sity and Argonide Corporation (Sanford, Fla.), led by Thomas J. Webster of the Department of Biomedical Engineering at Purdue, found that osteoblast function and consequently bone formation on the implant depend strongly on the topology of the implant's surface and the morphology of crystallites. They said that the shape and size of the nanophase implant particles are consistent with the dimensions of hydroxyapatite particles of natural bone. In general, the researchers identify three factors that promote enhanced osteoblast response: chemical composition, crystalline phase, and topography.

As reported on November 5 in the online edition of the *Journal of Biomedical Materials Research Part A* (to appear in print in the December 15 issue), Webster, Rachel L. Price at Purdue, and their colleagues analyzed the osteoblast function depending on the degree of nanometer surface roughness of alumina substrates. The alumina-based materials were chosen for their high osteoblast activity as compared with titanium and etched glass. The researchers used conventional spherical (α-Al_2O_3 spheres, 167 nm), nanophase spherical (δ-Al_2O_3 spheres, 23 nm), and nanofiber (boehmite fibers 2–4 nm diameter by more than 50 nm long) alumina compounds.

The researchers found that cell adhesion and proliferation results are statistically greater on nanofiber alumina as compared with other compounds. More important, calcium deposition by bone cells significantly increases on both nanoparticulate alumina substrates. They analyzed the influence of the three factors on osteoblast function. The study of the first factor shows that proteins absorb differently on materials with dissimilar chemical composition; the study of the second factor, that the transition alumina (δ- and boehmite phases) may promote an increased cell response compared to the more crystalline alumina phase (α); and the study of the third factor, that a decrease in the grain size to nanometer dimensions translates to an increase in osteoblast function. The researchers demonstrated that nanofiber alumina may offer the potential to ensure sufficient bone ingrowth and therefore to make orthopedic implants more stable.

The researchers concluded that "with knowledge of the influence that chemistry, phase, size, and nanoparticle aspect ratio have on osteoblast function, an ideal material for orthopedic/dental applications may be designed."

EKATERINA A. LITVINOVA

Ferromagnetic Ordering of Pure Organic Compound Occurs Below 1.6 K

Contrary to Heisenberg's proposition that bulk ferromagnetic ordering could only appear in systems with heavy atoms, recent synthesis and characterization of several organic ferromagnets has been reported. Such systems are mainly based on sulfur- or nitrogen-containing organic radicals. A group of researchers from Cambridge University, in cooperation with scientists from CSIC–Universidad de Zaragoza (Spain), CNRS (France), Bunkyo-ku, Japan, and the University of Cardiff (United Kingdom) has discovered a thiazyl-based neutral organic compound that undergoes ferromagnetic ordering below 1.6 K.

As reported in the November 3 issue of *Angewandte Chemie*, Jeremy M. Rawson of Cambridge and colleagues have synthesized and described magnetic properties of the thiazyl-based radical, p-$O_2NC_6F_4CNSSN^{\bullet}$. The radical was obtained by consequent reaction of p-$O_2NC_6F_4CN$ with $Li[N(SiMe_3)_2]$ and SCl_2 in Et_2O solution.

Upon determination of the crystal structure of the radical, the researchers were able to explain the ferromagnetic behavior of the substance. They described the crystal structure as chains of molecules linked through electrostatic $S^{\delta+}\cdots O^{\delta-}$ interactions in the (110) plane with the planes related by means of a 4_1 screw axis along the c-axis. In this case, the molecules form four symmetry-equivalent intermolecular S···N contacts 3.681 Å in length.

The researchers provided detailed magnetic measurements at low temperatures and showed that the compound exhibits Curie–Weiss behavior down to 10 K, while at the temperatures below 1.6 K, it begins to order ferromagnetically. Furthermore, the research team observed magnetic anisotropy in magnetization values along and perpendicular to the [001] axis of a single crystal. Based on crystal structure and previous studies of ferromagnetic properties of analogue thiazyl molecular magnets, the research team concluded that ferromagnetic interactions in the compound are referred to the nearly orthogonal nature of the singly occupied molecular orbitals on neighboring molecules.

ANDREI A. ELISEEV

News of MRS Members/Materials Researchers

Annelise Barron, of the Materials Research Center in Northwestern University, Illinois, was promoted to associate professor with tenure this fall.

