Thinner, Smarter, Faster... Better

In the information age, almost everyone is looking at how they can make materials smaller, thinner, smarter, faster, and better than they've made them before—especially the materials used in high-tech electronic equipment, optical devices, sensors, and computers. As the field of electronic materials continues growing, four of the newest faculty members of the Penn State materials science and engineering department have a keen interest in where it goes. Their research interests range from better bulk processing methods for electronic chip manufacturing and thin film piezoelectrics, to the off-the-land of perfect superconductor sandwiches.

We want to revolutionize part of the process. —Clive Randall

by Jane Heywood

Research Profiles
You've got to get the current in and out.

—Suzanne Mohney

In electrophoretic deposition a direct current electric field is applied to particles in suspension. Under the influence of the electric field, the particles migrate and deposit on a surface. In this way, "we build uniform layers with submicrometer powders and can then fire them to 98 percent density," says Randall. They have combined this electrophoretic deposition method with the traditional method of tape casting to build multilayer capacitor devices.

Randall's group has used these methods to make capacitor, piezoelectric, and fuel cell materials. They are on their way to starting a thin revolution in the electronics/powder processing industry.

Contact

Lately there's been a lot of talk about using wide-band gap semiconductors such as gallium nitride in devices including blue-light emitting diodes for color displays and compact disc reading lasers, and silicon carbide for high temperature and high power applications. In all these applications one of the main problems is getting current in and out of the semiconductor.

Suzanne Mohney, assistant professor of materials science and engineering, became interested in materials as a junior in chemical engineering when she sat in on a semiconductor processing course. From there she pursued her senior experience in the microelectronics department at McDonnell Douglas and her research in graduate school led her into solving the problems of metals in electronic materials applications. One of Mohney's main interests is studying the relationships between semiconductors and the metal contacts used to get current in and out of them.

"The reaction between a metal contact and semiconductor can be both good and bad," Mohney explains with a smile. Good because a controlled reaction can be used to engineer the interface properties, and bad because an uncontrolled reaction can produce irreproducible results or even consume the semiconductor and ultimately destroy the device properties. "We're trying to find out what it is about the reaction that leads to good properties," she says.

By "good properties" Mohney means low-resistance contacts. One of the main problems with semiconductor technology is that a great deal of power can be lost at the point of contact between dissimilar materials such as a metal—semiconductor interface. So Mohney is studying the interface to find out how to make a better contact.

After depositing the contacts via physical vapor deposition or electrodeposition and patterning, the contact and semiconductor are annealed in a rapid thermal annealing (RTA) furnace to get a reaction between contact and semiconductor. Mohney and her students have studied the thermodynamics and kinetics of the semiconductor—contact interface after annealing, and although the group studies several varieties of semiconductors it is the reaction for gallium nitride and silicon carbide that they find most interesting.

"The formation of a thin nitride layer between gallium nitride and the metal contact is important," Mohney stresses. "And the annealing gas is important for some of the semiconductors. The thin interfacial nitride layer that forms between the semiconductor and metal contact is the key to a low-resistance contact in n-type gallium nitride.

Because of the intensity of the applications it is used in, "stability is a big issue for silicon carbide," says Mohney. As part of a collaborative effort Mohney's group is the first to report that a metal boride contact on silicon carbide will remain stable even when heated to extremely high temperatures. This feature makes it an excellent candidate for high temperature applications like transistors for automobile engines.

Ceramic Muscle

Many of us grew up with the space shuttle as just another facet of life. For Susan McKinstry, assistant professor of ceramic science and engineering, it was getting a reaction between contact and semiconductor. McKinstry and her students have studied the thermodynamics and kinetics of the semiconductorman—contact interface after annealing, and although the group studies several varieties of semiconductors it is the reaction for gallium nitride and silicon carbide that they find most interesting.

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McKinstry began studying piezoelectric thin films in graduate school. Today, she and her graduate students to make piezoelectric thin films using four methods—sol-gel, pulsed laser deposition, magnetron sputtering, and ion beam sputtering—depending on the film size, chemistry, complexity, and need for controlled layer orientation. It sounds simple, but thin film materials come with a special set of problems. In bulk piezoelectric materials the motion of the domain walls under an applied electric field—called the extrinsic property—supplies about one-half of the total piezoelectric coefficient. At the thin film scale, piezoelectric materials like lead zirconate titanate (PZT) end up with only half the normal piezoelectric coefficient. It seems, McKinstry has discovered, that the extrinsic property of piezoelectric materials isn't active in thin film form. So where does one turn for a little more muscle? "Changing the processing conditions," says McKinstry, "or try different materials."

The current standard for thin piezoelectric materials is lead titanate structures that are 700 Angstroms thick and as smooth as the substrate they are grown on.

