



imagine

Spring 2015

The Newsletter of Materials Science and Engineering at Penn State



From the Desk of Dr. Messing



Dr. Gary L. Messing

Distinguished Professor of Ceramic Science and Engineering, Department Head, Materials Science and Engineering

Dear Friends and Alumni of MatSE,

First, thank you for helping our young people gain access to a MatSE degree, to travel to professional conferences and to have access to state-of-the-art equipment in their lab courses. 2014 was a banner year in so many ways.

Our alumni were recognized with the Alumni Fellow Award (Dr. Delbert Day '60, '61), R.E. Tressler Awards (Dr. Jon-Paul Maria '94, '96, '98, Dr. Linda Jones '84, '87 and Dr. Uday Pal '84) and the McFarland Award (Dr. Vladimir Ban '69).

Student enrollments have almost doubled in the last 6 years with 261 undergraduates in MatSE. We project 55 B.S. graduates in 2015—one of the largest classes in materials science and engineering in the U.S. Graduate enrollment is holding steady at 160 students. Last year we were able to award \$250,000 in scholarship support. Our students continue to excel.

A few of our faculty have received prestigious awards including Professor Long-Qing Chen, the Materials Theory Award of the Materials Research Society, Roman Engel-Herbert received an NSF CAREER Award for research in the emerging field of oxide electronics, and Professor David Green completed his term as President of the American Ceramic Society.

See the MatSE website <http://www.matse.psu.edu/> for other highlights of the year including new research in 2-D materials.

As many of you know the Steidle Building renewal project began in September. Check out <http://oxblue.com/open/Mascaro/Steidle> to follow process from a web cam overlooking the building. Although the building is paid for from capital funds we are seeking resources to purchase state-of-the-art equipment and continuous departmental support for the MatSE activities in "new" Steidle.

With the transformation of Steidle Building to a modern, state-of-the-art teaching and research facility, we have a unique opportunity to recognize and highlight those individuals who are responsible for our legacy. We propose to commemorate them by naming offices, meeting rooms, and laboratories in their honor. A plaque will display the person's likeness and note their significant contributions. In this way our students, faculty and visitors will understand and be made aware of our history each and every day. Please consider supporting the "Legacy on Display" initiative by naming spaces. Joel Reed ('82) and his wife Kim Boeshore Reed ('84) named the first lab for Joel's dad the Paul Reed Thermal Analysis Lab in Steidle Building (see <http://news.psu.edu/story/328916/2014/10/03/administration/couples-inaugural-gift-steidle-laboratory-honors-1945-alumnus>).

If you would like to consider naming a lab or office to honor the legacy of our department please do not hesitate to contact me at messing@matse.psu.edu or 814-865-2262. I hope to meet many of you in 2015.

We are.....

DEPARTMENT OF

MATERIALS SCIENCE AND ENGINEERING

COLLEGE OF EARTH AND
MINERAL SCIENCES

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On the Cover

"FESEM image of tetrathiafulvalene-Au nanostructures which looks like flowers and leaves"

Image by Mengquian Lu Graduate Student, Engineering Science and Mechanics. Image submitted for MVC-6, our 6th annual Materials Visualization Competition.

For more information see back cover.

Donald W. Hamer Endows Professorship

Donald W. Hamer, a 1968 Penn State alumnus and 2013 recipient of the Materials Science and Engineering Honorary Alumni of the Year Award, and his wife Marie Bednar, recently created an endowed professorship in Penn State's Department of Materials Science and Engineering. Their commitment of \$1 million will establish the Hamer Professorship in Materials Science and Engineering.

"This gift to Materials Science and Engineering is in many respects simply a 'payback' to Penn State for all I have gained from the many associations I've had with Penn State folks," said Hamer. "Much of the success I've had in my business efforts comes from these associations; and in addition to business prosperity, my life has been enriched in personal ways that give me happiness, satisfaction and many friendships resulting in a rich life here in Happy Valley."

