

Catalyst

ChemE Students Take Research from Lab to Market

Savvy investors know that a small fraction of good ideas become successful products. Yet, some risk-taking entrepreneurs and investors find the potential to have impact on society and gain big financial return irresistible. The Chemical Engineering department has been working with partners across campus to help our faculty and students learn to translate a research idea into an innovative product.

Taking the grand prize

In April 2013, ChemE students in the PolyDrop team received the \$10,000 grand prize in the Environmental Innovation Challenge for their novel conductive polymer additives that optimize lifetime, adhesion, and mechanical and electrical properties of conductive paints. After several years collaborating with Boeing, Professor Danilo Pozzo, their advisor, understood the need for conductive paints to dissipate charge. The lightweight polymeric additives PolyDrop sought to develop would allow paint to conduct electricity at a much lower weight than metal-filled paints. The team worked in Professor Pozzo's lab for 9 months to develop, test, and formulate the additive as an easy-to-integrate product for painting aircraft and other vehicles built from carbon fiber reinforced composites. They also developed and pitched a business plan for Polydrop.



ChemE seniors Odin Jacobovitch, Scott Landro, Heather Milligan, Naomi Miyake, and Volha Hrechka celebrate their team's success.

The seniors were inventing and testing new technologies as part of an

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ChemE Welcomes New Assistant Prof Cole DeForest



Cole DeForest will join the ChemE faculty this January.

ChemE continues to grow, this year with the addition of new faculty member Cole DeForest. Professor DeForest brings expertise in the areas of biomaterials, stem cell biology, and protein engineering. "Cole's excellent training, demonstrated research creativity, and ability to articulate ideas are the hallmarks of an outstanding faculty member," said Daniel Schwartz, department chair. "His collaboration with the UW School of Medicine Institute for Stem Cell and Regenerative Medicine means he is part of a team that has the ability to turn promising research results into technologies that improve human health. He is poised to become a leader in the biomaterials and tissue engineering field."

DeForest considers UW to be the premier university for biomaterial-based science and notes that "UW Chem E possesses an unrivaled sense of camaraderie and collaboration, both critical in tackling 'big' research problems such as those related to human health." Reflecting on the ways his

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Message from the CHAIR

Just over four years ago, when I took over as Chair of the department, we were entering dark times for the state's finances and our student's job prospects. Yet, all of us in Benson Hall knew there were several things that had to get done to keep our students moving forward. Foremost was implementing our reformed molecular and nanoscale curriculum. Next, the department needed to partner with, benefit from, and influence, the campus initiative in molecular engineering. Finally, we needed to build new resource streams to counter fickle government funding. As I prepare to finish my term as Chair, I am happy to report all of these things have happened.



Daniel T. Schwartz

Our faculty modernized the ChemE curriculum with two new required courses, two revamped courses, new modular content, and the creation of a new transcript-recognized nanoscience and molecular engineering degree option. We have also added an entrepreneurial design project track for seniors. In our recent ABET accreditation review, we received top marks for the reformed curriculum.

Because of the molecular engineering initiative, ChemE was able to hire two new faculty, and both are located in the beautiful new Molecular Engineering building. As the State has emerged from the doldrums, we've seen a boost to engineering enrollment and funding, enabling us to hire a third faculty member and recruit again this year. We now have more faculty and students than at any time since I arrived 22 years ago.

Finally, our generous donors rallied to support our students as they saw that slumping state support meant a rising tuition burden. Thank you! At the same time, we are growing our Masters degree in a way that helps the department bottom-line and spreads the influence of our education farther.

It has been exciting being Chair, and I look forward to Dean Bragg's announcement of my successor.

Contact Chair Schwartz at chechair@uw.edu

PolyDrop *(Continued from cover)*

innovative senior capstone design course that is focused on product innovation. The new capstone experience was first piloted by Professor Dan Schwartz in the 2011-2012 academic year with a single student team. This academic year, there are six undergraduate teams working on projects proposed by five faculty members.

Laying the groundwork

As part of the product innovation capstone, the PolyDrop team was expected to prepare a research plan and budget, then secure support from Chemical Engineering's discretionary fund, the College of Engineering Capstone fund, and the Buerk Center for Entrepreneurship. In an interview with the College of Engineering (COE), team member Landro recalls their motivation, "If you don't have funding, you don't have a project." The team was awarded more than \$5,000 to conduct the experiments that could make their proposed product a reality.

