

PSE Alumni Newsletter

Fall 2013

Hopefully this newsletter finds you well at the end of what has been another exciting and eventful year for PSE. To introduce the newsletter, I'll preview some of the featured contents and highlight a few additional news items that didn't make it into the issue, but are nonetheless noteworthy.

This year has been another outstanding year for PSE students. Since the publication of last year's newsletter, 26 new PhDs have joined the ranks of the PSE Alumni (page 6). In this time, PSE students have received an impressive array of national awards for their research (page 8). A notable highlight was the awarding of a three-year **2013 Samsung Fellowship** to **Jaewon Choi** (pictured below), a 3rd year PSE student and joint advisee of Ken Carter and Tom Russell. Selected from a competitive and international field of candidates, Jaewon was the first and sole honoree selected from outside of Korea.

PSE faculty continue to devote their efforts to expanding the frontiers of research and education in polymers, a notable example of the latter being the "Short Course on Polymers" recently developed and taught by PSE faculty (page 3). In addition to the awards faculty received in the past year (page 8), one noteworthy honor will be given next year to Ryan Hayward, who will be the recipient of the 2014 Dillon Medal from the APS Division of Polymer Physics. Those attending the March Meeting in Denver, may take the opportunity congratulate Ryan in person at a Dillon Medal symposium that will be held in his honor. One final bit of faculty news, Greg Grason (your newsletter editor) was promoted to the rank of Associate Professor with tenure this September, and Harry Bermudez will be promoted to Associate rank with tenure beginning officially in January 2014.



Above: Jaewon Choi (2nd from right) is awarded 2013 Samsung Fellowship.

In the spring of 2013, a long-time member of the PSE community and emeritus professor, Otto Vogl, passed away. In honor of his contributions to UMass and the department, a brief tribute to Otto is included in this issue (page 7).



Finally, please join me in congratulating a member of the PSE staff, Jack Hirsch, who has been awarded the College of Natural Sciences Outstanding Staff Award.

Jack Hirsch, Conte Building Manager & Surface Analysis Facility Director

This award recognizes not only Jack's long-term service to PSE as Director of the Surface Analysis Lab, but also his more recent duties as Conte Building Coordinator, a role which helps keep *all* PSE facilities running smoothly. By simultaneously performing both jobs well, while pleasantly interfacing with a broad community, Jacks makes PSE a more productive and efficient place. Jack was be honored at the November 25th CNS Faculty and Staff Awards Reception.

PSE Newsletter Editor

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PSE Highlights

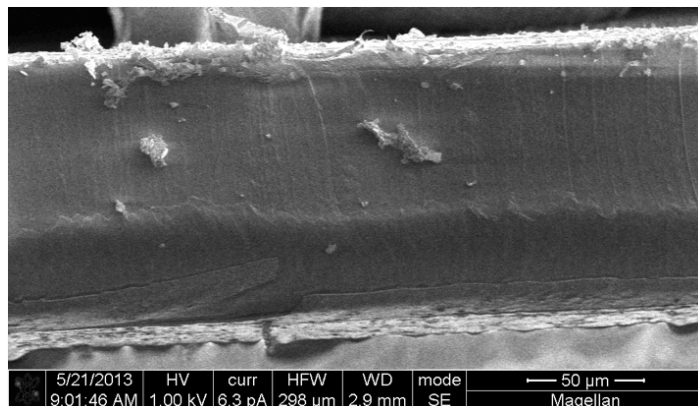
Changing Face of UMass Microscopy

Electron Microscopy has enjoyed a long-stranding tradition in PSE, highlighted by numerous discoveries, including the bicontinuous network morphology in block-copolymers in 1986. Since that time, electron microscopy capabilities have advanced at a rapid pace. Current electron tomography allows for 3D image reconstruction rendering model calculations of 2D projections obsolete. A combination of field-emission sources and aberration correction has pushed current resolution limits to subnanometer scales (~ 0.4 Å).

