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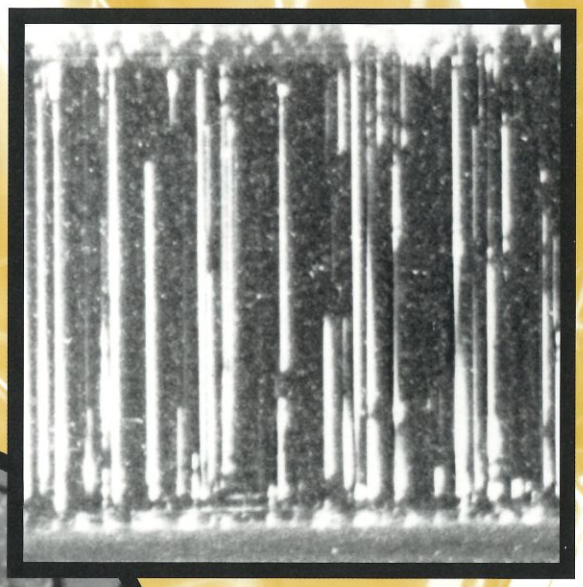
MATSE

PENN STATE



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1855

on the cover:

***Circle**: an unblended polypropylene–nylon mixture. Mike Chung is working on a method to functionalize polyolefins which are used in many every day items including plastic bags (background). **Square**: optical micrograph of the multiple cracks that form on the surface of glass processed using a new technique developed by Dave Green.*

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Editorial Director: Richard Tressler
Writer/Editor: June Heywood

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POLYMER MIXOLOGY

by June Heywood

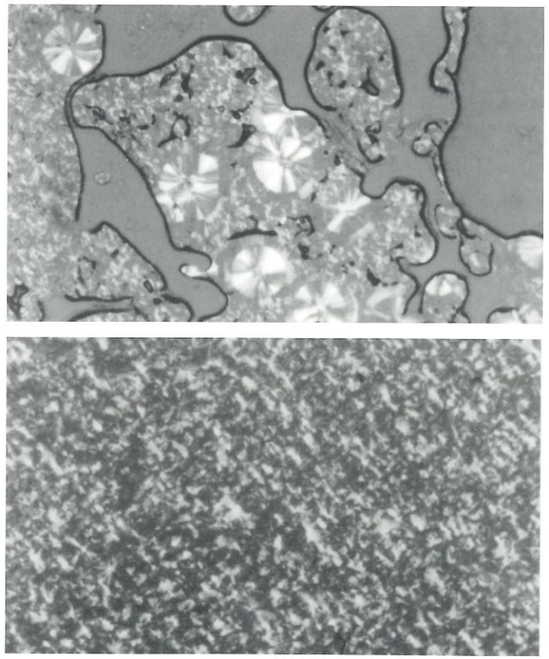
Polyolefins—the technologically important polymers including polyethylene and polypropylene—are inexpensive to produce, easily recyclable without the pollutant and toxic side effects of other polymers, are stable, and have good mechanical properties. In addition to being inexpensive, polyolefins can be processed via the typical methods including extrusion or injection molding, compression molding, injection blow molding and calendaring to create sheets, films, or fibers. They're used in everything from milk jugs and soda bottles to bulletproof vests—whatever one can imagine. But the good qualities come at a price for polyolefins don't like to mix with other materials.

It is ironic that the beneficial properties of polyolefins are the very thing that makes them difficult to use in combination with other materials. "Polyethylene and polypropylene are very stable, or inert, so they are hard to modify," says Mike Chung, professor of polymer science. "You can dig a plastic bag out of the ground after 25 years and it's still good—it doesn't degrade." Chung has studied the problem of combining polyolefins with other materials for more than fifteen years.

Since their discovery fifty years ago, polymer chemists have been looking for ways to make polyolefins more interactive or, in other words, functionalize them. A major problem is that the Ziegler–Natta catalysts typically used to polymerize polyolefins are either "poisoned" by or prefer to form complexes with the nonbonded electron pairs of "functional group" monomers that are added to make the polymers more useful—effectively killing the polymerization process. Methods such as ionizing radiation including X-rays, γ-rays, and e-beams, exposure to ozone or UV with accelerators, and free radical initiators also have been attempted. However, these modification methods usually lead to side reactions including cross-linking and chain cleavage, leave large amounts of ungrafted homopolymer, lack any ability to control polymer structure or composition, and ultimately degrade or destroy the polyolefins desirable properties including its strength and stability.

"It's like oil and water," says Chung. "You have oil on your hands, it requires soap to get the oil and water to mix before the water can carry the oil away." Chung's "soap" in the functionalization process turns out to be three distinct "reactive co-monomers": borane, p-methylstyrene, and the most recent discovery, divinylbenzene. In a 1994 *EMS Bulletin* Chung writes, "My initial idea came from pondering the unique location of boron on the Periodic Table. . . . Boron is the only element located in the nonmetallic region that is a Lewis acid with electron deficiency." Boron's position made Chung think that it stood a good chance of coexisting with the Ziegler–Natta catalysts making it possible to incorporate an α-olefin containing borane group into a polyolefin using Ziegler–Natta catalysts. He also believed that its location next to carbon, and the covalent bonds boron forms with carbon (similar to carbon–carbon covalent bonding) indicated that boron's solution and solid state properties would mimic those of a typical hydrocarbon polymers, and more importantly, that it would polymerize under the same conditions and processes that pure olefins do.

The process is not a direct or post-polymerization process—Chung calls it a compromise—and the chemistry can be applied to several α–olefins including ethylene, propylene, 1-butene, 1-octene, and their mixtures. The borane monomer is copolymerized with the α–olefin and is effectively incorporated into the polymer chain without side reactions. The result is a functional polyolefin (Chung likes to call it an "interfacial material") with a borane anchor site that can be used to join the polymer with other materials. The functional polymer can be easily modified under mild reaction conditions, usually at room temperature, to incorporate other functional groups depending on the material's ultimate application. What Chung has also found is that the borane reactive site can be used to introduce entire polymers (rather than a single functional group) to create a variety of graft copolymers. For example polypropylene-graft-PMMA, polyethylene-graft-PCL, and Butyl-graft-PMMA. These graft polymers are especially effective as compatibilizers when added in small quantities to mixtures of polyolefins and other polymers.

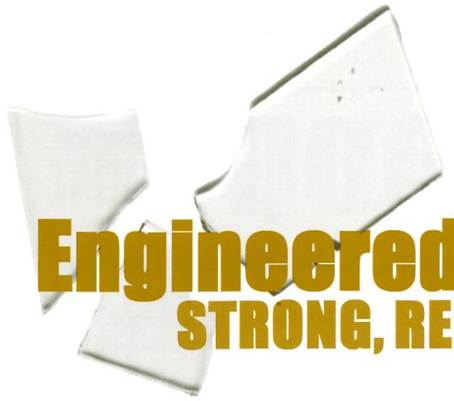


Top: A mixture of polypropylene (patterened areas) and nylon (smooth areas). Bottom: A totally homogeneous mixture of the two after polymerization via Chung's functionalization process.

The same chemistry technique has been applied using p-methylstyrene. And Chung is especially excited about recent work with divinylbenzene. "It has two double bonds so you can do two polymerizations and introduce almost any functional group we want without side reactions," he says. This should make it possible to combine nearly any polymer with the stubbornly unmixable polyolefins, and design polymer combinations based on their intended end-use applications.

Besides the obvious applications in engineering materials, for car bumpers and trim and indoor–outdoor carpet, as well as anything that requires printability, reactivity, or adhesion (think lipstick that won't rub off on you), Chung has begun thinking about making smart polymeric materials using this method. While polymers are not a strong dipole, they do have the benefit of great flexibility and good mechanical strength. "We are thinking about ways to introduce functional groups with steric control so that polar groups are facing the same direction with regular molecular structure," says Chung. "Then if the poly-

Continued on page 6



Engineered Glass:
STRONG, RELIABLE, AND USER FRIENDLY

by June Heywood

Whether it's transparent or opaque, used for containers or windows, clear or colored, the mechanical properties of glass often leave something to be desired.