Hamer is the chairman and founder of State of the Art Inc., in State College, PA., a leading supplier of film resistive components to the biomedical, communications, aerospace and defense industries.

Steidle Building Renovations are Underway!

This past summer all faculty, staff, and students completed relocation of MatSE facilities from Steidle Building to temporary locations on the east side of campus. Demolition began this fall, with the middle section of the building seeing complete demolition in a matter of days, followed by the removal of interior walls and corridors. These changes will make way for the realization of a new state-of-the-art facility housing upgraded and expanded laboratories, offices, student study areas, and more. To date renovation plans are on schedule, with an anticipated completion date of May 2016.

Inaugural Laboratory Space Named in New Steidle

The Department is pleased to announce that Joel Reed (2014 President-Elect of GEMS and '82 Ceramic Science and Engineering) and Kim Boeshore Reed ('84 Computer Science) have funded the creation of the Paul Reed Thermal Analysis Lab in Steidle Building.

The lab will be named after Paul Herman Reed ('42 BS Ceramic Science and Engineering), who served as president of Pennsylvania Refractories Association and was Vice President and General Manager of New Castle Refractories, a Dixon company before his retirement. Their gift will be used to support undergraduate education and research using thermal characterization tools in the new lab.

Please contact Gary Messing (messing@matse.psu.edu) if you are interested in naming the teaching and research labs in the renovated Steidle Building. All monies will be used to support the equipping of the state of the art teaching and research labs.



A view of Steidle Building looking east from Deike Building. To see more photo's and keep up to date with the project like us on facebook: [facebook.com/PennStateMatSE](https://www.facebook.com/PennStateMatSE)

An advertisement for the journal "Focus on Materials". The top left features the title "FOCUS ON MATERIALS" in large, bold, white letters. Below it, text reads "For your FREE subscription visit: mri.psu.edu/subscriptions". The central part of the ad is a collage of several journal covers. One cover prominently displays "Smart Materials", another "Computation from A to Z", and another "Visualizing Materials: The beauty beneath the data". The bottom left corner contains the text "Keep up with the materials research community at Penn State with a free subscription to Focus on Materials, the research bulletin of the Materials Research Institute." Below this, it states "Focus on Materials is available as a:" followed by a list: "Print Magazine (3 issues/year)", "Electronic Communication or", and "Both". The bottom left also includes a short description: "Focus on Materials covers the breadth of Penn State's interdisciplinary materials research with in-depth research articles, faculty profiles, and brief summaries of breaking news."

Joel Reed; Joel's father, Paul Reed; Gary Messing; and Kim Boeshore Reed; posed for a photo. (Image: Patricia Craig)



*Michael Hickner
Associate Professor of Materials Science
and Engineering, Chemical Engineering*

Exploring New Frontiers in 3D Printing Polymers

Before joining Penn State in 2007 Dr. Michael Hickner was a staff researcher at Sandia National Laboratory in New Mexico working on alternative energy and water purification technologies. His research and teaching interests include all aspects of polymeric materials, using polymers in batteries, fuel cells and environmental applications, and learning how the structure of polymers influences material properties and function.

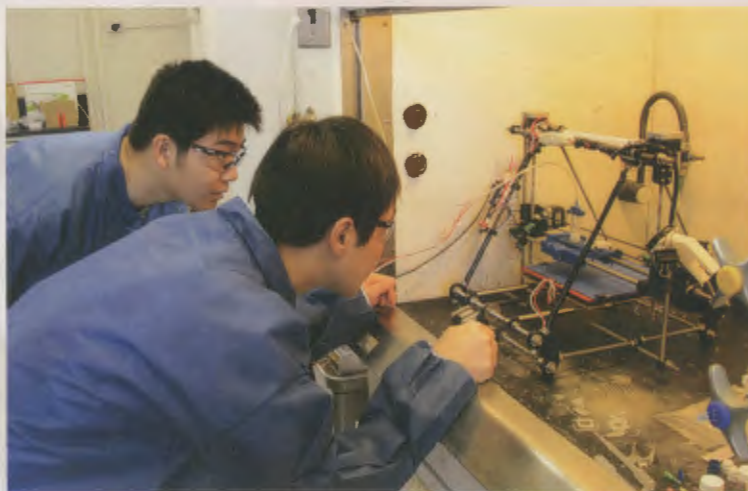
Dr. Hickner became interested in working with polymers during his undergraduate studies at Michigan Tech. "I loved chemistry and physics, so engineering and materials science were natural places for me," says Hickner. Currently Dr. Hickner is exploring the use of the disruptive technology of additive manufacturing, or 3D printing as it's commonly known, to explore ways of developing new polymeric materials and working with them in a 3D printable format. "In our lab we synthesize many different types of polymers, but most of our samples are flat pieces of plastic sheet - not very exciting to beginning researchers or stakeholders outside the membrane community."