In 2009, UMass was awarded an NSF major research instrumentation (MRI) grant to acquire a high resolution FEI Magellan 400XHR-SEM. Traditional SEM has limited application for high resolution imaging of polymer based materials, due to damaging beam effects occurring at the high energies required by increased resolution. The Magellan, however, can reach sub-nanometer resolution at extremely low beam energies, making it an ideal surface imaging tool for carbon based materials.

In 2010, Alexander Ribbe became director of the UMass Microscopy Center. Dr. Ribbe received his doctorate from University of Bayreuth in 1993, with a dissertation focussing on electron microscopy in polymer science and energy-filtered TEM. At that time Zeiss, developed a so called in-column energy filtered TEM that employed an electromagnetic prism to separate scattered

electrons according to their energies, similar to the use of prisms in optics. In a TEM, this filter performs the same task as the above mentioned electromagnetic prism and separates electrons scattered by a specific element in a sample while generating a 2-dimensional element distribution map, ideal for characterizing the light elements of polymeric or biological materials.



Secondary electron image of multi-layer polymer sample imaged without conductive coating via FEI Magellan SEM.

In 2012, UMass Amherst was fortunate enough to receive a second NSF MRI award to acquire a field emission gun based energy filtered TEM, which will be installed and ready for operation in the spring of 2014. Along with an inline energy filter, the instrument will have both electron tomography and cryo-imaging capabilities. To accommodate these state-of-the-art microscopes the EM center will undergo major renovations this fall.

Notwithstanding this substantial progress in renewing electron microscopy at UMass, the future holds important opportunities for growth. The microscopy center has requested funds through the recently announced Massachusetts Life Science Initiative, to acquire an environmental SEM, which will add imaging capabilities for moderate-pressure fluid systems. The remaining piece of the puzzle will be a so-called Focused-Ion-Beam (FIB) microscope, which allows the preparation of ultra-smooth cross-sectional samples for SEM observations, as well as ultra-thin sections for TEM observations. This instrument is planned for a future NSF-MRI proposal.

Dr. Ribbe is quite excited about all of the recent developments which will offer state-of-the-art electron microscopy to the research community at UMass Amherst and our academic as well as cooperate collaborators in the near future. For further information about the center or inquiries about facilities usage, please contact the staff at the UMass Electron Microscopy Center at www.umassmicroscopy.com.



The JOEL JEM-2200FS Energy Filtered Transmission Electron Microscope scheduled for installation in late 2013.

PSE Short Course on Polymers

Professors Shaw Hsu, Alan Lesser and Bryan Coughlin combined their efforts to establish and teach an introductory short course on “Polymer Structure & Characterization: Basics, Opportunities and Issues”. The course has been taught twice in Amherst (October 2011, March 2013) and once as a road show in the San Francisco Bay area (June 2012). Attendance at each of the courses has been excellent, and attendee responses have been appreciative for what they were able to learn from the instructors. This course is designed for those with some technical background or education in science, who are currently working in some aspect of the broader polymer industry. Attendees learn about polymer synthesis and characterization, engineering design, and performance of polymer materials. The course covers polymers from basic principles, opportunities and applications, to issues associated with performance. Attendees gain a much better understanding of synthetic techniques, polymer structure-performance relationships and mechanical testing methodologies. The course covers thermoplastic/thermoset materials and naturally derived polymers. The short course generally concludes with a panel discussion on new polymer materials and current day challenges and opportunities. Topics discussed span the gamut from current applications of polymers through new opportunities for polymeric materials.

Further course offerings are planned for Spring 2014 and beyond. If there are associates in your organization who might benefit from attending, or if you would like to have a short course designed for you colleagues and taught “in-house” please contact Professors Hsu (slhsu@polysci.umass.edu), Lesser (ajl@polysci.umass.edu) or Coughlin (coughlin@mail.pse.umass.edu).

Symposium Honors Frank Karasz

A conference was held on June 27th and 28th to honor the many accomplishments of Professor Frank Karasz on his 80th birthday. The two day conference, entitled “A Random Walk through Polymer Science”, was co-organized by Professor Alan Lesser and Dr. Joseph Machado, a PSE alum and advisee of Prof. Karasz. Approximately 75 attendees and participants were involved in the two day event including many alum from PSE who were advised by Frank or colleagues who worked with him during his professional career.