Jean Blachère, associate professor emeritus at the University of Pittsburgh, has received the **Albert Victor Bleininger Memorial Award** from the Pittsburgh section of the American Ceramic Society in recognition of his leadership in the ceramics field.

Lynn Boatner of Oak Ridge National Laboratory received the **2003 American Association for Crystal Growth Award** in recognition of his "novel research in the area of crystal growth that has advanced the application of single-crystalline materials and enhanced the appreciation of crystals both scientifically and aesthetically."

Gail J. Brown, principal research physicist in the U.S. Air Force Research Laboratory at Wright-Patterson Air Force Base in Ohio, has received the **Air Force Basic Research Award** for cutting-edge research on superlattice materials for next-generation infrared sensing. The award also recognizes Brown for exemplary leadership in coordinating the research project from computational modeling and growth of the superlattice materials to initial device testing of the new materials' system.

James Wai-Jeung Chan of the Chemical Engineering and Materials Science Department at the University of California, Davis, received the **2003 Zuhair A. Munir Award for Best Doctoral Dissertation** from the UC—Davis College of Engineering for his research on "Confocal Laser Spectroscopy of Glasses Modified by Ultrashort Laser Pulses for Waveguide Fabrication" under the mentorship of Subhash Risbud.

Bai Chunli, vice president of the Chinese Academy of Sciences, has been elected vice president of the Asia Pacific Academy of Materials, a nongovernmental institution aimed at promoting free exchanges of research and development in the field of materials research through international cooperation.

Thomas F. George has been appointed chancellor of the University of Missouri—St. Louis, effective September 1, 2003. Before coming to UM—St. Louis, George

https://doi.org/10.1557/mrs2003.249 Published online by Cambridge University Press

served as chancellor of the University of Wisconsin—Stevens Point. He is a professor of chemistry and physics and an active researcher in the development of theories and mathematical techniques on computers to describe phenomena in chemical/materials/laser physics, with applications in nanotechnology. He maintains active collaborations with scientists internationally and holds the title of visiting professor of physics at Korea University in Seoul.

Martin L. Green joined the National Institute of Standards and Technology as group leader of Electronic and Optoelectronic Ceramics.

Mihal E. Gross has recently joined the Physical Sciences S&T Division of the Office of Naval Research in Arlington, Va., with responsibilities for direct energy conversion and nanoscience research.

Subhadra (Su) Gupta will join the Department of Metallurgical and Materials Engineering at the University of Alabama at Tuscaloosa as associate professor in January 2004. She has developed a broad range of process technologies for thin-film applications in data storage, semiconductors, integrated optics and acoustics, displays, and medical electronics.

Larry L. Hench, Imperial College, London, and **Frank T. Filser**, ETH Zurich, have been selected for the **International Ceramics Prize 2004** by the World Academy of Ceramics.

Jim Hutchison, chemistry professor, has been named director of the Materials Research Institute at the University of Oregon.

Kozo Ishizaki of the Department of Materials Science and Engineering at Nagaoka University of Technology in Japan has been appointed to the new position of vice president for international affairs at the university, in which he will be responsible for establishing the university's research cooperation and exchange programs with institutions worldwide.

Nobuo Kimizuka of Kyushu University received the **2003 Wiley Polymer Science Award** for "The Development of New Self-Assembling Nano-Systems." The award was announced by John Wiley & Sons Inc. and the Society of Polymer Science, Japan (SPSJ), and recognizes SPSJ members under the age of 45 who have demonstrated work showing considerable potential.

William Frank McClune has been elected as **Distinguished Fellow of the International Centre for Diffraction Data** in recognition of his sustained, outstanding work in the field of powder diffraction.

John E. Morral was named chair of the Department of Materials Science and Engineering at The Ohio State University, effective October 1, 2003.