While Dr. Hickner's group has explored 3D printing with commercially available polymers, his lab also synthesizes new materials with potential applications for water treatment membranes, batteries, biomedical applications and more. "We'd really like to take those polymers and integrate them into a multi-material 3D printed system where we can print an entire battery or water treatment membrane in one-shot rather than assembling devices after the materials are processed," says Hickner.

Another focus of Dr. Hickner's group is to take liquid precursors (liquid monomers and polymers) and use heat, photo cross-linking, or other methods to develop new chemistries that can solidify polymers quickly in place. Such a process would allow for the printing of complex shapes using stereo-lithography or direct write of liquid precursors. This process would allow greater flexibility and complexity of what could be accomplished with 3D printing of polymers.

Dr. Hickner's group has worked with various partners to bring a material science perspective to cross-discipline problem solving. One example is his group's involvement with the Lunar Lion project. Dr. Hickner's group has worked on printing new types of polymers for their applications, and engaged in fundamental work examining the strength of 3D printed parts. According to Dr. Hickner, "We want to understand all aspects of the 3D printing process and new applications in 3D printing to see where the opportunities are to bring new materials into the field." To that end, Dr. Hickner along with a dedicated group of graduate and undergraduate students from a variety of disciplines have engaged in creating Lab207 - a "make space" that allows interested students to explore various aspects of 3D printing. The lab was built with MATSE donor support and provides a place for students to try out their own ideas. The lab currently has ongoing projects in biodegradable sensors, new photocrosslinkable polymers, polymer recycling, and high resolution 3D printing.

The university setting has allowed Dr. Hickner's group to form strategic partnerships to further his research aims. According to Hickner, "We've been able to develop partnerships with groups that have insight into 3D printing hardware and processes, or have really cool applications like Lunar Lion where they need new materials and insight into the strength of polymer composite parts and that's something we can contribute to from a research setting."



Students in Lab207 observe a 3D printer customized for the printing of liquid solvents. For more about the project visit lab207.weebly.com



Joan Redwing
Professor of Materials Science and
Engineering, Chemical Engineering
and Electrical Engineering

Exploring Ways To Improve Efficiency Of Solar Cells Using Advanced Thin-Films

Solar cells, also known as photovoltaic cells, convert sunlight directly into electricity and have tremendous potential to help meet the world's future energy needs but the cost and efficiency of current solar cells hinders them from being a feasible mainstream source of energy. Dr. Joan Redwing is researching a specialized category of solar cells - referred to as "tandem" solar cells - that have the possibility of increasing, perhaps even doubling, the efficiency of solar cells.

Photovoltaic cells basically convert electromagnetic energy in the form of sunlight to electrical energy. Cells typically are made up of a layer of semiconducting material, usually silicon. When sunlight strikes the cell, some of it is absorbed and the energy from the absorbed light knocks electrons free from the semiconductor material.

Redwing explained, "The objective of tandem, or stacked, cell technology is to absorb more of the light reaching the cell's surface. In order to capture more of the incoming light, different semiconductor materials that can absorb different parts of the visible light spectrum are stacked in multiple layers. By capturing more of the solar spectrum, the conversion efficiencies can be improved."