Technical success is part of the equation, but students also learn to assess the economic potential of their technology and communicate their ideas clearly. As participants in the Challenge, the students demonstrated their technology to more than 100 judges with diverse professional backgrounds, and then engaged in Q&A. From the students' perspective, the critical element was to "talk to judges, make sure they leave knowing what you do, why you do it, how it's good for the environment." From the judges' perspective, as described by the Buerk Center's Connie Bourassa-Shaw, student teams get a "reality test" of the viability of the engineering problem, solution, and market opportunity.

PolyDrop's Heather Milligan explains to COE interviewers how the innovative product design capstone course required the students to master teamwork. "We worked with product development, we worked in the lab, we worked with the university community, we worked on building relationships. The combination of all of that really allowed your engineering expertise to shine through and helped foster more innovation."

Where is PolyDrop now?

PolyDrop finished the academic year on a roll. They won additional prizes, and fielded inquiries from major paint and chemical companies. Professor Pozzo saw the experience as a true motivator for students. "It actually allows the student to get some significant coaching on what it takes to develop a new venture . . . It sparked the entrepreneurial instinct in some of these students – a hypothetical company that they were exploring turned into something that could be real." Volha Hrechka chose to dedicate the year after graduation to PolyDrop.

Six months after graduation, Hrechka continues to work in Professor Pozzo's lab on polymeric additive formulation and testing. Though she deferred regular ChemE employment, she receives a modest paycheck as a UW Commercialization Fellow. PolyDrop is now a registered Washington State Corporation, and Hrechka is out pitching PolyDrop to potential investors. She has also interviewed seasoned professionals for possible leadership roles in the company. And most exciting, PolyDrop is now negotiating its first outside funding. Once funded, PolyDrop will leave the university as a newly fledged start-up company.



PhD students Michael Lombardo, Trevor Braun, Honorio Valdes, and Andrew Sinclair prepare for their leadership role in Capstone Design.

See PolyDrop, next page

DeForest *(Continued from cover)*

research focus aligns with the department's diverse expertise, he says "I expect that aspects of the biomaterial systems I develop will find utility in the clean-tech sector, just as the nanosciences will shape how we approach cell culture."

Formally trained as a chemical engineer, DeForest brings additional expertise in material science, organic synthesis, polymer chemistry, bioengineering, biophysics, protein engineering, and photochemistry. His postdoctoral research at the California Institute of Technology with Professor David Tirrell focused on the development of a novel class of engineered protein therapeutics whose delivery profile can be dictated precisely with light and offers promising new avenues in needleless-treatment of chronic illness and early-stage detection of disease.

DeForest obtained his Ph.D. at the University of Colorado at Boulder where he was part of Professor Kristi Anseth's laboratory. There he developed novel polymer-based hydrogel materials for use in regenerative medicine and tissue engineering applications and also published work in journals including *Nature Materials*, *Nature Chemistry*, and *Angewandte Chemie*. He earned his bachelor's degree in Chemical Engineering from Princeton University in 2006.

After growing up in Boulder, Colorado, which gave him "a deep appreciation for the solitude offered by the outdoors," he spent the last 1.5 years in Los Angeles, where he "developed a taste for the cultural amenities afforded by a large, coastal metropolis." He describes his move to Seattle as a chance to partake of both worlds. After a brief holiday in South America, he will be heading up the coast to join us in January 2014.

When he joins us, he'll bring one of the biggest of the big questions: "How can we exploit chemistry, material science, and stem cell biology to aid in human health?" Our students are eager to join him in his pursuits and DeForest looks forward to teaching and mentorship with delight. "One of my favorite things in life is helping to play a part in the 'eureka' moment for a student. Whether it is implementing a tricky equation in MATLAB, solving the steady-state approximation for a reaction-diffusion problem, or determining what one wants to do after their degree, there is nothing that makes me happier than to see that satisfactory 'I get it!' smile!" ■



An illustration of the concept of using photochemical reactions to modify material properties locally so as to guide stem cell differentiation spatially in 3D.