Smoothness is important for all the piezoelectric structures, and even more so for the Josephson Junctions. Schom wants smooth layers—the smoother the better because he doesn't want any reactions between the layers. Just smooth, thin, surfaces for his Josephson Junction sandwiches. So far the smoothness of Schom's MBE grown superconductors isn't great. The surface gets rougher as the layers grow, but Schom thinks it's still just a matter of control. The structure of a high temperature superconductor is much more complex than that of other perovskite oxides that he has been able to grow. As more analysis equipment is added to the growth equation, Schom expects that it will become easier to reach the smoothness levels required for superconductor sandwiches.

Schom's focus has also shifted away from just growing superconductors. "We're trying to develop a better process for growing high temperature superconductor material with other materials like metals and insulators," he says. "Like the layers of a BLT, they lay down the elements at a time in precisely controlled layers to make perfect sandwiches of superconductor, insulator, superconductor—a Josephson Junction sandwich. In addition to superconductor structures, Schom is working on other perovskite structures like ferroelectric materials that can be controlled MBE technique, Schom and his students have been able to grow lead titanate structures that are 700 Angstroms thick and as smooth as the substrate they are grown on.

How do you move things?

—Susan Troller-McKinstry

We're in the sandwhich making business.

—Darrell Schom

Darrell Schom doesn't look like a radic. But in the 1980s, while in graduate school at Stanford, Schom did something thatradic. He got interested in high temperature superconductors and along with his advisor decided that molecular beam epitaxy (MBE) might be a good way to make them. But even then it "wouldn't have been advisable to start dumping yttrium, barium, and copper—materials Schom calls "death to superconduc- tors"—into an MBE machine that was used only for growing superconductors. But at Stanford Schom was close to Varian, and the company just happened to have an old MBE machine that they had recently discarded. So they let him use it to try to grow high temperature superconductors. "And it worked," says Schom.

It's been ten years since then. Schom, now an assistant professor of materials science and engineering at Penn State, has his own MBE system dedicated to growing perovskite oxides. In that time Schom has grown a lot of superconductors using MBE. But just growing high temperature superconductors isn't Schom's focus anymore. Today it's all about control. For Schom control is such an issue that he had his MBE machine built with atomic absorption analysis—the first ever commercial machine to incorporate this feature. It allows him to measure the spray being released into the MBE vacuum chamber in real time and adjust it to maximize a layer's smoothness as it grows.

We're in the sandwich making business.

—Darrell Schom

Continued on page 10
Penn State Materials Puzzle

by Jane Heywood

Materials science and engineering, like the pieces of a puzzle, is a complex melting of disciplines that when snapped together form a complete picture. At Penn State, the materials science and engineering puzzle is gigantic. Nearly 200 faculty work on materials or materials related research. A rough approximation of the research dollar value places it at $30 million per year. Putting together a puzzle of such complexity is like the double-sided “impossible” puzzles. Over the years, people gathered pieces of the Penn State materials puzzle together into labs and centers, but an overall image never emerged. In 1992, the University established the Materials Research Institute (MRI). Chaired by then senior vice president for research, David Shirley, the MRI brought together representatives from the “completed sections” of Penn State’s materials puzzle. These representatives were charged with establishing a method to obtain the big federal block grant funds. For the next five years MRI tried various methods to get these big contracts without success. What did MRI accomplish? It outfitted a new materials research building in the Penn State Research Park. It opened up new channels for communication. It helped us see our weaknesses and strengths. But it didn’t get new funding.

With Shirley’s departure at the end of 1996, the MRI was reorganized and slightly more than a year later has emerged with a new focus and new goals. Its new director, Carlo Pantano, professor of materials science and engineering and director of the Materials Characterization Lab, says “we can’t do everything together, but what can we do to make the sum greater than the parts?” He is focusing on the common ground: students and facilities.

First, it is obvious to everyone at Penn State that being one of the largest and most diverse materials research universities is not always a blessing. Although it makes sense from the inside, Penn State’s organizational structure can be confusing for potential students and faculty. Many can’t find their niche and so opt for other universities with more defined boundaries and smaller programs. Pantano proposes that one function of the MRI should be presenting the entire Penn State materials community in a way that makes sense to the outside: eliminating the need to explain the relationships over and over again at every faculty interview or student visit.

Secondly, “facilities are a pain,” Pantano says bluntly. “Access to them needs to be more straightforward.” In addition, many of Penn State’s facilities are no longer on par with what’s available elsewhere; especially in key areas that are becoming much more important in the materials arena. Discussions across campus suggest that there are three key areas in which Penn State could capitalize on its considerable capabilities if it has the proper support in terms of facilities and faculty expertise. These areas are materials for medical treatment, materials for telecommunications and computers, and materials for transportation and energy conversion.

