

DEPARTMENT OF
MATERIALS SCIENCE AND ENGINEERING

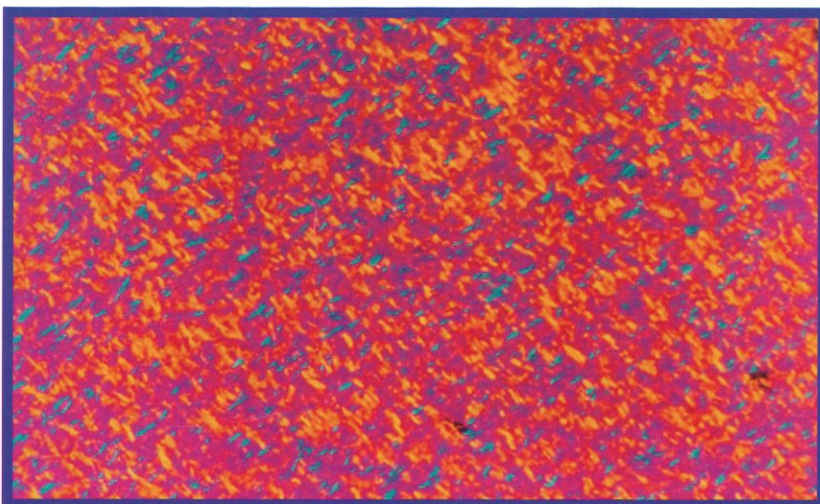
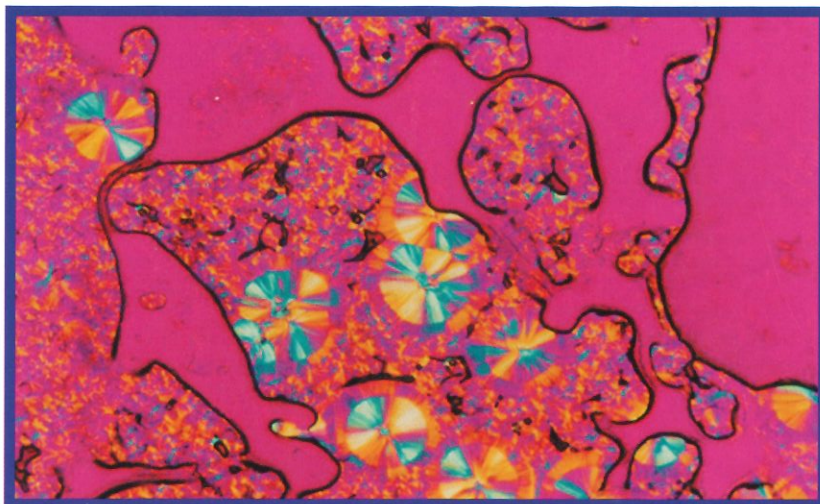
COLLEGE OF EARTH AND MINERAL SCIENCES

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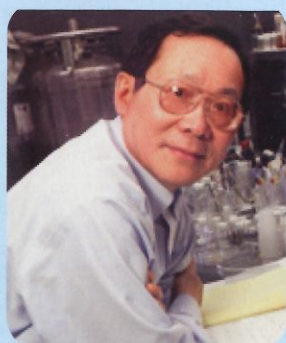
Newsletter

Functional Polyolefins: Expanding Performance and Applications

Professor Mike Chung and his group are working with Mitsubishi Chemical Company to commercialize new PP production.



Polarized optical micrographs of (top) two homopolymer blend with i-PP/PC = 70/30 and (bottom) two homopolymers with 5% of our compatibilizer PP-g-PCL. (100x).



Professor Mike Chung is known for his research in the functionalization of inert and non-polar polymers, including the two most important classes of commercial polymers—polyolefins (PE, PP, EP rubber, etc.) and fluoropolymers (PTFE, PVDF, etc.). Despite their commercial success (influencing our daily

life), both types of polymers have been suffering from poor interactive properties (low surface energy) and this has limited their applications, especially in the high value areas of coating, blends, and composites. In the past decade, Professor Chung's group at Penn State's Department of Materials Science and Engineering has been studying new functionalization chemistry, which is centered on the advanced metallocene catalysts in concert with the designed reactive comonomers and chain transfer agents.

(continued on page 6)



Gary L. Messing
Head, Materials Science and Engineering

Dear Friends,

The most important contributions of universities are the graduates. There is no question that your time as a college student is one of considerable enrichment and growth. In this newsletter we seek to recognize more of our alumni and to learn about their progress since leaving "Dear Old State". This spring we will begin the new Distinguished Alumni Award in MatSE to recognize graduates or friends who have most positively represented, influenced or contributed to the Department of Materials Science and Engineering. The awardee will be honored at the Annual Awards Banquet each spring. Please consider nominating a fellow classmate for this award by sending me an email at messing@matse.psu.edu.

This spring the IPAC will complete its transformation from a solely advisory body to one that will act as a working board to enhance the visibility and quality of the department. The Board will provide activities and events that will support students, faculty and alumni. The new Board will meet once in the fall to focus on student activities and student recruitment, and in the spring to serve the important role of review and advice and to honor our many outstanding students, faculty, staff and alumni at the annual spring banquet. With these new duties, we will be expanding the board from 10 to 15. If you are interested in serving, or want to nominate someone, please drop me a line.

The newly revised MatSE website is continuing to progress. We have added a new web based Alumni News site on the department web site. We are anxious to receive information about exciting milestones or events in your life. (e.g., awards, birth of a baby, job change, etc). Please email the info to georgiana@matse.psu.edu, we would love to share your information with the alumni, faculty and friends.

The department continues to renovate the building to enhance the visibility of materials education and research at Penn State. We are currently creating a variety of display cases with materials of the world. One such case will hold athletic equipment: baseball, football helmet, golf balls. Another case will host the Lion Heart. Other topics will be transportation, communications, and materials history. We will be telling the story about how materials influence our lives. If you have any materials products to donate for display, please contact Mike Fleck fleck@matse.psu.edu or Frank Driscoll driscoll@matse.psu.edu, who are heading up this project.

Finally, a huge word of thanks to Dr. Robert (Bob) Kumpf (Ph.D. 88, M.S., B.S., Polymer Science) for his help with gaining support for the new Bayer Graduate Fellowships and support for the new International Internship in Materials program. The \$300,000 from the Bayer Foundation will make a big difference as we work to remain one of the best materials program in the country. Let us know if you would like to be more involved in any of the above activities or have suggestions for better serving the needs of our alumni.