Processing techniques, such as thermal or chemical tempering, increase glass strength by putting the surface under compression. What David Green, professor of ceramic science, and his colleagues also noticed is that although the strength of tempered glass increases, its strength variability increases significantly as well. (In one study of chemically tempered silica glass the coefficient of variation in strength increased by a factor of two.) In addition, tempered glass, while stronger, still fails catastrophically. Together these drawbacks become problems when design engineers select materials for projects. "For brittle materials, design engineers often need to ensure the mechanical reliability in terms of very small failure probabilities at a prescribed design stress level for a given lifetime," writes Green et al. in the February 26, issue of *Science*.

Recent studies on polycrystalline ceramics have shown that they can be modified by adding fibers, whiskers, or transforming particles, so that as a crack propagates through the material it encounters increasing resistance resulting in a stronger material. Green wondered "why can't we get the same effect in glass that we can in ceramics?"

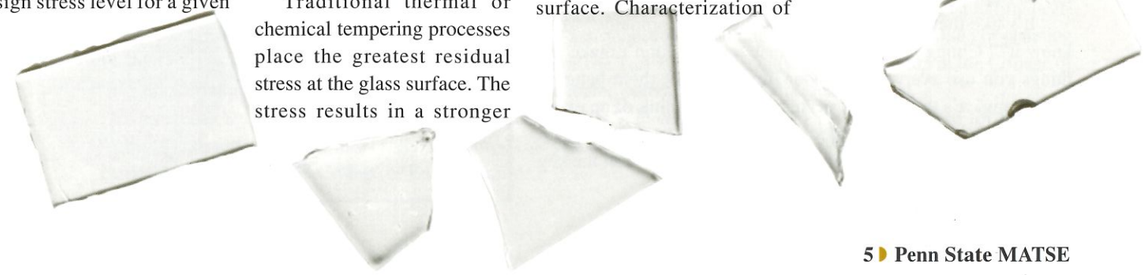
Working with Dr. R. Tandon of Caterpillar Inc. and V. M. Sglavo of the University of Trento, Italy, Green has developed a method for making glass stronger, reducing the strength variability between pieces of glass, and getting it to warn them before it fails. How'd they do that?

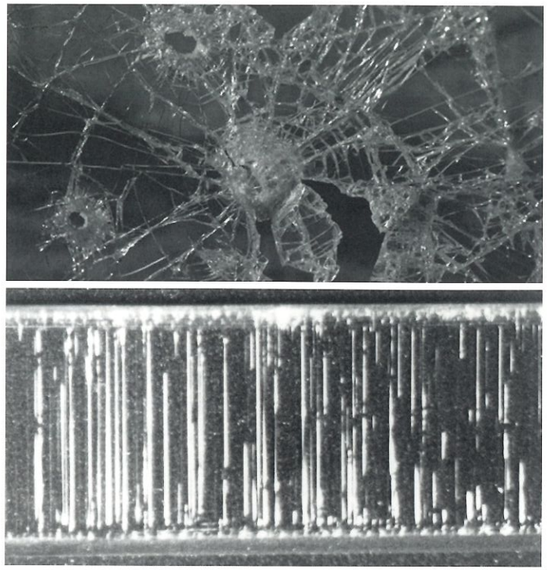
Traditional thermal or chemical tempering processes place the greatest residual stress at the glass surface. The stress results in a stronger glass, however strength variability is also increased as a result of the wide range of flaw sizes present in the glass surface. Larger flaws are able to propagate past the surface more easily than smaller flaws, which contributes to the strength variation. This information, in conjunction with the results of the recent strength studies on polycrystalline ceramics led the researchers to consider alternative compression profiles in the hopes of maximizing strength and minimizing strength variation in tempered glasses. They decided to move the maximum residual stress inward.

To do this the researchers chose a chemical tempering method for a sodium–aluminosilicate glass whereby potassium ions where exchanged for sodium ions in the molten glass for 24 hours at 500°C, followed by a thirty minute "backwards ion exchange" of sodium for potassium ions at 400°C. The result is a glass in which the maximum residual compression lies beneath the surface. Characterization of this glass showed average strengths more than triple those of untempered glass. Additionally, the coefficient of variation in strength dropped from approximately 20% to 2.4%. Which means "we're much more sure of when it's going to break," says Green.

During mechanical testing the researchers found that many small cracks would form in the untempered surface layer, but were arrested by the underlying compressed layer, similar to the phenomenon seen in the polycrystalline ceramic materials impregnated with fibers or whiskers. (See photo next page.) This "multiple cracking" essentially provides a warning that the glass is approaching failure and should be replaced.

Since the public announcement of this development, researchers from the medical profession to the oil industry have contacted Green to find out more about its potential applications in their fields.





Optical micrograph showing the shallow multiple cracks that formed on the tensile surface of one of Green's glasses. (Specimen vertical width is 5mm.) Compare with the photo (top) of a broken car windshield—a more typical glass response to stress.

Chemically and thermally tempered glass has been used in many products since it was first introduced. The new chemical tempering method may make it useful for many more. The visible "warning" the glass provides before final failure makes it useful in applications where safety is a concern. Green also believes that the reduction in strength variation they have achieved may be the first step in actually designing an exact breaking point into the tempered glass. If it is possible, the potential applications range from thin glass for photocopiers and scanners to switch applications like rupture disks that will break on command. It only requires a little imagination and a precise knowledge of the material's ultimate breaking point.❖

POLYOLIFINS—Continued from page 4

mer chains have the same structure, the polymer will crystallize to form polar nano-domains that are sensitive to external fields and can be used like a sensor to detect things in medical and military applications."

"It's like that commercial for the chemical company." "You know it?" Chung asks. "The one that says 'we don't make the things you use every day of your life, we make them better.'" For Chung, it's the point of his research. "We think of an existing problem in industry and look for something useful and practical to solve it." Functionalized polyolefins may be just the key to doing that.❖

COOP
COOPERATIVE PROGRAM IN METALS SCIENCE AND ENGINEERING

The Cooperative Program in Metallurgy (COOP) was established as the Steel Companies Fund in 1934 when the Metals Science and Engineering Program was the Department of Metallurgy. It was the department's first organized program of research support.

In the 1950s the program was expanded into COOP. At that time the faculty felt—as they do today—that strong ties to the metallurgy industry were essential to educating well-trained and knowledgable students who were prepared to become metallurgical engineers and who are today industry leaders and respected university professors.

Today COOP seeks to establish a partnership between the metals industry and the University whereby both parties benefit. By maintaining an open dialogue and interaction between metals-oriented companies and the Metals Science and Engineering Program, students come to understand the problems and needs of industry and are better prepared to enter the workforce. Industrial representatives have the opportunity to interact with potential employees and communicate their concerns to a large group of faculty, students, and metals professionals. The annual COOP meeting brings the two parties together and is a catalyst for new ideas, gives students the opportunity to present their research in a professional setting, and provides a forum for discussing important metals-related issues. The 1999 COOP meeting will be held October 7 and 8. **For more information contact:**

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a catalyst for university–industry interactions

department news

A Grand Destiny: The Penn State Campaign

THE PENN STATE CAMPAIGN

By now, many of you may have already heard about *A Grand Destiny: The Penn State Campaign.* With a goal of $1 billion in private support, it is vast undertaking designed to strengthen Penn State's mission of teaching, research, and service.

During the "quiet phase" of the campaign, $557 million has been gifted or pledged to the University. The campaign will run through June 30, 2003 and has four major objectives: undergraduate student support, primarily for scholarships or other financial assistance; graduate student support predominantly as graduate fellowships which are becoming more important in recruiting graduate students; faculty support in the form of endowed chairs and professorships to attract high-quality teachers and assist in their research and creative activities; and program support for the teaching and outreach initiatives that Penn State has previously outlined—one of which is materials science.