PolyDrop *(continued from page 2)*

Scaling up the product innovation capstone

In 2012, Professor Schwartz landed a three-year Department of Education grant that funds four Ph.D. student assistants each year to help scale-up this teacher-intensive capstone experience, making it available for 30% of each senior class. As a bonus, the four Ph.D. students gain unique project management experience working with their teams. The goal of the course is to educate great chemical engineers. But if the fire of innovation is stoked in a few entrepreneurial graduates each year, the world will be a better place. For Volha Hrechka, PolyDrop didn't end at graduation, but gave rise to an entrepreneurial project that might just produce one of the hot, new start-ups of tomorrow. ■

Faculty Honors

François Baneyx was named a 2013 Fellow of the American Association for the Advancement of Science.

James Carothers was a 2013 recipient of the Sloan Research Fellowship in Computational and Evolutionary Molecular Biology.

David Castner is a newly elected member of the Washington State Academy of Sciences and has also been named an Honorary Member of the American Vacuum Society.

Brad Holt was appointed Associate Chair of the ChemE Department.

Samson Jenekhe received the College of Engineering's Faculty Innovator Award for Research and is also a newly elected member of the Washington State Academy of Sciences.

Shaoyi Jiang was the co-organizer of the International Conference on Bioinspired and Zwitterionic Materials (ICIZM 2013) in Hangzhou, China. Professor Jiang and **Buddy Ratner** published in the journal *Nature Biotechnology*.

Mary Lidstrom was elected to the National Academy of Sciences, among the highest honors a scholar can receive, and was awarded the 2013 American Society for Microbiology Proctor and Gamble Award.

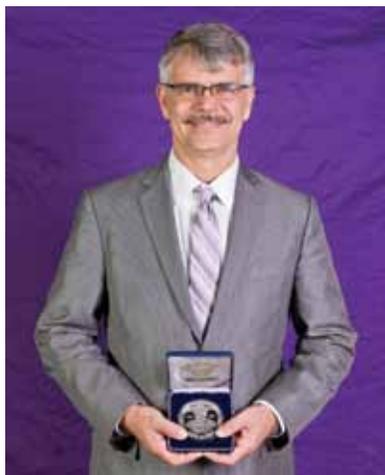
James Pfaendtner was named a UW Distinguished Teaching Awardee and was selected to take part in the NAE's Frontiers of Engineering Education Symposium.

Danilo Pozzo received the DOE's 2013 Early Career Award and was chosen a UW Outstanding Undergraduate Research Mentor.

ChemE faculty honored newly-retired Professor **Larry Ricker** by their support of an Emeritus appointment. Congratulations!

Daniel Schwartz was appointed the Founding Director of the newly established Clean Energy Institute.

2013 Distinguished Alumnus in Industry, Ronald L. Litzinger



Ronald L. Litzinger, President of Southern California Edison, holding the R. W. Moulton Medal.

At the 2013 Chemical Engineering Graduation Ceremony we were honored to have guest speaker **Ronald L. Litzinger** (BS '81), this year's recipient of the department's R. W. Moulton Award for Distinguished Alumnus in Industry. The event was held in Kane 130, and Litzinger was pleased with the venue. Thirty-two years ago, he received his Bachelor of Science in Chemical Engineering in Kane Hall. An even fonder memory, thirty-six years ago, was walking into Kane Hall as an 18-year old freshman for his first college course—Pre-Calculus. At that time he admired the accomplishments of the Moulton award winners (and their black and white photos on the Benson display wall) and admits he never imagined he would find himself among their distinguished group. "Stay curious, take chances, and persevere," he advises the graduating seniors, "and you too could possibly come full circle to Kane 130."

Litzinger is president of Southern California Edison (SCE), which serves more than 14 million people in 15 counties of Central, Coastal and Southern California and is one of the nation's largest investor-owned electric utilities. Previously, Litzinger was chairman, president and chief executive officer of Edison Mission Group (EMG), the competitive power generation business of SCE's parent company, Edison International. He joined Edison as an engineer at SCE in 1986 and since has served in a variety of capacities throughout Edison International's companies.

Highlights of Litzinger's career include his instrumental role in getting EMG's Sunrise power plant in Bakersfield, California, online in less than a year, helping to ease the energy constraints of the California power crisis of 2000-2001. He also played an important role in helping EMG get back to financial strength from 2002 to 2004 and in architecting Edison International's 2004 strategic plan. Before joining Edison, Litzinger was an engineer for Texaco subsidiaries.

