drives manufactured today use GMR heads. Scranton was one of the key executives who brought together the technical teams needed to solve the difficult problems faced in taking MR and GMR heads to the marketplace.

During the past two decades, the research innovations of **Barney L. Doyle** have had a significant impact on the study of fundamental and applied physics, including the use of accelerators in materials,

New APS Fellows from FIAP

Richard K. Ahrenkiel
National Renewable Energy Laboratory
For pioneering and innovative work in the techniques and analysis of recombination/minority-carrier lifetime and transport in semiconductors and for outstanding contributions to numerous areas of condensed-matter physics.

Kwong Kit Choi
U.S. Army Research Laboratory
For contributions to the foundation and development of quantum-well infrared technology, the discovery of new quantum noise properties, and the pioneering application of excitation hot-electron spectroscopies in quantum-well studies.

Barney L. Doyle
Sandia National Laboratories
For the invention of numerous micro-ion beam analysis techniques and their innovative application to solid-state physics, fusion energy, materials science, and radiation effects of semiconductors.

Jerome Lewis Duggan
University of North Texas
For outstanding contributions in the application of low-energy nuclear technology to analysis in the semiconductor, metals, and geophysics industries, and for initiating an international conference as a forum for the interaction of industrial and academic physicists.

Mark Steven Lundstrom
Purdue University
For insights into the physics of carrier transport in small semiconductor devices and the development of simple, conceptual models for nanoscale transistors.

Joseph Grover Gordon, II
IBM Almaden Research Center
For his pioneering contributions to the study of electrified interfaces through the development and application of techniques for in situ vibrational spectroscopy and structural characterization.

Robert A. Scranton
IBM Almaden Research Center
For leadership in the development and commercialization of the magnetoresistive effect and the giant magnetoresistive effect in hard-disk drives, enabling unprecedented advances in the density of magnetic data storage.

Robert James Spry
Air Force Research Laboratory
For important contributions to semiconductor defect spectroscopy, analysis of nonlinear optical devices, and polymer conductivity and optical properties.

Michael Alan Tamor
Ford Motor Company
For the application of physics in the automotive industry, in particular the development of diamondlike hard coatings and hybrid-electric-vehicle energy management simulation tools.

Peter Stanley Winokur
Sandia National Laboratories
For contributions to the understanding of physical mechanisms governing the response of complementary metal oxide semiconductor (CMOS) devices to ionizing radiation and to the development of radiation-hardened silicon gate CMOS technology.

microelectronics, and fusion studies. Doyle, manager of the radiation-solid interactions and process department at Sandia National Laboratories (Albuquerque, NM), has developed new analysis techniques to explore the effects of ion beams on various materials. His efforts have been an influential force in materials-science, solid-state and plasma physics, and microelectronics R&D.

"Since his initial invention—helium-beam elastic recoil detection—which is now a standard tool in nearly all modern ion-beam materials analysis laboratories, Barney has gone on to develop or co-invent an amazing array of extremely clever ion-beam techniques with equally significant impact," says S. Thomas Picraux, director of Sandia's Physical and Chemical Sciences Center. "These include heavy-ion backscattering microscopy, with its sensitivity demonstrated to lower than 1/10,000th of a monolayer for heavy contaminants; the single-event upset-imaging microscope, which has played a major role in our laboratory for radiation-effects microscopy; and most recently, ion-induced electron emission microscopy as an alternative to a scanned microbeam for analysis."

Jerome Lewis Duggan, professor of physics at the University of North Texas (UNT) in Denton, was cited for his "outstanding contribution in the application of low-energy nuclear technology for analysis in the semiconductor, metals, and geophysics industries," and for a conference that he initiated in 1968 and still nurtures.

The gathering, now the International Conference on Applications of Accelerators in Research and Industry, began as a teaching and academic session at Oak Ridge National Laboratory. It changed dramatically and immediately doubled in attendance when Duggan joined the UNT faculty in 1974 and added industrial applications to the conference format. The conference's 16th session convened last November in Denton with more than 1,000 participants from 50 countries.

During the past three decades, the accelerator has become a necessity to the semiconductor industry and an important part of medicine, and researchers from these and other areas attend the conference faithfully. "We bring in industrial scientists to lecture about what they are doing, which can help others with similar problems," Duggan says. "More important, people from one research area sit in on a lecture from another field and get good ideas hadn't thought of before."

The Forum department is initiated by the American Physical Society's Forum on Industrial and Applied Physics (FIAP). For more information about the Forum, please visit the FIAP Web site (http://www.aps.org/FIAP/index.html), or contact the chair, Laura Smoliar (Laura.Smoliar@gte.net).