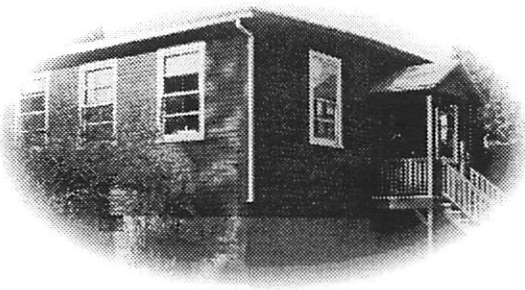


The Annex

December 1998 Volume 2, Number 1



Welcome to the second issue of The Annex, the Newsletter of the UMass Polymer Science and Engineering Department. As with all things, PSE is changing and evolving. Sadly, Professor Emeritus Roger S.

Porter, one of the great

names in applied polymer science and the first Head of the PSE Program and later of the Department, died on August 25, 1998, at the age of 70. Roger was the recipient of numerous honors and awards, including an Honorary Doctorate of Science from the University of Massachusetts. The department would like to thank the many alumni and friends of Roger who sent their condolences. Roger was featured in last year's issue of The Annex, where he gave an excellent history of the early years in the department. He will be missed.

Last summer, we saw the departure of David Tirrell and Bruce Novak. Dave is now the McCollum-Corcoran Professor in the Division of Chemistry and Chemical Engineering at the California Institute of Technology. Bruce left UMass to become Department Head of Chemistry at North Carolina State University where he holds the Schaeffer Distinguished Professorship. Both Dave and Bruce continue appointments in PSE as Adjunct Professors. Searches are currently underway for two synthetic chemists to replace them. The advertisement describing our search can be viewed on the PSE Homepage at <http://www.pse.umass.edu>. Professor William MacKnight was inducted into the National Academy of Engineering in October and in December was appointed as the Wilmer D. Barrett Professor of Polymer Science and Engineering. Also, Norman Page, one of our famed technicians who maintained our instruments for many years, has retired. He remains on the local scene and pursues his love of piloting airplanes.

Helmut Strey, a biophysicist who recently joined the department as Assistant Professor, is featured in this issue of The Annex. The Graduate School's Microanalytical Laboratory, headed by Dr. Greg Dabowski, relocated to the second floor of the Conte Polymer Research Center. In addition to running the Microanalytical facility, Greg assists both MRSEC and PSE by coordinating activities associated with the operation of the Conte facility and the polymer educational outreach effort. Last year we hired Dr. Igor Kaltashov, a specialist in Mass Spectrometry. The Conte building now houses an impressive Mass-Spec Central Facility which will soon contain 4 instruments valued at over \$1 million.

All in all, PSE continues to excel. Last year we graduated 21 Ph.D.'s. However, to continue to excel, PSE must meet the annual challenge of recruiting top Ph.D. candidates. While we maintain an active recruiting program, we need your help. Recruiting is not an exact science and remains a labor intensive and expensive task, as we invite each prospective candidate to campus for an interview. If each of you could recruit a replacement for yourself, one who is as good as you, our recruiting problems would greatly diminish. I am assured by David Hoagland, our Graduate Program Director, that he would welcome your assistance in helping us identify qualified students to study in PSE. Those of you in industry are in a wonderful position to evaluate the summer students working in your laboratories who are interested in graduate school. Also, some of the best candidates are employee colleagues with considerable experience who wish to return to school to obtain a Ph.D.

Another problem we face is fellowship support for first year students. Recall that your enrollment in PSE meant that your first year of study was supported by the department, freeing you from TA and research activities during the time you took courses and cumulative examinations. Most of this fellowship money came, and continues to come, from industrial gifts. With companies consolidating

and rethinking how they spend money at universities, this type of fund-raising is becoming increasingly difficult. We need your help: first, convince your company to give unrestricted fellowship gifts to the department and, second, make your own gift. When we moved into the Silvio O. Conte National Center for Polymer Research, the faculty donated \$80,000 to establish a PSE Fellowship Endowment Fund. In addition, a few alumni have added over \$30,000 to the same fund. I shall formalize this gift giving by undertaking a campaign to raise funds exclusively for fellowships. Currently, the department spends over \$300,000 per year on first year fellowships. Over 400 Ph.D.'s earned their degrees under our faculty's mentorship. If each of you could give modestly on an annual basis, this help, combined with industrial gift-matching, could develop a substantial fund to help buffer difficult years; and with perseverance, the fund could grow to the point where a number of fellowships could be permanently endowed from the interest. Such a fund would help ensure that future PSE students have the same advantage you enjoyed during your tenure in the department. Your participation is needed.