By identifying technologies—instead of specific materials—that will require the combined research efforts of scientists and engineers across disciplinary boundaries to solve complex problems, Pantano hopes that new beneficial linkages will be formed. To begin the process, and at the same time improve Penn State facilities and attract new research dollars, Pantano suggests simply looking at what current faculty need right now to enhance their research and where new faculty appointments could help.

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Two Retire from the Faculty

Robert E. Newsham, Alcoa Professor of Solid State Science and associate director of the Materials Research Laboratory, has retired from the faculty as professor emeritus. He has been a member of the faculty since 1966, when he came to Penn State from MIT as an associate professor. He was appointed as professor in the Department of Materials Science and Engineering in 1970, and served as chairman of the Solid State Science Program of the Graduate School from 1972 to 1990. He was named Alcoa Professor in 1987, and elected to the National Academy of Engineering in 1989.

Newsham is known worldwide for his work in ferroelectric materials, particularly electroceramics, composite materials for electronic applications, and currently, smart materials. Among many other achievements, he discovered the polar glass-ceramic pyroelectric sensors, and a new class of composite thermistors and chemical sensors, and pioneered the development of composite piezoelectric transducers.

He is author or co-author of more than 500 research papers and three books: Structure-Property Relations (1975), Classic Crystals (1987), and Piezoelectricity (1992). For his research contributions he received the Citation Classic Award in 1987, the American Ceramic Society’s E. C. Henry Award for the Best Paper of the Decades 1979-1988, the Distin- guished Merit Award of the University of Illinois in 1989, the Real Advances in Materials Award of the National Association of Technical Societies in 1994, numerous “best paper” awards, and 13 patents.

Professor Newsham’s teaching ability was apparent from the start of his Penn State career, and was recognized by the Wilson Award for Outstanding Teaching from the College of Earth and Mineral Sciences in 1972. In 1965 he received a distinguished speaker award from the Institute of Electrical and Electronic Engineers, and in 1950 the Outstanding Educator Award of the Ceramic Education Council. In addition, Newsham has served as a distinguished speaker at numerous universities.

He served as vice chair of the U.S. National Committee for Crystallography and as a member of the National Research Council Solid State Sciences Committee, as president of the American Crystallographic Association, and counselor of the American Ceramic Society, and served as co-editor of the Journal of the American Ceramics Society for ten years.

Among his honors are Penn State’s Faculty Scholar Award (1986), the John Jeppson Medal (1991), the International Ceramics Prize of the Academy of Ceramics (1992), the Centennial Award of the Ceramics Society of Japan (1991), and the Albert Victor Bleisinger Memorial Award (1995). He received the Humboldt Senior Scientist Award in 1994 and was named a Distinguished Life Member of the American Ceramic Society.

Newsham received a B.S. in mathematics from Harvard College, M.S. in physics from Colorado State University, Ph.D. in physics from Penn State, and P.K.D. in crystallography from Cambridge University (U.K.). He served as a research fellow at the Cavendish Laboratories, Cambridge, and subsequently as assistant and associate professor at the Massachusetts Institute of Technology.

In retirement he continues his research at the Materials Research Laboratory.

Peter A. Thrower has retired from Penn State as professor emeritus in materials science. He has been a member of the faculty in the Department of Materials Science and Engineering for twenty-nine years, and since 1980 has served as coordinator of the department’s graduate program. Thrower received B.A., M.A., and Ph.D. degrees in physics from Cambridge University, U.K., and served as a scientific officer at the U.K. Atomic Energy Authority at Harwell from 1960 to 1969, before joining the Penn State faculty as an associate professor.

He is a specialist in carbon materials, graphite, and carbon composites. Thrower has served
Upcoming Events

August 8, 1998
Summer Commencement Ceremonies
Undergraduate Degrees: Bryce Jordan Center
The Graduate School: Eisenhower Auditorium

October 1–2, 1998
Industrial and Professional Advisory Committee (IPAC) Meeting
Department of Materials Science and Engineering

October 8–9, 1998
Annual Cooperative Program in Metals Science and Engineering
For more information contact the metals program office: (814) 865-5446.

October 15–17, 1998
Penn State Ceramics 75
PCA 53rd Annual Ceramic Forum and Ceramic Science and Engineering 75th Anniversary Celebration
For registration materials contact: Ms. Carey Shuey, (814) 865-4992

December 20, 1998
Winter Commencement Ceremonies
Undergraduate Degrees: Bryce Jordan Center
The Graduate School: Eisenhower Auditorium

New Undergraduate Departmental Scholarship
Charles and Donna Carson have pledged $25,000 to endow a new undergraduate scholarship in the Department of Materials Science and Engineering. The “Charles G. and Donna H. Carson Scholarship in Materials Science and Engineering” will provide recognition and financial assistance to outstanding undergraduate students who enroll in the department. Only students who have achieved superior academic records and manifest promise of outstanding academic success will be eligible for the scholarship.