Redwing is collaborating with researchers Chito Kendrick, Adele Tamboli and Eric Toberer from the Colorado School of Mines and the team is investigating the use of semiconductor crystalline silicon diselenide (SiSe_2) as a thin film to sit atop a more conventional silicon solar cell. They are exploring how best to synthesize the material into a thin film, as well as how to treat, or "dope," it with other elements to improve its photovoltaic qualities.

"We're interested in using SiSe_2 because it has a 'band gap' of about 1.7 eV," says Redwing. The band gap - the amount of energy, expressed in electron volts (eV), needed to be overcome before the semiconductor will conduct electricity - of a typical solar cell made from crystalline silicon is relatively low at about 1.1 eV, which means much of the higher energy photons in sunlight are lost as useless heat. "With a higher band gap, SiSe_2 can more effectively absorb the higher energy photons, which increases the efficiency of the solar cell."

The team of researchers recently received one of four grants awarded by the Research Corporation for Science Advancement (RCSA), through its Scialog Collaborative Innovation Award program, to support the tandem solar cell research.

In RCSA's announcement on February 14, President Jack Pladziewicz said, "The goal of RCSA's Scialog (short for science dialog) initiative is to get top scientists talking to one another in hopes of accelerating breakthrough discoveries in areas of major global concern."

Redwing believes, "If we can efficiently harness solar energy through this next generation of solar cells, we will virtually have an unlimited supply of energy."

Redwing is a professor of materials science and engineering and electrical engineering. She received her bachelor of science in chemical engineering from the University of Pittsburgh and her doctorate in chemical engineering from the University of Wisconsin-Madison. She is an affiliate of the Materials Research Institute.

RCSA (www.rescorp.org) was founded in 1912 and is the second-oldest foundation in the United States (after the Carnegie Corporation), and the oldest foundation devoted wholly to science. Research Corporation is a leading advocate for the sciences and a major funder of scientific innovation and of research in America's colleges and universities.



Xiaotian Zhang, an undergraduate student in materials science and engineering, removed a sample of silicon diselenide from an annealing furnace. The researchers are investigating the use of semiconductor crystalline silicon diselenide (SiSe_2) as a thin film to sit atop a more conventional silicon solar cell. They are exploring how best to synthesize the material into a thin film as well as how to treat or "dope" it with other elements to improve its photovoltaic qualities.



(Pictured from left) Dr.'s Nasim Alem, Ismaila Dabo, Alison Beese, Joshua Robinson, and Hojong Kim

Meet MatSE's New Faculty

The Department has welcomed 5 new junior faculty members to our diverse group:

Nasim Alem (Northwestern)

Dr. Alem's research explores the effect of defects, vacancies, interfaces and grain boundaries on the chemical, physical and electronic properties of materials using imaging and spectroscopy techniques in TEM.

Ismaila Dabo (Massachusetts Institute of Technology)

Dr. Dabo's group develops and uses quantum and multiscale computational methods to understand the performance of materials for energy conversion and storage.

Allison Beese (Massachusetts Institute of Technology)

Dr. Beese's research interests are in experimental and computational multiscale mechanics of materials ranging from metals to composites.

Joshua Robinson (The Pennsylvania State University)

Dr. Robinson's interests span a wide range of electronic materials capable of integration into many different technologies. However, materials for electronic and optoelectronic, as well as radiation detection have become a prime focus of his research.

Hojong Kim (Massachusetts Institute of Technology)

Dr. Kim's research is motivated by the need for sustainable technology development for our modern society. The primary focus of his research lies in understanding and developing electrochemical processes to meet these needs.

Faculty Retirements

Congratulations to our most recent retirees.

David Green,

Professor Emeritus of Ceramic Science and Engineering
David Green joined the Department of Materials

Science and Engineering in 1984 as an Associate Professor of Ceramic Engineering. His research focused on relationships between fabrication, microstructure and the properties of brittle materials.