Among the many distinguished invited speakers who contributed were John Reynolds from Georgia Tech., Bin Hu from Univ. of Tennessee, Kazuo Sakurai from Kitakyushu University. Social activities included a banquet at the Lord Jeffery Inn on the evening of June 27th and a musical performance on the 28th by Jade Quartet, which featured Professor MacKnight on viola. Many members of the UMass community, including our new Chancellor Kumble Subbaswamy and our Dean Steve Goodwin, were in attendance at the Lord Jeff to honor Frank’s many contributions. Financial support for the event included donations from the office of the Vice Chancellor for Research, the College of Natural Sciences, the Polymer Science and Engineering Department, the Department of Chemical Engineering, and generous contributions from PSE alumni.



“A Random Walk through Polymer Science” symposium banquet attendees honoring Prof. Frank Karasz on his 80th birthday.

Voices from PSE

For this issue, we posed a single question to three current and three former students from PSE about their experiences in the department. The responses from our “future alumni” and “former students” are featured below.

“What was strongest memory of the cumulative exam experience? What type of impact do you think the exam experience has had on your research or career?”

Svetlana Morozova

Hometown: Falmouth, MA

Undergrad: Cornell Univ., 2011
(Math & Physics)

Group: Muhtukumar

Research: vision physics; complex biopolymer gels



The cumulative exam was a stressful, but a necessary experience. The strongest memory that I associate with the exam is studying with my class, and specifically, going over old cumulative exam questions with my peers. We met every day of the week for a few hours before the Saturday examination. Since we were not provided answers to these questions, it was both entertaining and extremely helpful to discuss possible answers as well as possible approaches to the problems. I believe that this example of teamwork translates directly to ongoing graduate research collaborations. Also, it is imperative in the science community to understand and address broad, open-ended questions, and the cumulative exam was great practice for this difficult skill.

Jimmy Lawrence

Hometown: Jakarta, Indonesia

Undergrad: Univ. of Tokyo, 2005
(Chem. Eng.)

Group: Emrick

Research: synthesis of polymer-functionalized nanoparticles



My strongest memory is from the morning before the exam: My friend and I went over the study material and she asked, “This part (3-4 pages full of NCA polymerization mechanism) is too much to remember, I don’t think they are going to ask this, do you?” “Hmm, I don’t remember this well, it will be quite cruel to expect us to draw all these in such a short time.” “How about this one (seminar topic)?” “I am not sure..but let’s check out her publications again.”

Those two questions appeared as Q1 and Q2 in the exam. I answered them first, desperately jotting down any vague memories I had before they disap-

peared. From then, I always pay attention whenever she asked “Do you think they will ask this?”

In the end, the most important thing I learned from the exam was the value of teamwork. Clearing the exams as soon as possible is important, but also making good progress on the research. It turns out the latter is quite affected by how friends/collaborators (in any academic year) perform in their exams, so it is always a good idea to help friends/junior students in their study. Until 2012, failing one cumulative exam means getting “~6” months worth of anxiety, and detrimental consequences to research focus. Nevertheless, the cumulative exam was one of the attractive elements for my joining PSE. This “multiple qual exam”-like process ensures that all PSE graduates are highly knowledgeable in the fields of polymer science and engineering.

Polina Ware

Hometown: Burlington, VT

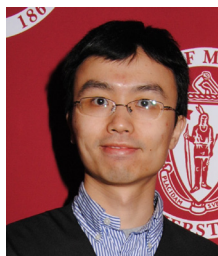
Undergrad: UMass Amherst,
2008 (Chem Eng.)

Group: Lesser

Research: crystallization in thermocurable composites



The cumulative exams are fair, reasonable, and based on the core concepts that polymer scientists should know. However, when I was a first year student the questions seemed overly hard, arbitrary and, sometimes not connected to what I learned in my classes. I was determined to work hard and ensure that I would persevere through these exams. I studied for three hours every day. And two weeks prior to the exam I studied for eight hours per day. By using this strategy, I passed the exams and became a stronger researcher. Investing time in the preparation for cumulative exams early on in the Ph.D. helped me to progress faster. I designed smarter experiments and had better interpretation of the results. Since I had to manage studying for the exams, making progress in research and having a healthy work-life balance, I developed valuable organizational and time management skills.