Charles Carson received his M.S. and Ph.D. degrees in metallurgy from Penn State in 1966 and 1970. He is the vice president for environmental affairs at U.S. Steel in Pittsburgh, Pennsylvania. His wife Donna is also a Penn State alum. Their support of the undergraduate materials science and engineering students is greatly appreciated.

Metals Centennial Fellows Show their Appreciation
The graduates of the Metals Science and Engineering Program who were recognized as Centennial Fellows of the College of Earth and Mineral Sciences have established an endowed fund to acknowledge the special honor they were afforded in being recognized during the College’s Centennial Celebration.

This pledge of support is the second endowed scholarship for the Electronic and Photonic Materials Program within the Department of Materials Science and Engineering. The “Daniel W. Hamer Scholarship in Electronic and Photonic Materials” was established in 1995 to provide students with the skills to succeed in the industries that depend on materials scientists for advances in devices that we rely upon every day. This scholarship is a meager step forward for the program and its ability to educate students in this expanding, and interdisciplinary, area of materials science.

This accreditation represents a key step forward in the program and is a testament to the dedication of the students and faculty who have graduated in this field.

EPM Program Receives First Scholarship
The Hamer Foundation has pledged its financial support for a new undergraduate scholarship in the Department of Materials Science and Engineering. The scholarship will be called the “Donald W. Hamer Scholarship in Electronic and Photonic Materials” and will provide financial support and recognition for undergraduate students who have proven academic success.

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The Hamer Foundation, founded by the Hamer Foundation, Inc., in State College which is a manufacturer of thick and thin film resistive products. It employs many graduates of Penn State’s materials programs.

75th Anniversary of Penn State Ceramics
This year the Ceramic Science and Engineering Program is celebrating its 75th Anniversary. The original Department of Ceramic Engineering was established in 1923 deriving from courses taught by metallurgy and geology professors as early as 1911. Since then it has evolved to its current status within the Department of Materials Science and Engineering.

In honor of the 75th Anniversary, the ceramics program and the Pennsylvania Ceramics Association will co-sponsor the 53rd Annual Ceramic Forum—an event that dates back to the early days of Penn State Ceramics. This year’s forum will highlight Penn State’s current ceramics facilities and expertise. The second day will feature Penn State affiliated materials scientists and focus on Advances in Technology. The day will culminate with Dr. Robert E. Newhall’s inaugural address and the presentation of the Alumini Achievement Award in Ceramics.

Saturday morning has been set aside for a tailgate party before the 1998 Homecoming Game vs. Purdue University. It will be held behind the Materials Research Lab for all those who attend the meeting. For additional information, or registration materials, contact Ms. Carey Shuey in the ceramics program office at 814-865-4992.

Golden Anniversary McFarland Award Recipient Richard Shultz (second from right) and his wife Betty (center) talk with students Rachel Schwartz and Keith Williams at a reception just prior to Shultz’s presentation of the annual McFarland Lecture.

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Golden Anniversary McFarland Award Recipient Richard Shultz (second from right) and his wife Betty (center) talk with students Rachel Schwartz and Keith Williams at a reception just prior to Shultz’s presentation of the annual McFarland Lecture.

McFarland Award Golden Anniversary Celebration Held
In 1920, David Ford McFarland arrived at Penn State and served as head of the Department of Metallurgy from 1920 to 1945. During that time McFarland had a profound influence on the department and the more than 400 students who graduated under his guidance. His influence is still felt today as many of these graduates have gone on to become leaders in the world metals industry.

It was fifty years ago this year that the David Ford McFarland Award for Achievement in Metallurgy was first conceived and bestowed upon a Penn State alumus by the Penn State Chapter of ASM International. The award was named for McFarland not only to honor him, but also to lend the activity the dignity of his name. H. M. Davis, who suggested that the award bear McFarland’s name, wrote, “It is a measure of
the Metals Science and Engineering Program hosted a full day symposium on Friday, April 26, featuring Penn State alumni and focusing on Metals into the 21st Century. Professor K. Osseo-Asare, chair of the Metals Science and Engineering Program, opened the symposium with an African proverb. “You can see the moon from your own back yard, so why do we come together to look at the moon? It is to let our visions interact.” He encouraged everyone to use the symposium as a family reunion. And indeed it was much like a family reunion for many of the previous McFarland winners, alumni, former faculty, current faculty, students and staff who had a chance to visit and reacquaint themselves with people they had not seen for many years.