Litzinger earned a bachelor's degree in chemical engineering from the University of Washington and a master's degree in management from the University of Redlands. He is a member of the Visiting Committee at the University of Washington's College of Engineering. ■

NAME THAT ALUM!

Renowned as an inventor with 116 patents, this person is known as the "Father of Industrial Chemistry" in the 20th century. Who is this famous UW Chemical Engineering alumnus?

Send your responses to kyoneda@uw.edu by January 15, 2014 for a chance to win a \$25 Amazon gift card. Answer will be revealed in the next issue of Catalyst.

Leadership Seminar Stimulates Seniors' Career Aspirations

Alumni from across the career spectrum are part of this Fall's Leadership Seminars, including CEOs, directors, and engineers.

Nils Miller (PhD '92), GSB Environmental Strategy Senior Scientist, Hewlett-Packard Company

Norman Foster (PhD '79), Construction Manager, McKinstry

Tony Huang (BS '82), Director of Finance, Clorox

John Geil (BS '12), R&D Engineer, Proctor and Gamble

Tae Han (BS '98, PhD '03), Associate Director and Head of Clinical Pharmacology, Seattle Genetics

Spencer Reeder (BS '90), Senior Manager for Domestic and International Climate Programs, Cascadia Consulting Group

Stephen Lee (BS '84 in ChemE, Microbiology, and Chemistry), CEO, Draco Aerosystems

Matt McMullan (BS '98), Area Manager, NALCO

Burton Brooks (BS '52, MS '54), Chairman and President, Chemithon Corporation

Brian MacArthur (PhD '77), Vice President, Operations, Chemithon



Leadership Seminar Speaker Norman Foster (center) visits with Chair Daniel Schwartz (left) and Professor John Berg.

UW Distinguished Alumni Veteran Award

On November 11th, Veterans Day, **Charles Matthaei**, veteran and ChemE class of 1943 alumnus, was presented with the UW Distinguished Alumni Veteran Award. The Veteran's Day Ceremony capped off a week of events held to show appreciation for veterans and active-duty members of the UW community. The series of events were organized by the UW Alumni Association in coordination with ROTC units, the Husky United Military Veterans RSO, and many veterans in the UW community.

Matthaei began attending the UW in 1938 and was called to active duty when the U.S. entered World War II. For much of the war he was stationed on the battleship USS Missouri.

He has maintained strong ties to our department. He established the Charles W. H. Matthaei Endowed Professorship in Chemical Engineering in 2001 and was the 2003 recipient of the ChemE Distinguished Alumnus Award. ■



Charles "Chuck" Matthaei (from left) with grandson and ChemE graduate student James Matthaei, UW President Michael Young, and U.S. Senator Patty Murray.

Inaugural Bruce A. Finlayson Lecture Features President Eric Kaler

In May 2013, all alumni were invited to ChemE's inaugural Finlayson Lecture to honor Rehnberg Chair Professor Emeritus and Former Chairman of Chemical Engineering **Bruce A. Finlayson**. Finlayson taught chemical engineering and applied mathematics at UW for 38 years, and was chair of the department from 1989 to 1998.

The lecture featured former UW Chemical Engineering faculty member and current President of the University of Minnesota, **Eric W. Kaler**. Kaler presented a research lecture, "Surfactant Microstructures," and a public lecture, "The Future of the American Research University." Dr. Kaler is one of the nation's foremost experts in complex fluids, with applications in drug delivery, food processing, pharmaceuticals, and manufacturing. He is the former dean of the University of Delaware's College of Engineering and former provost at Stony Brook University in New York. ■



Rehnberg Chair Professor Emeritus Bruce A. Finlayson (left) and guest lecturer Eric W. Kaler, President of the University of Minnesota.

Inspire New Ideas – Support ChemE

An engineering education is out of the financial reach of many talented students. Endowed scholarships and fellowships assist with support for tuition, books, and fees. They also help us attract the nation's brightest students and keep our Chemical Engineering department competitive with peer engineering schools across the nation.