Finally, I again invite each one of you to visit PSE at any time. We need your cooperation. Please keep in touch.

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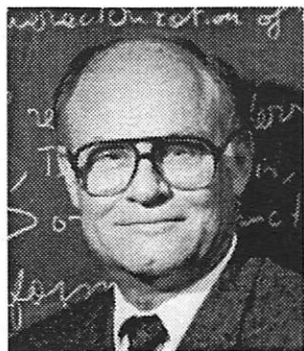
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In Memorium



Dr. Roger S. Porter
1928–1998

After a long illness, Professor Emeritus Dr. Roger S. Porter passed away on August 25, 1998. Dr. Porter was the first Department Head of Polymer Science and Engineering, UMass Amherst. He was a former Treasurer of the ACS Division of Polymer Chemistry and an Alternate Counselor of the division. An inductee into the Plastics Hall of Fame, Dr. Porter was awarded the Paul J. Flory Polymer Education Award in 1998 by the ACS Polymer Division. He was also on the Board of Trustees of the Gordon Research Conferences. Dr. Porter developed a strong relationship with all of the PSE students and was held in highest regard by everyone. He enjoyed many sports activities at the professional and college levels and had an avid knowledge of Amherst history. The PSE Department was privileged to enjoy a long and fruitful relationship with Dr. Porter for over 30 years. He will be missed. What follows are among the numerous comments the department received from Dr. Porter's colleagues and friends.

It is difficult for me to quantify Roger's overt (and covert) help over the years. I knew Roger's name as a graduate student in the mid 1960's since I worked in the then little known area of liquid crystals, a field that Roger and his long-time colleagues Julian F. Johnson and Edward M. Barrell had explored. Shortly after assuming an assistant professorship in 1972 (at University of Connecticut) my Ph.D. advisor Author Tobolsky died; this left me stranded with respect to having a mentor support system. However Roger and Julian worked to insure that I was not handicapped by Tobolsky's death. In 1976, as a four-year-old assistant professor I received a major honor as a direct result of Roger's assiduous politicking—I was selected to Chair the Gordon Conference on Liquid Crystals. Over the years other honors came my way which I attributed to Roger's generous behind-the-scenes activities. In sum, Roger and Julian became my new mentors and with their advice and encouragement my career blossomed. My memories of Roger are very fond and I'll miss his sincere interest in my career, his seminal contributions to polymer physics, and his supportive presence in our fragile community.

Edward T. Samulski
Cary C. Boshamer Professor & Chair
Department of Chemistry
University of North Carolina
Chapel Hill

From a remote Polymer Science and Technology Department in the small Basque Country in Spain please receive the deepest sympathy of a group of colleagues who have known and appreciated the scientific work and personality of Roger Porter.

Juan J. Iruin & colleagues,
Polymer Science & Technology Department
Chemistry Faculty
University of the Basque Country
Spain

Roger Porter has been my mentor for 31 years, since 1967 when he and I both started in the University of Massachusetts Polymer Science and Engineering Program. It was simply a wonderful experience to be one of Roger's first students. Together we finished my Ph.D. in less than three years with six publications. He gave me key advice in preparing for and selecting my first job and continued to be my friend and advisor for my career. He made polymer science come alive for me, giving me a joyful, rewarding and productive career. Roger was not only an excellent scientist, educator, and administrator, he also had that key element of integrity and insisted that of his students. I truly miss his presence in my life.

John Southern
Senior Science Fellow & Growth Opportunities Director
Monsanto Company

We at Florida are especially saddened by Roger's passing. He was a true gentleman, scholar and friend. As an active member of our External Advisory Committee, Roger was dedicated, insightful and supportive of our polymer engineering program. We will truly miss his approach and presence.

Anthony B. Brennan
University of Florida
Materials Science and Engineering

Alumni Profile

Many of our Alumni are in distinguished positions in the industry and in academia. In this issue we talked to some of them about their careers and their memories of UMass. Here is what they have to say in a new feature that we are introducing this issue.

Matthew Tirrell (University of Minnesota, Middleman '77)

"I am now Professor and Head of the Department of Chemical Engineering and Materials Science at the University of Minnesota where I started as an assistant professor 22 years ago immediately on graduating with a Ph.D. in PSE from UMass. My research is in manipulating the surface mechanical properties (adhesion, friction, lubrication) of materials by the deposition of thin layers of polymers, amphiphiles and other organic materials. Recently, most of my effort has gone toward new approaches to optimizing bioadhesion. Many skills were developed at UMass but the one that stands out in my mind was the sense of being continuously at the forefront of the field. Excellence was expected of everyone and we were constantly exposed to a stream of scientific leaders from around the world. It made one realize how competitive top notch science is and how high a standard one had to reach in order to make key contributions."