Paul Howell, Professor Emeritus of Metallurgy

Paul Howell joined the department in 1981 as an Associate Professor of Metallurgy. Dr. Howell conducted research in a variety of fields including; materials science education, computers in education, materials archeology, metallic materials: steels and aluminum-based alloys, and phase transformations.

Digby Macdonald, Professor Emeritus of Materials Science and Engineering

Digby Macdonald joined the department in 1991 as a Professor of Materials Science and the Director of the Center for Advanced Materials. Dr. MacDonald's work involved electrochemistry, thermodynamics, and corrosion science, with emphasis on the growth and breakdown of passive films, chemistry of high temperature aqueous solutions, electro-catalysis, advanced batteries and fuel cells, stress corrosion cracking and corrosion fatigue, materials for nuclear power reactors, and the deterministic prediction of localized corrosion damage.

Paul Painter, Professor Emeritus of Polymer Science

Paul Painter joined the department in 1977 as an Assistant Professor of Polymer Science. Dr. Painter conducted research involving vibrational spectroscopy of polymers, phase behavior of polymer blends, coal structure, and processing fossil fuels using ionic liquids.



(Pictured from left) Dr.'s Green, Howell, Macdonald and Painter



Dr. Chen received the MRS Materials Theory Award at the MRS fall meeting on Dec. 3rd 2014 in Boston, MA.

Chen Receives MRS Materials Theory Award

Long-Qing Chen, distinguished professor of materials science and engineering, and engineering science and mechanics, and mathematics has received the Materials Research Society's (MRS) 2014 Materials Theory Award. The award recognizes exceptional advances made by materials theory to the fundamental understanding of the structure and behavior of materials.

Chen was cited for his pioneering work in the development of the phase-field method and its applications in the computational modeling of mesoscale structures and their dynamics in inhomogenous materials.

Chen's research interests are in multiscale modeling, integrating density functional theory calculations, thermodynamic analysis and phase-field simulations; ion transport and microstructure evolution in solid electrodes and electrolytes in lithium-ion batteries and solid oxide fuel cells; interactions between dislocations, plasticity and phase microstructures; and integrated computational materials science and engineering.

He received his award, consisting of a \$5,000 prize, trophy and citation certificate, during the MRS fall meeting on December 3 in Boston.



*Clive Randall
Professor of Materials Science and Engineering, Co-Director Center for Dielectrics and Piezoelectrics*

Randall Receives Ferroelectrics Recognition Award

The Ferroelectrics Recognition Award (IEEE-UFFC) was presented to Professor Clive Randall, co-director of the Center for Dielectrics and Piezoelectrics, at the recent International Symposium on Applications of Ferroelectrics (ISAF) meeting held at Penn State University. Professor Randall's work was recognized for a number of long-standing contributions to the field of ferroelectrics, piezoelectrics, and dielectrics, ranging from a fundamental perspective through to engineering in aiding commercialization. Randall said "it was a great pleasure to receive this award, and that it was largely due to the inspiration of his wonderful colleagues, collaborators, students, and staff over the years", and he accepted on behalf of this large group.



*Zi-Kui Liu
Professor of Materials Science and Engineering*

Liu Receives 2014 J. Willard Gibbs Phase Equilibria Award

Zi-Kui Liu, Professor of Materials Science and Engineering, is the 2014 J. Willard Gibbs Phase Equilibria Award recipient. He is cited "For his contributions in computational thermodynamics through integrated first-principles calculations and the CALPHAD method and for the advancement of phase-equilibria theory, database development, materials design and promotion of thermodynamics."

The Gibbs Award was established in 2007 to recognize outstanding contributions to the field of phase equilibria. The award honors J. Willard Gibbs, one of America's greatest theoretical scientists.

In addition to many other contributions, Gibbs laid the thermodynamics foundations of phase equilibria with his brilliant essay, "On the Equilibrium of Heterogeneous Substances," published in 1876 and in 1878 in the Transactions of the Connecticut Academy.

Professor Liu received his award at MS&T'14, October 2014 in Pittsburgh.