You can help secure a student's future by supporting Chemical Engineering. Private support is essential to our success. Endowed scholarships, fellowships, professorships and chairs, along with flexible unrestricted gifts, can translate into real opportunities for our students and faculty.

Planned gifts provide creative and flexible strategies for your estate and charitable planning – they can include bequests, real estate and annuities. Some planned gifts provide you with income and many can reduce your taxes. The greatest benefit, however, lies in knowing you are supporting the work in Chemical Engineering and ensuring our students have access to a wonderful chemical engineering education.

To learn more about supporting Chemical Engineering with a gift, planned or otherwise, please contact Halbe Dougherty-Wood at halbedw@uw.edu or (206) 685-9816.

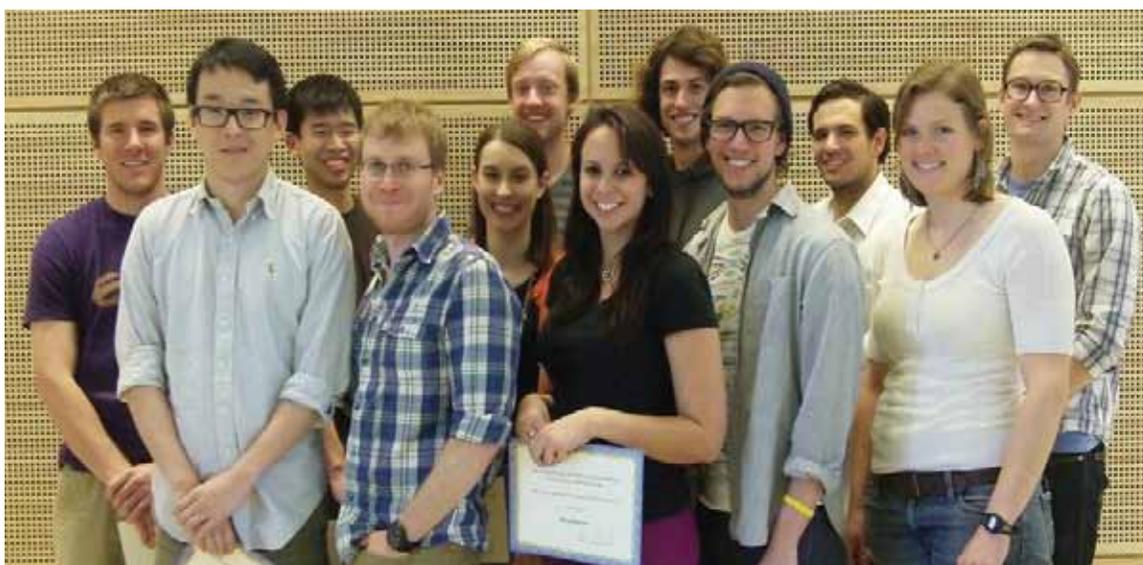
Guest Writer: Cori Bucherl

ChemE graduate student Cori Bucherl will soon depart on her travels as a 2013 Bonderman Fellow. The prestigious Bonderman Fellowship poses a unique question to its applicants, "Where would you go if you had eight months to travel solo?"

I applied to UW's graduate school to research renewable energy. As I progressed through the first couple years, I slowly accepted that a research career would not be my main contribution to saving the world. A Master's degree in ChemE is my academic end point and I intend to use it to pursue sustainable engineering. However, simply living in Seattle (after 22 years in Indiana) opened a world of experience about which I am incredibly excited. I learned that I am passionate about being in the mountains, about music and dance, and about exploring the intricacies of human interaction. When I received an email about the Bonderman Fellowship, it struck me as the perfect opportunity to challenge and cultivate these newfound passions. In short, this fellowship funds 8 months of solo travel with the exclusive purposes of exploration and self-discovery. It's an unbelievable and amazing gift made possible by University of Washington alum, David Bonderman. I am absolutely delighted and honored (and nervous) to be a recipient.

The Bonderman application process is extremely open-ended, so the travel plan is of my own devising. On December 29, 2013, I board a one-way flight to Peru, where I'll spend a month before moving on to Chile and Argentina for three more months. In May 2014, I fly to Thailand, my first opportunity for exploration in Asia. I will visit Nepal, India, Sri Lanka, and Indonesia during the remainder of my 8 months as a Bonderman Fellow. I plan to spend a lot of time near to and in the mountains. I want to learn firsthand about music, language, food and dance. I can't wait to experience the people, culture and history of places so entirely outside my realm of experience. In these situations, I'm so excited to study my own mind and how I interact with myself and with those around me. Overall, I expect that I will be surprised and that I will leave this journey with an entirely new perception of the world and our shared humanity.