The alumni of the Department of Materials Science and Engineering and it's associated programs have always been generous in their support donating hundreds of thousands of dollars for undergraduate scholarships, equipment, undergraduate travel expenses to professional meetings, and seed money for developing new areas of faculty research. The strong base of undergraduate scholarship money has been particularly effective in the department's recruiting efforts over the past several years. We appreciate your contributions and welcome your support at any level. Recently, alumni of the metals and ceramics programs endowed undergraduate scholarships that will assist us in our continuing efforts to increase both the number and quality of students we recruit into the department.

Metals–Honors College Scholarship

Richard M. Wardrop, Jr. and his wife, Jeannette, have committed $100,000 to endow merit-based scholarships for undergraduate students who participate in both the Schreyer Honors College and the metals science and engineering program.

In recent years, job opportunities for metallurgists have grown as demand for these specially trained scientists and engineers has expanded to include industries that use metals. In addition, demand for metallurgy graduates in metal-producing industries remains steady. The Wardrops created this scholarship to attract and retain an outstanding group of undergraduate students to the Metals Science and Engineering Program who will be able to meet these future needs of industry. Students who receive the scholarship will be known as the Richard M. Wardrop, Jr. Scholars.

A native of McKeesport, Pennsylvania, Wardrop earned a B.S. in metallurgical engineering from Penn State. He is the CEO of AK Steel, and is currently serving on the materials science and engineering department's Industrial and Professional Advisory Council (IPAC) and as a member of the College's volunteer fund-raising committee for the campaign.

Ceramic Scholarship

William and Estelle Turney have endowed the William and Estelle Turney Scholarship in Ceramic Science and Engineering. The scholarship will provide recognition and financial assistance to outstanding students who are enrolled or planning to enroll in the Ceramic Science and Engineering Program. The Turney's also established a scholarship in the College of Earth and Mineral Sciences for students who have demonstrated potential for academic achievement.

The Turney's are alumni of Penn State. Bill received his B.S. in ceramic science in 1965, and worked for Harbison Walker Refractories for his entire career. He retired five years ago after its Baltimore, Maryland plant was closed. Estelle Turney is a graduate of the College of Education.

The 1999 McFarland Award Recipient, George Carson, talked with students and alumni at a reception in his honor just prior to his presentation of the Annual McFarland Lecture.

Charles G. Carson, III Receives 1999 McFarland Award

Charles G. Carson, III, vice president of environmental affairs for U.S. Steel, was honored with the David Ford McFarland Award for Excellence in Metallurgy. The award is given each year by the Penn State Chapter of ASM International to a Penn State alumnus who has achieved distinction in the field of metallurgy. In conjunction with the award, Carson presented the 51st Annual McFarland Award Lecture on Saturday, April 24, on the University Park campus.

Carson, who graduated from Penn State in 1970 with M.S. and Ph.D. degrees in metallurgy, is responsible for overseeing U.S. Steel's environmental compliance and improvement activities, and coordinating the company's relations with various environmental agencies and groups. His lecture, "Challenges Facing the American Steel Industry," refuted the *Economist's* recent characterization of American steel as a dying industry. He focused on the industry's readiness to meet current and future challenges such as imports, alternative materials, environmental concerns, and sustainability, and turn them to a commercial advantage.

Carson is active in several environmentally concerned organizations including the Wildlife Habitat Council of which he is chairman of the board, the technical and environmental committees of both the American and International Iron and Steel Institutes, and as a member of the national board of Keep America Beautiful. He is vice president of the advisory board to Penn State's New Kensington campus. In 1994 he received the Alumni Achievement Award from Penn State's College of Earth and Mineral Sciences and was one of its Centennial Fellows in 1996. He is a member of ASM International and TMS.

The McFarland Award was established in 1948 and is named in honor of David Ford McFarland who was head of Penn State's Department of Metallurgy from 1920 to 1945.

Upcoming Events

July 8–11, 1999
Thirty-third Annual Central Pennsylvania Festival of the Arts Performance, Concerts, and Sidewalk Sale
(Children's Day: July 7, 1999)

August 7, 1999
Summer Semester Commencement Ceremonies
Undergraduate and Associate Degrees
Bryce Jordan Center at 10:30 a.m.
For more info: 814-863-8500 or 814-865-6357

The Graduate School
Eisenhower Auditorium at 2:00 p.m.
For more info: 814-865-5448

August 24, 1999
Fall Semester Classes Begin
For more information: 814-863-8500 or 814-865-6357
registrar@psu.edu

September 20–22, 1999
Fine Powder Processing International Conference
Penn State Conference Center Hotel
For more info: Cheryl Knobloch (814-863-6156) or clk18@psu.edu

September 23–25, 1999
54th Annual Ceramic Forum
Ceramic Process Technologies for Manufacturing Efficiencies
Penn Stater Conference Center Hotel
Sponsored by the Pennsylvania Ceramics Association and the Ceramic Science and Engineering Program
For more info: John Hellmann (814-865-4992) or David Green (814-863-2011)

December 18, 1999
Fall Semester Commencement Ceremonies
Undergraduate and Associate Degrees
Bryce Jordan Center at 10:30 a.m.
For more info: 814-863-8500 or 814-865-6357

The Graduate School
Eisenhower Auditorium at 2:00 p.m.
For more info: (814-865-5448)

If you have an event for the Upcoming Events Column, please contact the *Penn State MATSE* editor for consideration.

Harold J. Read

Harold James Read, professor emeritus of metallurgy, died April 19, 1999 in Grove City, Florida. He was 88.

Read joined the Department of Metallurgy in 1945. He was a pioneer in the field of electroplating and carried out a large research program in addition to his teaching activities. He and his graduate students designed test equipment and used electron diffraction and electron microscopy to study the thin films of metal deposited in electroplating. Read also served extensively as a consultant to industry believing that the knowledge gained from being on the forefront of the metallurgical field benefited both teaching and research.

Dr. William Bitler, professor emeritus of metallurgy, remembers Read as one of the faculty members who first taught and stressed the importance of writing and oral presentation in technical fields. He also served twice as interim department head when members of the department left for new positions.

Read was a member of several scientific and professional societies. He was president of The Electrochemical Society from 1966–1967, and was made an honorary member in 1986. In addition he received the Scientific Achievement Award of the American Electroplaters Society and was selected as an honorary member. In 1973, he received the Melvin Romanoff Award of the National Association of Corrosion Engineering for his article with George Di Bari, "Electrochemical Behavior of High-purity Aluminum in Chloride-Containing Solutions."

Read retired from the faculty in 1971 when he and his late wife moved to Florida.

Robert W. Lindsay

Robert W. Lindsay died May 5, 1999 at Centre Community Hospital in State College. He was 86.

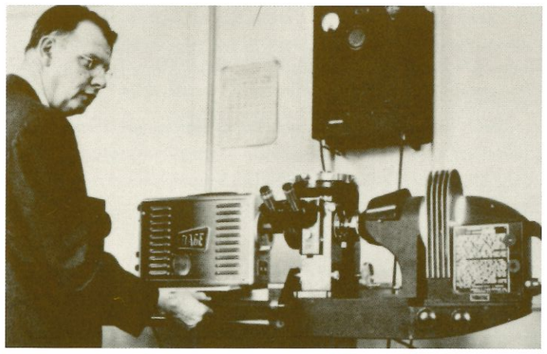
Lindsay joined the Department of Metallurgy in 1945, and was department head from 1960 to 1969, serving during its transition in 1967 from department to a section within the Department of Materials Science and Engineering. He retired in 1972 as professor emeritus after 27 years.

During his tenure as department head, Lindsay concentrated on building a strong faculty whose senior members taught at both the undergraduate and graduate levels and he insisted that faculty maintain strong ties with industry to stay knowledgeable of new developments in the field. Lindsay was also a dedicated and innovative teacher. In the 1950s he inaugurated metallurgy instruction via television with a ferrous metallography course. He was awarded the Albert Easton White Distinguished Teacher Award from the American Society for Metals in 1977.

