



# POLYMER TECHNOLOGY CENTER

Summer 2010 Edition



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## New PTC Faculty, Dr. Karen Wooley of Chemistry Department

Dr. Wooley received her Ph.D. from Cornell University in 1993. She joined the Chemistry Dept. at Texas A&M University in July of 2009. For details see page 2.

## MARK YOUR CALENDAR FOR PTC'S UPCOMING CONFERENCES!

- **July 14th-APPEAL**  
@ Houston, TX
- **October 6th-SCRATCH**  
@ Detroit, MI
- **October 28th-29th - PTIC**  
@ Texas A & M University

The Scratch Behavior of Polymers Consortium (Scratch) and the Polymer Technology Industrial Consortium (PTIC) were held on April 8-9, 2010. The following companies were in attendance:

### Scratch Behavior of Polymers Consortium (Scratch) April 8, 2010

- Advanced Composites
- Axel Plastics
- Cadillac Products Packaging Co.
- Dow Chemical Co.
- ExxonMobil
- Kaneka Texas Corporation
- MyTex Polymers
- Phillips Sumika Petroleum Corp.
- Rio Tinto Minerals
- Washington Penn
- Whole Tree Inc.

### Polymer Technology Industrial Consortium (PTIC) April 9, 2010

- 3M
- Advanced Composites
- Bruker Optics, Inc.
- Cadillac Products Packaging Co.
- Dow Chemical Co.
- Hoerbiger Corp of America, Inc.
- Huntsman Corp.
- Kaneka Texas Corp.
- MyTex Polymers
- South Texas Section of the SPE
- Tokai Rubber Industries Ltd.
- Toyo Ink Mfg. America LLC
- Washington Penn
- Whole Tree Inc.

**Polymer Technology Center**  
Texas A&M University  
MS 3123  
College Station, TX 77843-3123  
Hung-Jue Sue, Director  
(979) 845-5024  
hjsue@tamu.edu  
Isabel Cantu  
(979) 458-0918  
icantu@tamu.edu or  
Website: <http://ptc.tamu.edu>





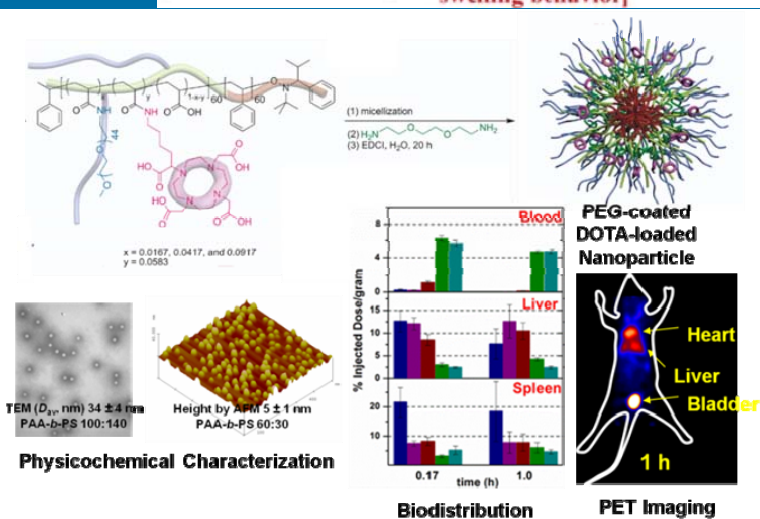
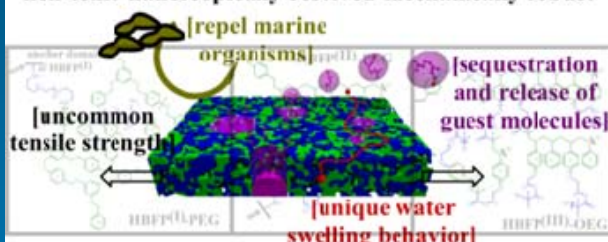
Dr. Karen L. Wooley,  
Chemistry Dept.

Our research activities combine organic syntheses, polymerization strategies and polymer modification reactions in creative ways to afford unique macromolecular structures, which have been designed as functional nanostructures, polymer systems having unique macromolecular architectures, and/or degradable polymers. The emphasis is upon the incorporation of functions and functionalities into selective regions of polymer frameworks. In some cases, the function is added at the small molecule, monomer, stage, prior to polymerization, whereas, in other cases, chemical modifications are performed upon polymers or at the nanostructure level; each requires a strategic balance of chemical reactivity and the ultimate composition and structure.