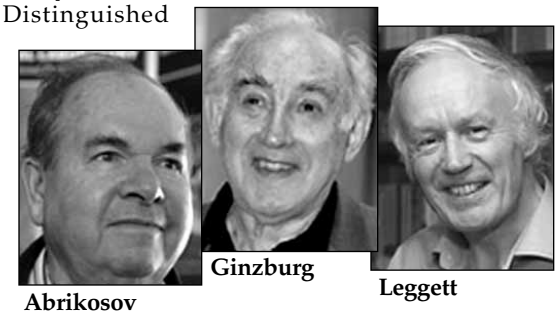
Alison Ord, chief research scientist at Australia's Commonwealth Scientific & Industrial Research Organisation (CSIRO), and her computational geoscience team have been awarded the **Otto Trustedt medal** from the global metals and technology company Outokumpu in recognition of the team's contributions to understanding the Outokumpu mineralizing system in Finland, particularly for improving the understanding of copper, zinc, cobalt, nickel, and gold mineralization in the company's mining area.

Jack Rowe has been named deputy director for the new Institute for Advanced Materials, Nanoscience, and Technology at the University of North Carolina; he will also serve as adjunct professor in the Department of Physics and Astronomy at UNC.

Jim Shackelford, professor in the Chemical Engineering and Materials Science Department at the University of California, Davis, received the **UC—Davis Academic Senate Distinguished Teaching Award.**

Michael Stadermann of the University of North Carolina, Chapel Hill, received an

Abrikosov, Ginzburg, and Leggett Share 2003 Nobel Prize in Physics for Superconductors and Superfluids


Abrikosov Ginzburg Leggett

Alexei A. Abrikosov, Distinguished Scientist at Argonne National Laboratory, USA; **Vitaly L. Ginzburg**, former head of the Theory Group at the P.N. Lebedev Physical Institute, Russia; and **Anthony J. Leggett**, MacArthur Professor at the University of Illinois at Urbana-Champaign, USA, received the 2003 Nobel Prize in Physics from the Royal Swedish Academy of Sciences "for pioneering contributions to the theory of superconductors and superfluids."

Superconducting materials are able to displace magnetic flows completely or partly. Those that displace magnetic flows completely, characterized by the Meissner effect, are called Type I superconductors, and can be understood by the BCS theory, which is based on the formation of pairs of electrons (Cooper pairs). This, however, proved to be inadequate for explaining superconductivity in Type II superconductors which lack or show only a partial Meissner effect. Abrikosov was able to explain this phenomenon theoretically. His starting point was a theory formulated for Type I superconductors by Ginzburg (along with Lev Landau). Ginzburg realized that in order to explain the interaction between the superconductor and magnetism, an order parameter (wave function) describing the density of the superconducting condensate needed to be introduced. There was a breakpoint for the value of this parameter which indicated two types of superconductors. Abrikosov was able to complete the theory by showing that Type II superconductors had these specific predicted values. Although formulated in the 1950s, these theories have gained renewed importance in the recent rapid development of new high-temperature superconducting materials, all of which are Type II superconductors.

Liquid helium can become a superfluid at temperatures under 2 degrees above absolute zero, losing all resistance to internal movement. When compared to ^{4}He, the rarer isotope ^{3}He was found to transform into a superfluid at much lower temperatures. While BCS theory explained ^{4}He superfluidity well, it did not work for ^{3}He superfluidity. Leggett explained the properties of the new superfluid in a decisive way. He was able to create a theoretical framework and bring ^{3}He superfluidity under the umbrella of existing BCS theory. Superfluid ^{3}He has been used to study other phenomena as well, including how order passes into chaos or turbulence, one of the unsolved problems of classical physics.

Abrikosov, born in Russia, received his PhD degree in physics at the Institute for Physical Problems, Moscow. Ginzburg, also born in Russia, received his PhD degree in physics at the University of Moscow. Leggett, born in the United Kingdom, received his PhD degree at the University of Oxford. Detailed information on each scientist's contributions to the study of superconductors and superfluids can be accessed at Web site http://www.nobel.se/physics/laureates/2003/public.html.

https://doi.org/10.1557/mrs2003.249 Published online by Cambridge University Press

Honorable Mention in the photographs category of the **Inaugural International Science & Engineering Visualization Challenge** for "Buckling of a Multi-Wall Nanotube." Stadermann and contributors Mike Falvo, Sean Washburn, and Richard Superfine of UNC used a novel technique called "conductance-imaging atomic force microscopy" to photograph a carbon nanotube atop a silicon surface at the atomic level. The challenge is a joint project by the National Science Foundation and *Science* to "encourage recognition of the visual and conceptual beauty of science and engineering." The image is published in the September 12, 2003 issue of *Science* and can be accessed online at www.sciencemag.org.