Lindsay also played a role in assisting future generations of metallurgy students by establishing the Penn State Metallurgy Alumni Scholarship Fund in 1969 which has provided support for hundreds of metallurgy students. In honor of Lindsay's 27 years of service to Penn State metallurgy, the Robert W. Lindsay Award in Metallurgy is given each year to a student who demonstrates excellence in physical metallurgy.

Prior to joining Penn State, Lindsay was employed in metallurgical industries. He received his B.S. in 1933 from Tufts University in Medford, Massachusetts, and his M.S. and Ph.D. degrees—both in metallurgy—from MIT.

Lindsay is survived by his wife, Virginia; three daughters: Susan L. Leisner of Pasadena, California, Ann M. Lindsay and Martha H. Lindsay, both of State College; and a son Robert E. of Germantown, Maryland.



Dr. Robert Lindsay inaugurated instruction in metallurgy via TV with a course in ferrous metallography. He is shown here in the mid-1950s with a TV camera attached to a metallograph.

Graduate Program Ranked Seventh in Nation

Penn State's materials science and engineering graduate program was recently ranked seventh in the nation by *U.S. News & World Report*. The annual ranking of engineering specialties is based solely on reputation. The magazine asks graduate school deans, program directors, and senior faculty to rank each schools reputation and identify the ten best programs in each specialty. Penn State's materials program has been highly ranked for several years. It was also ranked ninth in the last National Research Council survey which conducts a study approximately every ten years.

New Faces

Many of you probably associate the time you spent in the department with the name or face of a program staff assistant. And many of you probably have memories of similar faces and names because for many years the names and faces didn't change.

Well, congratulations are in order because over the past year, three longtime program staff assistants left the department to take promotions in other Penn State units. April Benson (ceramics) accepted a position as the administrative assistant for the Materials Re-

search Institute; Linda Decker (polymers) is the administrative assistant for Penn State's new Astrobiology Institute; and Susan Hull (metals) left to join the EMS dean's office as the human resources assistant.

Since their departures, the department has hired three new program staff assistants. Tina Shawley is keeping the rebels in polymers in line. Carey Shuey has her hands full with the ceramics program. And Shelly Kachik, who joined the department in April, has her work cut out for her in the metals office.

We also have a new grants and contracts coordinator. In November 1998, Patty Prestash was hired to fill the position that Carol Fee vacated when she accepted a position as administrative assistant in the College's Department of Geosciences. Stop in and say "hello" to all the new recruits when you get a chance!

Roys Awarded 1999 Charles L. Hosler Alumni Scholar Medal

Della Roy, professor emerita of materials science, and Rustum Roy, Evan Pugh professor emeritus of the solid state, professor of science, technology and society, and professor of geochemistry, are fixtures of the Penn State materials science community. Beginning with their degrees, Rustum a Ph.D. in ceramics in 1948 and Della an M.S. in 1948 and Ph.D. in mineralogy and petrology in 1952, they have dedicated their careers to science and education. They were recently awarded the 1999 Hosler Medal from the College of Earth and Mineral Sciences for "their outstanding commitment to science."

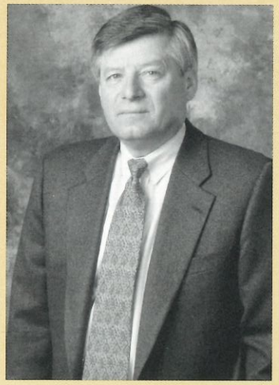
Della and Rustum nurtured a diverse group of talented scientists at the Materials Research Laboratory (which they helped found in the 1960s), and encouraged them in the development of new materials and state-of-the-art technologies that have brought significant recognition to the University over the past forty years.

Throughout her career, Della Roy has been an important model and mentor for women in Science. Rustum Roy pioneered the teaching of Science, Technology, and Society at Penn State. Both have received extensive recognition from the international science community for their research and education achievements and have been elected member of the National Academy of Engineering for many years.

The Hosler Medal recognizes the distinguished career of Dr. Charles L. Hosler, professor emeritus of meteorology and Dean of the College of Earth and Mineral Sciences from 1965–1985 who served Penn State as senior vice president for research and Dean of the Graduate School.

alumni news

Paul Stecko ('66 Metals) to Receive 1999 Alumni Fellow Award



Paul T. Stecko, chief operating officer of Tenneco and president and CEO of Tenneco Packaging, will be honored with the Alumni Fellow Award at the College of Earth and Mineral Science's annual Obelisk Dinner in September 1999. The Alumni Fellow award is the most prestigious of the Alumni Association's awards.

Stecko graduated from Penn State with his B.S. in metallurgy in 1966. While at Penn State, he was an ALCOA Foundation Scholar. Stecko also earned an M.S. in metallurgy and an MBA from the University of Pittsburgh. He began his career as a materials engineer at E.I. Dupont in 1966. From 1967 to 1977 he held managerial positions at the Bettis Atomic Power Division of Westinghouse Electric Corporation, and then joined International Paper in 1977. At International Paper—the largest company in the paper industry with more than $14 billion of worldwide sales—Stecko held VP and general managerial positions in the Coated Papers and Pulp and Hammermill and Pulp Business divisions, and was general manager of the Ticonderoga Mill. His final post was as vice president and general manager of Publication Papers, Bristols and Converting Papers where he was instrumental in developing and manufacturing a new line of recycled papers.

After sixteen years with International Paper, Stecko joined Tenneco Packaging in 1993 as its president and CEO. Since then, Stecko has doubled Tenneco Packaging's sales from $2 billion to $4 billion, making it a leader in the packaging industry. Its products include some of the most recognizable name brands on the market: Hefty®, Baggies®, One-Zip® bags, and E-Z Foil® aluminum cookware.

In January 1997, Tenneco, a global manufacturing company with more than $7 billion in annual sales, named Stecko its chief operating officer with the automotive and packaging divisions reporting directly to him. In September 1997, *Industry Week* magazine named Tenneco one of the world's 100 best-managed companies.

Stecko is a member of the board of directors of American Forest & Paper Association and of Evanston Inventure—an organization of major companies and institutions in Evanston, Illinois. In 1996, Stecko was named a Centennial Fellow during the College of Earth and Mineral Sciences' Centennial Celebration.

Sixties

W. Joseph Schlitt ('68 Metals) is engineering manager of hydrometallurgy at Kvaerner Metals. Schlitt received the 1999 Arthur F. Taggart Award that is given annually by the Society for Mining, Metallurgy and Exploration and recognizes significant contribution to the science of mineral processing. He received the award for the paper "Method for determining the sulfuric acid balance in cooper-leach systems," which was published in *Minerals & Metallurgical Processing* in 1997. Co-author on the paper is John H. Templeton of SAIC, Corp.

Schlitt has authored or co-authored more than forty technical papers over the years in various peer reviewed journals and symposia proceedings. He writes "I guess this is not a bad record for someone who opted for the rigors of a career in the mining industry, rather than the pleasures of academia."

Eighties

Mary Lou Balmer ('87 Ceramics) was awarded a DOE Young Independent Scientist Award and a Presidential Early Career Award for Scientists and Engineers in November

1998. The award recognizes the work Balmer is doing at Pacific Northwest National Lab in Richland, Washington, on immobilization of Cesium in nuclear waste.

Sandra Pifer Davis ('85 Polymers) is now at Kemira Pigments in Savannah, Georgia, after spending ten years with Millennium Petrochemical as a technical service engineer for compounded products. Davis is active in the Color and Appearance Division of the Society of Plastics Engineers and has coordinated the technical program for two conferences since 1995.

Nineties

Scott Andrews ('93 Metals) is a metallurgist for Trinity Industries Wheel and Axle Division. Trinity manufactures custom circular forgings for the rail, mining, and steel industries, as well as axles for rail cars.