UMass memories: "I remember Professors Stein and Karasz's lectures on physical chemistry that were really illuminating for me, our great summer intramural softball teams that were always competitive for the University championships and my classmates and near classmates so many of whom have gone on to leadership positions in universities and companies."

Advice to current students: "Have confidence that you can be a leader in your career in industry or university work. Push yourself, the rewards are great."

Mark Hoffman (Lawrence Livermore National Laboratory, Price '79)

"I'm in applied research at Lawrence Livermore National Laboratory. Over the past few years I developed an explosive as part of a team of physicists and chemists working on a large explosive device. The team received the Laboratory Director's Initiative Award when the device was successfully tested last year. I learned about polymer chemistry from Robert Lenz and Otto Vogl. This knowledge allowed me to formulate the polyurethane binder used in the device above. I learned polymer characterization from Frazer Price and Richard Stein, rheology from Stanley Middleman and mechanical properties from Bill MacKnight. All these have come in handy over my career."

UMass memories: "I remember working on Frazer Price's cabin in Vermont with Beatta Abba and Dave Armatrage,

worrying about qualifiers like everybody else I knew, and helping build my office in Draper Hall basement. I remember going to my first APS meeting in Atlanta. Several of us went to a 5 star French restaurant for dinner one night. I had to look for the cheapest thing on the menu to be sure my \$20 would cover my bill. I remember playing softball with Dave Tirrell at 3rd base, Al Schuler at short, Mike Wolkowicz at second, Chuck Sherwood may have pitched, I forget, and Dave Alberghini sometimes played first (all these guys may not have played in the same year)."

Advice to current students: "Work hard, but not too hard. Enjoy your time at UMass. Get to know your Professors. You might find they are actually human too."

Surendra Agarwal (Kraft Foods, Porter '80)

"I have 4 industries in India, manufacturing and supplying high quality plastic containers to multi-national companies like Procter & Gamble. I am also the Senior Technology Advisor of Rigid Packaging at Kraft Foods, U.S. My job involves working jointly with resin manufacturers, machinery manufacturers and plastic processors to invent resin and technology for future and new applications resulting in Productivity, Quality Improvement and Consumer Complaints Reduction. At UMass, I developed a very good understanding of resins and developed a strong technical educational background in plastic processing and characterization."

UMass memories: "I miss the UMass campus life a lot. I have great memories of the Prince House where I lived, of several PSE professors who have made me what I am today. I will always be grateful to all of them, especially my advisor Dr. Roger Porter."

Advice to current students: "All the students should feel very lucky to be a part of the world's best department. You should all make the best use of the opportunity you have."

Christine Costello (Exxon Research & Engineering Co., McCarthy '87)

"I am currently the Section Head of the Polymers group at Exxon's Corporate Research lab in Annandale, NJ. I supervise (administratively and technically) about 30 researchers, 11 who are Ph.D. I work with the technology divisions of our affiliate

companies (e.g. Exxon Chemicals, Exxon Production Research, and Exxon Research and Development Labs and others) to define and carry out research programs in the following areas of polymer science: polyolefins, water soluble polymers, additives for fuels and lubes, and additives for oil and gas production. Most of the research programs are fundamental in nature, providing the basic science needed to develop a product or process. In addition, folks in the lab are often called upon for new ideas or "out of the box" approaches to technical problems throughout the company. The key skill developed while at UMass was the ability to take an interdisciplinary approach to research. When you take this interdisciplinary approach, you learn to interact effectively with people in many different areas of science and engineering. Since most problems these days are interdisciplinary in nature (even for an industry as mature as the oil industry), being able to work successfully with engineers, geologists, and biologists, for example, is a highly valuable skill. The second most important skill I learned at UMass was effective communication. Science, no matter how good it is, will be worth nothing unless it is communicated successfully. UMass offered a number of venues for this including regular participation by graduate students at National ACS and APS Meetings and CUMIRP poster sessions."

UMass memories: "Eric Beckman's parties."

Advice to current students: "My advice to PSE students is to take advantage of the opportunities you have at UMass. Build strong networks; you don't realize it now, but this will help you in the future. Most importantly, have fun."

