

## North of the Border

The American Physical Society (APS) will hold its 2004 March meeting March 22–26, 2004, in Montreal, a locale that will allow physicists to enjoy a blend of old world charm and cutting-edge science and technology. The APS's Forum on Industrial and Applied Physics (FIAP) will focus its annual March meeting program on activities that cross both national and disciplinary boundaries, with a particular emphasis on applied physics activities in Canada.

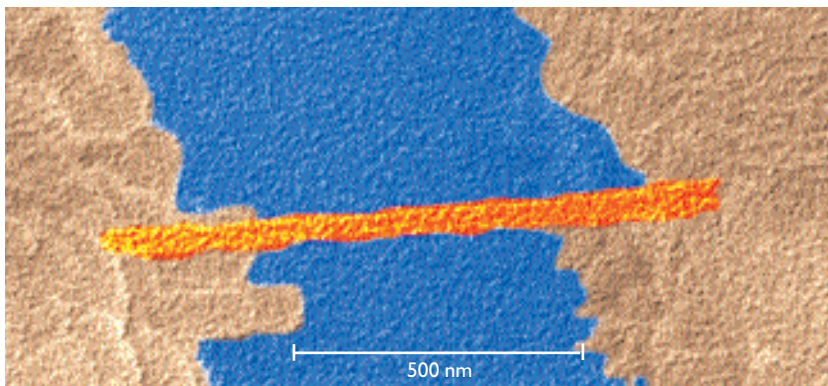
The FIAP program will include 1 tutorial, 17 focus sessions, and 10 invited symposia, which will update work in broad areas of interest to industrial and applied physicists, and to many engineers as well. Topics will include semiconductor devices and materials, microelectromechanical systems (MEMS), nanotechnology, hydrogen storage and power conversion, molecular electronics, biologically inspired computing, optoelectronics, and new developments in ceramics. In addition, there will be an invited symposium on the future of physical-science research in industrial laboratories.

### Quantum dots

On Sunday, March 21, a premeeting tutorial titled "Organic and Inorganic Semiconductor Quantum Dots," an event suggested by FIAP, will provide a comprehensive review of progress in these fascinating structures of emerging practical interest. Semiconductor quantum dots, with typical dimensions of less than 10 nm, represent a new class of material systems that provide a degree of flexibility unmatched in bulk materials.

Victor Klimov of Los Alamos National Laboratory will describe the synthesis and nonlinear optical properties of inorganic semiconductor quantum dots and quantum dot lasers, and Alexander Bratkovski of

Hewlett-Packard Labs will present the latest developments in organic quantum dot electronics. David Lockwood of the National Research Council of Canada (Ottawa) will describe the basic properties of silicon–silicon germanium nanostructures and discuss



**Figure 1. Colorized scanning electron micrograph of a carbon nanotube grown by chemical vapor deposition and selectively positioned to bridge two pre-patterned electrodes.**

Microelectronics and Physical Sciences Lab,  
Motorola, Tempe, Arizona

their applications in advanced photodetectors. Leonid Tsybeskov, New Jersey Institute of Technology, will discuss the fabrication and basic properties of nanocrystalline silicon–amorphous silicon oxide superlattices and their applications in novel semiconductor memories. This tutorial will provide an excellent introduction to the increasingly practical world of quantum dots.

### Industrial research

After World War II, research in the physical sciences flourished in U.S. industrial research laboratories. Recently, however, many laboratories in both the United States and foreign countries have significantly reduced their workforces. Moreover, the remaining researchers in the physical sciences have been refocused toward more applied R&D programs, which have the goal of achieving practical results in a shorter time. One may ask whether physics as a discipline will continue to flourish in this environment or go back to its earlier role as a primarily academic and somewhat esoteric discipline.

FIAP focus-session organizer Alex

Demkov of Motorola, Inc. (Austin, TX), has assembled a panel of industry and government experts to address this concern. Speakers in this session include APS Pake Prize recipient Robert Marshall White of Carnegie Mellon University; Kenneth Hass,

manager of the physical and environmental sciences department at Ford Motor Co. and chair of FIAP; Iwona Turlik, corporate vice president of Motorola, Inc. (Schaumburg, IL); Charles B. Duke, vice president and senior research fellow at the Xerox Wilson Center for Research and Technology; and Donald Senich, senior advisor for small business procurement policy in the

division of design, manufacture, and industrial innovation of the National Science Foundation. The discussions begun in this session will likely continue into the evening in the bars and restaurants of Montreal.