John C. Arlotti ('95 Ceramics) is an operations engineer for servohydraulic testing systems at Satec Systems. He designs and supports an entire line of servohydraulic fatigue testing equipment, and is also the special projects manager.

Catherine A. Barron ('94 Polymers) is employed by The Boeing Company doing failure analysis of airplane components.

Gregory S. Bibbo ('88, '92 Ceramics) has seven years of experience at Osram Sylvania in operations and manufacturing as both an operations manager and process engineer.

Chad Cannan ('95 Ceramics) is a graduate of the U.S. Air Force Undergraduate Space and Missile Training at Malmstrom Air Force Base. He received his Master's in management from Troy State University in August 1997.

Mark Carper ('91 Ceramics) is a process engineer for TDK Components USA, Inc.

Brent Cottom ('95 Ceramics) is working at Pratt & Whitney in Palm Beach Gardens, Florida.

Amy A. Dowell ('96 Materials Science and Engineering) began working for EYE Lighting in 1996 as a process engineer. She is now in the Marketing and Sales Division.

Patrick S. Eaton ('91 Polymers) completed his Master's degree in Textile Chemistry and Polymer Science in 1995 at NC State. He is now working at National Starch and Chemical in the Synthetic Polymer Research Group as an analytical chemist. He married Lara Eldon on July 8, 1994.

Keith L. Eklund ('95 Metals) is a research engineer at ARCO Exploration and Production Technology in the Materials Technology Group.

Mark A. Fanton ('95 Ceramics) is the supervisor of the Analytical Services Group in the R&D Division at Spang & Co.

David M. Fusina ('94 Ceramics) is a sales engineer for SOUTHCO, Inc.—a mechanical engineering manufacturing firm. He is a member of the $3 million sales club.

Richard A. Fry ('88, '92 Ceramics) is pursuing a D.Sc. in materials science at George Washington University in Washington, D.C. His thesis topic is "Development of a Kerr Effect Magnetometer for Magneto-Optical Research." He is a recipient of the Presidential Merit Fellowship.

Lucille A. Gianuzzi ('92 Metals) received a 1997 NSF CAREER Award. She is on the faculty at the University of Central Florida in Orlando and is director of the Cirent/UCF Materials Characterization Facility. Her research focuses on impurity effects on grain boundary diffusion.

Mark Golla ('94 Ceramics) is a sales supervisor at Norton Company. Before joining Norton, Golla was an application specialist with Harbison-Walker Refractories.

Mark R. Haas ('95 Metals) is the metallurgical engineer for the ALCOA Lafayette Operation's large extrusion facility.

Douglas C. Hague ('92, '95 Metals) is a senior materials engineer at Pratt & Whitney. He leads a program on vapor phase intelligent processing of materials–thermal barrier coatings that is a DARPA funded Pratt & Whitney/GE joint effort.

Robert C. Haupt ('95 Polymers) is a urethane applications chemist with Inolex Chemical Company. He writes "I was lucky to obtain a position that deals with all aspects of my polymer science education," and credits Dr. Paul Painter with helping him get what he considers his "ideal job."

Daniel P. Heck ('81, '83, '90 Ceramics) has been a senior scientist at Solarex since 1987.

Bryan P. Livengood ('92 Polymers) graduated in 1995 with a Ph.D. in polymer science from the University of Akron. In January 1998 he was promoted to the team leader for Lexmark toner development. He has nine U.S. patents pending.

Daniel Madey ('95 Metals) worked as a materials engineer at General Electrical Corporate R&D until 1997. In the fall of 1997 he began full-time doctoral studies at Yale University in the chemical engineering department.

Mario Maffei ('94 Polymers) is currently pursuing a Master's degree in polymer engineering at the University of Akron.

John Manko ('95 Ceramics) is a QA, QC, and R&D metallurgist at West Homestead Engineering and Machine Company (WHEMCO) in the steel foundry.

Cindy Kreider Montgomery ('85 Polymers) was appointed scientific advisor to the director of the Materials Science and Engineering Laboratory at NIST in February 1997. Before joining NIST five years ago, she worked in the silicones industry—most recently at GE Plastics.

Dear Alumni and Friends,

A recent article by Professor Mert Flemings, former head of MIT's materials science department, prompted me to give you an update about the changes we have initiated in the Penn State materials science and engineering department as a result of the strategic planning process we began three years ago and update annually. We have recognized many of the trends Flemings discusses in the marketplace for our graduates. (I'll refer you to his excellent paper in *Annu. Rev. Mater. Sci.*, 29:1–23, for the details.) Society's needs, with respect to the materials field, have become much more diverse in the last 2–3 decades with the business explosion in computation and telecommunications creating new research needs and new employment opportunities. We also see an emerging market in the area of materials in medicine involving instrumentation, sensors, implants, etc., for which we want our graduates to be competitive. Furthermore, nontraditional employment in investment banking, business consulting, and law, beckons to more and more of our students. In short, to respond to the markets for our students and to the knowledge needs of society we must become a broad-based materials department while maintaining enough flexibility for emerging niches to grow to full-fledged subdisciplines alongside the established ones.

In our strategic planning, we have identified five enhancement areas for our department—materials in medicine; industrial ecology ("green" processing); materials for telecommunications and computation (electronic, photonic, magnetic materials); materials for propulsion and transportation; and smart materials and devices. At the same time the University has identified materials as one of its five emphasis areas and established the Materials Research Institute (MRI) to act as the overall planning body and the conduit for new funds. In our recent hiring we have emphasized these areas (see last newsletter for interests of three new faculty), with the latest addition of Dr. Erwin Vogler from Becton-Dickinson Corporation, whose expertise is in materials for medicine. We are currently searching for an electronic materials specialist to bolster our fledgling group in that area and link us formally to the electrical engineering department via a joint appointment.

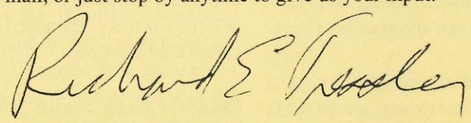
We still see a continuing strong market for graduates in our traditional areas of strength, thus we will continue to offer specialties in metals, ceramics, and polymers while offering new flexibility to those students who desire it. And we are developing a minor in materials that we expect to have broad appeal for engineers and perhaps, scientists also.

With this broadening of our discipline, the blurring of the traditional materials boundaries, and the emergence of new emphasis areas in our department, we are questioning whether our current administrative structure is adequate for the future. Professor Mike Coleman, former head of our department, is chairing a committee charged with studying this aspect of our department and recommending an appropriate structure to the faculty in the summer of 1999.

As many of you know, our space in Steidle Building is woefully inadequate as modern laboratory space. In the near term we will acquire additional space in Hosler Building (the former Mineral Sciences Building) that will be renovated for laboratory space. We will create more faculty offices in Steidle Building and realign space usage there. A committee chaired by Professor Paul Painter is hammering out a logical path forward in that area.

In the long term, we desperately need a modern materials research building. To attract the best faculty (and retain them) and the best graduate students we simply must have competitive facilities. MRI is making the case to the University administration for a big building that could house the Materials Research Laboratory (MRL), the Materials Characterization Laboratory (MCL), and many of our faculty research labs. You will hear more about this building program as we attempt to build broad support for it and to raise funds to assist with its construction. Dean Dutton is solidly behind this plan as are the other deans involved in the materials research enterprise.

So times change. And if we want to remain among the ranks of the best MatSE departments in the country we must change. We hope that you will support us as we move forward in these endeavors, and welcome your suggestions and advice both as alumni and as professionals in the field. Please write, call, e-mail, or just stop by anytime to give us your input.



Richard E. Tressler, Professor and Head
Department of Materials Science and Engineering

Walter J. Moorhead ('90 Metals) is the director of purchasing and business planning for CP Industries, Inc.

David Mountz ('95 Polymers) is a doctoral candidate in polymer science at the University of Southern Mississippi.

Stephen Preisler ('94 Ceramics) is a product engineer with Carrier Transicold-Carrier Corp.