Penn State Hosts 2014 Research Experience for Undergraduates Symposium

The Department of Materials Science and Engineering at Penn State hosted the 2014 Research Experience for Undergraduates Symposium and poster session on July 31st. This Symposium is a collaboration of REU in Soft Materials (MatSE), REU in Chemical Engineering, REU in Chemistry, REU in Meteorology, Acoustics REU, PPG Fellows Materials Research Institute (MRI), National Nanotechnology Infrastructure Network (NNIN), Materials, Research Science and Engineering Center (MRSEC) REU, REU in Interdisciplinary Materials and Physics, Young Scholars Program and RET in Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST), Summer Experience in the Eberly College of Science (SEECoS).

The Research Experience for Undergraduates in Soft Materials is designed to prepare students for graduate

study, to encourage change in graduate education, and to provide a deeper understanding of the academic and professional fields the students are pursuing. With access to Penn State's strong research background and our department's significant expertise in the field of materials, the program is specifically designed to provide an opportunity for students to perform research who would not normally have the chance to do so.

Assisted by faculty and graduate student mentors, 88 students from 41 institutions conducted research in diverse areas of study during a 9 week period culminating in a presentation of their research and a poster session. This symposium was organized by the REU in Soft Materials MatSE Department. For more information about this REU program visit matse.psu.edu/reu.

2014-15 Undergraduate Research Fellows



This year, a U.S. Steel gift of \$6,000 was made to monetarily support our fellows and their research. Congratulations to the following students:

Alex Chichester-Constable, advised by Dr. Ismaila Dabo
Annan Cook, advised by Dr. James Adair
Rachel Lavrich, advised by Dr. Elizabeth Kupp
Rafael Vila, advised by Dr. Joshua Robinson
Rishabh Jain, advised by Dr. Evangelos Manias
Sarah Newby, advised by Dr. Douglas Wolfe
Sheevangi Pathak, advised by Dr. Allison Beese
Victoria Christensen, advised by Dr. Michael Hickner
Yalong He, advised by Dr. Hojong Kim
Yifan Zhao, advised by Dr. Susan Trolrier-McKinstry
Zelong Ding, advised by Dr. Suzanne Mohney



*Richard Otis
Graduate Student, Materials
Science and Engineering*

Richard Otis Receives NASA Fellowship

The department would like to congratulate Graduate Student Richard Otis on being awarded the NASA Space Technology Research Fellowship (NSTRF) to study and explore the use of 3-D printing technology to create gradient alloys.

NASA Space Technology Research Fellowships are awarded to graduate student researchers who show significant potential to contribute to NASA's goal of creating innovative new space technologies for our nation's science, exploration, and economic future. Selected candidates perform research at their respective campuses and at NASA Centers and/or at nonprofit U.S. Research and Development (R&D) laboratories. In addition to his or her faculty advisor, each student is matched with a technically relevant and community-engaged researcher who will serve as the student's research collaborator.

"My goal is to work with experimental metallurgists at NASA to validate my models and, if successful, build some prototype gradient alloys."

Otis is advised by Zi-Kui Liu, Professor of Materials Science and Engineering.



*Jennifer DiStefano
Undergraduate Student, Materials
Science and Engineering*

Jennifer DiStefano Wins Speaking Contest

Jennifer DiStefano, a senior in Materials Science and Engineering and working with Dr. Joshua Robinson, won the student speaking contest at the national MS&T student speaking competition in Pittsburgh, PA on Sunday, October 12th. The title of her talk was "Advancing Flexible Electronics through Novel 2D Materials."

MatSE Student Capstone Project Wins 1st Place

A joint team of Mechanical Engineering and Materials Science and Engineering undergraduate students conducting research sponsored by Bayer won first place for their Senior Capstone Design Project during the College of Engineering Design Showcase held Thursday, May 1, 2014 at the Bryce Jordan Center.

