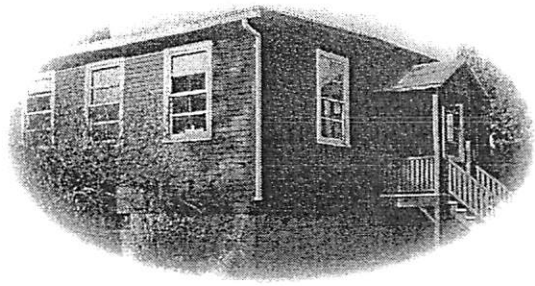
The Annex

December 1999 Volume 3, Number 1



Snippets

MacKnight Retires

Dr. Bryan Coughlin was hired from DuPont this year as an assistant professor and began working on September 1st. His work is in the area of synthetic polymer chemistry. There is additional information about him in the new faculty section (pg. 3). Among other faculty, Fall 1999 has also seen Dr. Alan Lesser obtain his tenure and Dr. Jacques Penelle get promoted to Associate Professor. Dr. Sam Gido became the new Graduate Program Director, taking over from Dr. David Hoagland. Dr. William MacKnight retired on the 31st of October but he continues his research and holds his office as Wilmer D. Barrett Professor Emeritus. Dr. Klaus Schmidt-Rohr will be leaving in February 2000, to begin his new position at Iowa State University.

Porter Memorial Symposium

The Roger S. Porter Memorial Symposium, in memory of Dr. Roger Porter, will be held from the 4th to the 6th of February 2000, at the Asilomar Conference Center, Pacific Grove, California. Dr. Shaw Hsu, Dr. Alan Lesser, and Dr. Richard Farris are coordinating the event. More information about this can be found at *www.pse.umass.edu/porter/*. This Symposium will be covered in two journals later in the year: *Polymer* which will be out in Fall 2000 as well as a future edition of *Polymer Engineering and Science.*

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Up Coming Events

All are invited to attend the ***Roger S. Porter Memorial Symposium*** to be held at the Asilomar Conference Center, Pacific Grove, California between the 4th and the 6th of February, 2000.

Dow Chemical Seminar Series – January 21, 2000
Ulrich W. Suter, Institute of Polymers, Zurich

Fraser Price Seminar Series – April 14, 2000
Isaac Sanchez, University of Texas, Austin

CUMIRP/MRSEC 2000 Meetings
Spring – May 9-11, May 10th is the CUMIRP 20th Anniversary Dinner
Fall – October 17-20

From the Editors

This is the third issue of The Annex. At the rate of one issue a year, we have been targeting the holiday season for the release of each issue. The newsletter is one of the best ways for the current and the past of PSE to be in touch with each other. With a lot of effort going into updating the alumni database this year, we now have the correct contact information for most of you. Thank you for your co-operation.

Maintaining the database and releasing the newsletter are activities that fall under the purview of the PSE Club. This year the General Electric Company, through its GE Plastics Division, presented $1500 to the PSE Club for support of its various activities. The presentation was made by Dr. Jerry Parmer of GE. There was also a field trip to the GE Plastics Plant in Pittsfield, Massachusetts, on June 25th. Another new development this year was the ASPIRE and High School OUTREACH talks given by the coordinators at the ACS meeting in New Orleans. The PSE Club also provided students as judges for two local science fairs. Among sports, the PSE Ultimate Frisbee Team finished this year's intramural championship in the best possible way, as champions!

The PSE Club, with the help of the faculty and alumni, will continue to develop on its efforts. The intent of the club is to foster an amicable relationship among students, professors and other members in the community and to enhance service to the community, regarding scientific development. We urge all of you, as our alumni, to stay in touch, you can email us at *alumni@mail.pse.umass.edu* or visit us on the web at *www.pse.umass.edu/psecl/alumni.html*. Thank you all for your support.

- Jeremy Morin, Arun Raman

PSE Faculty Directory

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Biophysics; biopolymers; liquid crystals; polyelectrolytes; polyelectrolyte-surfactant complexes; self-assembly; chiral interactions; structure and thermodynamics of biopolymer liquid crystals (small angle x-ray scattering, polarizing microscope, osmotic stress)

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Faculty Profile: Bryan Coughlin

The PSE Department recently hired Dr. Bryan Coughlin, who received a B.A. from Grinnell College and a Ph.D. from Caltech, both in Chemistry. After working for 5 years in DuPont's Central Research and Development Department in Wilmington, Delaware, he joined the PSE faculty in September 1999. The following article gives a brief introduction to his research interests.