Fundamental and applied studies are leading toward the incorporation of various functions into polymer materials, including biological activity, imaging capabilities, drug or gene delivery performance, toxin sequestration, photo- or electro-activity, triggered destruction, chemical reactivity, anti-biofouling characteristics, among others. Covalent and non-covalent interactions are employed in the development of new synthetic methodologies for the construction of the materials. Rigorous physicochemical characterization and *in vitro* and *in vivo* biological evaluations are performed. Therefore, students gain broad experience and achieve expertise across disciplines, with a foundation based upon organic chemistry, and extensions into analytical, physical and biological chemistries and engineering. Current projects aim to: 1) develop polymer coatings and nanostructures that exhibit minimized non-specific biological interactions and maximized specific biological interactions to achieve non-toxic anti-biofouling performance, tissue-selective targeting, tissue engineering, *etc.*; 2) expand the types of discrete nanoscale objects that can be produced from the supramolecular assembly of programmed block copolymers and/or from the intramolecular assembly of sophisticated macromolecular architectures; 3) advance polymerization chemistries to achieve selective polymerization of multi-functional monomers; 4) incorporate function into degradable polymers and degradable units regioselectively into nanostructures; 5) design materials as hosts for the controlled packaging, transport and release of diagnostic and therapeutic agents; 6) engineer complex materials as highly sensitive and multi-modal imaging agents; 7) develop synthetic methodologies to control the size, shape, and composition of nanostructures and investigate their hierarchical assemblies.

## Dr. Karen L. Wooley Group Research focuses on “The Preparation, Investigation and Application of Complex, Functional Polymer Materials”

### Idealized HBFP-PEG Amphiphilic Crosslinked Networks non-toxic•nanoscopically-resolved•mechanically robust



Dr. Robert L. Browning

Bobby joined Dr. Sue's research group in May 2004 after completing a Bachelor's degree in Chemical Engineering at Texas A&M. His work is focused on the testing and characterization of polymer surface deformation. He obtained his Master's degree in Mechanical Engineering in May 2006 and will be awarded his PhD in Material Science and Engineering in August

2010.

Bobby was born and raised in Longview, Texas. He moved to College Station in August of 2000 after graduating Pine Tree High School in 1998 and earning an Associates degree from Kilgore College in 2000. He is currently searching for employment in the polymer industry, preferably re-locating outside of Texas.

Contact: Phone – (979) 777-2829  
Email – B\_Squared02@yahoo.com



## Scratch Behavior of Epoxy-Polyester Powder Coatings

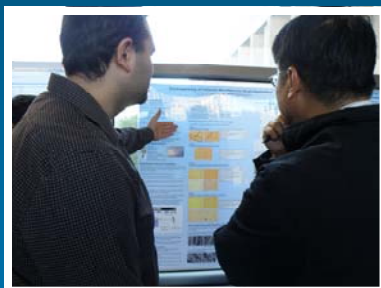
Dr. Massimiliano Barletta

June 1, 2010 @ ENPB Room 301

We investigated scratch behavior of epoxy-polyester powder coatings by surveying the impact of degree of cure on the coating adhesion of electrostatically applied coatings on a metal substrate. The thermoreological properties were studied during differential scanning calorimetry (DSC) and rheometry. The tensile and dynamic mechanical response of free-standing films were also investigated by electrostatic spraying of the powder onto a pre-coated stainless steel substrate using an intermediate layer of silicon-based heat surable release coating. Micro-scale depth sensing indentation and scratch tests on 'free-standing' coatings versus 'rigidly-adhering' coatings were also performed to pursue a structure-property relationship with regard to polymer coatings deposited on untreated and pre-treated substrates, as well as on intermediate layers of release coating. We establish a fundamental understanding on how the coating properties must behave to obtain desired coating performance.