Douglas J. Pysher ('85, '89, '92 Ceramics) is a research specialist at 3M. He received the 1995 R&D 100 Award as part of a team that developed a 3M ceramic composite filter. He also received the American Ceramic Society's Corporate Technical Achievement Award for the filter.

Lou Quattrocchi ('91 Metals) is an engineering manager with Pratt & Whitney.

Donald W. Rick ('91 Polymers) is a senior research chemist at Unilever Research U.S. His research interests are in materials science of skin care products.

Vincent J. Rovinski ('95 Metals) is a metallurgical engineer at NTN Driveshaft, Inc. He is responsible for the quality of induction hardened parts and for supporting CNC turning and forging when metallurgical problems arise.

David Rowley ('90 Polymers) is a graduate student at the University of California, San Diego.

Mark Ruprecht ('95 Ceramics) is a materials engineer in R&D for Kirkwood Industries, Carbon Division. The company manufactures carbon/graphite electromechanical products.

Thomas W. Scharf ('94 Ceramics) is conducting research on the mechanical and tribological properties of materials for the magnetic recording industry. He is working jointly with the University of Alabama and Eastman Kodak. He received the Eastman Kodak Young Investigator Award.

Douglas J. Sekelik ('95 Polymers) is a graduate research assistant at Case Western Reserve University.

Matthew Sgriccia ('90 Ceramics) is working at the O. Hommel Company as a ceramic development engineer. He is also developing, implementing, and marketing glass enamel systems for the automotive and decorative industries. He is co-inventor on the patent for zinc-based glass.

Malavika Sharma-Judd ('95 Ceramics) is currently pursuing a Ph.D. in engineering science and mechanics at Penn State under Dr. Maurice Amateau. She plans to graduate in the fall of 1999. Sharma-Judd is also employed at Penn State's Applied Research Lab in the Spray Forming Group. She was married in June 1996 to Todd M. Judd. They now have a son, Kiran Judd, born August 11, 1997.

David M. Simpson ('89, '91, '93) is a project scientist for Union Carbide Corp.

Esther Chang Smith ('93 Metals) is at the Yale School of Management.

Jonathan Stuart ('96 MATSC) is an R&D chemist in the area of modified polyurethane sealant and adhesives at Bostik, Inc. He married Laren Corle on September 26, 1998.

Kanishka Tankala ('91, '94 Metals) is a senior research engineer in the Construction Products Division at Norton Co. Tankala received the Dow Chemical Award for Research in Materials Processing.

Judy LaRosa Thompson ('95 Ceramics) is employed at The PQ Corp. She was co-organizer of the Cement Symposium at the 1997 Fall MRS Meeting.

Mladen Trubelja ('97 Ceramics) is a senior materials engineer in the Pratt & Whitney Aircraft Group. He is working on thermal barrier coatings for industrial gas turbine components.

Erik O. Wagg ('90 Ceramics) writes, "have been traveling the world technically troubleshooting ceramic pigments used in glaze and enamel applications . . . still mountaineering at a high intensity level. I love Colorado."

Jeffrey R. Warmkessel ('92, Polymers) graduated from the University of Akron with a Ph.D. in polymer science in May 1997. He is a senior research chemist with Ashland Chemical.

Jeff Wei ('96 Fuels) has a background in chemical engineering and particle technology. After graduating he worked at the Particulate Materials Center on pharmaceutical formulation development, and now is a senior scientist with Parke-Davis Pharmaceutical Research.

John Brittain

John O. Brittain, ('43, '51 Metals) died December 7, 1998, of a severe stroke. He is survived by his wife, Lois Brittain; two sons, Douglas and John Jr.; two daughters, Susan Woodruff and Lisa Ann Jesser; eight grandchildren, a sister, and two brothers.

Brittain, a native of Pittsburgh, Pennsylvania, received B.S. and Ph.D. degrees in metallurgy from Penn State. At the time of his death he was professor emeritus of the materials science and engineering faculty at Northwestern University where he had supervised more than 21 doctoral and sixteen Master's dissertations, and had co-authored more than 76 papers and one patent. During his tenure at Northwestern, Brittain also served at chairman of the Department of Materials Science and Engineering from 1968 to 1973 and as the director of Northwestern's Materials Research Center from 1976 to 1979. His research interests focused on the structure-property relationships in solid polymeric materials, in intermetallic compounds, and relaxation processes and mechanical behavior of materials.

In 1985 Brittain received the David Ford McFarland Award from the Penn State Chapter of ASM International. He was also a Kyoto University Scholar and president of the Chicago NW Chapter of ASM International.

faculty facts

Osseo-Asare Honored with Faculty Scholar Medal

Professor Osseo-Asare is one of six recipients of the 1998–1999 Faculty Scholar Medal for Outstanding Achievement in Engineering. The award was established in 1980 to recognize scholarly or creative excellence represented by a single contribution or series of contributions around a coherent theme. A committee of faculty peers reviews nominations and selects candidates. It is the highest honor Penn State confers upon its faculty.

Osseo-Asare was recognized for his contributions to the field of hydrometallurgy of which he is said to be "arguably the foremost researcher of his generation." His recent research provides significant insight into dissolution and precipitation reactions occurring during water processing of metals and ceramic powders, and in chemical-mechanical polishing in the microelectronics industry.

Osseo-Asare, who is professor of metallurgy and geoenvironmental engineering as well as chair of the metals science and engineering program, joined Penn State's faculty as an assistant professor of metallurgy in 1979. He received his B.S., M.S., and Ph.D. in materials science and engineering from the University of California, Berkeley, in 1970, 1972, and 1975 respectively. In 1997 he received the James Douglas Gold Medal from the American Institute of Mining, Metallurgical, and Petroleum Engineers. He is editor in chief of *Hydrometallurgy*.

Darrell Schlom to Receive Teaching Excellence Award from National Society

Darrell Schlom, associate professor of materials science and engineering, has been selected to receive the 1999 Bradley Stoughton Award for Young Teachers from ASM International. The award is given to encourage young teachers in the materials science, engineering, and design and processing fields by rewarding them for their efforts and their enthusiasm in imparting knowledge to students.

Schlom has been cited several times for his teaching effectiveness. In 1997 he received the Wilson Award for Teaching from the College of Earth and Mineral Sciences, and in 1989 was awarded the Ross N. Tucker AIME Electronic Materials Award for excellence in research and teaching. He was nominated for the Bradley Stoughton award for his "exceptional effectiveness as a classroom teacher, innovativeness in the use of classroom techniques and for unselfish dedication to one-on-one instruction."

Schlom received his B.S. in engineering and applied science from the California Institute of Technology, and M.S. and Ph.D. degrees from Stanford University in electrical engineering and materials science and engineering, respectively. Schlom joined the Department of Materials Science and Engineering in 1992 as an assistant professor. He was promoted to associate professor and granted tenure in 1998.

The Bradley Stoughton award was established in 1952 in memory of Bradley Stoughton who was an outstanding metallurgy teacher, Dean of Engineering, and who was president of ASM. Schlom will be presented with the award during ASM's Awards Dinner on November 2, 1999 in Cincinnati, Ohio.

Schlom recently received an Alexander von Humboldt Research Fellowship and will be on sabbatical for the next year at the University of Augsburg in Germany. While there Schlom plans to develop improved substrates (crystalline templates) used in growing thin films by MBE.

Wilson Research Award

David J. Green, professor of ceramic science and engineering, received the 1999 Wilson Award for Outstanding Research for his recent contributions on the mechanical reliability of porous ceramics. Green's research has focused on understanding how structure at various length scales controls the strength, stiffness, toughness, and thermal shock resistance of porous ceramics including fibrous ceramics, open and closed cellular ceramics, and partially sintered powders. His studies have led to improved mechanical reliability in these materials subsequently making them viable in new applications in radiant burners, high temperature filters, and as porous substrates. His work on partially sintered ceramics has led to techniques for sensitive, nondestructive monitoring and stress evaluation of the sintering process and mechanical property evaluation.