All the Best,

through scholarship endowments. In 1998, The William and Estelle Turney Scholarship in Ceramic Science and Engineering and the William and Estelle Turney Scholarship in the College of Earth and Mineral Sciences were established. These endowed scholarships are a key aspect of MatSE's undergraduate program; helping to attract students who are outstanding academically or can not attend Penn State without financial assistance. A year later, they established The Estelle and William Turney Scholarship in Elementary Education followed by The William and Estelle Turney Trustee Scholarship in Earth and Mineral Sciences and the Estelle and William Trustee Scholarship in Elementary Education in 2004. "It gives us a great deal of satisfaction," Bill says of his and Estelle's decision to endow scholarships. "People helped me when I was a new student and I wanted to in turn help new students."

In a sense, The Paterno Connection kicked things off for the Turneys. They were invited back to Penn State frequently during the Grand Destiny Campaign, keeping them up-to-date and included in what was happening on campus. There is excitement in their voices as Bill and Estelle talk about what Penn State and the College of Earth and Mineral Sciences are doing. "I especially love the TOTEMS (Total Orientation To Earth and Mineral Sciences) program," Bill said. "The faculty and staff involvement in the program leads to a greater sense of community." TOTEMS, a summer program just for first-year and transfer students in the College of Earth and Mineral Sciences, is an opportunity for students to make friends and meet current students and faculty before the semester begins. Bill and Estelle believe other colleges can benefit from building on the TOTEMS

program. Bill and Estelle are members of the College of Earth and Mineral Sciences' Obelisk Society and the Mount Nittany Society, and Bill helps the College with its fundraising efforts by serving as a member of the EMS Development Committee.

A Living Retirement

Bill refers to his retirement as a, "...living retirement." After Bill retired from Harbison-Walker in 1986, he and Estelle invested in various business ventures including operating an educational service franchise, where they assisted high school students with college preparations, and owning and operating a tree farm in Florida.

Residing in Severna Park, MD, where they raised their sons Mark and Adam, the Turneys help support many local charities. Especially close to their hearts, is the Salvation Army where Bill was active in their Capital Expansion campaign. Estelle, once very active in their sons' school PTA, was also involved with the local hospice; and Bill coached youth soccer for 10 years and managed a recreational swim team for five years. Bill and Estelle are always ready for snowfall as they are avid skiers, and when the weather is warmer, play "at" golf. They have been on a number of Alumni trips and especially enjoyed the EMS Alaska cruise last year.

Among Penn State's most loyal friends, Bill and Estelle return to University Park several times a year, for Mount Nittany and Obelisk Society meetings, an occasional football game and always a stroll across campus. "We have a lot of Penn State pride," Bill says summing it all up. "A wonderful place to go to school; I am so pleased to be a graduate of Penn State."

Opportunities for Giving

Private support is very important to the Materials Science and Engineering Department in a wide variety of ways. Steadily dwindling state appropriations create a critical need for private funds for scholarships, programs, facilities, faculty and outreach. We are infinitely grateful to the many wonderful alumni and friends of the Department who have made gifts and created endowments to support the mission of the Department. If you would like to make a pledge to support an endowed scholarship, please contact Kathy Spicer at 814-863-1779 or by e-mail at kkml@psu.edu.

INSIDE this issue:

- 3 Greetings from the Student Offices
- 4 MatSE News
- 6 Research Spotlight
- 7 Faculty Awards
- 10 Faculty Notables
- 11 Student News
- 13 Alumni News
- 14 Alumni Spotlight - William and Estelle Turney

Editor: **Gary L. Messing**
Writer/Editor and Layout:
Kimberly Sterndale

121 Steidle Building
University Park, PA 16802
(814) 865-0497

From the Undergraduate Studies Office

We have some great news for this academic year. Our enrollment numbers continue to climb, with 147 full time undergraduates ranging from freshman to senior status, and spread relatively uniformly across the four options. Our freshmen and sophomore classes comprise better than half, which is great news because we typically pick up quite a few new students from other majors during their third to fifth semester. We have a dozen Schreyers scholars among the ranks, and the undergraduate program cumulative GPA is hovering around a 3.0. We graduated 25 students in the 2004-2005 academic year, and anticipate another 20 for the 2005-2006 year; roughly half of our students went on to graduate studies at universities such as Virginia, Illinois, Clemson, and of course, some remain with us at Penn State.

Job opportunities have remained robust this year, with our graduates finding employment at places like ANH Refractories, Bayer, Bechtel Bettis, Micron Tech, Perryman Company, Rohm and Haas, Lockheed Martin, and the like. Summer research internship and cooperative education opportunities are similarly robust; if you are considering hiring some summer interns, or wish to arrange interviews for summer interns or full time employees, please contact us soon by e-mail or phone (Hellmann@matse.psu.edu or 814-865-0163) so we can accommodate you.

From the Graduate Office

We have had an exciting and productive year in the graduate office. We successfully completed a two and a half year effort to unify the MatSE Department and Intercollege Materials graduate degree programs at PSU. Integration began in Fall 05, and is well on its way as of this writing. The office for the unified program is located in 101 Steidle, with yours truly as the Chair, and Prof. Al Segall (ESM) as the Co-Chair representing students advised by faculty outside of the MatSE Department.

We would like to extend a very special thanks to Bayer Materials Science and 3M for their generous support of Graduate Fellowships to assist in recruiting outstanding domestic graduate students to our program. This financial support is invaluable for making early offers to high achieving applicants and subsequently attracting them to Penn State.

We are currently in the midst of recruiting season in the graduate office – just handling the 300+ applications and associated inquiries requires significant effort.

Equally exciting is the introduction of a new course concerning *Materials Engineering Methodology and Design* (MatSE 492W) in which students work in teams, with a faculty and industrial mentor, on solving an industrially-relevant problem in the spring semester of their junior year. The course has been very well received by industry and students alike, and we encourage you to contact either Earle Ryba (rx7@psu.edu) or me if you wish to participate; it's a great way to help our students hone their problem solving skills and we're always looking for new collaborations!

The *esprit de corps* among our undergraduates remains top notch! Our Keramos chapter once again won the National Outstanding Chapter award, and our Material Advantage™ chapter (a conglomerate of ASM International, the American Ceramic Society, TMS, and AIST) is equally vigorous in their participation in technical meetings, industrial site visits, and a wide array of outreach, recruiting, and professional development activities. We are fortunate indeed to have such great students in the Department.