## PTIC Student Poster Session Award Winners (April 8-9, 2010)

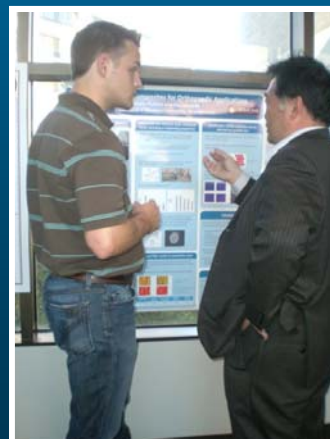
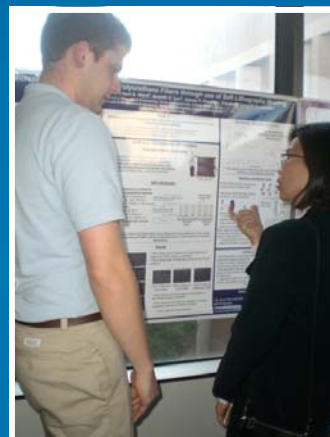
Name	MAJOR	Placed	Poster Title
Bobby Browning	MSEN	1ST	"The Effect of Illumination Angle on the Scratch Visibility of PVC"
Brennan Bailey	BMEN	2ND	"Inorganic-Organic Hydrogel Scaffolds for Tissue Engineering"
Sanjay Kalidindi	AERO	3RD	"Electric Field Manipulation of Cellulose Whisker-Reinforced Polymer Nanocomposites"



## Polymer Technology Industrial Consortium (PTIC) April 8-9, 2010

### Student Poster Session Participants

	Students Name	Major	POSTERS
1	Okan Ala	NEEN	"Methods for Fabricating Flexible Conducting Polymer Layers"
2	Brennan Bailey	BMEN	"Inorganic-Organic Hydrogel Scaffolds for Tissue Engineering"
3	Bobby Browning	MSEN	"The Effect of Illumination Angle on the Scratch Visibility of PVC"
4	Austin Cox	AERO	"Electrospinning of Cellulose Nanofibers for Smart Application"
5	Chungyeon Cho	MSEN	"Patterning Conformational Changes into Polyelectrolyte Multilayers"
6	David Dempsey	BMEN	"Micropatterning of Electrospun Fibers through Use of Soft Lithography Molding"
7	Pritha Ghosh	MEEN	"Shape Memory Polymers - Temperature Hysteresis: Characterization, Modeling and Simulation"
8	Melissa Giese	BMEN	"PEO-Modified Silicones with Enhanced Blood Protein Resistance"
9	Johannes Guenther	CHEM	"Chelate Phosphine Linkers with Long Alkyl Chains for Immobilizing Catalysts on Oxide Supports"
10	Cassie Hilliard	CHEM	"Phosphine Oxide Adsorption on Silica Surfaces"
11	Sanjay Kalidindi	AERO	"Electric Field Manipulation of Cellulose Whisker-Reinforced Polymer Nanocomposites"
12	Osit Karroonnirun	CHEM	"Ring-Opening Polymerization of Lactides Catalyzed by Natural Amino-Acid Based Zinc Catalysts"
13	Payam Khodaparast	AERO	"TiO <sub>2</sub> /PVDF Nanocomposites: Effect of Particle Surface Chemistry on"
14	Tao-Hua Lee	ECEN	"Hybrid Solar Cell Based on Semiconducting Nanomaterials"
15	Melanie Perera	CHEM	"Rigid Biphenyl and Tetraphenyl-element Linker Scaffolds that Prevent Interaction of Catalysts with Oxide Supports"
16	Kevin Plumbee	MEEN	"Novel UHMWPE Composites for Orthopedic Applications"
17	Uvege Priyadarshani	CHEM	"Synthesis of Terminally Functionalized Polyisobutylene Derivatives Via Diazonium Salt Intermediates"
18	Stacy Prukop	BMEN	"Shape Memory Polymers with Silicon-Containing Segments"
19	Sandani Samarajeewa	CHEM	"Enzymatic Degradation of Poly(Lactic Acid) Based Nanoparticles"
20	Ritu Shrestha	CHEN	"Thermally Triggered Shape Deformation and Retention of Shell Crosslinked Nanoparticles"
21	Nirmal Shankar Sigamani	AERO	"Characterization of Polyurethane at Multiple Scales for Sand Particle Erosion"
22	Dawei Zhang	MSEN	"Shape Memory Foams Based on Silicon-Containing Polymers"