Timothy Bee (International Specialty Products, McCarthy '93)

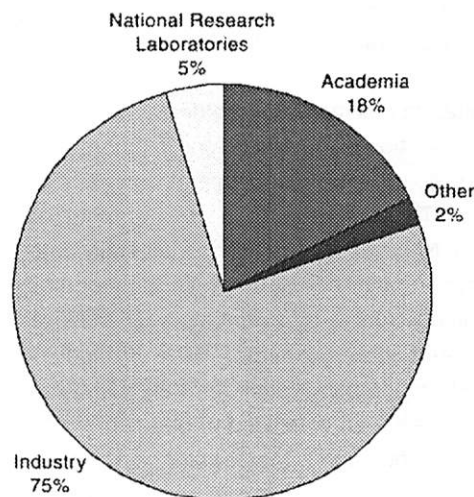
"After leaving UMass, I worked for 2.5 years in a variety of R&D positions (mostly in Central Research) for Dow Chemical. I then returned to school for an MBA at Carnegie Mellon Univ. in Pittsburgh and majored in Strategy, Marketing and Economics focused on technical innovation and new product development. During my studies, I interned at Bayer Corporation where I did economic analysis of new product/process development projects. The combination of a Ph.D. in Polymer Science and an MBA prepared me for my current position at International Specialty Products as the Director of ISP's Global New Product Commercialization Process. In this role, I am responsible for developing and implementing at ISP the Stage-Gate and Portfolio Management product development processes that other chemical companies have used to reduce their product development time to market and increase the success of their new products in the marketplace.

My work includes developing the process theory, materials and documentation; training the R&D, Marketing, Manufacturing and Finance members of the project teams in the process to help them work more efficiently and effectively; and working with ISP's senior executives to help them learn the process, review the projects and make sure we are doing the right projects in the right way."

"Without a doubt there are 2 major sets of skills I learned at UMass: (1) Defining concrete goals/objectives, developing a plan to meet them and making appropriate adjustments to overcome roadblocks or capitalize on new opportunities. (2) The ability to analyze a problem, break it down into its fundamental components, identify how others have solved similar problems and construct a solution that fits the specifics of my problem. These 2 skill sets have generally applied to technical, economic, marketing and organizational/performance issues that I have had to address."

UMass memories: "I remember my lunch-time basketball with the Runnin' Rebels, the Amherst co-ed softball championship with Team Chaos, preparing for Friday morning synthesis lab, all-nighters in the lab with the McCarthy group, and studying for cumes while barbecuing, eating lobster and swimming."

Advice to current students: "Identify what skills are/will be valued in your organization and the market in general, become aware of your value to your organization and your own strengths/weaknesses, and continuously challenge yourself to learn and improve so that even if your organization changes and no longer needs your particular skills the market will still find you valuable."



Where PSE Alumni are!

Alumni News

Thank you for your continued responses to the questionnaire and for sharing your triumphs and achievements with us. Keep the updates and news coming.

Michael W. Yang '72 - (Polyfibrion Technologies Inc.) "After 20 years in charge of the R&D for printing plate product development, I have changed my job function to help my company in developing Asia-Pacific business. Around 30% traveling time to Asia-Pacific is anticipated annually. I might bump into someone at an airport somewhere in Asia. Watch out!"

Joel R. Fried '76 - (University of Cincinnati) "I am currently a Professor of Chemical Engineering and Director of the Ohio Molecular Computation and Simulation Network at the University of Cincinnati. I received the first annual Faculty Achievement Award at UC. My text, *Polymer Science and Technology* (Prentice Hall, 1995) is nearing its 4th printing. I currently edit *Polymer Contents* and am the Associate American Editor of *Computational and Theoretical Polymer Science*, published by Elsevier Science."

John Quagliano '87 - (Los Alamos National Lab) "I received my Ph.D. in Physical Chemistry from the University of Virginia in 1993. I am currently employed at Los Alamos National Laboratory, working in the Analytical Chemistry Division. My research interests include chemometrics, optical spectroscopy, visible lasers, lanthanide chemistry and scientific computing."

Joseph Machado '88 - (Shell Research and Technology Center) "I am married with 3 children and we will all be moving to Belgium for 3+ years as I continue to be involved in developing Shell's new CARICON polymer business where I will have responsibility for product technology in Europe."

Ajay Parkhe '94 - (PPG Industries) "You guys have done a great job with the first issue of the Annex. Congratulations! Some news from my end. I just concluded an MBA from Carnegie Mellon and am now working in Finance at PPG."

Current Research in the PSE Department

Three fourth year PSE students, one from each of the major disciplines, briefly describe their research and post-graduation plans.