We encourage your input as we implement our strategic plan. Please, by all means, chime in with your thoughts!

—John Hellmann, Professor and Associate Head
for Undergraduate Studies

Special thanks go out to the grad office staff, Katina and Michelle, for their efforts. Our largest event was our annual Prospective Graduate Student Open House in late February, which was attended by ~40 outstanding undergraduate students from around the country. It was a rousing success, thanks to the efforts of our faculty, current graduate students, and Katina and Michelle of course.

As usual, we have had a number of graduate student seminars through the academic year, provided by people from academia, government and industry. Of particular note was the visit by our 2005 Taylor Lecturer, Prof. Marvin Cohen (Cal Berkeley), and the speakers in our 2006 MatSE Distinguished Speakers Series: Prof. Reinhold Dauskardt (Stanford), Prof. David Tirrell (Cal Tech), and Prof. David Weitz (Harvard).

—Jim Runt, Professor and Associate Head of
Graduate Studies Chair, Intercollege Graduate
Degree Program in MatSE

New Materials Science Building Update

The Materials Science Building Programming Committee had a busy Fall semester which culminated in submission of its final report in December 2005. It is now established that the new materials science building, with a budget of \$80M, and a new \$40M life science building, will be integrated in one building complex on Pollock Field. Rafael Viñoly Architects (NY, NY) has been selected for the project; our first meeting with them will be in January. The design phase will be completed in 2006, and construction will commence early in 2007. The opening is scheduled for mid to late 2008.

The over-arching goals of the new materials science building are to bring the materials research community *closer together* on central campus, and to significantly increase the quantity and quality of state-of-the-art

research space *on central campus*. The building will provide laboratory space that is outside the norm of conventional academic buildings in terms of vibration and EM-field free environments, and will be agile enough to handle the inevitable changes expected in the activities and priorities of interdisciplinary research (including a possible expansion of the building in the future). The building will emphasize core and shared facilities, which will be accessible to faculty and students whether they reside in the building or not, along with the individual laboratory and office space of the faculty and students who occupy the building. Altogether, the building will enable and support scientific collaboration, sharing of resources, University-wide networking, vertical integration of materials/devices/systems, and technology transfer to industry.

The building and its facilities will promote collaborative interdisciplinary research in three broad theme areas:

- **electronic/photonic materials, devices and systems**
- **nanomaterials, nanofabrication and nanostructures**
- **biomaterials, biomimetics and bionanotechnology**

Clearly, there will be a plethora of new opportunities for materials research at the interface with other disciplines, especially the life sciences. The building will possess the highest density of interdisciplinary faculty researchers on the Penn State campus, and the areas of research will be relevant to almost all technologies from computer memory to nanosurgery.

MatSE Student Advisory Committee Formed

At the end of the 2005 fall semester, Dr. Messing commissioned the formation of a new Student Advisory Committee (SAC). The SAC will draw representatives from the major student organizations within MatSE—Keramos, MRS, and Material Advantage—as well as members who serve as Departmental representatives to greater College and Campus organizations, such as EMS' Graduate Student Council (GSC) and the Graduate Student Association (GSA). Thus the mission statement: The SAC advocates the best interests of the student body in Department-affairs,

working toward the enrichment of MatSE student life, by representing both graduates and undergraduates of the various materials disciplines.

Some intended functions of the SAC will include providing input in department planning, interacting with IPAC, assisting in recruiting, representing students on the Faculty Council, and providing a resource for new and continuing students. Currently, the SAC is working toward establishing a working constitution and by-laws. It will also play a leading role in awarding the first ever

MatSE Faculty of the Year Award—nominated and ultimately chosen by the Department's students. Look for more news in the upcoming semester.

The SAC welcomes communication from the student body and any interested faculty or staff; please contact the Chair, John Creek (jac548@psu.edu), or the Vice Chair, Paul Cha (pcha@psu.edu), with any comments or concerns. The other SAC members are Jennifer Rygel, Ioanna Mina, Vivek Tomer, and Francelys Medina.

Announcing the MatSE International Internship in Materials Program

The Department is proud to announce the inception of the International Internship in Materials program (IIM). The goal of IIM is to enrich the learning experience of our undergraduates by immersing them in an international research activity. Likewise, by Penn State providing reciprocal opportunities for students from host institutions, our students can benefit from visiting international students' perspectives and cultures. The Bayer Foundation has given a very generous donation to begin the funding of the IIM program.

We have exchange agreements with the following universities: Darmstadt University of Technology, Germany; Friedrich-Alexander University Erlangen-Nuremberg, Germany; University of Leeds, England;

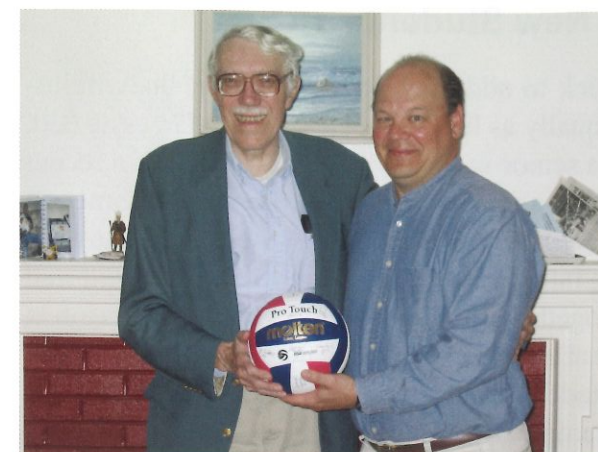
National School of Industrial Ceramics, Limoges France; University of Padua, Italy; The University of Sheffield, England; and Swiss Federal Institute of Technology (ETH), Zurich Switzerland. In addition, an institution in Spain will be coming on board in the upcoming year.

The students selected for the program will be offered research internships based on collaborations between Materials Science and Engineering faculty and faculty at our host institutions. Because the internships will be highly structured research programs, students will be able to use their work in support of their senior capstone project, a requirement for all MatSE students.

Two students from the University of Limoges (Jerome Cantonnet and Pierette Michaux)

and one student from the University of Sheffield (Owen Arnold) were with us last year. One student from Limoges and one from Erlangen will join us this Spring. Our first MatSE student to enter the program, Erin Haworth (Class of 2007) will be headed to Limoges for five months this Spring. Erin's research program will focus on the development of biomedical materials. As a dual major (MatSE/French), Erin will also be gaining credit towards her French degree while she is abroad. Andrea Fortunato (Class of 2007) will go to Padua University this summer.

