

They Are Jolly Good Fellows

The American Physical Society fellows are a select group: each year fewer than half a percent of the APS members become fellows of the society. Fellows are nominated by each APS division, forum, and topical group; this year, for the first time, that included the Forum on Industrial and Applied Physics (FIAP). The 13 fellows nominated by FIAP, in addition to doing outstanding work in physics, each played a key role in the development of an industrially important technology (see box, page 39).

Among the new fellows are people who contributed to the development of many

Motors for 15 years. He was a key member of a small group at GM assigned the job of finding a permanent-magnet material with the characteristics of samarium cobalt that contained neither samarium nor cobalt, both of which were expensive and in short supply. The team discovered rapidly solidified neodymium-iron-boron magnet materials and streamlined the technique by which they were made so that it could be scaled up to commercial quantities (Figure 1). GM then invested in a production facility for permanent magnets in Anderson, Indiana.

A physicist working for a technological

and testing to show that they had an unacceptable level of oxygen in the reaction chamber. The engineers who were doing the scaling did not appreciate that 100 ppm oxygen together with hot rare-earth metals was enough to change everything. With much ingenuity on Fred's part, the problems were solved, and the magnets successfully produced. I remember thinking at the time that it really does take an experimental physicist of unusual talent to enter a factory, with its completely different scale, and figure out why things were not working the way they should."

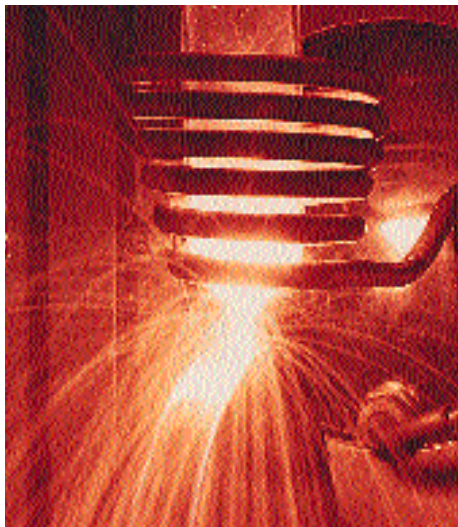
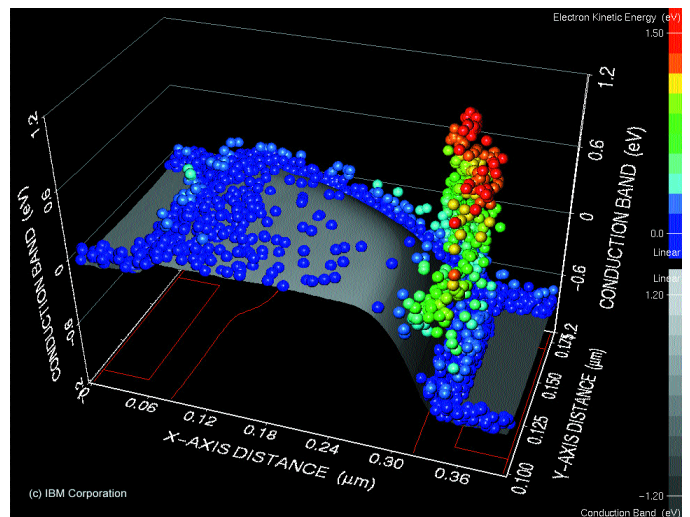


Figure 1. A research sample of neodymium-iron-boron magnetic material is rapidly solidified in a laboratory chamber at the General Motors R&D center (left).

Figure 2. Massimo Fischetti is responsible for the physics contained in Damocles, a program simulating electron transport in semiconductor devices (right).



technological devices we have come to take for granted. These include the niobium-titanium-copper wire found in the superconducting magnets in MRI systems, the gallium-indium-arsenide detector found in most modern optical-fiber telecommunications systems, the diode laser, low-loss optical fibers, mercury-cadmium-telluride infrared detectors, the atomic force microscope, neodymium-iron-boron permanent magnets, and the cesium atomic clock. Each of these fellows can say his understanding of physics has been embodied in a practical device.

Although some of the new fellows have university appointments, many have spent their careers working for technological companies. Frederick Pinkerton, for example, has been a research scientist at General

company must often, as a condition of employment, attend to the problems that arise when one tries to harness physics to do work. Although Pinkerton has done excellent fundamental physics and it was for this work that he was made a fellow, he was also sometimes called on to solve practical problems. The material world is neither simple nor accommodating, and a number of his colleagues were as impressed by his ability to solve these problems as to do physics.

In a letter supporting Pinkerton's nomination, Albert Sievers, professor of physics at Cornell University, wrote, "Initially, the large-scale process did not work, and Fred went to Indiana to figure out why. There was more than one problem that he discovered, but the one I recall was his proposal

Other letters reveal that work the fellows did influenced either corporate strategy or national policy. Using an innovative centrifuge experimental technique, Robert Schmidt did scaling studies that resulted in more reliable predictions of the size of the craters produced by nuclear explosions. As Albert Chabai, manager of the Ground Motion and Seismic Department of Sandia National Laboratories, explained it, Schmidt's work helped resolve a "surface-burst cratering dilemma. Many millions of dollars were spent by this country in trying to reconcile a discrepancy between hydrocode calculations and results of nuclear-explosion cratering in the Pacific.