In the past decade, my research interests have evolved from pure organometallic chemistry to a strong emphasis on the coordination polymerization of olefins. I was originally attracted to chemistry by the ability to utilize synthetic methods to prepare interesting molecules. During my graduate studies I discovered a novel class of organometallic catalysts that are able to polymerize α-olefins in a stereoselective fashion. This was my initial foray into the realm of metal catalyzed olefin polymerizations, a field of science that continues to fascinate me.

I view chemistry as the basis upon which polymer science is built. The synthesis and purification of monomers involves chemical reactions. The conversion of these building blocks to macromolecules once again involves chemical transformations. These chemical reactions, in conjunction with reaction engineering, produce the desired final polymer. Ultimately, it is the utilization of the unique physical chemistry of polymers that allows them to be manufactured into materials for use by society.

My experience at DuPont has shown me that the best science and technology results when there are close interactions among chemists, chemical engineers, and polymer scientists. I am quite excited to be beginning my own research program within PSE, and anticipate having many fruitful collaborations with my colleagues in the years to come. Efforts within my group will focus on all aspects of synthetic polymer chemistry, with particular emphasis being given to the coordination polymerization of olefins.

The challenge that we face currently in synthetic polymer chemistry is how to achieve an integrated approach to the preparation, processing, and ultimate properties of polymers. We now have at our disposal the possibility to exert a much higher degree of control over how we assemble monomers, or a mixture of monomers, into macromolecules. This control is the direct result of having a large number of transition metal based catalysts. These various catalysts can be thought of as comprising different tools in our chemical toolbox for constructing polymers. Using these catalysts under controlled reaction conditions will therefore allow us the opportunity to prepare macromolecule with very well defined molecular architectures.

A key portion of our future discovery process is going to be in selecting target macromolecules to prepare. We must then devise strategies to prepare these polymers. There will no doubt be times where there are no known methods for the synthesis of the desired material. This will, therefore, require us to develop novel catalysts.

Recently, there have been discoveries of new coordination polymerization catalysts that are capable of copolymerizing ethylene with vinyl monomers having polar functionalities. These initial findings point to the possibility of being able to prepare entirely new classes of ethylene based and propylene based polymers with a variety of different comonomers. This will then allow us to prepare a wide variety of unique and interesting macromolecules. Our research efforts will not stop after the completion of a synthesis. Developing a complete understanding of the physical and mechanical properties of these new polymers is required not only to understand their uniqueness, but also to further direct our subsequent research efforts.

I intend to rely heavily on my industrial experience in not only providing direction for my research efforts, but also in my teaching. I will strive to make connections between what the students learn in the classroom, and laboratory, and how this knowledge can be, and is, applied in industry. Industrial scientific focus while different than that in academia is certainly no less challenging nor less rewarding.

As you are no doubt aware, the PSE Department has an impressive collection of faculty, students, and research staff. These researchers in conjunction with the impressive array of instrumentation and top-notch facilities will allow us to continue to do world class scientific investigation. I am looking forward to contributing to the continued excellence of the PSE Department.

Alumni Profile

We are back this year with some more distinguished guests. Let us see what they have to say about their days at UMass and how that has led them to where they now are.

Jehuda Greener (Eastman Kodak Company, Middleman '78)

"I am a research scientist at Kodak Research Labs in Rochester, NY, where I hold the title of Research Associate. As part of my work at Kodak, I am involved in the conceptualization, design and development of imaging media of various types, i.e., photographic and non-photographic. The work entails polymeric material design, characterization and processing, and development of process-structure-property relationships for films and other product types. We spend a lot of time scaling up from the bench scale to the pilot scale and, ultimately, to the production scale. It is very satisfying to me (and I think to most industrial scientists) to see some of my ideas make their way to a product or a manufacturing process. One sure thing: polymer science is very, very important in almost anything that we do at Kodak. Believe me!!!! In my free time (i.e., in the evenings) I also teach a graduate course on polymer rheology and processing at the University of Rochester"

"My most valuable "skill" that I was able to hone at UMass is critical and independent thinking and the ability to learn new skills. All other skills learned at PSE, particularly in the areas of modeling and characterization, have given me an appreciation for the range of possibilities available for looking at polymeric materials from theoretical and practical perspectives. Also, an intuitive 'feel' for the response and properties of polymers in the solution, melt and solid states, which I developed at UMass, has been invaluable for solving and understanding many "real life" problems."

UMASS Memories: "Only after leaving Amherst did I learn to appreciate the beauty of the Pioneer Valley area. I have especially fond memories of visits (with my wife to be) to Skinner Park, Puffer's Pond, Deerfield and the Berkshires and, of course, the pond on campus. I have traumatic memories from the "tallest library in the world." Are bricks still falling from the top floors? During my years at UMass (mid 70's), the University was a hotbed of radical politics and this was evident especially at the Campus Center which was chuck full of people with many different and often strange political agendas, and the dress code was VERY informal. On my more recent visits to UMass I was struck by how conservative the students have become (by comparison) since those happy days. I am still very grateful to many of the PSE faculty who were very gracious and patient with me during my first year at UMass when my language skills (in English!) were VERY limited (I was at that time a newly arrived foreign student from Israel)."