After my incredible tenure as a Fellow, I will travel until I feel like returning to the US or until my own travel budget dwindles. I would love to live in Seattle (or the Pacific Northwest) and work in the sustainability sector as an engineer and educator. The end of 2014 is still a long time and a million unexpected experiences away, so we'll see what happens!



At the 2013 ChemE Awards Day Luncheon, graduate student award recipients smile for the camera.

Nano News!

It was a banner year for the Nanoscience and Molecular Engineering (NME) program. Started by Chemical Engineering Professor and Molecular Engineering & Sciences Associate Director for Education **René Overney**, the undergraduate track program now has more than 120 students from across the College of Engineering in its ranks, 51 of them from Chemical Engineering. This June, 27 graduating students received degrees in engineering with a specialization in Nanoscience and Molecular Engineering, the largest class to graduate since the first NME cohort of 3 students graduated just 2 years ago.

The participating departments also increased, with Electrical Engineering joining Bioengineering, Chemical Engineering, Mechanical Engineering, and Materials Science & Engineering, for a total of 5 departments offering the Nanoscience and Molecular Engineering degree track.

ChemE's recently-completed ABET accreditation review, masterminded by Associate Professor **Stuart Adler**, further outlines the significance of our entire undergraduate curriculum reform process. The ABET evaluator specifically cited as a strength our integration of molecular and nano-scale principles throughout the curriculum. No programmatic weaknesses were identified, a first for ChemE since ABET changed the evaluation process in 2000.

The graduating NME class presented posters at the annual UW Undergraduate Research Symposium where several rooms in Mary Gates Hall were dedicated to nanotechnology research. Three NME winners, BioE student Eric Do, MSE student Natalie Larson, and ChemE student Curtis Whittle were presented with an award certificate for their winning posters. ■



ChemE student Curtis Whittle, 2013 Nanoscience & Molecular Engineering Poster Awards winner, with Professor René Overney.

Graduate Student Honors

A highlight of our year was the inaugural Graduate Student Award Ceremony, brainchild of ChemE Graduate Program Coordinator and Rehnberg Chair Professor **Hugh Hillhouse**.

The event featured a presentation by 2013 Faculty Lecture Award winner, **Luo Mi**.

Other students presented with awards include:

Taeshik Earmme, Runner Up, Faculty Lecture Award

Greg Newbloom, 2013 High Impact Publication Award

Ann "Kasia" Nowinski, Best Oral Presentation

Benjamin Rutz, Runner-up, Best Oral Presentation

Mark Borysiak, Best Poster Presentation

Beau Richardson, Runner-up, Best Poster Presentation

Save the Date

Monday, September 15, 2014

WHY: We're celebrating **John Berg's** 50-year career at ChemE

WHAT: Reception and dinner

PLUS: John is making a scrapbook. Help us reminisce and reconnect by sending pictures of, and comments about, your time at UW for inclusion in the scrapbook. Electronic form preferred, and please label items with the approximate date and names of the people pictured.

Send pictures to:

Professor John Berg
Chemical Engineering
265 Benson Hall, Box 351750
Seattle, WA 98198

berg@cheme.washington.edu



Photo by Chris Sully

Members of the undergraduate class of 2013 gather together under the fountain and the mountain.

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Web site: www.cheme.washington.edu Reception: 206-543-2250

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ChemE Undergrads Explore Local Opportunities



ChemE juniors and seniors toured the Phillips 66 plant in Ferndale, WA to get a first hand look at downstream oil refining. In this photo, they pose with Phillips 66 process engineers including recent ChemE graduate Heather Milligan (far right).

2013 Distinguished Alumnus in Academia, E. James Davis



2013 Distinguished Alumnus *Professor Emeritus E. James Davis* enjoys ChemE Awards Day festivities with Professor François Baneyx. Davis was recognized as a leader in aerosol chemistry and physics and microparticle spectroscopy and optics.