### Hydrogen storage

In the future, hydrogen could potentially serve as a common, clean energy source. A major barrier to its widespread use as a commercially viable fuel for vehicles is the lack of convenient and cost-effective hydrogen storage. Current hydrogen-storage technologies rely on liquid and compressed-gas systems, but further progress remains the goal, particularly in the development of solid-hydrogen storage materials. FIAP will present a focus session and an invited symposium to explain the current research in hydrogen-storage materials, measurements, and modeling.

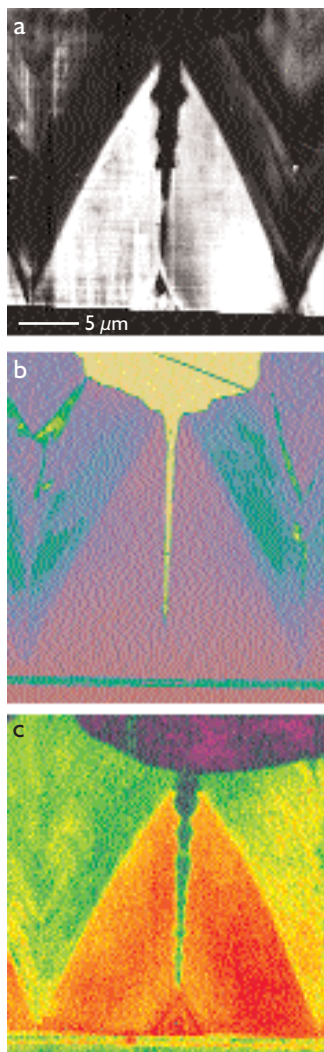
The invited symposium will open with an overview by George Thomas of Sandia National Laboratories (Livermore, CA), titled "Hydrogen storage: Where are we now, and where do we need to go?" Craig Jensen of the University of Hawaii at Manoa will describe hydrogen storage in sodium

alanates; Gerbrand Ceder of the Massachusetts Institute of Technology will show first-principles calculations of metal- and complex-hydride systems; Omar Yaghi of the University of Michigan will discuss metal-organic frameworks for hydrogen storage; and Richard Chahine of the Université du Québec à Trois-Rivières will describe hydrogen storage in carbon structures. These talks will focus on cost-effective storage and the safe, efficient use of hydrogen in fuel cells or internal-combustion engines to power motor vehicles.

## Molecular electronics


FIAP and APS's Division of Materials Physics will present an invited symposium on the challenging issue of making electrical contact to molecules, an essential problem to resolve before one can begin to develop practical, commercial applications of molecular electronics (Figure 1). Electronic devices based on molecules as active components would provide attractive alternatives to inorganic devices because of the large changes in conductivity that can be achieved with a single molecule, but this conductivity is affected profoundly by the method in which molecules are contacted.

Julia Hsu of Sandia National Laboratories (Albuquerque, NM) will describe progress in forming electrical contacts to molecular layers by nanotransfer printing (Figure 2). J. G. Kushmerick of the Naval Research Laboratory will discuss a study of the effects of molecular bonding on current-voltage symmetry; Antoine Kahn of Princeton University will focus on the use of X-ray photoemission spectroscopy to examine dipole formation between organic molecules and inorganic electrodes; C. D. Frisbie of the University of Minnesota will present an atomic-force-microscope study of molecular-metal contact resistance; and A. W. Ghosh of Purdue University will describe quantum mechanical calculations



**Figure 2. The electrical properties in different growth regions of a gallium nitride sample are illustrated using a conducting-tip atomic force microscope operating in different modes: a current map (a), a dopant map (b), and a surface potential map (c). This work was done at Bell Laboratories in 2000-2001 by Julia Hsu before she moved to Sandia National Laboratories, and is not the subject of her invited talk at the APS 2004 March meeting.**

of transport through single molecules. This symposium will be one of several invited and focus sessions on the continuing transformation of molecular electronics and biologically inspired computing from laboratory curiosities into viable technologies that will have future commercial applications.

The FIAP program also encompasses a broad range of other topics. These include terahertz semiconductor devices and their applications, multifunctional and complex oxides and their interfaces, microelectronics processing, materials and phenomena for solid-state power conversion, and a focus session on landmine detection. The complete FIAP program is accessible at the APS Web site, <http://www.aps.org>, by either following the link to the FIAP home page or going to the APS March meeting pages. 

## B I O G R A P H Y

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