Advice to Students: "Don't pigeonhole yourself as a 'polymer scientist' (This may be heresy at PSE!). Rather, broaden your outlook and consider yourself a materials scientist with a good understanding of polymers. Keep in mind that in most (if not all) cases your graduate studies and thesis work are just a stepping stone to a long and, hopefully, fulfilling technical career where you are likely to encounter many problems outside the realm of polymer science. Your learning does not stop at graduation day. It is a continuous and never-ending process. Always, try to go after the interesting and challenging problems (especially those that are 'impossible to solve') and leave the "mundane stuff" to others. Most important, even though polymers are fascinating materials, don't get "married" to your work. There are other important and equally fascinating things in life, so put your technical work at the proper perspective. Go get them and don't forget to have fun!!!"

Jerome Parmer (General Electric Company, Porter '87)

"I am currently with GE Plastics at the Headquarters site in Pittsfield, Massachusetts. In the past three years at GE I've worked in product development and technology management for our PC/ABS business. At present I am working with all functions across the business to help roll out a new global technology/product information management system. Prior to arriving at GE, I worked for AlliedSignal in a variety of positions in Chicago, Illinois and Morristown, New Jersey."

UMASS Memories: "Studying for cumes, mid-week excursions to Vermont when the powder was fresh, Top of the Campus group lunches with Dr. Porter, raspberry picking, the "Strategic Air Command" faculty, the great students and visiting scientists who made UMass such a great place to learn."

Advice to Students: "While at UMass one of the key things I learned was about how to communicate with people from different backgrounds. The interdisciplinary nature of Polymer Science and related training at UMass provides lessons that can be applied to a lot of areas in life. You have to communicate effectively if you want to move your ideas from the laboratory out into the world."

Han Sup Lee (INHA University, Korea, Hsu '89)

"I am now teaching at the Department of Textile Engineering, INHA University, which is in Inchon, Korea. I have been a professor here since 1990. Since the textile industry is an important part of Korean economy, there are a number of universities providing textile-related

degrees in Korea. I teach polymer science courses and instrumental analysis, in addition to the basic courses such as physical chemistry and statistics. My main research area is related to the structural analysis of various polymers using mainly FTIR spectroscopy and SAXS. At UMass, FTIR spectroscopy was an important tool I used for my doctorate. The FTIR related techniques and basic theories introduced to me at Dr. Hsu's Lab have been extremely helpful. Since I have a solid background in FTIR spectroscopy from UMass, I could expand my spectroscopic interest into 2D ATR IR spectroscopy. I have also been extensively using a synchrotron SAXS/WAXS method for macroscopic structural analysis. PAL (Pohang Accelerator Laboratories, Korea) has built third generation synchrotron facilities here and has been providing beam time to users since 1997."

UMASS Memories: "Several scattering-related courses that I took from Dr. Stein have played a key role in expanding my research field into synchrotron SAXS/WAXS. Basically, most of my research interests are related to my education and experiences at PSE UMass. I think the best benefit that I obtained from the department has been from the numerous seminars given by the world's best researchers. By attending such seminars and regular courses, I could set my research standard similar to theirs. During my almost 10 years of experience at INHA University, I have seldom synthesized polymers. However, I have been working closely with many polymer chemists in Korea. The synthesis and lab courses that I took at PSE have provided me the necessary foundation in polymer chemistry. Therefore I don't think I have any difficulties in communicating and exchanging ideas with a pure polymer chemist."

Advice to Students: "I think a Ph.D. journey is the process building the basics. Thus, having a variety of experiences instead of concentrating on a specific field will be helpful after graduation. These experiences might range from regular courses, seminars, and frequent discussions and interaction with other people in your own research group as well as other groups. Keeping eyes and ears wide open will be a good tactic for students."

Darrin Pochan (University of Delaware, Gido '97)

"I am currently an assistant professor in the new Materials Science and Engineering Department at the University of Delaware. It is a unique position in that the department is practically brand new (officially founded in 1998 by 5 senior faculty). I was the first assistant faculty member hired and so now I get to play a big part in planning the future direction of the department. My current research focuses on the self-assembly of block polypeptides, organic/inorganic blends and crystallization of polymers at interfaces."

"The key skills that I developed at UMass was being able to recognize the importance of a combined knowledge of synthetic chemistry, physics and engineering to tackle materials science technology needs and cook up interesting research, being able to discern the solid from the junk in the literature and also an ability to silver plate the inside of tortuously shaped blown glass objects with the best of them."