The symposium covered the economics of today’s metals industry, trends in metals processing technology, applications for metallic materials, and the environment and the metals industry. Materials science and engineering department head, Richard Tressler commented on the appropriate of the symposium as a guide for the department as it structures its educational and research agendas in response to the future needs of industry.

The Golden Anniversary McFarland Award recipient was Dr. Richard Shultz who received his Ph.D. in metallurgy from Penn State in 1970. Shultz is presently the vice president of technology for Cleveland Cliffs Reduced Iron Corp. and director of ironmaking technology for Cleveland Cliffs, Inc. Prior to joining Cleveland Cliffs, Shultz spent 24 years (right out of graduate school) with Armco Steel Corp.—first in research and development and later as general manager of technical services for the Corporate Business Development Group. Shultz is active in several professional societies and is a recipient of the prestigious Ironmaking Merit Award from the Ironmaking & Rebuilding Division of ISS. He is an EMS Centennial Fellow and has been an active member of his community.

The 50th Anniversary Weekend concluded with Schults’ presentation of the Alumni News of the Annual McFarland Lecture titled “Raw Material Challenges of the Dynamic New Steel Industry, Why They Be Met?” and the annual McFarland Banquet that evening where Shultz was officially presented with the award.

Graduate Study Fellowship

People who have been working in industry and now desire to return to school for graduate study on a full-time basis in metals science and engineering, may be especially interested in the Helen R. and Van H. Leichliter Graduate Fellowship. The fellowship supplements the normal graduate stipend to provide a total stipend of $20,000 per year. Active areas of research in the program include aqueous processing, corrosion, synthesis, crystallography, deformation and fracture, electrochemistry, electronic materials, laser processing, metallization, nanocrystalline materials, numerical simulation of transport processes, phase transformations, and welding. For additional information, phone the Leichliter Fellowship contact Professor Suzanne Mohney via e-mail at molinns@emps.psu.edu.

Better Continued from page 5

for these sandwich recipes is huge. The military is already using low temperature superconductors for highly sensitive detectors, but it would rather use high temperature superconductors. The commercial sector want to use them for very fast electronics and digital devices. Superconductors may no longer be, as Schloen calls it, “pipe in the sky,” but someday you might just find one in a sandwich.

The Future

Over the next century the need for better materials for electronic applications will continue to grow. The materials subspecialties of ceramics, metals, and polymers will all be tapped as the world’s desire for smarter, thinner, faster, and better materials draws on all areas of materials. Penn State’s Department of Materials Science and Engineering has recognized the need in this area and several years ago established an undergraduate specialization option within the department called the Electronic and Photonic Materials Program (EPM). Rundall, Mohney, McKinstry, and Schloen are core faculty within the program. Along with other faculty from the Ceramics Science and Engineering Program and new faculty to be jointly appointed between the new program and the Polymer Science and Engineering Option, they will form the basis for Penn State’s continued materials science excellence and leadership throughout the Information Age.

Puzzle Continued from page 6

ate the linkages. Then, with financial support from MRL, new faculty would be hired and the responsible of establishing a new multidisciplinary program and facilities. Facilities that could be shared by all the faculty across campus who need to do their research. It is important to note that the new faculty would be hired as joint appointments between “whichever departments make the most sense,” says Pancaro. Like a many-tricked octopus reaching out to work with faculty in multiple areas, the new joint appointments and shared facilities would be the foundation from which a new Penn State strength could grow.

It is a different approach that Penn State’s usual method of combining everyone in a big pot, stirring it up, and waiting to see what emerges. But with a proposed $2.5 million budget that would provide support for everything from joint faculty salaries, graduate fellowships, and facilities support, this plan could uncover the pieces that are needed to complete the Penn State materials puzzle.

1998 Hosters Medal Awarded to Ceramics Alumnus

Charles Greskovich, has been named the 1998 recipient of the Charles L. Hosters Alumni Scholar Medal. The Hosters Alumni Scholar Medal is the highest honor given by the College of Earth and Mineral Sciences. It was established in 1992 to honor the career achievements of Dr. Charles Hosters, the College’s eleventh dean, and to recognize “an alumnus who has made outstanding contributions to the development of science.”

Greskovich received his B.S. in ceramic technology in 1964, and his M.S. and Ph.D. degrees in ceramic science in 1966 and 1968, respectively—all from Penn State. After graduating he was awarded an NSF post-doctoral fellowship to study with Professor Schmalzried at Clausthal Technical University in Germany. In 1969 he became a staff ceramist at GE’s Corporate Research & Development Center in Schenectady, New York.

Greskovich’s research has been in optically transparent, polycrystalline ceramics that are useful in a number of applications. He is co-inventor of the first efficient ceramic scintillator composed of multiphase rare earth oxides that are now used in nearly all CT-body scanners sold by GE. The uniqueness of this ceramic scintillator and his work resulted in twelve U.S. patents and several awards.