Determination of Polymer Backbone Conformations in Amorphous Polymers by 2D Double-quantum Solid-state NMR

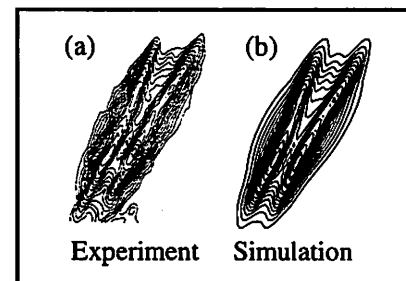
Matthew G. Dunbar (Advisor Klaus Schmidt-Rohr)

The microstructure analysis of amorphous materials has been a challenging area of study for both experimentalists and theoreticians. X-ray and neutron scattering are probably the best techniques to determine molecular structure but are typically limited to macroscopically ordered systems. This excludes the determination of conformations in amorphous polymers since they do not have the degree of order required for X-ray diffraction. This work is an application of modern and novel solid-state NMR techniques to experimentally determine conformations and their distributions in amorphous polymers. The techniques utilize the orientation dependence of the chemical shift anisotropy tensor, ^{13}C — ^{13}C dipolar coupling, and C— ^2H quadrupolar coupling. These "NMR" sensitive interactions are then correlated to give conformation or torsion angle information about the polymer backbone. Synthesis of isotopically labeled polymers is required to perform the experiment. Therefore, I have synthesized several ^{13}C and ^2H labeled

polymers. Experimental spectra are matched with simulated spectra to extract conformation information. The experimental torsion angles and distribution are then compared to theoretical studies like the RIS model and more complex molecular modeling that include intermolecular interactions. The figure shows the best fit simulated spectrum (b) with a torsion angle distribution of 68% trans and 32% gauche compared to the experimental spectrum (a) of poly(^{13}C styrene-co-styrene).

After graduation, there are several avenues that I would like to explore. Ideally, I would like to work in industry for a few years and then go on to a teaching career.

The level of teaching spans from a professor at a small university to perhaps being a high school science teacher. With this in mind, a postdoc position following graduation is another possible route.



Heterogeneous Polymer Modification Reactions

Heather J. Hayes (Advisor Thomas J. McCarthy)

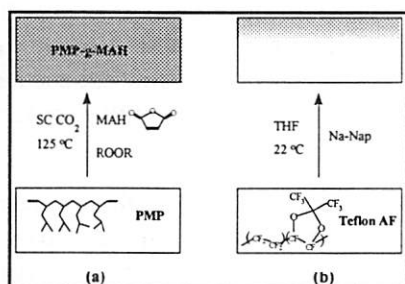
Two distinct heterogeneous modification reactions are being explored in my research - (a) the bulk modification of polyolefins using supercritical carbon dioxide (SC CO₂) as the solvent and swellent and (b) the surface chemical modification of an amorphous fluorocopolymer of tetrafluoroethylene and a perfluorodioxole (Teflon AF).

In the first project, the free-radical grafting of maleic anhydride onto poly(4-methyl-1-pentene) has been optimized and the resulting polymer has been

well characterized primarily using infrared, NMR, and swelling studies. Two initiators have been compared for their effectiveness – benzoyl peroxide and dicumyl peroxide. Degrees of maleation achievable using this new approach are much greater than commercially available products made by an extrusion process because of the ability of SC CO₂ to effectively dissolve and deliver the reactants into the fluid-swollen substrate.

In the second project, Teflon AF has been reduced using sodium-naphthalide (Na-Nap), forming a surface containing a large degree of unsaturation. The reduction is confined to the top 200 nm of the film and provides a reactive handle through which further chemistries can be conducted in order to create a more wettable, biocompatible, or easily adhered to surface. The resulting modified layer is being fully characterized to understand the mechanism and reactivity of the fluoropolymer before and after modification. The modified Teflon AF will then be used as the permeable support for an asymmetric gas separation membrane made with poly(p-xylylene) as the selective layer.

With plans to graduate this summer, I have accepted a position in applied research with Milliken and Co. in Spartanburg, SC.



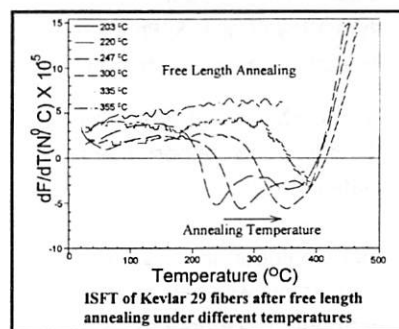
Mapping the Stress and Thermal History in High Performance Fibers: Application in Lifetime Prediction and Property Enhancement

YuanQiao Rao (Advisor Richard J. Farris)

My research aims to develop a methodology to illustrate the stress and thermal history in fibers, so as to predict the residual material lifetime and to provide further property enhancement. During my research, an iso-strain force temperature test (ISFT) and an iso-force strain temperature test (IFST) were found to illustrate the stress and thermal history in Kevlar fibers subjected to various thermal or stress conditions. To understand fundamentally why these tests illustrate the stress and thermal history, the relaxation transitions of the fibers were studied by DMTA and DSC. Analyses of the DMTA thermograms show two unreported relaxation processes. These transitions not only yield characteristic ISFT peaks with peak height related to stress history and peak position related to thermal history, but also provide potential property enhancement information as well as explanation of fracture mechanism.