Gregory Thompson has joined the Department of Metallurgical and Materials Engineering at the University of Alabama in Tuscaloosa as assistant professor. His research interests are in phase stability and corresponding functional property responses in nanostructured materials.

John M. Torkelson, Walter P. Murphy Professor of Chemical Engineering and Materials Science and Engineering, was appointed director of the Materials Research Center (MRC) at Northwestern University, Illinois, effective September 1, 2003. He succeeds R.P.H. Chang, who directed the MRC for 14 years. Chang continues as director of the Materials Research Institute at Northwestern.

Yoshinobu Tsujii of Kyoto University received the **2003 Wiley Polymer Science Award** for "Synthesis and Properties of Newly Developed Polymer Brushes." The award was announced by John Wiley & Sons Inc. and the Society of Polymer Science, Japan (SPSJ), and recognizes SPSJ members under the age of 45 who have demonstrated work showing considerable potential.

James R. Von Ehr, founder, chair, and CEO of Zyvex Corporation (Richardson, Texas), a molecular nanotechnology company, received the **Ernst & Young's Entrepreneur of the Year Award (Southwest Area) for Pioneering** in June 2003. The Entrepreneur of the Year Institute celebrates the accomplishments of great entrepreneurs and increases public awareness of the benefits these innovators provide to society. Von Ehr also serves on the Nanotechnology Technical Advisory Group of the U.S. President's Council of Advisors on Science Technology.

James Wagner, the provost and interim president at Case Western Reserve University in Cleveland, has been named president of Emory University in Atlanta, Ga. Before arriving at CWRU, Wagner was a professor of materials science and engineering at the Johns Hopkins University's Whiting School of Engineering. While at Johns Hopkins, he chaired the Department of Materials Science and Engineering and was director of the Materials Research Center of Excellence.

Stephen L. Yarbro, a chemical engineer and 20-year Los Alamos National Laboratory veteran, now heads the laboratory's Nuclear Materials Technology Division. As leader of the 800-person division, Yarbro will provide scientific and technical leadership in actinide materials science and manufacturing technology.

Whitesides Receives 2003 Kyoto Prize

George Whitesides, Mallinckrodt Professor of Chemistry at Harvard University, has received the **2003 Kyoto Prize in Advanced Technology** for "pioneering a technique of organic molecular self-assembly and its application to nanomaterials science." Whitesides's activities cover a broad spectrum, from fundamental chemistry to applied technologies, and have produced major innovations in the creation of nanofunctional materials. Through exhaustive investigation of chemical combinations and physicochemical characterization of self-assembly in organic molecules, Whitesides has made a significant contribution to the development of new fields in materials science. In the course of his research, Whitesides noted in particular that alkanethiolates adsorb well to gold and silver substrates, an insight that he then used in developing a technique to fabricate self-assembled monolayers (SAMs). These ultrathin layers of organic molecules occupy an indispensable place among the materials currently employed in organic nanotechnology. In addition, Whitesides further developed SAM technology to propose a microcontact printing method that employs organic substances, making complex patterning possible at the micrometer level. This method, now known as soft lithography, does not require the expensive equipment or advanced technologies necessary for the photolithography used in conventional semiconductor manufacturing. Furthermore, the method can be utilized for patterning organic molecules and biomolecules, which exhibit a diverse range of properties. Whitesides's soft lithography, therefore, could also be considered a type of "molecular printing," opening the way to innumerable potential applications in biotechnology and other fields.

Whitesides is an honorary member of the National Academy of Sciences, the American Academy of Arts and Sciences, the American Philosophical Society, and the Royal Netherlands Academy of Arts and Sciences. Other recent honors and awards include the World Technology Award for Materials from the World Technology Network, the Von Hippel Award from the Materials Research Society, and the U.S. National Medal of Science. Whitesides received his PhD degree in 1964 from the California Institute of Technology, and he served as chair of the Department of Chemistry at Harvard from 1986 to 1989.