Greskovich has also worked on non-oxide ceramics and been recognized for his scientific achievements in the area including receiving the Ross Coffin Purdy Award of the American Ceramic Society for the paper “Sintering Covalent Solids.” His continued work on these solids including Si3N4 resulted in a novel densification process called “gas pressure sinter process” that is used by several materials companies.

Greskovich is a Fellow of the American Ceramic Society and a member of the Electrochemical Society and Materials Research Society. In 1991 he was selected as a Coolidge Fellowship winner—GE Corporate Research and Development Center’s highest honor—for his development of technologically important ceramic materials and his outstanding contribution to the advancement of ceramic science and engineering. Greskovich has published more than fifty refereed papers and been awarded 43 U.S. patents.

Eighites

Mari Lou Balmer-Miller (’89 Ceramics) is a senior research scientist at Pacific Northwest National Laboratory. She studies catalyst characterization and development, phase diagram determination, crystal structure, and zeolite development.

Peter F. Baumann (’81 Metals) is a senior materials engineer with Airline, Inc. in North Haven, Connecticut. He is working on a Ph.D. in materials science at Polytechnic University, and is chairman of the ASTM 207 Committee on Light Metals and Alloys.

Craig M. Berkey (’93 Ceramics) is an operations manager at AVX.

Jim Bienemann (’78 Ceramics) is an account manager with Becton, Dearborn, Inc.

Andrew K. Birchenhall (’84 Metals) is a senior researcher at DuPont Central Research in Wilmington, Delaware. He has received the Westinghouse Signature Award and the DuPont Engineering Excellence Award.

Darryl P. Boll (’84, ’91 Ceramics) is a section leader at Los Alamos National Laboratory. He received the American Ceramic Society Robert L. Cubie Award for Young Scholars in 1997, and the Distinguished Performance Award from Los Alamos National Lab in 1995.

Robert J. Butera (’82, ’83 Polymers) received his Ph.D. in 1988 from Case Western Reserve. He is employed by DuPont.

Gary M. Cardin (’83 Metals) is a product metallurgist working with customers on applications of stainless steel. He is employed by Allegheny Ludlum Corp.

C. C. Chamba (’83, ’86 Metals) is a senior lecturer in physical metallurgy at the University of Zambia School of Mines. Formerly, he was head of the Department of Metallurgy and Mineral Processing and assistant to the dean for graduate studies.

Denise A. ( stockedus) Clayton (’83 Polymers) works as a producer assurance quality engineer in aerospace on the space shuttle program for Lockheed Martin Manned Space Systems in New Orleans, Louisiana. She received a “Silver Snoopy,” the highest award the Astronaut Corp gives to shuttle contractor personnel.

Phil D’Annibale (’81 Metals) is a product engineer with Central Sprinkler Co.

Sandra ( Pifer) Davis (’83 Polymers) has worked at Quantum Chemical Corp. for nine years doing technical service support for the colors and compounds business area. She was the Society of Plastics Engineers’ (Colors and Appearance Division) Technical Program Committee chair for 1997 RETEC.

Melanie Kramer DelleCurti (’87 Polymers) is the computer projects coordinator for...
Andy Dalley (91 Metals) is a plant metallurgical engineer and QA manager for Weico Industries.  
Brian D. DelHaut (94 Polymers) is a regional sales director for a video retail chain and is taking master's degree credit at Penn State Great Valley.  
Tedd M. Dougherty (91 Ceramics) is attending Georgia State University pursuing a master's degree in decision sciences. He is employed by United Parcel Service as manager of a team that designs and implements strategic cost tools.  
Priya J. Drivadi (94 Ceramics) joined Corning Inc. in 1995 and is currently working as a senior scientist in the environmental products division researching environmental applications of materials like cellular ceramics.  
Stephen A. Dyman (90, 92 Ceramics) is working at Norton Electronics on Si-SiC diffusion components.  
Jeffrey Eckert (91 Metals) received his M.S. in industrial engineering from Binghamton University in January 1995. He is a process engineer in charge of polyethylene reduction at Osum Syvama.  
George Felder, III (93 Polymers) studies polyester urethanes as blood-contacting polymers in artificial heart/ventricle assist pumps. He and Dr. James Runte have involved polymer graduate students in this ongoing medical research.  
Eric N. Fischer (95 Metals) is the supervisor of a metallurgical lab at AMP Inc.  
Paula D. Freyer (92 Materials Science) is a senior research engineer studying high temperature super alloys at Westinghouse Science and Technology Center. She received the 1995 ASM Outstanding Young Member Award, the