Throughout his career, Green has contributed to the teaching and understanding of the mechanical behavior of ceramics. After completing his Ph.D. at McMaster University, Green worked for the Canadian Federal Government in the Department of Energy, Mines, and Resources, and at Rockwell International Science Center before coming to Penn State in 1984. From 1991 to 1997, he served as the chair of the ceramic science and electronic and photonic materials programs in addition to his teaching and research activities. He has authored more than 160 publications including two books: *Transformation Toughening of Ceramics* and *Introduction to Mechanical Properties of Ceramics*—a textbook published by Cambridge University Press. Green has also been an active member of the American Ceramic Society. From 1994 to 1996, he acted as its vice president for publications as well as editor of the *Journal of the American Ceramic Society*—the world's premier journal on ceramics. He was made a Fellow of the Society in 1991.

The Wilson Research Awards were established in 1989 to honor significant research achievement of the College of Earth and Mineral Sciences' faculty. The award is made possible by the bequests of Matthew J. Wilson, Jr. ('18 mining engineering) and Anne Coghlan Wilson.

Three Elected Fellows of APS

Three professors in the department of materials science and engineering were elected fellows of the American Physical Society. Professors Ralph Colby, Sanat Kumar, and Paul Painter were all recognized along with other 1998 APS Fellows at the annual meeting held March 26–28, in Atlanta, Georgia. The APS Fellowship Program was created to recognize members who have made advances in knowledge through original research and publication or have made significant and innovative contributions in the application of physics to science and technology.

Ralph Colby, assistant professor of materials science, was cited for advancing the understanding of the dynamics of macromolecular liquids.

Sanat Kumar, professor of polymer science, was recognized for his pioneering simulation work on thin films of polymers and thermodynamics of polymer blends.

Paul Painter, professor and program chair of polymer science, was recognized for his work on theoretical and spectroscopic characterization of hydrogen bonded polymer blends.

Other Honors, Awards, and Special Activities

James H. Adair, associate professor of materials science and engineering, was elected chair of the American Ceramic Society's Basic Science Division and appointed chair of the Society's public relations committee.

Long-Qing Chen, associate professor of materials science and engineering, was appointed an associate editor of the *Journal of the American Ceramic Society*.

Michael Coleman and **Paul Painter**, both professors of polymer science, jointly received a two-year special creativity extension from the National Science Foundation for "outstanding scientific and technical progress on their research 'Specific Interactions in Polymer Systems.'"

Tarasankar DebRoy, professor of materials science and engineering, was elected a fellow of the American Welding Society in April 1999. DebRoy also served as coeditor and editor (respectively) on two recently published books: *Trends in Welding Research* and *Science and Technology of Welding and Joining*.

John Hellmann, associate professor of ceramic science and chair of the ceramics and electronic and photonic materials programs, has been appointed to a two year post as an associate editor of the *Journal of the American Ceramic Society*. Hellmann also assumes the presidency of the Ceramic Educational Council of the American Ceramic Society this year.

Sanat Kumar, professor of materials science and engineering, was elected program chair of the American Physical Society's Division of Polymer Physics. He will serve during the 1999–2000 term.

Merrilea Mayo, associate professor of materials science and engineering, has been elected treasurer of the Materials Research Society. She will assume her duties in September 1999, after she returns from her sabbatical leave and service as a Congressional Fellow.

Robert E. Newnham, professor emeritus of solid state science, delivered the Kreidle Lecture at the 10th Annual Rio Grande Symposium on Advanced Materials, in Albuquerque, New Mexico. The lecture honors the memory of glass scientists Norbert Kreidle, who was a member of the Penn State faculty fifty years ago.

Carlo Pantano, professor of materials science and engineering and director of the Materials Research Institute, was elected to the executive council of the Applied Surface Division of the American Vacuum Society. He will serve from 1999 to 2002.

Distinguished professor of metallurgy, **Howard Pickering**, delivered the keynote lecture *Critical Factors in Localized Corrosion III*, at the Electrochemical Society meeting held in Boston, Massachusetts last November.

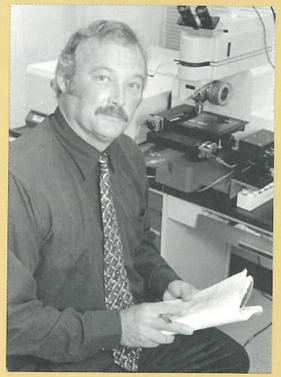
Earle Ryba, associate professor of metallurgy, received the 1999 Most Innovative Teacher Award from the Schreyer Institute for Innovation in Learning and the USG Academic Assembly. The award recognizes faculty for their leadership in undergraduate education at Penn State. Ryba received the award for his Metallurgical Literature course, Metals 310W.

Karl Spear, professor of materials science and engineering, has been elected to the officer chain of the Electrochemical Society. Spear has played an important role in the Society over the years, receiving their Solid State Science and Technology Award in 1997. He will hold the office of president in four years.

Richard E. Tressler, professor and head of the materials science and engineering department, recently served as chair of the five-year review committee for the School of Materials Science and Engineering at Georgia Tech. He was also a member of the Committee of Visitors for the triennial review of the National Science Foundation's Division of Materials Research.

Susan Trolier-McKinstry, associate professor of ceramic science, was elected president of the National Chapter of Keramos—the ceramics honor society. Trolier-McKinstry was also recently appointed to a two-year term as an associate editor of the *Journal of the American Ceramic Society*.

Department's Biomaterials Activities Get Booster Shot



Erwin Vogler will join the Department of Materials Science and Engineering as a visiting scientist and associate professor, on July 1, 1999. Vogler's expertise in biomaterials surface science will expand the current efforts of the department in this area. His research program is geared toward developing a fundamental understanding of the biophysical mechanisms that underlie the biological response to materials. This knowledge is applied to improve materials use in biomedical or biotechnical applications by providing essential bioengineering data with the specific goal of developing new biomedical devices. The research program is interdisciplinary, integrating the separate fields of surface science, liquid phase physics (as it applies to water), biophysics, and bioengineering into a single program focused on biology at interfaces.

Vogler comes to Penn State from his previous position as a research fellow at the Becton Dickinson Research Center located in the Research Triangle Park, North Carolina. Prior to joining Becton Dickinson in 1988, he was a research chemist at DuPont Experimental Station in Wilmington, Delaware. Vogler is a member of several professional organizations including the Colloid and Surface Chemistry Division of the American Chemical Society, the New York Academy of Sciences, and the American Association for the Advancement of Science. In addition, Vogler has served on the advisory board of several university centers studying biological materials. He holds more than thirty foreign and domestic patents.

student scoop

Graduates Earn Honors

Three materials science and engineering students graduated with honors during the Spring 1999 Commencement Ceremonies. **Enrico Bellomo** (polymer option) graduated with high distinction. **Monica Woodward** (polymer option) and **Richard Wolf, Jr.** (ceramic option) received highest distinction. Monica was also the Student Marshall for the spring ceremony. See the *Student Profile* for more information on her achievements.

PHOTO BY HENRY GONG

Matthew Motyka (foreground—graduating senior) talks with department head, Richard Tressler at the 1999 EMS Spring Graduation Reception on May 15, while Professors John Hellmann and Clive Randall chat in the background.

President's Freshman Award

Justin Horvath received a President's Freshman Award from Penn State this year. The award is presented annually to undergraduate students who have earned a 4.0 cumulative grade point average (based on at least twelve credits and not more than 35) before the end of the fall semester of the academic year.

Special Scholarship and Fellowship Awards

Curtis Billmann (Darrell Schlom—advisor) was awarded a 1999 Intel Foundation Graduate Fellowship. The award covers a full year of tuition and fees, as well as a twelve-month stipend. In addition, Curt will have access to an Intel mentor during the coming year and will receive an Intel microprocessor-based computer system as part of the award.

Tonya Faust (junior—metals option) received the 1998 International Symposium on Superalloys Scholarship from TMS.