If you are interested in learning more about our program you can visit the new IIM pages on our website located at www.matse.psu.edu/iim/iimHome.



Dr. Donald Hamer (BS '68, EE), a long time supporter of Penn State, joined the 2005-2006 Donald W. Hamer Scholarship awardees for a luncheon at The Nittany Lion Inn. Dr. Hamer is pictured with scholarship awardees Gary Paradee, John Foreman and Matthew Gadinski (standing) and Trevor Buehl (seated). The Donald W. Hamer Scholarship in Electronic and Photonic Materials in the College of Earth and Mineral Sciences was established to provide recognition and financial assistance to outstanding undergraduate students enrolled or planning to enroll in the Electronic and Photonic Materials option in the Department of Materials Science and Engineering.



Dr. Donald Hamer with the 2005-2006 Donald W. Hamer Scholarship awardees.

Alumni Events

Dean Eric Barron hosted an alumni reunion luncheon at the Nittany Lion Inn last June. Pictured below are MatSE graduates from the classes of 1940 through 1955, who attended the luncheon. The reunion luncheons are a terrific opportunity to not only reminisce but see first-hand what



MatSE alums from left to right: Charles Larson ('55, Ceramics), John Werner ('54, '60, Metals), Charles Brachbill ('49, Ceramics), Fletch Byrom ('40, Metals), and Richard Brown ('60, Metals)

is happening in the department and on campus. A lot can happen in 50 years!

This year's Reunion weekend will be held on June 2-3, we hope to see you then.

Last Fall we brought MatSE to you. In September, we hosted a wine and cheese reception in conjunction with the MS&T Meeting in Pittsburgh. Current students, alumni, and faculty had the opportunity to reunite and share memories of Penn State. John Hellmann, Professor and Associate Head of Undergraduate Studies, updated the group on the current activities in the department. The reception was an excellent opportunity for people to reconnect and network with fellow alums. This year's MS&T Meeting will be held October 14 through 18, in Cincinnati; watch for information about the MatSE reception on our web site: <http://www.matse.psu.edu/news/events.htm>.

The department also hosted a reception in State College for our local alumni.

To view additional pictures of this reception, go to: <http://www.matse.psu.edu/news/photoAlbums/alumni1/index.htm>

William and Estelle Turney Give Back by Helping New Students



There were no buses on campus in 1965 when Bill and Estelle Turney met on College Avenue their senior year at Penn State. Instead of hopping on the Loop, they walked the smaller campus in all kinds of

weather. Other things were different as well: they watched television in their dorm basements and waited in line to share the telephone in their dorm hallways. Not everything has changed, however; like today's students, Bill and Estelle got most of their information about the outside world from the Daily Collegian or the radio, and enjoyed going to the HUB, where they could chat with friends and watch movies for free. Even then the University Park campus seemed, with its 17,000 students, to be a small city unto itself. Today, Bill and Estelle return frequently to their alma mater, where they still like to walk the campus together, among old buildings that bring back fond memories and the many new buildings that have sprung up as Penn State's student body grew to 40,000-plus.

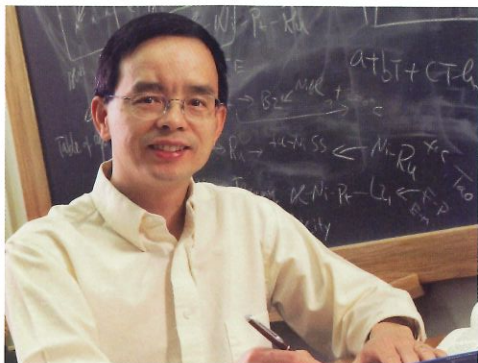
William Turney (CerSc, '65) grew up in Greensburg, Pennsylvania in the Laurel Highlands of southwestern PA. With a choice between the University of Pittsburgh and Penn State, Bill was swayed by a cousin with a degree in ceramics engineering from Georgia Tech who convinced him that Penn State's ceramics science program was the way to go. The experience would prove to be life changing for the young man from a somewhat sheltered background. "I went as a boy and came out a man," Bill says about the impact of the diversity of cultures and backgrounds he encountered on the bustling campus. The classes, too, were transformative, especially Prof. Vladimir Stubican's refractories class, and Prof. Guy Rindone's popular glass class.

Bill is quick to add that meeting Estelle, his wife-to-be, was equally as life changing. Estelle Graessle (Ed, '65) was a senior in the College of Education, a recent transfer from a private women's college. They met on a Friday afternoon in front of the A Store (now Moyer's Jewelers), introduced by a mutual friend. They started their life together after graduation when Bill took a job in Baltimore at Harbison-Walker, a manufacturer and seller of high-grade ceramic refractory products and services for high-temperature applications in various materials industries. Bill worked the front line as a foreman in manufacturing and Estelle found a job teaching at an elementary school, a career she continued as Bill's job took him on to Indiana and Ohio. Bill worked his way through the ranks, learning the ropes and thus preparing him well to become manager of the Wyndham, Ohio plant and subsequently the Baltimore plant, the largest plant at that time. Bill's experience starting out on the frontline led to an invitation to join John Dutton, who at that time was the Dean of the College of Earth and Mineral Sciences (EMS), at a round table discussion about business training in the industrial workplace. "I know first hand what it is like to go into a job where I had the science and technology training but not the business training. With no directives or no (course) electives, you had to learn by the seat of your pants," Bill explained. Bill eventually became a member of the Dean's Advisory Council on Global Business Strategies, from which the Earth and Mineral Sciences academic minor, Global Business Strategies for the Earth, Energy, and Materials Industries was developed. The College of EMS developed the minor to introduce students to financial, investment, and management concepts applied to private sector organizations whose operation emphasizes the Earth and its environment, the energy and mineral industries, or the development of new and enhanced materials.

Giving Back Brings Turneys Satisfaction

Bill recalled, "In 1998, Estelle and I were invited to the Paterno Connection in Baltimore. We were so impressed by Coach Paterno and the level of excitement (about Penn State) in the room that we knew we had to do something." Committed to education and Bill being a scholarship recipient himself, the Turneys knew that "doing something" would be giving back

Center for Computational Materials Design Launched



Zi-Kui Liu, Associate Professor in the Department of Materials Science and Engineering, will serve as the Director of the new **NSF Center for Computational Materials Design (CCMD)**.