Stephen G. McQuown (91 Polymers) works on R&D of automotive powder coatings at PPG Industries.  
M. Sean Ness (93 Polymers) is a sales and marketing manager for the medical, dental and retail products of Tekscan Inc. He covers the West Coast, Canada, and Mexico, and is presently taking on management of Latin America. Tekscan manufactures tactile pressure measurement systems.  
Jon M. Poole (80, 96 Metals) is a senior metallurgist at Inco Alloys International.  
William U. Pursell (62 Metals) is the general manager of U.S. Bolt—a small hot forge bolt company with a "turn around" opportunity. He has been active in the American Production and Inventory Control Society.  
Alessandro Rengan (74, 88, 92 Metals, Ceramics, Materials) is a Senior Professor of ceramic science in the Department of Mineral Engineering at National Cheng Kung University in Taiwan.  
James J. Hummel (95 Polymers) is a supervisor of Specialty Films at AEP Industries, Inc.  
Suresh Kumar (93 Ceramics) is working in R&D of nickel hydride powders for high energy density Ni-Metal Hydride EV batteries at Energy Conversion Devices in Troy, Michigan. They are scaling up the R&D work to a pilot plant level.  
Bryan F. Livengood (92 Polymers) is a technology team leader with Lexmark International, Inc. He received the 1995 Perkins Elmer Thermal Analysis Award and the NCTAS Award, and the 1994 Plastic Institute of America Fellowship.  
Steven W. Marts (94 Ceramics) is a ceramic process engineer with Advanced Cerametrics, in Lambertville, N.Jeh New York.

James H. Ailair, associate professor of ceramic science and engineering and director of the Particulate Materials Center, has been named a fellow of the American Ceramic Society.  
Paul W. Brown, professor of materials science and engineering, has been named executive editor of The Journal of Materials Education, and been elected to the Materials Education Council.  
Long-Qing Chen, assistant professor of materials science and engineering, was recently awarded a National Science Foundation "Special Creativity Extension," for his research activities on microstructural evolution. The award is granted by program NSF to principal investigators who are carrying out notable research. The Special Creativity Extension will lengthen Chen's current NSF grant by two years and increase the funding by more than ten percent. The extension will allow Chen to pursue new directions.  
T.C. (Mike) Chung, professor of polymer science, has been made an honorary scholar in the Institute of Chemistry of the Chinese Academy of Science.  
Michael E. Coleman, professor of polymer science, was named a fellow of the American Physical Society this year.

Tarasankar Debroy, professor of materials science and engineering, received the 1998 Warren F. Savage Memorial Award from the American Welding Society. This award recognizes the paper published in the Welding Journal that best represents "innovative research resulting in a better understanding of the metallurgical principles related to welding." The American Welding Society is the largest organization in the world dedicated to advancing the science, technology and application of welding. It serves more than 48,000 members internationally.

Ian Harrison, professor of polymer science, received the PENNATP Award of Special Recognition for his service to the organization. The Pennsylvania Technical Assistance Program (PENNTAP) is an organization that specializes in providing free assistance and expert advice to small Pennsylvania businesses.

Professor Peter Thresher, who retires this year, is captured here expand-
Harrison has also been selected to participate in the Fulbright Scholar Program. He will visit Thailand from October to December as a visiting scholar at the National Metal and Material Technology Center, National Science and Technology Development Agency. His work will focus on the development of new materials for use in the automotive industry.

Diby D. Macdonald, professor of materials science and engineering and director of the Center for Advanced Materials, will lead an effort at the University of Pittsburgh to develop new materials for use in the automotive industry.

Leaves of Absence

Leaves of absence at Penn State are granted for purposes of intensive study or research that will increase the quality of the individual’s future contribution to the University. Leaves of absence have been granted to the following individuals in the department:

Aftab H. Carim, associate professor of materials science and engineering, is on leave from October to December as a visiting scholar at the National University of Singapore. His work will focus on the development of new materials for use in the automotive industry.

Saman K. Kumar, professor of materials science and engineering, is on leave from October to December as a visiting scholar at the National University of Singapore. His work will focus on the development of new materials for use in the automotive industry.

Merriella J. Mayo, associate professor of materials science and engineering, is on leave from October to December as a visiting scholar at the National University of Singapore. His work will focus on the development of new materials for use in the automotive industry.

Lubash R. Rudovic, associate professor of fuel science, is on leave from October to December as a visiting scholar at the National University of Singapore. His work will focus on the development of new materials for use in the automotive industry.

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Student's scoop

Mahmoud Abd Elhamid standing by his poster at the 1998 Graduate Research Exhibition. He received an honorable mention.

Student Receives Honors

Mahmoud Abd Elhamid (Howard Pickering, advisor), received an honorable mention at the Thirteenth Annual Graduate Research Exhibition held on March 27-28. Abd Elhamid’s poster was titled “The Effect of Benzotriazole on the Kinetics of Hydrogen Absorption by Iron.” The exhibition is a showcase for the wide range of research activity that is conducted at University Park, mostly by graduate students, and totals more than $350 million per year.