To establish a structure-property-stress and thermal history histogram, I tracked the structures by X-ray diffraction and the properties of materials altered by heat and stress by mechanical testing. Using this known relationship, heat tensioning and pressurized heat tensioning yielded large property enhancement. The material lifetime principle was derived through a systematic study of both static and dynamic fatigue behavior so as to predict the residual material lifetime. The loading time of a given material is obtained from the ISFT study, knowing the amplitude of the applied stress. Then using the lifetime principle the residual lifetime can be calculated. In my study, I also addressed the significance of material anisotropy and have developed a composite-theory-based model to predict the change in modulus of the yarn with the degree of twist.

I hope to start my career with a position in industrial R&D, where I have the confidence and enthusiasm to advance technology.



Materials Research Science and Engineering Center

This year, under Tom Russell's leadership, the PSE Department was awarded a four-year 6 million continuation of our Materials Research Science and Engineering Center, MRSEC, NSF grant.



Thomas P. Russell
Director, MRSEC

The tradition of excellence in multidisciplinary and interdisciplinary research and education in polymer science and engineering at the University of Massachusetts Amherst has been fostered by 25 years of continued support from the National Science Foundation. The strong ties between UMass and the NSF began with the creation of the Materials Research Laboratory in 1973 with an initial award of \$225,000 in annual support and continues today under the

Materials Research Science and Engineering Center (MRSEC) program (established in 1994) with funding of \$1.5M annually. MRSEC has helped the PSE Department to account for more than 15% of all U.S. Ph.D.s in this field (Directory of Graduate Research, American Chemical Society, 1997).

The NSF MRLs and subsequent MRSECs were created with the mission to support interdisciplinary and multi-disciplinary materials research and education of the highest quality while addressing fundamental problems in science and engineering that are important to society. The competition is excruciatingly competitive with very exacting requirements and expectations, with only 25 laboratories nationwide — and only 1 — UMass — focusing strictly on the study of polymeric materials.

In the true spirit of a MRSEC, the Center at UMass undertakes several coordinated multi-investigator projects which integrate the efforts of 24 faculty drawn from 4 departments (Chemical Engineering, Chemistry, Physics, and Polymer Science and Engineering) and 26 graduate students and postdoctoral associates. These activities focus on two Interdisciplinary Research Groups (IRGs), entitled *Controlled Interfacial Interactions* (IRG-I) and *Polymers in Supercritical Fluids* (IRG-II). Through these IRGs, the Center addresses two of the most important strategic areas in polymer and materials science and engineering: i) the manipulation of polymer morphology on the nanoscopic level both parallel and perpendicular to the surface by controlled interfacial interactions and ii) the use of environmentally benign supercritical CO₂ to dramatically enhance the efficiency of polymer processing for the production of materials with unique morphologies.

In addition, the Center maintains efforts in emerging research areas. The first program, *Polymers With Well-Defined Architectures*, is motivated by new synthetic and processing

methodologies that promise to push polyolefins into demanding applications heretofore reserved for far more costly materials. Multi-investigator projects in this seed will address the development of polyolefin block copolymers as adhesives and compatibilizers, the incorporation of periodic defects to control viscoelastic properties, generation of high strength, low cost fibers, and conformational control over longer length scales to induce intermolecular ordering. The effect of hydrostatic pressure, an essential element in the preparation and processing of polymers, on the synthesis and mechanical properties of polymers is the focus of *Polymer Synthesis, Fragility and Yielding Under Pressure*.

Under MRSEC support, this commitment to excellence in education has been expanded to reach undergraduate and K-12 students as well. Strong educational and research ties have been formed with two nearby women's colleges, Smith and Mount Holyoke, with additional ties to Howard University in Washington, DC and the University of Puerto Rico, Mayaguez Campus. The goal of the Mount Holyoke and Smith College programs is to foster the participation of undergraduate women in the activities of the MRSEC. The programs at Howard University and UPR promote the involvement of Black and Hispanic Americans in the Center's research.