With the vision of being the premier collaborative U.S. university activity in computational materials design, the Center for Computational Materials Design (CCMD) is now a reality. Collaboration between the university participants and the Center's members from industry and government laboratories, facilitated by an award as a National Science Foundation Industry/University Cooperative Research Center, will accelerate the transfer of research results into applied technology. Reflecting on the start-up of the Center and its promise, Liu notes "Computational modeling and simulation are becoming key technologies to support materials research and development in both academia and industry. The establishment of the CCMD enhances the infrastructure of computational materials research in the nation, explores and extends the interface between engineering systems design, information technology and physics-based simulations, and integrates materials research as part of component and device design. Furthermore, through industrial and governmental participations, the CCMD will improve the intellectual capacity

of the workforce, conduct high quality research projects relevant to the economic growth, and develop curriculum in computational and systems design aspects of materials. The complementary expertise at Penn State and Georgia Tech provides an ideal environment to work on this exciting and challenging endeavor."

The CCMD will receive guidance from a Member Advisory Board initially consisting of 13 organizations representing large and small business, including suppliers and end users, as well as DOE and DOD laboratories. Based on needs identified by the CCMD members, faculty from Penn State and Georgia Tech will carry out projects proposed to address these needs, often involving an interdisciplinary group including not only materials science and engineering faculty and graduate students, but also engineering systems design faculty, computer scientists and applied mathematicians. Prof. David McDowell of Georgia Tech, TMS member and Associate Director of the CCMD, views the interactions not only between Penn State and Georgia Tech, but also between disciplines as a key enabler for the Center's progress. He notes "The CCMD offers a unique opportunity to conduct both short and long term research supporting innovative materials design capabilities at the intersection of industry relevance and scientific forefront, bringing together essential elements of databases, information technology, decision theory, and first principles to continuum modeling of process-structure-property-performance relationships."

The Center participants are certainly not new to the area of computational materials design. The Penn State group has developed the MatCASE suite of multi-scale modeling tools and

databases through an NSF Information Technology Research project involving Ford and NIST. Georgia Tech has focused on the integration of heterogeneous, multiscale material models into systems-based robust design of materials, including the development of a virtual design studio concept. This concept will be applied in the CCMD to allow the MatCASE materials modeling components to be integrated along with a suite of decision-based robust design tools, configured differently for each materials design problem.

A key mission of the Center is to educate the next generation of scientists and engineers with a broad, industrially-relevant perspective on engineering research and practice, preparing them to contribute in the emerging field of materials design. In this regard, the member organizations will realize benefits not only directly from the results of the research projects but also indirectly from the availability of trained prospective employees, who will be well suited to implement computational materials design tools in practice.

The Center for Computational Materials Design, while on its way, is quite interested in considering additional members. More information can be obtained by visiting the CCMD website at <http://www.ccmd.psu.edu/> or directly from Center Director Z.-K. Liu via e-mail at zikui@psu.edu or Associate Director D.L. McDowell at david.mcdowell@me.gatech.edu.

**Functional Polyolefins:
Expanding Performance and Applications** *(Continued from cover)*

Several new functionalization routes have been developed, and showing effective incorporation of functional (polar) groups in the polymer chains with well-controlled molecular structures. The resulting functional polymers (based on old polymer structures) and new polymer blend and nanocomposite materials exhibit a unique combination of chemical and physical properties and show many potential commercial applications, from long-lasting composite coating, out-door stable high impact engineering plastic, ultrathin polymer films for high pulse and high energy density capacitors, to new boron-containing materials for hydrogen storage. In addition to 150 professional papers and two books reporting the experimental results, Professor Chung also assisted PSU to protect the new functionalization technology in 45 US patents (some with world-wide protection).

In the past year, Mitsubishi Chemical Company in Japan has signed two option agreements and is negotiating another one with the Penn State Intellectual Properties Office for commercialization of three closely related polypropylene technologies covered in Professor Chung's patent portfolio. In addition to the royalty fee and all patent expenses incurred during US and international patent applications, Mitsubishi is also supporting Professor Chung's research with a new research agreement (totaling more than a half million US dollars in two years). Professor Chung is currently serving as a member of the Mitsubishi Corporate Advisory Board. One application area is illustrated in Figure 1 (cover), in which the immiscible polypropylene and polycarbonate blend becomes compatible to form a uniform microphase separated morphology with desirable properties. Daikin Corporation (a major fluoropolymer producer) has been a long-term supporter of the Professor Chung research group in developing new fluoropolymer coatings and nanocomposites. In addition to research and consulting agreements, the company has provided funds to PSU for covering all patent expenses related to the new fluoropolymer technology (totaling about a half million US dollars in the past three years). Recently, a new family of pre-form functional ethylene-based rubber particles has been synthesized and patented by Professor Chung's group. This inexpensive ethylene-based rubber is known for its good stability, often used as the sidewall (protecting layer) in automotive tires. The new and tiny (sub-micron) functionalized rubbery particles can be uniformly embedded in important engineering plastics (such as PP, nylon,

epoxy, PET, SAN, and PC) with excellent interfacial adhesion and uniformity to increase their resistance to cracking/fatigue and harsh environment (UV, ozone and heat). Figure 2 shows an example of a new ABS material with its morphology, which can extend ABS from indoor-bound applications to out-door environments. Several companies around the world are discussing this technology with the Penn State Intellectual Property Office.

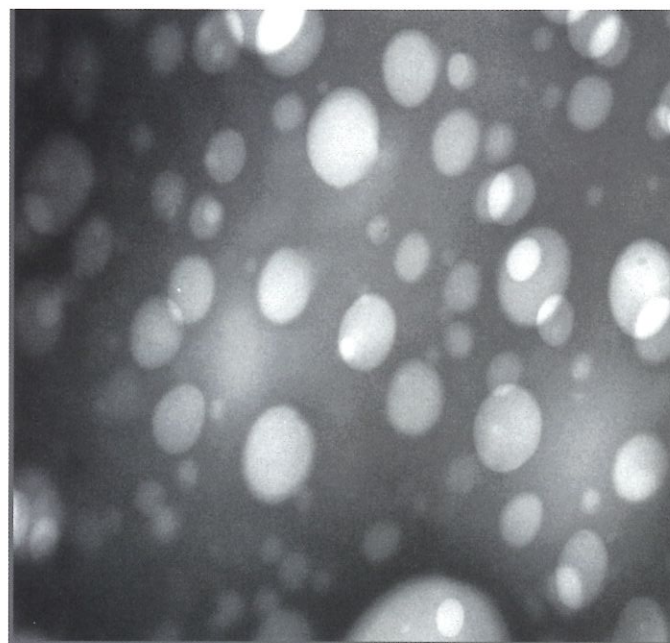


Figure 2: TEM micrograph of a new ABS engineering plastic containing about 20 wt% EP rubber particles and 80 wt% SAN copolymer with (S/AN= 70/30 wt%).