The group, advised by Dr. Allen Kimel, Assistant Professor of Materials Science and Engineering, conducted a study comparing dust palliatives and erosion control substances. The study compared Bayer products, which are latex resins, against current market products of various material makeup. Products tested were required to be safe for people and the environment, non-corrosive, not wash away in the rain, prevent erosion, prevent dust clouds, and to be easy to store and apply.

The team began by benchmarking commercial products, and choosing the ones that offered the most competition to the Bayer latex resins. They then tested the water erosion and dirt percolation performance of competitor products and the latex resins. The results were used to determine if the latex resins offered a competitive edge or a specific quality that can be used as a selling point to enter the market. The team concluded the project by doing an economic analysis, and researching alternative markets that Bayer may explore.

The team was pleased with the performance of the Bayer product, and expressed interest in conducting further research in the future.



*Pictured from left: Anthony Farah, Kasey Morgan, Dylan Readp (Mechanical
Engineering), Azim Uddin (Materials Science and Engineering)*



*Delbert E. Day
Day is curators' professor emeritus of Materials Science and Engineering, senior investigator, and former director of the Graduate Center for Materials Research at the Missouri University of Science and Technology.*

Delbert E. Day Receives Alumni Fellow Award

Delbert E. Day '60g, 61g was honored for his outstanding professional accomplishments and given the lifelong title of Alumni Fellow. Day and 20 other alumni were granted the honorific, the highest award given by the Penn State Alumni Association.

Day is curators' professor emeritus of Materials Science and Engineering, senior investigator, and former director of the Graduate Center for Materials Research at the Missouri University of Science and Technology. Day is the former chairman and president of MO-SCI Corp., a company he co-founded that manufactures special-purpose glasses for the healthcare, electronics, transportation, aerospace, chemical, and sporting goods industries. He has published more than 390 technical papers dealing with the structure, mass transport properties, and uses of glass; edited three books; and received 62 U.S. and foreign patents. He also conducted the first U.S. glass-melting experiments in microgravity on NASA's Space Shuttle.

"The Alumni Fellow program showcases the significant contributions Penn Staters make to our nation and the world every day," said Roger L. Williams, executive director of the Penn State Alumni Association. "Even more important, it provides our fellows the opportunity to share their experience and wisdom with students, faculty and staff, thus adding an extra dimension to Penn State's academic programs."

Since the award was established in 1973, more than 700 alumni have been honored with the title of Alumni Fellow - designated a permanent and lifelong title by the Penn State Board of Trustees - out of more than 631,000 living alumni.



*Vladimir Ban
Vladimir Ban received his undergraduate degree from the University of Zagreb, Croatia in Chemical Engineering, and his Ph.D. from the Pennsylvania State University in Materials Science.*

Vladimir Ban Receives McFarland Award

Dr. Vladimir Ban was presented with the 2014 David Ford McFarland Award at the annual Materials Science and Engineering Awards Banquet.

The McFarland Award has a long history of recognizing excellence in Penn State graduates. Previous winners have included captains of industry, respected academics, and entrepreneurs, truly an impressive collection of people and a testament to the excellence embodied in the graduates produced by this department from its rather humble beginnings to today. Two words that can be used to describe these past winners are "leader" and "achievement". This year's winner, Dr. Vladimir Ban, certainly embodies these traits.

Vladimir Ban received his undergraduate degree from the University of Zagreb, Croatia in Chemical Engineering, and his Ph.D. from the Pennsylvania State University in Materials Science. He started his scientific career at RCA Laboratories in Princeton, New Jersey. He specialized in the science and technology of semiconductor materials, such as silicon and gallium arsenide, which became the foundation of today's computer and communication industries. Vladimir has authored over 80 scientific articles and has over 30 US Patents granted or pending.

In 1984 Vladimir and his colleague Dr. Gregory Olsen founded Epitaxx Inc., a company dedicated to manufacturing of indium gallium arsenide detectors for fiber optic communication networks. In 1991, Epitaxx Inc. was sold to Nippon Sheet Glass Company and then, in 1999, resold to the JDS Uniphase. Epitaxx Inc. grew to more than 1,000 employees, before falling a victim of outsourcing to Asia.