**Consortium for Advancing Performance Polymers in Energy Applications—  
 APPEAL**

Oil field applications are among the most strenuous and grueling conditions for materials, but also offer the largest opportunities for improvements. The use of advanced polymers in traditional engineering applications has already grown significantly, particularly with materials such as polyimides (PI), poly(phenylene sulfide) (PPS), poly(phenylene oxide) (PPO), poly(ether sulfones), and poly(ether ether ketone) (PEEK). However, there has been very limited characterization of these materials in high demand applications, such as high pressure, high temperature, or corrosive environments, and this has greatly limited the ability to incorporate them in design.

The Consortium for Advancing Performance Polymers in Energy Applications (APPEAL) was formed to combine the resources of industry with the knowledge base of academic facilities in an effort to develop fundamental knowledge of these unique materials, as well as to give design and production insight for product development. The Consortium allows members to directly voice their opinions and make suggestions about what needs to be done to benefit their interests. All findings are the immediate intellectual property of all members within the group and all subsequent production is royalty free. Texas A&M University has already shown a strong desire to establish Texas as the leading knowledge center for advanced polymers in oil applications in the world. Combining this interest with the experience of Prof. Hung-Jue Sue and Dr. Tim Bremner, Vice President of Advanced Engineering & Materials Technology, Hoerbiger Corporation of America, Inc. the co-directors of the Consortium, the potential for significant gains in both knowledge and application is limitless.

**June 3, 2010 meeting w/  
 companies in attendance:**

- Automated Dynamics
- Baker Hughes
- FMC Technologies
- Greyhill
- GE Oil & Gas
- Halliburton
- Hoerbiger
- National Coupling
- Oil States Industries
- SBM-Offshore, Inc.
- Smith International
- Teledyne Scientific

**The Appeals Consortium will have a second meeting on July 14th, 2010 from 9-2 at a downtown Houston location:**

Texas A&M Institute of Bioscience & Technology  
 2121 West Holcombe Blvd.  
 Houston, TX 77030  
 Board Room /Room 1119 on the 11th floor

Parking is available across the street from the main entrance to this building, on the corner of Holcombe and Pressler Street, if you are interested in attending, please contact Mr. Barton Scarbrough at: barton.scarbrough@hoerbiger.com.

## TAMU NEWS

### TAMU Graduates

A record number of graduates crossed the stage - TAMU had more than 6,000 - during the five degree-granting ceremonies on Friday and Saturday, May 14-15, 2010.



### TAMU TUITION INCREASE

Texas A&M's tuition will go up by 2.8 percent this fall, or \$4.81 per semester credit hour, which comes out to an average increase of \$104.70. Comparatively, A&M has the smallest such increase for any major public university in the state. According to College Board, the average college tuition for a public four-year university in 2010 is \$7,020, which is a 6.5% increase from last year. Students will also pay, on average, from \$377 to \$420 more than last year for this year's room and board, depending on the type of college they attend. Although students can expect tuition increases every year, President Loftin responds to the increase with a positive outlook: "As I have said many times, our goal is to continue being recognized as a best value, while maintaining the academic excellence for which we are well-known".

### TAMU Budget Cuts

Texas A&M has been directed to outline plans for cutting as much as 10 percent of our state budget for the next two years as requested by the Legislative Budget Board, in addition to the 5 percent cut that TAMU has planned for the current biennium. TAMU does not yet know the exact dollar amount of the fiscal year 2012 and 2013 cuts, but, since the vast majority of state budget goes to support personnel, it is highly likely that any further reductions will affect some in our Aggie Family. President Loftin states that "we will do our best to minimize the impact of these cuts on our fundamental mission of teaching, research and service."

## PTC News

### SPE FELLOW



On Sunday, May 16th, Dr. Sue was recognized as an SPE fellow at the SPE Society's 68th Annual Technical Conference (ANTEC 2010) in Orlando, Florida.

Dr. Nicole Zacharia is awarded grant from Texas Space Grants Consortium



PTC congratulates Dr. Nicole Zacharia, assistant professor in the Department of Mechanical Engineering at Texas A&M University, for receiving a new grant from the Texas Space Grant Consortium New Investigator Program for her polyelectrolyte thin film research.