UMASS Memories: "Solving many complex polymer science problems at the Ale House, performing late-night building inspections of the Conte Building during construction - maybe the single most important factor in it being the world class facility that it is today!"

Advice to Students: "Go to seminar- get that interdisciplinary knowledge. Don't eat too many cookies beforehand and get fat."

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. Now you can update your information on the World Wide Web at www.pse.umass.edu/psecl/alumni.html.

Sridevi Narayan-Sarathy '94 - (Ashland Chemical Company) " Enjoyed reading the issue of The Annex. Just writing to say that we had a baby boy, Gautam, on August 16th, 1999. I continue to work with Ashland Chemical Company as a Senior Research Chemist."

Robert J. Fleming '95 – (3M Company) "This is a great newsletter, keep it up!"

Current Research in the PSE Department

"So What's Cooking?" Three fourth year students discuss their research and future plans.

Engineering 2-D and 3-D Crystallinity for Segmented Copolymers

Joel Schall (Advisor Jacques Penelle)

The objective of my research is to synthesize polymers with long aliphatic (crystallizable) segments interrupted at regular distances by short non-crystallizing segments. The target polymers are polyesters of the form $[\text{-O-(CH2)}_x\text{-OOC-(CF2)}_y\text{-CO-}]_n$ where x is ideally greater than 40 and y is less than 10. In theory, the fluorinated segment will be incapable of co-crystallizing with the aliphatic segment due to its higher cross-sectional area per chain (27 $Å^2$ for PTFE versus 18 $Å^2$ for PE) and the tendency of fluorinated chains to form helices as opposed to polyethylene's planar zigzag. This should result in the fluorinated segment being excluded to the polymer chain folds, provided that the aliphatic segment is long enough to give formation of a stable crystal. The subsequent polymers should display interesting surface properties; in particular, they might behave like PTFE on the surface, while their material properties could approximate those of polyethylene. The polymer crystals are being characterized by DSC, TEM, electron diffraction and X-ray techniques including WAXS and SAXS. The polymer surfaces are being studied with XPS.

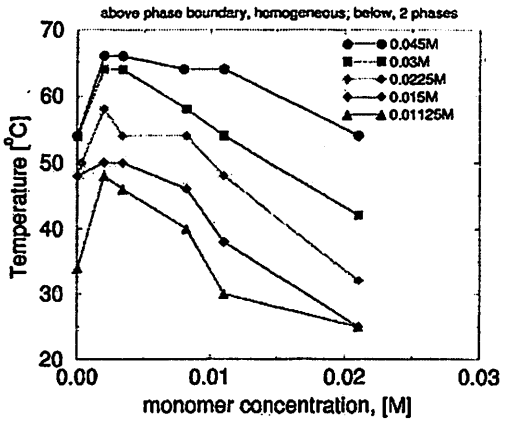
A second project involves preparation and characterization of 2-D crystalline polymers. A solution of hexatriaconta-17,19-diyn-1,36-diol in 1-phenyloctane is placed on the surface of freshly-cleaved highly-oriented pyrolytic graphite. The compound adsorbs to the surface of the graphite in a herringbone-like pattern, as shown by STM (scanning tunneling microscopy). The adsorbate can be polymerized through the triple bonds by UV irradiation, resulting in a two-dimensional, mesh-like polymer. Eventually we hope to further crosslink this polymer by reaction of the hydroxyl groups (e.g., with short diacids); we may ultimately try to desorb the polymer from the graphite without losing the 2-D structure.

After graduation, I plan to initially pursue a career in industry. However, I have enjoyed being a TA in the department and working with our two outreach programs, High School OUTREACH and ASPIRE, so I hope to remain active in educational activities.

Phase Behavior of Polyelectrolytes

Vivek Prabhu (Advisor Murugappan Muthukumar)

My experimental and theoretical interests are in the solution behavior of charged macromolecular systems. I am currently investigating the structure of assembled microtubules, which are charged hollow cylinders formed from tubulin protein dimers. The largest length scale structure with liquid crystalline order is probed with polarized-optical microscopy and small-angle light scattering. We are investigating this complex assembly to understand how the higher level structure at the micron to millimeter length scale is affected by changes in ionic strength and polymer concentration.



My second area of interest is in the phase behavior of synthetic flexible polyelectrolytes such as sodium poly(styrene sulfonate). By varying the ionic strength of these aqueous solutions, with added barium chloride, we find a complex precipitation-like behavior with similarities to an upper critical solution temperature. It is found that increasing the ionic strength promotes immiscibility, such that higher temperatures are required to maintain a homogeneous phase, as seen above. We are currently using small-angle neutron scattering to probe the nanometer length scales and static and dynamic light scattering to examine single-chain and aggregation behavior upon approach to an unstable phase boundary.