T.C. (Mike) Chung, Professor of Materials Science and Engineering, can be contacted at chung@matse.psu.edu or visit www.matse.psu.edu/fac/profiles/chung.html for additional information.

2005-2006 MatSE Undergraduate Research Fellows

We are pleased to announce the 2005-2006 Undergraduate Research Fellows in the Department of Materials Science and Engineering. The Undergraduate Research Fellows (URF) Program was launched last spring to encourage undergraduate students to pursue research experiences with MatSE faculty. The program is limited to Freshman-Junior level students. The Fellows will present the results of their research at the departmental poster competition on April 25, 2006.



The 2005-2006 URFs and their advisors are:
Front row: Stefan Yohe (Susan Trolier-McKinstry); Jessica Serra (Gary Messing)
Back row: Dennis Shay (Beth Dickey); Matt Scates (Chris Muhlstein); Gary Paradee (Jian Xu) and Trevor Buehl (Suzanne Mohny). Not pictured: Jason Kruike (Paul Painter), R. Chatchaidech (Qing Wang), and Rod Reber (Ron Hedden).

MatSE 411 Class Takes a "Sweet" Trip

Did you know that making candy and particularly chocolate candy processing shares common process fundamentals with ceramic processing? Professor Messing took his MatSE 411 class on a tour of Gardner's Candies in Tyrone, PA, to see the processing of peanut clusters, assorted filled chocolates and the incomparable peanut butter meltaways. The tour was given by company President Sam Philips who explained how they controlled the viscosity and rheology during chocolate production with specific time-temperature controls and chocolate quality with proper annealing. Great fun was had by all as we sampled our fresh chocolates on the way back to Penn State. Tours are given to the public on a regular basis, so you don't have to take MatSE 411 to enjoy the tour.



**Congratulations
MatSE Graduates!
Summer 2005, Fall 2005**

B.S. degrees

- Robert Clark
- Joshua Panfile
- Brandon Ribic
- Michael Ruffin
- Jacob Smail

M.S. degrees

- Kristen Breece
- Abuzer Dogan
- Jane Howell
- Elena Hung
- William Janosik
- Rebecca Kirkpatrick
- Yi-Hsiu Liu
- Jason Mattia
- Patrick Raynaud
- Samuel Schoenberg
- Thomas Trammell
- Ting Zhu

Ph.D. degrees

- Nazanin Bassiri Gharb
- Brian Erwin
- Kevin Fox
- William Golumbfskie
- Usama Kandil
- Rajneesh Kumar
- Kok-Keong Lew
- Zijie Lu
- Aravind Mohanram
- Joshua Robinson
- Sarah Rouse
- Gaurav Sharma
- Guohua Wang
- Zhiming Wang
- Timothy Yosenick
- Yu Zhong

Penn State Chapter of KERAMOS Takes Home Outstanding Chapter Award

Congratulations to the Penn State student chapter of Keramos for winning the Keramos Outstanding Chapter award. The Keramos National Professional Ceramic Engineering Fraternity was established in 1902 to promote interaction between and camaraderie among students and Ceramic Engineering professionals. This award recognizes the chapter that has done the most to uphold the Keramos objectives of service and scholarship. Each of the 12 chapters across the country composes an annual report outlining the activities they are involved with during the year, which is the basis for the awards. Students in the Penn State chapter were involved in numerous activities including helping with EMEX (the College of Earth and Mineral Sciences open house), organizing industry tours and lectures and making an electronic copy of the blue book, which contains information on the origins and history of Keramos.

The Penn State chapter of Keramos, 90 members strong, is composed of undergraduate and graduate students, post-doctors, and faculty. The PSU Chapter is advised by Allen Kimel, Assistant Professor of Materials Science and Engineering, and led by student officers Paul Cha, President; Jennifer Rygel, Vice President; Alexana Cranmer, Secretary; Brian Gabriel, Treasurer and Andrea Fortunato, Herald.

Alexana accepted the award on behalf of the Penn State chapter at the Keramos meeting at the annual symposium in Cocoa Beach on January 22, 2006.



Pictured left to right: Alexana Cranmer, Secretary; Brian Gabriel, Treasurer; Paul Cha, President; and Jen Rygel, Vice President, (missing from the picture, Andrea Fortunato, Treasurer)



Jason Mattia, a 2005 M.S. graduate of the Materials Science and Engineering program, was a dedicated Lion Ambassador for over four years. Jason became a member as soon as he was able as an undergraduate student and continued on through his graduate studies. The Lion Ambassadors: Penn State Student Alumni Corps, are a group of informed students who provide service to the university

while enhancing the relationships between students and alumni. Jason did his graduate thesis "Studies in Hydrogen Bonding in Polyurethanes, Polyureas," under the advisement of Professor Paul Painter, Professor of Polymer Science. Jason is currently employed as a Project Manager for Alcoa Kama in Hazleton, PA.

More Student Awards

Joseph Ryan, PhD candidate in MatSE, was the winner of the 2005-2006 Earth and Mineral Sciences Poster Exhibition held on September 7, 2005. His poster was titled "Reactive Sputter Deposited Silicon Oxycarbide Thin Films." Joe is advised by Dr. Carlo Pantano and is working on the creation of amorphous thin-films via vapor deposition and sol-gel methods.

Alejandro Levander, undergraduate student in MatSE, was one of the winners of the undergraduate poster presentation competition in the engineering category at the Society for the Advancement of Chicanos and Native Americans in Society (SACNAS) Conference held in Denver, CO, in Fall 2005.

David Green Receives Von Humboldt Award



Professor **David J. Green**, Department of Materials Science and Engineering, has been presented with a 2006 Humboldt Research Award. The Alexander von Humboldt Foundation grants up to 100 of these Research Awards annually to scientists and scholars from outside Germany with internationally recognized academic qualifications. The

research award honors the academic achievements of the award winner's lifetime. Furthermore, award winners are invited to carry out research projects of their own choice in Germany in cooperation with colleagues for periods of between six months and one year. The Alexander von Humboldt Foundation is a non-profit foundation established by the Federal Republic of Germany in 1953 for the promotion of international research cooperation. It enables highly qualified scholars not resident in Germany to spend extended periods of research in Germany and

promotes the ensuing academic contacts. The Humboldt Foundation promotes an active world-wide network of scholars from 125 countries.