Experiments conducted by Dr. Schmidt together with the scaling arguments he advanced definitely called into question

conventional thinking on the subject and challenged the community of hydrocode calculators to reexamine their procedures carefully. We can look back now and recognize that the work of Dr. Schmidt and his colleagues was correct in all respects and that it guided those of us working in the field unerringly to the correct conclusions about surface-burst cratering by nuclear explosives.”

Schmidt's work provided confidence that large events would produce craters smaller than “various ad hoc scaling hypotheses” had suggested they would. This, in turn, made hard silo basing modes more attractive and also affected U.S. nuclear-targeting doctrine. Schmidt's work was unusually influential but many of this year's nominations suggest that physics, far from being the ineffectual, cerebral discipline it is sometimes portrayed to be, remains a good fulcrum, one able to shift the weighty worlds of both business and government.

Nominations

As we join in congratulating these new fellows, we should also begin thinking about others to nominate for this honor. It has been said that an important measure of a society is its ability to recognize and reward its most distinguished members. But unless many people help in the search for new fellows, some highly qualified physicists will go unrecognized.

Applications for candidates who have been influential in applied physics, whether they are university, government, or corporate employees, should be submitted to FIAP. Successful applications will show, through patents, publications, and letters of recommendation, a record of outstanding scientific accomplishment. Common oversights are failing to document the impact of discoveries or inventions, failing to include references able to speak authoritatively about the candidate's contributions, and failing to list patents and publications. The FIAP Fellowship Nomination Committee assesses scientific accomplishment as rigorously as other APS groups but makes a special effort to include in the evaluation technical achieve-

New Fellows and Their Fellowship Citations

Harvey E. Cline

General Electric R&D Laboratories

For sustained and significant applications of physics to semiconductor processing and medical imaging, most notably thermomigration production of vertical *pn* junctions and 3-D display algorithms for X-ray computed tomography and magnetic resonance imaging.

Leonard S. Cutler

Hewlett-Packard Labs

For fundamental applications of physics in the development of precise, commercial atomic-frequency standards and clocks, and the two-frequency laser interferometer, an essential tool in modern integrated-circuit manufacturing.

Lee A. Feldcamp

Ford Motor Company

For contributions in the applications of physics to practical automotive control systems and computed tomography and to fundamental understanding of electron spectroscopies.

Massimo Vincenzo Fischetti

IBM Research Division

For the development of first-principle modeling that accurately predicts the performance of submicron semiconductor devices (see Figure 2).

Zafar Iqbal

Allied Signal Inc.

For outstanding contributions to the design, synthesis, understanding, and application of nonconventional electronic, optical, and energetic materials—from porous silicon to polydiacetylenes, high-temperature superconductors, and explosives.

Jack Dean Kingsley

General Electric Corporate R&D (retired)

For sustained excellence in the science and technology of lasers, lighting, television, displays, and medical diagnostic imaging equipment.

Robert D. Maurer

Corning Glass Works (retired)

For fundamental studies of the optical properties of glass that led to the fabrication of the first low-loss optical fibers, now used worldwide for long-distance telecommunication.

Thomas Perine Pearsall

University of Washington

For seminal contributions to the InGaAsI alloy system, a material used in the emitter and detector components of optical-fiber communication links.

Frederick E. Pinkerton

General Motors R&D Center

For research on the physics of rare-earth/transition-metal materials and contributions to the establishment of a com-

mercial permanent-magnet technology, (see Figure 1).

Calvin F. Quate

Stanford University

For co-creation of atomic force microscopy, development of inventive applications of scanning probe microscopies, and his critical role in bringing the technologies to industrial and academic use.

Marion B. Reine

Loral Infrared & Imaging Systems

For technical leadership in the design and development of innovative photoconductive and photovoltaic HgCdTe devices for advanced infrared detectors.

Lewis Josiah Rothberg

AT&T Bell Laboratories

For pioneering work furthering applications of and manufacturing approaches for organic electronics through fundamental understanding of organic photophysics and transport.

Robert Max Schmidt

Boeing Defense & Space Group

For seminal research that demonstrated the dominant influence of gravity on cratering phenomena and applications to impact cratering of planets and to missile basing, and for spacecraft protection simulation techniques.

ments that have had major industrial impact. In this way, the committee strives to balance the sometimes differing measures of success for applied and fundamental research.

Fellowship applications can be made at any time, but the evaluation process is annual. To be considered for the next fellowship awards, applications must be submitted by January 15, 1998. Further information regarding submissions can be obtained by writing to the APS Fellowship Office (One Physics Ellipse, College Park, MD 20740-

3844), calling 301-209-3268, or visiting the APS Web site (www.aps.org). ☐

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