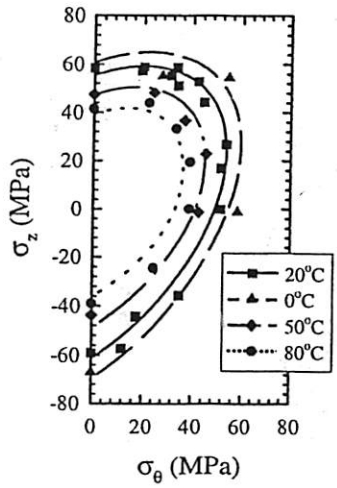
After graduation, I wish to pursue either post-doctoral work on biological systems or an industrial position with interests in transport properties of polymers. In the future I have hopes of returning to the collegiate atmosphere as a professor in a chemical engineering or material science program.

Yield and Failure Behavior of an Aliphatic Polyketone Terpolymer Subjected to Multi-axial Stress States

Nicole R. Karttunen (Advisor Alan J. Lesser)

The use of polymers in engineering applications has made the mechanical characterization of these materials under multi-axial stress states essential. Additionally, as many polymers incur some level of anisotropy during processing, it is important to consider this aspect as well. It is also crucial to consider the effects of strain rate and temperature since they have significant influence on the yield behavior.

My research has been on the multi-axial testing of an aliphatic polyketone terpolymer. Samples of this thermoplastic material are hollow cylinders which are anisotropic due to the extrusion process. Samples are subjected to multi-axial stress states by simultaneously applying internal pressure (with nitrogen gas) and an axial load (tensile or compressive). The pressure and load are increased proportionately to maintain a constant stress state throughout the test. By varying the ratio of load to pressure between the tests, a wide range of stress states can be achieved. Focus has been on the yield and failure behavior of the material, with studies on the effects of strain rate, temperature and stress state. In addition to these test parameters, the effects of processing conditions (e.g. extrusion rate and cooling rate) have also been investigated.



Yield locus predictions. Symbols represent experimental data, lines represent the model predictions .

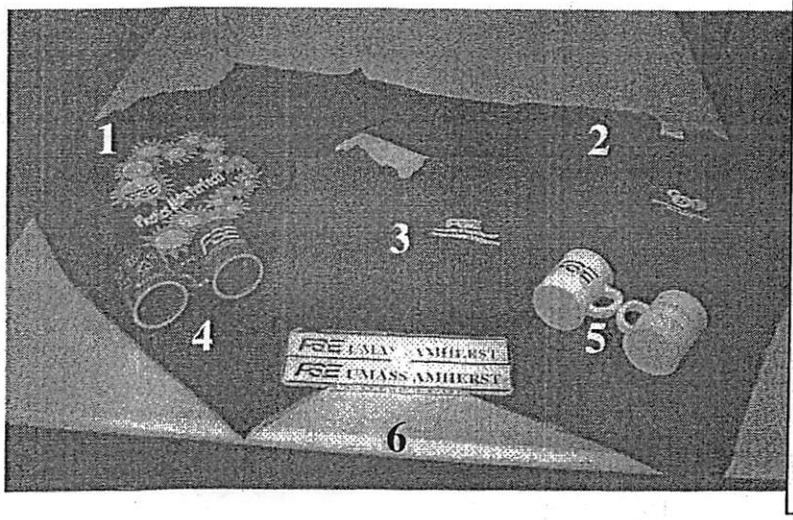
Several interesting observations have been made for the case of anisotropic material. For example, while it might be expected that the effects of temperature and strain rate on the principal yield strengths would be similar (time-temperature superposition), this is not observed. Rather, the temperature has a greater affect in the axial direction than in the hoop direction, while the effect of strain rate is greater in the hoop direction. By combining a yield model based on a thermally activated process with a continuum level model for pressure-dependent anisotropic materials, we have been able to apply a model to describe the yield locus, accounting for the effects of temperature, strain rate and stress state.

The processing conditions may affect the morphology of the material and may induce residual stresses. Such alterations, in turn, affect the mechanical behavior of the material. Research is ongoing to understand the process/property relationships in this important class of new polymers.

I plan to complete my research in about one year. Following graduation, I would initially like to work in industry R&D, and possibly in academia later in my career.

PSE Memorabilia

See enclosed envelope for ordering information, fill in the order form, and mail the self-addressed envelope back to us. Feel free to ask any questions. Order yours today!