Wei Zhao**PSE Entering Year:** 2007**PSE Advisor:** Greg Grason
& Tom Russell**Current Position:** Research
Scientist, Bridgestone Americas

Not surprisingly, I don't remember much from questions I had in my cumulative exams. I guess this makes sense, as people tend to forget things that they don't use regularly. One thing I do remember is that we had quite broad questions and I had to cover pretty much all the knowledge that I learned in class in order to prepare for the exams. What's really surprising to me is that, ever since I finished with the exams I have had many experiences that I feel myself benefiting from that period of study, both in my previous research and current work. Even though I don't remember every piece of knowledge in detail, I keep a vague memory of what we learned and more importantly, I know where to look for if I need to know previously learned details, or how to wade into a new research area. That's enough to get started when confronted with real world problems, as I learned when I jumped from the world of block copolymer assembly to the world of rubber last year. In addition, I feel very lucky that I had great classmates to work with during the preparation for the exams, which made us share a piece of cherishable memory and become real friends.

Molly Shoichet**PSE Entering Year:** 1987**PSE Advisor:** Tom McCarthy**Current Position:** Prof. & Canada
Research Chair, Chem. Eng & Appl.
Chem., Univ. Toronto

My strongest memory of the cumulative exam experience was passing! I passed my last exam in December and was able to celebrate at the department holiday party. Before each exam, I would re-read Young's book – *Introduction to Polymer Science* – as a quick way to reimmerse myself in the broad fields of polymer science. I often recommend this book to new graduate students in my own laboratory as a way to get up to speed quickly on the fundamentals of polymer science. The cumes also encouraged lifelong reading of the current literature and the importance of science building on itself – that is where lessons of scholarship learned in one field can be applied to another.

Richard Campbell**PSE Entering Year:** 1972**PSE Advisor:** Otto Vogl**Current Position:** Global Tech-
nology Manager, Quadrant Engi-
neering Plastic Products

The subject of cumulative exams takes me back more years than I care to admit. It was certainly a stress inducer at the time, but overall a beneficial experience, in hindsight. Two specific incidents that stand out when I reflect on my memories associated with the exams:

1) My "Hail Mary" exam. As always, we had to answer 4 of 6 questions and since I am not an engineer, that often easily determined the two to skip. (I always say my degree is in "PS&e" – small e for my Engineering expertise, despite the several courses.) This was one of those exams. I could only confidently answer three questions, while the fourth had to do with Piezoelectric Polymers, something I had never heard of. I knew the basic piezoelectric principles relating to inorganic crystals, i.e. a lighter, so did my best to conceive a concept out of thin air of how this could possibly be related to polymers. Surprisingly, I passed the exam. A few days later Prof. Karasz congratulated me on how well I answered his question and asked me how I knew so much about the subject! Little did he know...

2) The second standout incident was a Friday night before an exam when the two rowdy guys next door – definitely not academic material - decided that was a good night for a wild blowout party. Between the blasting music and pandemonium in the parking lot, no one in the apartment complex was able to get a wink. The police visited multiple times, but with only transient effects. I therefore went into the exam with no sleep, just frustration, but somehow passed it.

From the Hail Mary answer I learned that although it's always nice to have all the facts, sometimes there will be situations where you just have to wing it and not be afraid to do your best with what is known, using knowledge, logic and intuition to fill in the blanks as much as possible. Formulate a hypothesis, test it with the facts available, and go. Industry usually can't wait until 100% certainty is achieved.

PSE Graduates

(Aug. '12-Oct. '13)



May 2013 PSE graduates: (left to right) J. P. Mahalik, Hitesh Thaker, Joe Krumpfer, Felicia Bokel, Kathleen McEnnis, Lisa Groth (PSE Graduate Program Manager), Peiwin Zheng, Yongping Zha, Jun Cui, Naveen Singh and Wei Zhao.