ASM International has named its 2003 fellows and award recipients:

Lyle H. Schwartz (Air Force Office of Scientific Research) has received an **Honorary Membership** for "innovative and effective leadership in planning, prioritizing, and administering materials research and development within the federal government and industrial/ government partnerships, for outstanding work in x-ray and neutron diffraction, Mössbauer spectroscopy, and for service to ASM International."

Craig R. Barrett (Intel) has received a **Medal for the Advancement of Research** "for outstanding leadership and support of electronic materials and fabrication process research and development leading to the creation of the Pentium family of processors, the world's most widely used microprocessor."

Distinguished Life Membership has been given to **John Herbert Buckingham** (New Zealand Defense Force) for "visionary leadership in advancing technology for the national security of New Zealand and for guidance on international measurement standards"; **Helmut G. Hadrys** (Krupp Thyssen Stainless GmbH) for "exemplary vision and leadership in the formation of a worldwide leading specialty materials supplier and efforts in promoting international employment and cultural understanding"; and **John T. Mayberry** (Dofasco Inc., Canada) for "outstanding leadership through focusing on the involvement of people, community support and sound financial

https://doi.org/10.1557/mrs2003.249 Published online by Cambridge University Press

performance of one of the most successful primary steel producers in North America."

Martin E. Glicksman (Rensselaer Polytechnic Institute) has received the **Gold Medal** for "pioneering contributions to understanding basic solidification processes, especially dendritic growth, scaling laws, and microstructure development in the design of novel and advanced materials, and for a lifetime of mentoring and training students in their pursuit of materials careers."

Brij B. Seth (Siemens Westinghouse Power) has received the **William Hunt Eisenman Award** for "visionary leadership in applying sound engineering principles to introduce advanced materials, novel processes, unique inspection techniques, and pioneering repair procedures that have enhanced power plant efficiency, reliability and economics."

William D. Nix (Stanford University) has received the **Albert Sauveur Achievement Award** for "outstanding work on mechanical behavior of solids; pioneering research on the mechanical behavior of thin films, multilayers, and silicon small volume structures; and for stimulating other researchers in this field."

Robert G. Henning (Sandia National Laboratories) has received the **Allan Ray Putnam Service Award** for "20 years of dedicated service as treasurer of the Albuquerque Chapter, leadership in significantly revitalizing the financial health and viability of the chapter, and for long and devoted support of the chapter as a 25-year executive committee member and a chapter officer."

David F. Bahr (Washington State University) has received the **Bradley Stoughton Award for Young Teachers** for "exemplary work in teaching and motivating students through practical laboratory projects, for superb classroom teaching, for increasing the visibility of materials science education across the geographic and disciplinary spectrum and for always putting students first."

Thomas H. Courtney (Michigan Technological University) has been selected for the **Albert Easton White Distinguished Teacher Award** posthumously for "a sustained, productive academic career in teaching, research, and administration throughout which he inspired students to achieve the highest levels of academic and, subsequently, professional career accomplishments," to be accepted by his son.

Cool Polymers Inc. has received the **Engineering Materials Achievement Award** for "development and application of injection-moldable plastics with exceptionally high thermal conductivities that enable new applications and opportunities for commercial use of thermoplastics."

The **Henry Marion Howe Medalists** are **P.M. Prasad** and **T.R. Mankhand** (Banaras Hindu University, India), **P. Suryaprakash Rao** (Regional Engineering College, India), **S.N. Singh** (Veer Kunvar Singh University, India), and **A.J.K. Prasad** (National Metallurgical Laboratory, India) for their paper, "Kinetics of the Direct Synthesis of Molycarbide by Reduction-Carburization of Molybdenite in the Presence of Lime," published in the June 2002 issue of *Metallurgical and Materials Transactions B.*

The **Marcus A. Grossmann Young Author Award** recipients are **Yan Wang, Martin Valdez,** and **Sridhar Seetharaman** (Carnegie Mellon University) for their paper, "Formation of CaS on Al_2O_3-CaO Inclusions during Solidification of Steels," published in the August 2002 issue of *Metallurgical and Materials Transactions B*;

Hongbo Tian (University of Tennessee, Knoxville) won the **ASM International Graduate Student Paper Contest** for a paper on "Environmental Effects of Fatigue of Type 316 Stainless Steel for the Spallation Neutron Source."