Zacharia will work on "smart" textiles, which can be used to incorporate functionality into uniforms. These functionalities include actuation, sensing and health monitoring, protection to environmental stimuli, and power storage. This work will focus on electrically conducting films and simple electrochemical cells on various types of textiles. Electrical functionality in textiles will be crucial to the next generation of uniforms and clothing for any number of applications, such as integrating sensors and batteries into uniforms for military use, for workout clothing that can sense biological functions, or for health monitor for the elderly. One problem with existing methods is in the poor stability of most conductive polymer coatings, or the loss of flexibility and increase in weight when stiff metal threads are woven into the textiles. Polyelectrolyte multilayers provide a platform for perfectly conformal coatings with mechanical properties matched to those of the substrate, potentially minimizing damage due to delamination or cracking. Zacharia will use a scalable spray deposition technique in collaboration with Svaya Nanotechnologies.

Zacharia joined the Texas A&M Engineering faculty in August 2009. Her research interests are in the areas of responsive soft and colloidal materials; biomimetic properties such as self-healing and self-repair in thin films; polyelectrolyte multilayers and their properties; soft lithographic and other patterning techniques; and colloidal systems, especially asymmetric particles such as Janus particles. The TSGC New Investigator Program, established in 2003, is designed to assist in professional development of faculty members or researchers who strive to begin a career in research.

### Dr. Jaime C. Grunlan was named recipient of the 2010 Carl Dahlquist Award



PTC congratulates Dr. Jaime C. Grunlan for receiving the coveted 2010 Carl Dahlquist Award from The Pressure Sensitive Tape Council (PSTC). PSTC presents the Dahlquist Award to one speaker during its annual technical conference. The recipient, following the evaluation of a panel of judges, demonstrates the very best in research relating to adhesive tape technology.

Dr. Grunlan is an assistant professor in the Department of Mechanical Engineering at Texas A&M University, with a joint appointment to the Artie McFerrin Department of Chemical Engineering and the university's Materials Science and Engineering Program. He received a bachelor's degree from North Dakota State University and a Ph.D. from the University of Minnesota.

# PTC Faculty



# SPE Student Chapter

## SPE Officer election for 2010-2011

Name	E-mail Address	Office #
Perla Balbuena	<a href="mailto:Balbuena@tam.u.edu">Balbuena@tam.u.edu</a>	979-845-3375
Dave Bergbreiter	<a href="mailto:bergbreiter@tam.u.edu">bergbreiter@tam.u.edu</a>	979-845-3437
Janet Bluemel	<a href="mailto:bluemel@chem.tam.u.edu">bluemel@chem.tam.u.edu</a>	979-845-7749
Tahir Cagin	<a href="mailto:cagin@che.tam.u.edu">cagin@che.tam.u.edu</a>	979-862-1449
Elena Castell-Perez	<a href="mailto:ecastell@tam.u.edu">ecastell@tam.u.edu</a>	979-862-7645
Xing Cheng	<a href="mailto:chengx@ece.tam.u.edu">chengx@ece.tam.u.edu</a>	979-845-5130
Zheng D Cheng	<a href="mailto:zcheng@tam.u.edu">zcheng@tam.u.edu</a>	979-845-3413
Abraham Clearfield	<a href="mailto:a-clearfield@tam.u.edu">a-clearfield@tam.u.edu</a>	979-845-2936
Terry Creasy	<a href="mailto:tcreasy@tam.u.edu">tcreasy@tam.u.edu</a>	979-458-0118
Donald Darensbourg	<a href="mailto:d-darensbourg@tam.u.edu">d-darensbourg@tam.u.edu</a>	979-845-5417
Jaime Grunlan	<a href="mailto:jgrunlan@tam.u.edu">jgrunlan@tam.u.edu</a>	979-845-3027
Melissa A. Grunlan	<a href="mailto:mgrunlan@tam.u.edu">mgrunlan@tam.u.edu</a>	979-845-2406
Wayne Hung	<a href="mailto:hung@tam.u.edu">hung@tam.u.edu</a>	979-845-4989
Helen Liang	<a href="mailto:hliang@tam.u.edu">hliang@tam.u.edu</a>	979-862-2623
Anastasia Muliana	<a href="mailto:amuliana@tam.u.edu">amuliana@tam.u.edu</a>	979-458-3579
Ozden Ochoa	<a href="mailto:oochoa@tam.u.edu">oochoa@tam.u.edu</a>	979-845-2022
Zoubeida Ounaies	<a href="mailto:zounaies@tam.u.edu">zounaies@tam.u.edu</a>	979-458-1330
K.R. Rajagopal	<a href="mailto:kraiajopal@tam.u.edu">kraiajopal@tam.u.edu</a>	979-862-4552
J.N. Reddy	<a href="mailto:jnreddy@tam.u.edu">jnreddy@tam.u.edu</a>	979-862-2417
Cris Schwartz	<a href="mailto:cschwartz@tam.u.edu">cschwartz@tam.u.edu</a>	979-845-9591
Dan Shantz	<a href="mailto:shantz@tam.u.edu">shantz@tam.u.edu</a>	979-845-3492
Erik Simanek	<a href="mailto:simanek@tam.u.edu">simanek@tam.u.edu</a>	979-845-4242
Hung-Jue Sue	<a href="mailto:hjsue@tam.u.edu">hjsue@tam.u.edu</a>	979-845-5024
Steve Suh	<a href="mailto:ssuh@tam.u.edu">ssuh@tam.u.edu</a>	979-845-1417
Jyhwen Wang	<a href="mailto:jwang@tam.u.edu">jwang@tam.u.edu</a>	979-845-4903
John Whitcomb	<a href="mailto:whit@aero.tam.u.edu">whit@aero.tam.u.edu</a>	979-845-4006
Karen L. Wooley	<a href="mailto:wooley@tam.u.edu">wooley@tam.u.edu</a>	979-845-4077
Nicole Zacharia	<a href="mailto:nzacharia@tam.u.edu">nzacharia@tam.u.edu</a>	979-845-2204