1 Navy blue short sleeve tee shirt with PSE in circles, Polymer Science & Engineering UMass Amherst on crest and "Plastics Makes Perfect" design on back; colors are yellow, white, aqua, and sky blue

2 Navy blue long sleeve tee shirt with same design as #1

3 Sweatshirt with official PSE Logo, University of Massachusetts and Polymer Science and Engineering on crest, available in forest green, navy blue, and maroon; printing is white

4 Maroon ceramic coffee mug with the 7 Recycling Symbols, the word "Recycle!", and official PSE Logo; printing is white

5 White plastic building dedication coffee mug with date and building name and official PSE Logo; printing is maroon

6 PSE UMASS AMHERST Bumper Stickers; printing is red

PSE OUTREACH and Education

"Polymers are all around us"

High School OUTREACH

The High School OUTREACH Program at the Polymer Science and Engineering Department was developed in 1995 by the PSE Club. OUTREACH focuses on introducing, educating and informing students from grades K-12 and college undergraduates about polymers and polymer science. The program consists of a lecture with various demonstrations geared to the audiences' age group. The OUTREACH Program is very flexible,

ranging from a purely show-and-tell lecture, where you demonstrate typical uses of polymer from soda bottles, to carpeting, to car side panel, to an in-depth discussion of polymers involving polymerization kinetics and viscoelastic behavior. Typically a lecture involves defining what a polymer is, leading to polymeric properties such as glass transition, and molecular weight then concluding with some interactive experiments. The experiments include many things from making super balls, to testing the super absorbency of poly(vinyl alcohol). The OUTREACH Program visits many of the area schools and has traveled as far away as Springfield, MA. The program can cater to basically any age and/or size group and the students truly enjoy the lecture and look forward to us coming back the following year. The OUTREACH Program has been very successful, and was the foundation for the ASPIRE Program.

ASPIRE

The goal of the ASPIRE Program is to teach high school students the basics of polymer science, give them an introduction into research and development, perform research with world class equipment, and spark interest into the sciences. The program was created, designed and is taught by PSE graduate students. The ASPIRE Program consists of five sessions held on alternating weekends. The program is designed for 10-12 students with experiments encompassing the broad aspects of polymer sciences. Each Saturday, high school students explore a different discipline of polymer science: chemistry, chemical engineering, materials science, and physics. Currently, the experimental areas of

investigation are step and chain polymerization, polymer structure and dynamics, mechanical properties, and polymer morphology. The day starts with a general lecture with topics relevant to that week's experiment. After the lecture, students spend approximately three hours performing experiments using techniques such as gel permeation chromatography, nuclear magnetic resonance spectroscopy, and scanning electron microscopy, which are not available in high school laboratories. Students are challenged to apply concepts learned from the lectures, and the experiments are adapted to each student's interests and strengths. The day ends with snacks and brief talks from graduate students about their personal paths to polymer science and their graduate school research. Currently, the graduate students are changing the experiments so as to give the experiments a more real world feel. For example, instead of spending one weekend on polymer engineering and the next on polymer morphology, our goal is to combine the two experiments, such as first fracturing a sample and then examining it with a scanning electron microscope.

Exploring the World of Plastics CD-ROM

MRSEC and the National Plastics Museum, in Leominster, Massachusetts, have collaborated to produce an interactive polymer CD-ROM designed for the general public to provide a brief description of some of the most important issues and topics found throughout the plastics industry. With the help of Richard S. Stein, William J. Vining, and Chemistry Higher Education Workgroup, the CD-ROM is now complete. The CD-ROM is grouped into categories including common plastics, polymers, processing, uses, recycling, and history. Within each category are interactive demonstrations such as chain polymerization, blowmolding, and the LAPD trying to

fracture polycarbonate. For example, under common polymer uses, one can choose space and discover various plastics incorporated into the spacesuits, or the Hubble Space Telescope. There are many other visuals and interactive demonstrations. The videos are well narrated. Currently, there is a drive to translate this information to the

World Wide Web. In the upcoming weeks there will be a link to the "*Exploring the World of Plastics*" site from the PSE MRSEC site www.pse.umass.edu/mrsec/edu.html. Due to the large size of the video files initially the web version will only have limited interactive videos. Also, there is a push for a second version of the CD-ROM designed for college and graduate level teaching. This CD-ROM will incorporate more technical information.