Yongping Zha (G. Tew) August 13, 2012

“Metal-Containing Functional Polymers: (I) Room Temperature Magnetic Materials and (II) Anion Exchange Membranes”

Nicholas Hendricks (J. Watkins & K. Carter)

August 9, 2012

“Porous Metal Oxide Materials through Novel Fabrication Procedures”

Wei Zhao (G. Grason & T. Russell) September 18, 2012

“Helical Ordering in Chiral Block Copolymers”

A. Ozgul Tezgel (G. Tew) September 21, 2012

“Protein Transduction Domain Mimics by ROMP and Their Bioactive Cargo Delivery”

Brenton Hammer (T. Emrick) September 25, 2012

“Synthesis and Solution-driven Assembly of Functional Polythiophene Derivatives”

Hitesh Thaker (G. Tew) September 26, 2012

“Synthetic Mimics of Antimicrobial Peptides from Aryl Scaffolds”

Jyoti Mahalik (M. Muthukumar) October 15, 2012

“Computer Simulation of Viral-assembly and Translocation”

Jun Cui (A. Crosby & G. Tew) October 15, 2012

“Resilient Polymer Networks via Thiol-norbornene Chemistry: Mechanical and Adhesive Properties”

Sam Pendergraph (K. Carter & A. Crosby)

November 29, 2012

“Patterning and Mechanical Analysis of Fiber-Based Materials”

Jared Archer (A. Lesser) December 7, 2012

“Impact Resistant Glassy Polymers: Pre-Stress and Mode II Fracture”

Kathleen McEnnis (T. Russell) December 12, 2012

“Particle Behavior on Anisotropically Curved Interfaces”

Felicia Bokel (R. Hayward) January 14, 2013

“Solution Assembly of Conjugated Polymers”

Scott Christensen (R. Hayward) April 4, 2013

“Photo-reaction of Copolymers with Pendent Benzophenone”

Michael Bartlett (A. Crosby) May 2, 2013

“Scaling Reversible Adhesion in Synthetic Biological Systems”

Michael Beaulieu (J. Watkins & A. Lesser) May 20, 2013

“Applications of Planar and Patterned Metal Oxide Nanocomposites and Reactive Polymer Blends as Gas Permeation Membranes”

Yuri Ebata (A. Crosby) May 28, 2013

“Bending, Wrinkling, and Folding of Thin Polymer Film/Elastomer Interfaces”

Weiyin Gu (T. Russell) July 25, 2013

“Manipulating Block Copolymer Self-Assemblies in Bulk and Thin Films by Thermal and Solvent Annealing”

Melissa Lackey (G. Tew) July 30, 2013
“Novel PEG-based End-linked Networks: From Synthesis to Mechanics”
Kamil Bugra Toga (T. Russell) August 7, 2013
“Studies on the Wrinkling of Thin Polymer Films Floating on Liquid”
Yanbo Wang (M. Muthukumar) August 16, 2013
“Computer Simulations of Polyelectrolyte Stretching and Translocation”
Benjamin Mohr (M. Muthukumar) August 27, 2013
“Macromolecular Assemblies: Human γ -crystallin Protein, Glutamic Acid Bottle Brushes, and Hyaluronic Acid Hydrogels”
Sahas Rathi (S. Hsu & B. Coughlin) August 29, 2013
“Toughening Semicrystallin Poly(Lactic Acid) by Morphology Alteration”

Bo Peng (M. Muthukumar) August 29, 2013
“Theory and Simulations of Polyelectrolyte Complexes”
Elizabeth Sterner (B. Coughlin) September 5, 2013
“Photocleavable Junctions in Complex Polymer Architectures and Photoetchable Thermoplastics”
Li Yao (J. Watkins) October 3, 2013
“Self Assembly of Block Copolymers for the Fabrication of Functional Nanomaterials”
Eric Anderson (J. Watkins & S. Gido) October 17, 2013
“Hydrogen Bond Assisted Assembly in Block Copolymer Blends and the Influence of Nitrile Additives on Solid and Gel Polymer Electrolytes for Lithium-Ion Batteries”
Tsung-Han Tsai (B. Coughlin) October 21, 2013
“Ionic Copolymers for Alkaline Anion Exchange Membrane Fuel Cells”

In Memorium

Otto Vogl, long-time PSE faculty member and world renowned Austrian polymer scientist, died on April 27, 2013. He was 85.