ASM Fellows are **John A. Brooks**, retired (Sandia National Laboratories, Livermore); **Bruno Buchmayr** (Technical University Graz, Austria); **Robert D. Caligiuri** (Exponent Failure Analysis Associates, Menlo Park, Calif.); **Dianne Chong** (The Boeing Company, St. Louis, Mo.); **James D. Cotton** (The Boeing Company, Seattle, Wash.); **John W. Elmer** (Lawrence Livermore National Laboratory); **Katherine T. Faber** (Northwestern University); **David U. Furrer** (Ladish Co., Inc., Greenfield, Wisc.); **Nicholas J. Gianaris** (Visteon Corporation, Dearborn, Mich.); **Lawrence D. Graham** (PCC Airfoils Inc., Beachwood, Ohio); **Richard B. Gundlach** (Climax Research Services, Wixom, Mich.); **Shuji Hanada** (Tohoku University); **Gene E. Ice** (Oak Ridge National Laboratory); **J. Ernesto Indacochea** (University of Illinois at Chicago); **Ursula R. Kattner** (National Institute of Standards and Technology); **Richard Knight** (Drexel University); **Paul J. Kovach** (Stress Engineering Services Inc., Houston, Texas); **K. Sharvan Kumar** (Brown University); **Michael N. Lesychyn** (Hydro One Networks, Canada); **Billy R. Livesay** (Georgia Institute of Technology); **R. Winston Revie** (Canada Center for Mineral and Energy Technology, Canada); **Fernando Rizzo** (Departamento de Ciencia dos Materiais e Metalurgia, Brazil); **Elwin L. Rooy** (Rooy and Associates, Aurora, Ohio); **Rainer Schmid-Fetzer** (Technical University of Clausthal, Germany); **Erland M. Schulson** (Dartmouth College); **Darrell F. Smith Jr.**, retired, (Special Metals Corp., Huntington, W.Va.); **William D. Spiegelberg** (Brush Wellman Inc., Cleveland, Ohio); **John J. Stephens, Jr.** (Sandia National Laboratories); **Harry W. Walton**, retired, (Torrington Company, Forest City, N.C.); **Ji-Cheng Zhao** (GE Global Research Center, Schenectady, N.Y.); and **Steven J. Zinkle** (Oak Ridge National Laboratory).

Technology Review: MIT's Magazine of Innovation announces in the October 2003 issue 100 innovators 35 years old or younger whose technologies are poised to make a dramatic impact on society. The publication considered four major disciplines: computing, biotech and medicine, the Internet, and nanotechnology. The innovators include the following materials researchers:

Zhenan Bao (Bell Labs/Lucent Technologies), who fabricates organic semiconductors used in flexible and cheap electronic devices;

Marcela Bilek (University of Sydney), who designs coatings to improve implanted medical devices and industrial tools;

Colin Bulthaup (Kovio), who developed new fabrication methods that could slash the cost of chip manufacturing;

Scott Gaynor (Dow Chemical), who devises processes used to make polymers with improved properties;

Cary Gunn (Luxtera), who shrinks optical circuitry to speed transmissions on phone and Internet networks;

Yu Huang (Massachusetts Institute of Technology), who fashions three-dimensional grids of nanowires that act as electronic circuits;

Jordan Katine (Hitachi Global Storage Technologies), who makes higher-density hard drives using magnetic nanomaterials;

David M. Lynn (University of Wisconsin—Madison), who synthesizes polymers that are better able to deliver therapeutic genes;

David A. Muller (Cornell University), who images the individual atoms critical to a transistor's electronic properties;

Yasunobu Nakamura (NEC Fundamental Research Laboratories), who achieved a breakthrough that could help make quantum computing a reality;

Balaji Narasimhan (Iowa State University), who devises timed-release polymers to replace multiple vaccine injections;

Ainissa G. Ramirez (Yale University), who formulated an advanced universal solder for electronics and optics;

Manfred Stefener (SFC Smart Fuel Cell), who constructs small fuel cells to efficiently power laptop computers;

Ralf Wehrspohn (University of Paderborn), who fabricates nanotube crystals that can route optical telecommunications signals faster than competing chips; and

Peidong Yang (University of California, Berkeley), who assembles nanowires that could revolutionize lasers and computers.

https://doi.org/10.1557/mrs2003.249 Published online by Cambridge University Press