If you are interested in obtaining the CD-ROM "*Exploring the World of Plastics*" please send a check or money order for $10.00 made out to the National Plastics Center & Museum to cover the cost of the CD-ROM and shipping to:

National Plastics Center & Museum
210 Lancaster Street (Route 117)
Leominster, MA 01453

Teleconferencing

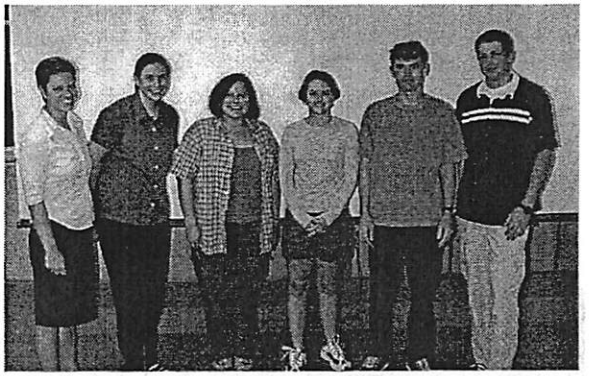
This past November, the PSE Department entered the 21st century with the first ever PSE polymer teleconference to New York's Plainview Elementary School and Boston's Latin Academy. The teleconference was also viewed at RPI, NY and Frontier Regional High School in Sunderland, MA. The OUTREACH Program assisted with the project. The teleconference consisted of an introduction by Professor Richard S. Stein on polymers, followed by interactive demonstration from both Plainview and Amherst on polymer chemistry and polymer physical properties. The teleconference was a great demonstration of how the PSE department can continue its educational OUTREACH into the new century. The OUTREACH Program hopes to continue the success of the teleconference with hopes of reaching schools beyond its current capabilities.

Science Days

This is a program sponsored by the Dean of Natural Sciences and Mathematics of the University of Massachusetts for high school students throughout the state of Massachusetts. This year over 800 students came from as far away as Cape Cod to participate in the three-day event. The students got the opportunity to see first hand what goes on at UMass. The students participate in lectures and tours of various departments throughout campus including astronomy, chemistry, and polymer science and engineering. The PSE Department plays an active role in this program. The department offers a number of student tours through the shared MRSEC facilities including XPS, NMR, mass spectrometer, and the microanalytical laboratory. Furthermore, this is used as an opportunity for the OUTREACH Program to be introduced to teachers and the opportunities of visiting schools throughout Massachusetts are discussed.

REU Program

The Research Experience for Undergraduate (REU) Program is a ten-week program targeting undergraduate college students, which focuses on current research in the PSE Department and is sponsored by MRSEC. Undergraduates get the opportunity to perform state-of-the-art research in collaboration with graduate students. The REU Program



began in 1998 and had five students from colleges throughout the US and the world. Last summer, the REU Program was expanded to 9 students and concluded with an REU symposium where students presented their results to the PSE community. Examples of the research done by the students last summer include studying ultrahydrophobic surfaces to behavior of DNA to computer modeling of grain growth in block copolymers. There are short abstracts for each student posted on the web on the MRSEC site www.pse.umass.edu/mrsec/edu.html#REU. With the success of Summer 1999, MRSEC is continuing to look for more qualified students. Your assistance in directing interested students to the program would be greatly appreciated, and applications for the program can be found on-line.

Snippets

Nanostructure Workshop

A one-day workshop on nanostructured materials was organized by MRSEC on May 12th, which was a series of talks involving reputed speakers. Among those who presented were Moungi Bawendi from MIT, Louis Brus from Columbia University, Craig Hawker from IBM Almaden Research Center, Galen Stucky from UCSB, Heinrich Jaeger from the University of Chicago, Paul Chaikin from Princeton University and Jim Watkins and Mark Tuominen, both from UMass, Amherst. Another significant MRSEC release this year is the CD-ROM titled *"Exploring the World of Plastics"* (pg. 9), in collaboration with the National Plastics Museum. More details about the workshop and other MRSEC activities can be found at www.pse.umass.edu/mrsec, which is a new web site launched on September 17th.

New Facilities

A lot of new facilities have been acquired in recent months. Among new MRSEC facilities are equipment to determine molecular weight (vapor pressure osmometer, high temperature gel permeation chromatography, ultracentrifuge) reputed to make this one of the best in the country for molecular weight determination and an STEM/AFM instrument to study surface science. Two high-pressure polymerization reactors were acquired by Dr. Penelle and Dr. Coughlin. The computer facilities have been added to enhance the network and also Dr. Muthukumar's labs. Other facilities include a high flux rotating anode x-ray generator with multilayer optics and a MALDI TOF mass spectrometer.