Professor Green will be based at the Technical University in Darmstadt and will be performing research on the mechanical behavior of ceramics with Professor Juergen Roedel. The research is aimed at better understanding the stresses that arise in the drying of ceramic thin films and the influence of strain mismatch during the processing of ceramic materials. These stresses are known to cause damage and distortion during processing, which impacts the quality and performance of the material. This research will be performed over a three-year period starting in June 2006.

Professor Green received his Ph.D. in Materials Science at McMaster University in Canada. He joined the faculty in the Materials Science and Engineering Department in 1984 where he combines his research on the mechanical behavior of ceramics with teaching. Professor Green has served as Senior Journal Editor of the American Ceramic Society since 2002.

Robert Newnham Receives 2005 Alumni Fellow Award

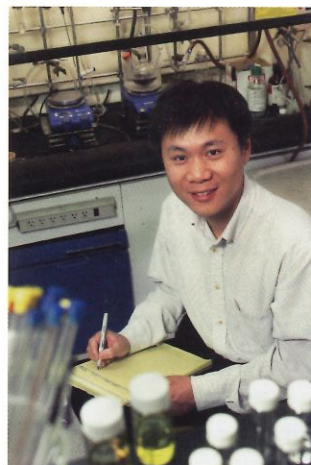


(L-R) Lewis Gold, Alumni Council President, Eric Barron, Dean EMS, **Robert Newnham**, Daniel Larson, Dean of Science and Graham Spanier, PSU President

Robert E. Newnham, Alcoa Professor Emeritus of Solid State Science, was a recipient of the 2005 Penn State Alumni Fellow Award. Penn State President Graham Spanier presented Dr. Newnham with the award, the highest honor bestowed by the Penn State Alumni Association.

Dr. Newnham completed his Ph.D. in Physics at Penn State in 1956, where he later became a member of the faculty of Materials Science and Engineering in 1966. Dr. Newnham has had a long distinguished career and is a true pioneer in materials research. During his tenure at Penn State, he supervised over 100 theses, received numerous honors, and continues to be highly sought-after for lectures and collaborations. Dr. Newnham continues to be an exceptional ambassador for Penn State.

Qing Wang Receives NSF CAREER Award

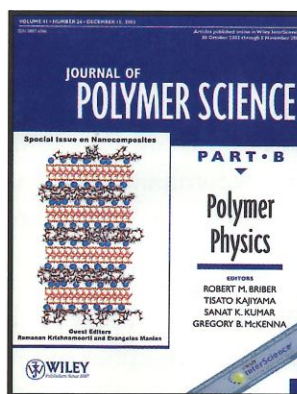


Dr. Qing Wang, Assistant Professor of Materials Science and Engineering and Virginia and Philip Walker Faculty Fellow in the department, has been awarded an NSF CAREER award for his proposal, "Development of Novel Electroactive Polymer Assemblies." This five-year grant is one of the National Science Foundation's most prestigious awards, and is

intended to support the development of future academic leaders. Dr. Wang received his Ph.D. from the University of Chicago in 2000 and was a postdoctoral research fellow at Cornell University from 2000 to 2002. He joined the faculty of the Department of Materials Science and Engineering at Penn State in July 2002. Since his arrival, he has built a research group and laboratory facilities to develop new nanostructured polymeric materials. Electroactive polymers are becoming crucial components in advanced electronic devices such as light emitting diodes for display applications, thin film transistors for low-cost and ultra-dense logic and memory circuits, and photodiodes for

optical information processing. Combining advantages such as ease of processing, flexibility, versatility of molecular structure and tunable physical properties, organic polymer-based wires, gates, transistors, and storage devices not only hold promise in the continuing technological revolution, but also are entering our daily lives in several different ways. Smart tags that allow automated checkout of items at the supermarket, novel consumer products such as ultra-light, flexible displays for portable electronic devices and wall-size television screens are but a few of the possibilities. In Dr. Wang's program, a new generation of electroactive polymer assemblies will be developed via rational design, molecular engineering and hierarchical assembly. The nanometer-scale control of molecular organization will likely lead to materials with unparalleled physical properties for applications in energy storage, energy harvesting, and advanced microelectronics. This research program is a collaborative effort that will include an educational outreach program with Penn State Public Broadcasting and contributions from faculty at Penn State (Drs. James Runt and Qiming Zhang, EE).

Evangelos Manias an Author on Prize Winning Paper



Congratulations to Vikram Kuppa, Sirilak Menakanit, Ramanan Krishnamoorti, and **Evangelos Manias**, whose paper "Simulation Insights on the Structure of Nanoscopically Confined Poly(ethylene oxide)" was selected to receive the Journal of Polymer Science Part B: Polymer Physics Prize for

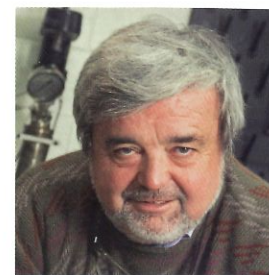
2006. This prize is awarded annually to the best paper published in the journal. A panel of editorial board members selected this paper from over 600 manuscripts published in JPSB during the past two years (2003-2005). The authors will receive their prize during the awards dinner at the meeting of the American Physical Society, which will be held in Baltimore, Maryland, March 2006.

Dr. Evangelos Manias, Associate Professor of Materials Science and Engineering, has been a faculty member at Penn State since 1999 making significant contributions in

the field of polymer nanostructures and nanocomposites. Currently, Dr. Manias' research group consists of 9 graduate students and 2 postdocs. Co-author Vikram Kuppa received his Ph.D. in 2003 under the advisement of Dr. Manias and is doing postdoctoral work at MIT; the paper above stands as a culmination of his Ph.D. research. Sirilak Menakanit was a M.S. student in Manias' group and received her degree in 2002. She is currently working as a staff scientist in Ceramic Industry Development Center, Thailand. Ramanan Krishnamoorti is a Professor of Chemical Engineering in the University of Houston. The research depicted in the prize-winning paper was funded by NIST/BFRL and by the ACS/PRF.



Macdonald Elected 2005 Fellow of ASM International



For contributions to the theory of corrosion and passivity, enabling the accurate prediction of accumulated corrosion damage, **Digby Macdonald**, Distinguished Professor of Materials Science and Engineering, and Director of the Center for Electrochemical

Science and Technology, was elected a 2005 Fellow of ASM International.