Complementing these programs are the completion, publication and distribution of the middle school curriculum, *Polymers All Around Us*, the further development of the polymer science Graduate Student Outreach Program for K-12, and the graduate student initiated ASPIRE program for high school students. With the National Plastics Center and Museum, a CD ROM is being developed to introduce high school students and the general public to basic polymer concepts.

Oversight of the day-to-day management of the Center lies with the Director, Thomas P. Russell, who consults regularly with an Advisory Committee and the Associate Director, Shaw Ling Hsu.

The MRSEC office can be reached by phone (413-545-2680) by fax (413-577-1510) or email (mrsec@polysci.umass.edu).

Faculty Profile: Helmut Strey

The PSE Department recently hired Dr. Helmut Strey, who received his Diploma and Ph.D. in Physics from the Technical University in Munich, Germany. After working for 5 years as a Visiting Fellow at the National Institutes of Health, Bethesda, Maryland, Dr. Strey joined the faculty here in October 1998. The following article gives a brief introduction to his research interests.



A citizen of Germany, Helmut Harald Strey began studying Physics in 1982 at the Technical University Munich. After finishing his Diploma in 1990, he continued on with his doctoral work at the same university for his Ph.D. In 1993 he graduated under the direction of Prof. Erich Sackmann with his thesis titled "Bestimmung elastischer Eigenschaften von Zellmembranen und Zytoskelett

mittels Flicker spektroskopie (*measurement of cell membrane and cytoskeleton elastic properties using flicker spectroscopy*). Helmut Strey was then awarded a Visiting Fellowship in 1994 at the National Institutes of Health in Bethesda, Maryland where he performed postdoctoral research until joining the PSE Department in October 1998. During this period he also received a research fellowship award from the Deutsche Forschungsgemeinschaft. In 1995, he also won the Schlossmann Award offered by Max-Planck Society, Germany for his research proposal on "Supercoiled plasmid DNA as a possible chiral and rodlike model molecule forming cholesteric liquid crystals."

Helmut Strey's research interests are in the fields of soft condensed matter physics and biophysics. Most biological materials have desirable physical properties that often cannot be achieved with synthetic materials. Strey believes that studying the organization principles of biological macromolecules will lead to an understanding of how to make better materials. "In the last few years traditional condensed matter physicists have become increasingly interested in soft condensed matter, including fluids and liquid crystalline phases of matter. A better theoretical understanding of the underlying ordering principles has resulted in the prediction and discovery of numerous liquid crystalline phases. It is now time to go one step further and investigate the microscopic details of the intermolecular interactions and the thermodynamics of packing in liquid crystals."

"In real systems hard core repulsion is always accompanied with softer exponential (e.g. electrostatic, hydration) and power law (e.g. van der Waals attraction) interactions. There may also be chiral interactions, typically very weak that may lead to long range order in liquid crystals. While working on DNA liquid crystalline phases, I became increasingly interested

in interactions between chiral molecules as well as their mesophases. To study these interactions, biological molecules offer many advantages. Biological materials are often made from macromolecules with varying stiffness and helicity such as: actin, collagen, DNA, elastin, fibrin, polysaccharides, spectrin, tubulin. Several of these molecules form lyotropic liquid crystals at in vivo concentrations. I hope that by investigating their structure, free energy and mechanical properties I will be able to find the laws which connect the microscopic interactions between the molecules with the macroscopic properties of their mesophases, such as elastic constants and cholesteric pitch. This may reveal the efficiency of the underlying principles of design."

Helmut Strey intends to work on projects on DNA condensation, the strength of chiral interactions, coupling between chirality and liquid crystalline packing, surfactant-polyelectrolyte complexes, and on DNA delivery in gene therapy. The main experimental technique in his research will be small angle x-ray scattering (SAXS) and polarizing microscopy.

One of the prime factors that motivated Helmut Strey to become a university professor was his interest in teaching and interacting with students. "When teaching as a graduate student in Munich, I enjoyed the challenge of preparing my physics lectures so that they captured the students attention while clearly delivering the material to be covered. As a professor, I intend to challenge and engage my students through my teaching, encouraging their curiosity and fostering their development as scientists." At PSE he intends to teach courses on condensed matter polymer physics and on biopolymers.

1998 PSE Graduates

The following is a list of the 1998 PSE graduates, their employers, advisors and dissertation titles.