The new offices for SPE were elected on May 3, 2010. We look forward to seeing you during the summer!

- President-Casie Hillard ([chilliard@mail.chem.tam.u.edu](mailto:chilliard@mail.chem.tam.u.edu)) (PhD student Chemistry)
- Vice-president-Payam Khodaparast ([p.khodaparast@gmail.com](mailto:p.khodaparast@gmail.com)) (PhD student MSEN)
- Treasurer: Geetha Chimata ( Master student MEEN)
- Secretary: Kevin Plumlee (PhD student MEEN)
- Web Coordinator: Johannes Guenther (PhD student CHEM)
- Publicity Coordinator: Melanie Perera (PhD student CHEM)
- Activities Coordinator: Peng Pianoliu (PhD student MEEN)
- CHEN Representative: Jennifer Carvajal
- MEEN Representative: Kevin White
- CHEM Representative: Jacqueline Pope
- AERO Representative: ---tba
- BMEN Representative: ---tba



Casie Hillard, President of SPE Student Chapter



## SPE President receives recognition

Jennifer Carvajal Diaz, President of the SPE Student Chapter at Texas A&M University, was recognized for her dedication to the position during the PTIC meeting on April 9th. To receive this honor was her husband Diego Cristancho, PhD in chemical engineering, currently working at Dow Chemical.



Dr. Jia "Daniel" Liu

Speaker: Daniel Liu, MSEN graduate (2009)  
Exponent – Engineering and Scientific Consulting  
May 20, 2010 @ 5:30 p.m.  
Room: 256 Jack E. Brown building

Abstract: Exponent is a leading engineering and scientific consulting firm. Exponent specializes in failure analysis, accident investigation and technical consulting for our clients' most challenging problems in a broad array of disciplines, including Mechanical Engineering and Materials Science, Thermal Sciences, Vehicle Engineering, Defense Technology Development, and Biomechanics. Consultants are expected to quickly understand a client's technical issues, determine root causes and provide technical guidance. This talk will present actual case studies and describe the role of the consulting engineer.

## Polymer Specialty Certificate Updates

<b>Students that have applied for Certificate</b>	<b>18</b>
<b>Students that have received the Polymer Specialty Certificate</b>	<b>14</b>

**For more information:**

<http://essap.tam.u.edu/polymer.htm>

**PTC Newsletter prepared by: Isabel Cantu**  
**Edited by: Zhen Liu and Kevin White**