Dr. Macdonald was presented with his award at the ASM Awards Dinner in Pittsburgh, Pennsylvania during ASM's Annual Event.

Messing Receives the John F. McMahon Lecture Award



Gary L. Messing, Distinguished Professor and Head of the Department of Materials Science and Engineering, was recently presented with the John F. McMahon Lecture Award by Dean Alastair Cormack (at right in photo) of Alfred University's Inamori School of Engineering. The Award was created to honor Dr. McMahon for his contributions to ceramic science

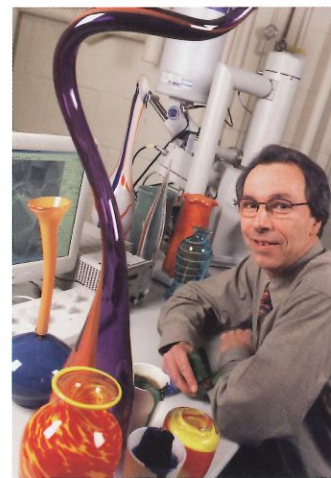
and engineering and is presented each year to a notable scientist or engineer in his field. Dr. Messing, who received his B.S. degree in Ceramic Engineering at the New York State College of Ceramics at Alfred University, presented the annual John F. McMahon Lecture titled, "Manipulating Microstructures – A Path to Better Ceramics."

Tressler Named 2006 Hosler Alumni Scholar Medal Recipient

Richard E. Tressler, Professor Emeritus of Materials Science and Engineering and alumni (PhD 67, Ceramic Science), has been chosen as the 2006 recipient of the Charles L. Hosler Alumni Scholar Medal in recognition of his remarkable career of academic and research achievement. The award, established in 1992, recognizes the very highest

levels of intellectual achievement or academic service attained by those educated in the College of Earth and Mineral Sciences. Dr. Tressler's tireless commitment and service to the Department, the College, and Penn State will be recognized at the College's Wilson Awards Dinner and Ceremony in April.

Pantano Honored



Carlo G. Pantano, Distinguished Professor of Materials Science and Engineering and Director of the Materials Research Institute, was recently honored at the 52nd Annual International Symposium Awards Ceremony of AVS, The Science and Technology Society (American Institute of Physics). He was elected a Fellow of the Society for "outstanding technical

Pantano also received The 2005 George W. Morey Award ...for "developing and applying computer modeling and surface science techniques for improved understanding of surface atomic structure and adsorption on silica and silicate glasses."

The George W. Morey Award is presented by the Glass and Optical Materials Division of The American Ceramic Society and sponsored by PPG Industries. The award recognizes achievements in the field of glass science and technology.

Professor Pantano received this award at the 6th Pacific Rim Conference on Ceramic and Glass Technology, Maui, Hawaii where he presented the Morey Award Lecture "Glass Surfaces: Computer Modeling and Experimental Validation."

contributions in the field of glass surfaces, interfaces, and coatings." The ceremony was held in Boston, MA on November 2nd, 2005.

Messing attends 2005 Kyoto Prize Ceremonies



Gary Messing and Kazuo Inamori at the Kyoto Prize Ceremonies

Professor **Gary L. Messing** was a guest at the 2005 Kyoto Prize Ceremonies held on November 10-12, 2005, in Kyoto, Japan. The Kyoto Prize was founded by Kazuo Inamori (2001 Honorary Ph.D.), Founder and Chairman Emeritus of Kyocera Corporation.

The activities of the Inamori Foundation reflect the lifelong beliefs of its founder that people have no higher calling than to strive for the greater good of humankind and society and that the future of humanity can be assured only when there is a balance between scientific development and the enrichment of the human spirit. The Foundation seeks to promote peace and prosperity among all people on earth through the promotion of mutual understanding.

The Kyoto Prize which marks the 21st anniversary as an international award to honor those who have contributed significantly to the scientific, cultural, and spiritual betterment of mankind. The Prize is presented annually in each category of Advanced Technology, Basic Sciences, and Arts and Philosophy. Each laureate is presented with a diploma, a Kyoto Prize medal, and prize money of 50 million yen per category.

Dickey Appointed Associate Director of MRI

Congratulations to **Elizabeth Dickey**, Associate Professor of Materials Science and Engineering, on her appointment as an Associate Director of the Materials Research Institute (MRI), effective January 3, 2006. In this position, Beth will assume responsibility for the Materials Characterization Laboratory (MCL). She will provide overall leadership and strategic planning for MCL, as well as budget and staff management.

Beth joined Penn State in 2001, and is the John T. Ryan Jr. Faculty Fellow in the Department of Materials Science

and Engineering. She was formerly at the University of Kentucky where she founded and directed the electron microscopy facility, and at Penn State, she has contributed significantly to the establishment of the state-of-the-art facilities and graduate courses for electron microscopy. She is an Editor for *Microscopy and Microanalysis*, and maintains an active research program on interfaces and grain boundaries in materials.

Retired

In 1960 a fresh new metallurgy Ph.D. from Iowa State joined our faculty. Since then Professor **Earle Ryba** has taken great joy in working closely with legions of metallurgy, and now MatSE, graduates. Earle quietly announced his retirement plans this summer and as of October 1, was officially 'retired'. Congratulate and thank

Earle for his unbelievable 45 years of service to Penn State. In 'retirement' Earle will continue to teach MatSE 259, mentor our undergraduates in MatSE 492W Materials Design and teach the odd x-ray/crystallography course.

In Memorium

George Simkovich ('59), Professor Emeritus of Metallurgy, died on August 5, 2005 at the age of 77. Dr. Simkovich received his B.S., M.S., and Ph.D. degrees from Penn State, going on to Yale University as a postdoctoral research associate. In 1960 on an NSF Fellowship, he worked under the guidance of Professor Carl Wagner at the Max Planck Institut für Physikalische Chemie in Göttingen, Germany, on a number of compounds primarily

in relation to point defect properties. Dr. Simkovich joined the faculty in the Metallurgy Program in 1964 performing research in oxidation and high temperature corrosion retiring as professor emeritus in 1991. During his tenure at Penn State, Dr. Simkovich received numerous awards and served as Metallurgy Program Chair from 1985-1986.

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Department of Materials Science and Engineering
The Pennsylvania State University
121 Steidle Building
University Park, PA 16802
Phone: (814) 865-0497

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