James Lettieri (Darrell Schlom—advisor) was recently awarded a National Defense Science and Engineering Graduate Fellowship. The fellowships are given by the Department of Defense to individuals who have demonstrated ability and special aptitude for advanced training in science and engineering. The DOD hopes that these fellowships will help to increase the number of U.S. citizens trained in science and engineering disciplines of military importance. The fellowship includes a stipend as well as payment of all tuition and fees for three years.

Matthew Opitz (junior—ceramic option) was awarded $1,000 from the Pence Scholarship fund of the Southwest Section of the American Ceramic Society.

Starsinic Award

Edwin Chan (junior—polymer option) has been awarded the 1999 Starsinic Award. The award was established in 1997 by alumnus Michael Starsinic to recognize the most outstanding junior student in the Polymer Science and Engineering option.

1999 Xerox Awards

Victor Jablokov (Don Koss—advisor) received a 1999 Xerox Award for his M.S. thesis *Ductile Fracture and Damage Accumulation Behavior of HY–100 Structural Steel*. The Xerox Awards in Materials Research are given each year for the best published work or research by doctoral and Master's degree candidates—

Student Profile: Monica Woodward

Monica Isabel Woodward walked down the aisle to Pomp and Circumstance at the Spring Commencement Cermonies as the Student Marshall for the College of Earth and Mineral Sciences—and she did it with a perfect academic record.

Monica is modest about her success and says it's because "I like what I study." After her junior year in high school, Monica spent the summer at Iowa State University conducting research through a Women in Science and Engineering Program. While there, her father encouraged her to "check out the departments" and discover what she wanted to do. Following his advice she arrived at materials with biological applications. Monica admits that it wasn't strictly "polymers" that interested her, but when she arrived at Penn State, Professor Paul Painter's glib tongue coaxed her into joining the polymer science and engineering option of the department. Her senior research project and thesis, *Diffusion and Polyurethanes*, were directed at improving the properties of the polymers used in the Penn State artificial heart.

Not content to just study polymers, Monica also completed two minors. A semester abroad at the University of Concepcion in Chile assisted with the first minor in Spanish. While there she took a course in geography "and loved it" she says, which led to her second minor in geography.

A University Scholar, Monica has a number of awards including a prestigious Clare Booth Luce Award that she received in 1997 from the Women in Science and Engineering (WISE) Institute. At the finale of her undergraduate career, Monica was one of twelve Penn State undergraduate students to be awarded a three year National Science Foundation Fellowship for Graduate Research, and is also receiving a John W. White Graduate Fellowship from Penn State. She will be using these awards to pursue graduate studies in the Bioengineering Department at the University of Washington. The department there boasts a large biomaterials effort, and Monica plans to work on tailoring material's surface properties to improve their interaction with epithelial cells. Congratulations Monica and good luck in your graduate career!

up to two in each category. The awards are based solely on creative research accomplishment without reference to grades, recommendation letters, or other honors.

Other Awards and Honors

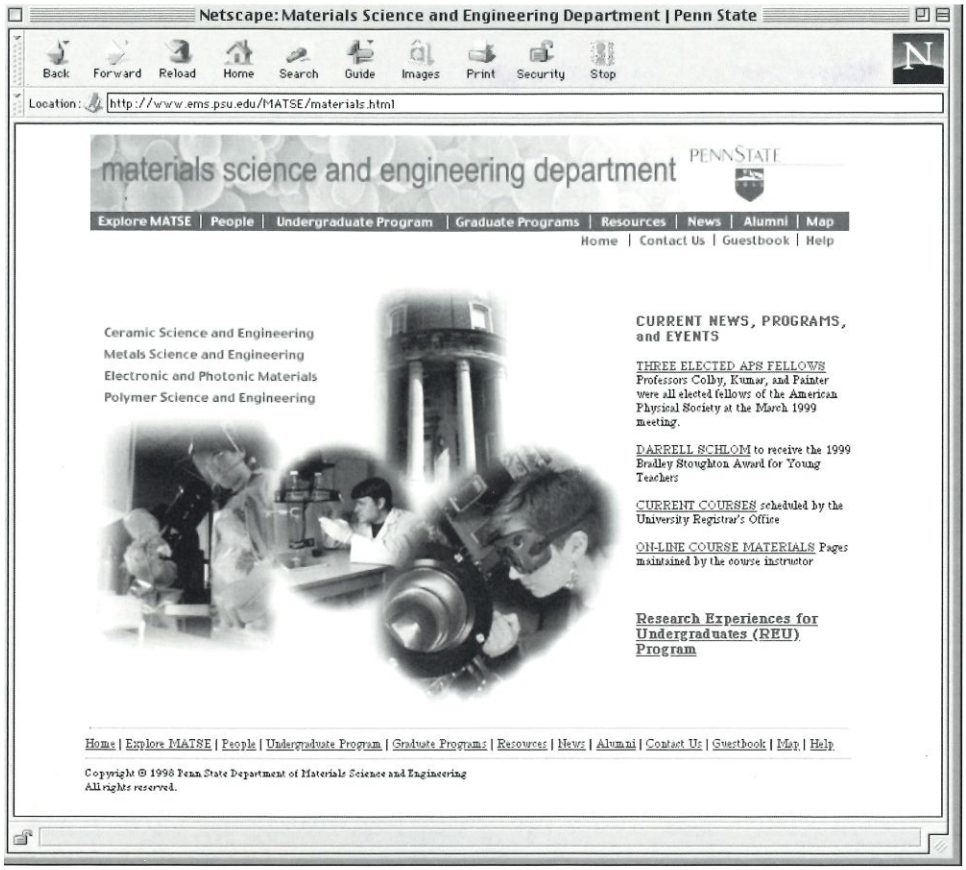
John DeLucca (Suzanne Mohney—advisor) received a MRS Silver Award for Graduate Student Research.

MRS Graduate Student Awards are intended to honor and encourage graduate students who have demonstrated academic achievement and excellence in materials research. The Silver Award carries a $200 cash prize, a certificate, and a one-year complimentary MRS student membership. John received the award for his research and presentation on *Electrodeposited Pt Contacts to n- and p-Type Gallium Nitride*, in which he gave a comparison between his new electrodeposited contacts and contacts prepared by the conventional method of physical vapor deposition.

Jeff Haeni (Darrell Schlom—advisor) received two special awards in 1998. He received the 1998 Best Student Paper Award at the Eastern Regional Conference on Crystal Growth and Epitaxy. Jeff was also awarded "Best Poster" at the 1998 IMAPS Keystone Chapter Meeting.

Nicholas Marchetti (junior—metals option) and **Robert Zilionis, Jr.** (graduating senior—metals option) are co-recipients of the 1999 Robert W. Lindsay Award in Metallurgy. The award is given each year to recognize undergraduate scholarship in physical metallurgy and promise as future metallurgical engineers. The award is named in honor of Professor Robert Lindsay, head of the metallurgy department from 1960–1969, who taught and studied metallurgy for 27 years at Penn State.

Ryan Williams (junior—electronic and photonic materials option) received the 1999 Brindley Award for Excellence in Nonmetallic Crystal Chemistry. The award is given each year to recognize outstanding undergraduate scholarship in crystal chemistry. It is named in honor of Professor George W. Brindley—teacher, researcher, and internationally recognized scientist whose studies in clay minerals and ceramics formed the basis of modern understanding in these fields.



MATSE on the World Wide Web

We've updated our World Wide Web site once again. Features include a guestbook where alumni can leave messages for each other, a form to keep us updated on your current address and activities, and up-to-the-minute news items and activities notices. Check back often to find out what's happening in the department.

We also have a list of links to materials companies, professional societies, and publications. In the fall we plan to start posting internship and job opportunities on the site. If you have anything to add, or just want to comment, send e-mail to the webmaster at jxh33@psu.edu

PENNSTATE
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215 Steidle Building
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Address service requested.

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Permit #1

Kathy Gummo
101 Steidle