Abd Elhamid has also been awarded an Energy Research Summer Fellowship from the Electrochemical Society. The fellowship, which is funded by the Department of Energy, was established to assist students in carrying out their summer research in areas of particular interest to the Electrochemical Society.

Weber Receives First Place at IMS Poster Competition

Christoph J. Weber (Howard Pickering, advisor), received the first place award in the IMS Graduate Student poster Competition.

Two Students Receive Evan Pugh Scholar Awards

Richard A. Wolf (junior—ceramic science and engineering) and Monica L. Woodward (graduating senior—polymers and chemistry) were awarded the 1998 Evan Pugh Scholar Awards. The awards, which are named for Evan Pugh, Penn State’s first president, began in 1993 and were originally awarded to the top five seniors in both the junior and senior classes. Today, the Evan Pugh Scholars are the juniors and seniors who fall into the top 0.5 percent of their classes.

Students Honored at the 1998 Wilson Banquet

Monica L. Woodward, (graduating senior—polymers and chemistry) received the 1998 Dean Edward Steidle Memorial Scholar Award. Each year, the College recognizes an advanced standing student who intends to continue their studies in graduate school for their outstanding scholarship with the Steidle Award. Woodward is a senior in the polymer science specialization of the department. She is also minoring in chemistry, Spanish, and geography, and plans to attend graduate school in either materials science or biochemical engineering.

The annual Earth and Mineral Sciences Exposition is held each spring as a way for high school students from across Pennsylvania, New Jersey, and New York, to discover what the College of Earth and Mineral Sciences has to offer. Faculty and students in the Department of Materials Science and Engineering were on hand April 4, during the annual Expo to answer questions and provide demonstrations of amazing materials properties for high school students interested in materials science and engineering as a career.
Continued from page 14

Jonathan P. Solomon (*93 Ceramics) is a process engineer at Chrysler Corp. and is responsible for design and development of automotive glass and accessories for Chrysler vehicles.

Erik A. Spitzer (*91 Metals) is employed by the U.S. Navy in the Sea Control Squadron. He was awarded the Navy Achievement Medal.

Matthew Stahley (*96 Ceramics) is an engineer with Lanxide Corp. He works in the applied composites technology group making prototype parts using Lanxide’s PIMEX process for fabricating metal-matrix composites.

Matthew A. Stough (*92, *94 Ceramics) is finishing his Ph.D. research as a graduate fellow at the ORNL High Temperature Materials Laboratory in Oak Ridge, Tennessee.

Greg Terchick (*93 Ceramics) is in charge of operating eight furnaces and rebuilds at PPG Industries in Lexington, NC.

Alan Then (*90 Ceramics) is a fiber optics manager at Karl Storz-Endovision. He holds four patents.

James F. Tressler (*91, *93, *97 Ceramics) is a CORE postdoctoral fellow in the Physical Acoustics Branch at the Naval Research Laboratory in Washington, D.C.

Louis M. Troilo (*90 Ceramics, *91 Materials) is a patent examiner at the U.S. Patent and Trademark Office. His “significant rewards” include the birth of his son Stefano Louis on December 4, 1995.

Eric Trumbauer (*91, *94 Ceramics) is employed as a plasma etch process engineer at a Texas Instruments CMOS wafer fabrication facility.

Juan H. Vazques (*93 Metals) is a tooling engineer with Cutler-Hammer.

Hari Venugopalan (*96 Materials Science) is a post-doctoral scholar at Penn State.

Joe Walten (*92 Polymers) implemented the ISO 9002 quality system at Nicofibers Co.

Michael J. Walter (*90 Metals) was married in June 1996 to Charlene. He is a regional metallurgist (Southern District) for Carpenter Technology Corp., providing technical support to the sales force and customer base.

Cynthia Ward (*90 Polymers) worked for Olin Chemicals for five years in various positions. She received an MBA in marketing and is now an account manager (sales) for General Electric Plastics in the silicones division.

George A. Wildridge (*93 Metals) was promoted to engineer-metallurgy at Borg Warner Automotive in September 1996.

Kiran Yadalla (*92 Ceramics) received an MBA from the University of Albany in May 1995, and is working for Anderson Consulting as a systems consultant.

Alumni Info Submission via the WWW

The Department of Materials Science and Engineering World Wide Web site is now set up for you to submit changes in your personal information directly to the department via the internet. If you would like to change your personal information, or submit news for publication in the Penn State MATSE, visit our web site and follow the “Alumni Info” link. Or get there directly using http://www.ems.psu.edu/MATSE/alumniform.html.

Kathy Gummo
101 Steidle