Born on November 6, 1927 in Traiskirchen, Austria, he studied chemistry and received his PhD at the University of Vienna in 1950, before becoming an instructor at the Chemical Institute of the University of Vienna.

In 1953, he came to the U.S. as a postdoctoral associate, first at the University of Michigan and then at Princeton University. He joined the Polychemicals Department of DuPont in 1956, and then moved to the polymers program at the Polymer Science and Engineering Department at the University of Massachusetts as full Professor in 1970. In 1982, he was appointed to the newly created Herman F. Mark Professorship at the Polytechnic University in New York. He retired in 1996 and returned as Professor Emeritus at the University of Massachusetts.

Otto Vogl made an enormous impact on the activities of polymer science of his generation. Most importantly, he strived successfully to make polymer science a global science and organization.

In his career, he worked and published in several innovative fields, from organic polymer chemistry to polymer physics to polymer technology.

Vogl was not only an extraordinary scientist and teacher, he also was involved in the globalization of polymer science. Starting from the early 1970s, he fostered U.S. cooperation with the Japanese polymer community, and served as the first president of the Pacific Polymer Federation.



He was crucial to the development of the Polymer Science and Engineering Department at the University of Massachusetts Amherst, and he played a key role in the founding of the Center for UMass-Industry Research on Polymers (CUMIRP), one of the first academic-industry cooperative programs in the U.S. and the only one of its era still running strong.

He received honorary doctoral degrees from Osaka University and the Friedrich Schiller University of Jena. In addition, he was an honorary member of a number of highly recognized professional societies, including the Society of Polymer Science of Japan and the Austrian Chemical Society.

He is survived by his wife Jane Cunningham Vogl (formerly of Sag Harbor, LI) of 60 years, two children, Eric G. Vogl and Yvonne V. Marsh, and 8 grandchildren.

<http://people.umass.edu/vogl/>

Student Honors

Daniel Aceveda-Cartagena - NSF Graduate Research Fellowship (2013)

Anesia August - 3rd place, poster competition, Nat'l Society of Black Engineerings (2013)

Michael Bartlett - Alan Gent Distinguished Student Paper, Adhesion Society (2013)

Isaac Bruss - Best Poster Award, Soft Condensed Matter Physics GRC (2013)

Jaewon Choi - Samsung Fellowship (2013)

Angela Cugini - Society of Plastics Engineers Foundation Fellowship (2013)

Sedef Piril Ertem - Santos Go Award (2012)

Jonathan Pham - Chateaubriand Fellowship (2013)

Minchao Zhang - Arkema Fellowship (2012)

Svetlana Morozova - Bayer Fellowship (2012)

Polina Ware - James Mackenzie Graduate Scholarship, Society of Plastics Engineers (2013)

Zhan Hang Yang - 2nd place, Thermoset Research Competition, Theormoset Resin Formulators Assn. (2013).

Faculty Honors

Ken Carter - Percy Julian Medal, NOBCCChE (2012); Special Creativity Award, NSF Division of Materials Research (2013); ACS Fellow (2013)

Al Crosby - College of Natural Sciences Research Award, UMass (2013)

Todd Emrick - PMSE Fellow, ACS (2013); Landmark Award, UMass Office of Intellectual Property (2013)

Ryan Hayward - Innovation Award, Journal of Polymer Sciences (2013)

Thomas McCarthy - Plenary Lecturer, Adhesion Society (2013)

Thomas Russell - Otto Warburg Prize, University of Bayreuth (2012), Honorary Fellow, Chinese Chemical Society (2012).

Maria Santore - AAAS Fellow (2013)

Greg Tew - ACS Fellow (2013); Distinguished Service Award, ACS Division of Polymer Chemistry (2013)

Jim Watkins - APS Fellow (2012)

Alumni Honors - We are always pleased to highlight notable accomplishments and honors of our alumni. If you have any items you would like us to share in an upcoming newsletter, please contact the editor at grason@mail.pse.umass.edu.