Newsletter Committee:
Co-editors: Jeremy Morin and Arun Raman
Contributors: Eileen Besse, Ann Brainerd, Bryan Coughlin, Richard Farris, Jehuda Greener, David Hoagland, Doug Howie, Nicole Karttunen, Hans Sup Lee, Mike Leonard, Alan Lesser, Jerome Parmer, Darrin Pochan, Vivek Prabhu, Joel Schall

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Lecture Series

This year, apart from the Dow Chemical Seminar Series, the 1999 Fraser Price Series had Dr. Ian Ward from Leeds University, UK, talking about *"Processing of Oriented Polymers."* 1999 also saw the third Richard Stein-Bayer Corporation honorary seminar. Dr. Robert H. Grubbs from California Institute of Technology talked about *"Polymer Synthesis with Late Metal Initiators."*

Departmental Kudos

The PSE Department was honored by the American Chemical Society this year as part of its "Global Salute to Polymers" Program. A commemorative plaque acknowledging the department's contributions to polymer science and engineering research and education was presented to Professor Richard Farris and Professor Emeritus Richard Stein during a recognition ceremony held in conjunction with the 1999 Spring CUMIRP Banquet. This year the department received a number one rating in *U.S. News & World Report's* Year 2000 rankings of "America's Best Graduate Schools" for the specialty category of polymer science.

Awards

Among the faculty, Dr. Frank Karasz was inducted into the Indian Academy of Sciences, Dr. Helmut Strey received the GenCorp Award, Dr. William MacKnight received the ACS Polymer Chemistry Award and Dr. Richard Stein, the Material Research Society von Hippel Award. Dr. Muthukumar was a Miller Fellow at UC, Berkeley. Among students, Lee Rockford received both the APS Division of Polymer Physics Padden Award and the GenCorp Award. Wei-Guo Hu received the Kenan Award from Union Carbide and the GenCorp Award. Terry Hobbs was awarded the EPA STAR Graduate Fellowship, Vivek Prabhu was awarded the NIH Chemistry-Biology Interface Fellowship and Arun Raman received the Santos Go Award.

1999 PSE Graduates

The following is a list of 1999 PSE graduates, their employer, advisor and dissertation title.

Duangdao Aht-ong
Chulalongkorn U, Thailand
Farris
Effect of Moisture on the State of Stress and Properties of Photographic Gelatin-Latex Coatings

Kelyn Arora
Procter & Gamble
Lesser & McCarthy
Preparation and Characterization of Microcellular Foams Processed in Supercritical Carbon Dioxide

Frederick Beyer II
Army Research Lab
Gido
The Morphological Behavior of Miktoarm Star and Multiple-Graft Block Copolymers

Emmett Crawford
Eastman Chemical
Lesser
Selected Studies on the Thermal and Mechanical Responses of Amorphous Glassy Polymers at Different Length Scales

Jennifer David
GE
Gido
The Synthesis and Characterization of Conformationally Asymmetric Diblock Copolymers

Susan Dawson
Eastman Kodak
Tirrell
Interfacial Self-Assembly of Polypetides and Molecular Recognition at a Monolayer Interface

Heather Hayes
Milliken
McCarthy
Heterogeneous Polymer Modification: Polyolefin Maleation in Supercritical Carbon Dioxide and Amorphous Fluoropolymer Surface Modification

Meng Che Hsieh
Imation Corporation
Farris & McCarthy
Polyelectrolyte Multilayer Assemblies: A General Surface Modification Technique for Initiating their Formation on Substrates and Determining their Mechanical Integrity

Wei-Guo Hu
Exxon
Schmidt-Rohr
Dynamics and Structure of Semicrystalline Polymers as Characterized by NMR, and their Relationship to Macroscopic Properties

Elbert Huang
IBM
Russell
Controlling Polymer Thin Film Structures by Tuning Interfacial Interactions

Gene Kim
Motorola
Farris & McCarthy
Material Properties of Novel Polymer Films

Edward Kung
GE
Lesser
Bulk and Surface Polymer Composites Prepared in Supercritical Carbon Dioxide

YuanQiao Rao
Eastman Kodak
Farris
The Evolution of Properties and Structure with External Stimuli in High Performance Fibers

Gregory Schueneman
Loctite Corp.
Lesser & Novak
Template-Directed Synthesis of Inorganic Heterogeneities and the Development of Ultrasonic Spectroscopy for the Analysis of Polymers

Jennifer Stewart
BASF
Farris & Novak
Synthesis and Characterization of Inherently Fire Safe Polymers: Chlorinated Bisphenol Based Polymers and Polycarbodiimides

Eric Welsh
NRL
Tirrell
Engineering the Extracellular Matrix: A Novel Approach to Polymeric Biomaterials

Dorie Yontz
Dow Chemical Company
Hsu
An Analysis of Molecular Parameters Governing Phase Separation in a Reacting Polyurethane Solution

Jonathan Zissu
Teaching
Muthukumar
The Effects of Salts on Polyelectrolyte Systems

A Penny for Your Thoughts

We are 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. You can email us at alumni@mail.pse.umass.edu, or fax the information to (413) 545-0082, or visit us on the web at www.pse.umass.edu/psecl/alumni.html for an online form along with links to a fax back form.

Name_____

Degree/Year Graduated_____

Advisor(s)_____

Address change_____

Suggestions, news, comments?

The Annex

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