In 1994 Vladimir started PD-LD Inc., a company specializing in packaging of photonic components, such as photo-diodes and laser-diodes. This is still the main business of the company.



McFarland Award (Continued)

In the course of the last few years, PD-LD developed a proprietary Volume Bragg Grating technology based on photorefractive silica glasses. This technology is finding increasing applications in security, medical uses, industrial process monitoring, law enforcement and other areas. A successful introduction of products based on this new technology is creating a significant new business for the company.

Vladimir and his family reside in Princeton, New Jersey.

Also in attendance were past McFarland Award Winners (from left): Mike Petrucci (2011), Russ Reber (2013), Vladimir Ban (2014), Jack Coppola (2006), Mahlon Dennis (2007)

Mahlon Dennis Awarded Alumni of the Year

Dr. Mahlon Dennis was awarded MatSE Alumnus of the Year at the annual Materials Science and Engineering Awards Banquet. The honorarium was established to recognize alums of the department who have made meaningful contributions to the department as well as lasting contributions to the materials science and engineering community.

Dr. Dennis is the founder and past President of Dennis Tool Company in Houston, TX. He was awarded a B.S. in Chemistry and Physics from Mansfield College in 1965. He received his M.S. and Ph.D. in Ceramics Science from The Pennsylvania State University in 1969 and 1971, respectively.

In 1973, he joined General Electric to work in the diamond business. He was the team leader of the group that developed polycrystalline diamond compacts into a worldwide business. He left GE to found Strata Bit Corporation in Houston, which developed a new drilling technology. In four years, sales approached \$50,000,000 and the company was sold to Sandvik in 1985. In 1988, he founded Dennis Tool Company to develop superabrasive products including diamond (PCD) and cubic BN for fixed cutter drill bits; PDC and microwave sintered carbide inserts and microwave sintered carbide and diamond carbide composite wear components. He sold Dennis Tool Company to Logan International Inc. where his two sons are employed.

Dr. Dennis has been awarded several dozen patents and published several papers. He was highlighted in Business Week as Entrepreneur of the Year in Texas. In 2007 he was recognized with the David Ford McFarland Award of the Department of Materials Science and Engineering and in 1998 received the "Distinguished Alumnus of Penn State" award.

Since 2009 he has contributed over \$100,000 to help undergraduates of financial need with the Dr. Mahlon Dennis Scholarship for Excellence in Materials Science.

Brosnan Receives Du-Co Ceramics Young Professional Award



Dr. Brosnan (3rd from left) presented on the topic of "staying on track in a career as a female scientist in an R&D environment" for the Penn State chapter of Materials Advantage this past October.

Dr. Kristen Brosnan '07 received the 2014 Du-Co Ceramics Young Professional Award. Dr. Brosnan is the current president of the National Institute of Ceramic Engineers (NICE), a past-president of the Ceramic Education Council (CEC), served on the Editorial Advisory Board for the ACerS Bulletin and helped launch the Young Professionals Network in 2010. In 2006, Dr. Brosnan was a recipient of the Graduate Excellence in Materials Science (GEMS) Diamond Award. She is primarily affiliated with the Basic Science Division.

Dr. Brosnan received her Ph.D. from Penn State working with Dr. Gary Messing. Recognition of this achievement was given during the ACerS 116th Meeting which took place the week of October 12, 2014 in Pittsburgh, PA.

PENNSTATE



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This publication is available in alternative media on request. Penn State is committed to affirmative action, equal opportunity, and the diversity of its workforce. U.Ed. EMS 14-60

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MVC

materials visualization competition



*7th annual competition
celebrating materials research
at Penn State.*

Now Accepting Submissions

www.matse.psu.edu/mvc

Best in Show MVC⁶ *"Silicon nano-tree
in a forest of silicon nano-wires"*
Sarah Eichfeld - Research Associate, Materials Science and Engineering

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