Naveen Agarwal

Kimberly-Clark

Farris

Characterization of Acrylic Based Latex Blend Coatings and Thermodynamics of Their Deformation

Yvonne Akpalu

N.I.S.T

Muthukumar & Hoagland

Competition between Phase Separation and Crystallization in Polyolefin Blends

Howard Bowman

University of British Columbia

Tirrell

Photopolymerization of Biomembrane Templates: Nanometer-Scale Hydrogels and The Photoinduced Release of Vesicle Contents

Andrew Bushelman

University of Connecticut

MacKnight

*Synthesis and Characterization of Blends of Poly(ethylene-*b*-(*atactic*) propylene) with Polyethylenes*

Georgia Dris Fishburn

G.E.

Barton

Adsorption of Poly(Dimethylsiloxane) from Supercritical Carbon Dioxide

Thomas Hahn

National Starch

Hsu

Characterization of Structural Transformations with Vibrational Spectroscopy

Robert Kody

3M

Lesser

Yield Behavior and Energy Absorbing Mechanisms of Single- and Multi-Phase Glassy Thermosets Subjected to Multiaxial Stress States

Chester Liu

Weather Services International

Muthukumar

The Evolution of Order in Liquid Crystals and Polymer Crystals

Samuel Miller

G.E.

MacKnight

Macroscopic Polymers from Cyclic Oligomers of Poly(butylene terephthalate)

Sophie Riou

DuPont

Hsu

Infrared Reflectance Spectroscopy as a Characterization Probe for Polymer Surfaces and Interfaces

David Schlitzer

Ciba Specialty Chemicals

Novak

The Chiral Induction of Polycarbodiimides through Diastereomer Formation

Margaret Starkweather

[raising two children]

Hoagland & Muthukumar

Polyelectrolyte Separation by Electrophoresis with Dilute Neutral Polymer Solutions: Simulations and Model Experiments

Regina Valluzi

Tufts University

Gido

*Interfacial Behavior of *B. mori* Silk Fibroin*

Jeanene Willcox

Elf Atochem USA

Gido

Development of Structure in Natural Silk Spinning and Poly(vinyl alcohol) Hydrogel Formation

Michael SeungJu Yu

University of Wisconsin

Tirrell

Smectic Ordering of Rod-Like Polymers Owing to Monodispersity of Chain Length: Synthesis and Characterization of Benzyl and (4-Hexadecyloxy)benzyl Esters of Monodisperse Derivatives of Poly(α , L-Glutamate)

Departmental Awards

Student Awards

Naveen Agarwal

Roon Foundation Award: Federation of Societies for Coating Technology and Coating Industry Education Fund

Gustavo Carri

Gen Corp Signature Award

Buddy Crawford

SPE Polymer Modifiers and Additives Division, Scholarship on Mechanisms of Rubber Modification

Weiguo Hu

39th Experimental NMR Conference Travel Award

Kristi Kiick

Santos Go Memorial Merit Scholarship
Gen Corp Signature Award

Edward Kung

Society of Plastics Engineers, Polymer Modifiers and Additives Division Scholarship

Jeremy Morin

Kodak Fellowship

Gregory Schueneman

98/99 Society of Plastics Engineers Composites Division Perkin Elmer Award

Chris Stafford

Santos Go Memorial Merit Scholarship

Jennifer Stewart

Ford Travel Grant from the Polymeric Materials: Science and Engineering (PMSE)

Shalabh Tandon

Capacitor and Resistor Technology Symposium Outstanding Paper Award

James Watkins

Unilever Award for Outstanding Graduate Research in Polymer Science and Engineering Awarded by ACS

Jeanene Willcox

Padden Award Finalist at the American Physical Society, Division of High Polymer Physics National Meeting

Faculty Awards

Richard Farris

Gen Corp Signature Award
Roon Foundation Award: Federation of Societies for Coating Technology and Coating Industry Education Fund
Elected Fellow of SPE (Society of Plastics Engineers)
Elected to the Board of Directors, SPE Polymer Analysis Division

Murugappan Muthukumar

High Polymer Physics Ford Prize from American Physical Society, 1998
Miller Fellow, University of California at Berkeley, 1998-99

Jacques Penelle

3M Nontenured Faculty Award
Gen Corp Signature Award

William MacKnight

Award for Distinguished Service for the Advancement of Polymer Science, Japan Society for Polymer Science (JPSC)
Elected to the National Academy of Engineering
Wilmer D. Barrett Professor of Polymer Science and Engineering

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A Penny for Your Thoughts

We're interested in hearing from you! Promotions, job changes, awards, publications, patents, family information? Let us know and we will print it in our next issue of The Annex.

Name _____

Degree/Year Graduated _____

Advisor(s) _____

Address change

Suggestions, news, comments?

The Annex

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