Most people’s first impression of chemistry is that it’s really hard and really boring. More often than not, their impressions of chemists are even worse. We want to change that impression; how better than to throw a giant party? On that score, the inaugural CIA, “Chemistry is Awesome” party was deemed a huge success! Any current OSU student who had ever taken a Chemistry class was invited to attend. 500+ guests gathered in the courtyard behind Gilbert Hall for an evening of chemistry demonstrations, music, food and fun. Some of the demonstrations presented were heavier-than-air bubbles filled with carbon dioxide, fingerprints made visible on objects using iodine fuming, a thermite reaction and disappearing ink.

The biggest draw for students, though, was the dunk tank. Complete with Chemistry Professors, the Department Chair and even the Dean of the College of Science, taking one for the team and climbing in for a chance at a dunking. No one went home dry!

The Chemistry/Spy themed cake was provided by Imagine Cakes, a specialty cake business new to the Corvallis area. Soup samples were distributed by Soup Cycle volunteers. The rest of the food was made in house by a veritable army of volunteers.

Music was provided by The Svens, a self-described “cowboy poetry surf rock” group who is comprised mostly of chemists. The Svens are somewhat of a local icon around campus. You can usually catch them playing at Bomb’s Away Café on Monroe St, an experience we highly recommend.

With just a little over a month to plan and implement the CIA Party, we didn’t get to accomplish as much as we had hoped, but this year’s success gives us a great foundation for next year. We’re planning more explosions (safe ones of course), more hands-on demos, more food, more activities and best of all, more fun! Ideas are already being discussed for how to make next year an even bigger and better event.

“I want people to know that chemists come from all different walks of life; that anyone can be a chemist and that chemistry is fun,” Department Chair, Rich Carter told the Corvallis Gazette-Times. We’re hoping that this year will be a good start toward changing the preconceived notions of chemistry and chemists. If not, come back next year, we’ll keep showing you that Chemistry can be fun.
Dear Alumni and Friends,

It is an exciting time to be a part of OSU Chemistry. Since 2012, our Department has undergone tremendous growth – resulting in 12 new faculty hires (2012: David Ji, May Nyman, Sean Burrows, Michael Burand, Kristin Ziebart, Jeff Gautschi, 2013: Sandra Loesgen, Michelle Dolgos, Dipankar Koley, Paula Weiss, Chris Knutson; 2014: Judy Giordan). Additionally, we have seen our graduate student population swell to over 120 students – which represents the largest PhD program on the Oregon State University campus. We had our largest graduating classes this June (Page 15). We are proud of our amazing students and alumni – including our 2013-2014 Undergrads of the Quarter: Corinne Brucks, Stefan Lucchini, Chris Heron, Cassandra Lew, Chadd Armstrong and Michael Hughes (Pages 4-5). Leah Chibwe received ACS ENVR 100th Anniversary Emerging Leader Award (Page 7). Steve Sloop (1996 graduate) founded OnTo Technologies who have developed technologies to enable battery recycling (Page 12). Our faculty are accomplishing amazing things. Staci Simonich’s work on nitrated poly-aromatic hydrocarbons was published in Environmental Science and Technology (Page 10). Chong Fang’s work on unlocking aluminum chemistry was published in Proceedings of the National Academy of Sciences (Page 11). Walt Loveland received the 2014 Glenn Seaborg Award from the American Chemical Society – one of the highest awards bestowed in nuclear chemistry (Page 6). Paul Ha-Yeon Cheong received a 2014 National Science Foundation CAREER award (Page 6). Margie Haak was honored as a 2014 Women of Achievement by the OSU Women’s Center (Page 7). Mas Subramanian gave an inspirational Gilfillan Lecture on his discoveries throughout his career (Page 6). Doug Keszler has been named the Associate Dean of Research for the College of Science (Page 7). We are proud of our distinguished emeritus faculty Glenn Evans (Page 8) and Ken Hedberg (Page 9) who continue to contribute to the OSU Chemistry community. The Department is also a committed community outreach and is attracting the next generation of scientists to chemistry. We hosted our first annual Chemistry Is Awesome (CIA) Party to help attract those chemists and change the perception of chemistry in the community (Page 1).

The 2013-2014 Academic year has been an important one for charting the direction of the Department as we embarked on a year-long strategic planning effort. We had developed a draft public document, which we would very much like our alumni and friends’ feedback on so that we can craft the final version. You can read more about the process we have gone through and find a link to a web version of the draft document on Page 14.

We want to thank you for your interest and support of our program over the years. It is because of our amazing graduates that OSU Chemistry is regarded as one of the top Chemistry programs in the Northwest. We look forward to continuing to engage with our alumni. We hope you will stay in contact and stop by Corvallis when you can. We would love to see you!

All the best,

Rich

Staci Simonich
Mutagenic PAH’s

Aluminum
From Modern Metals Magazine

OnTo Technologies
Better Battery Recycling
David T. Wong Summer Internship for Chemistry Undergraduates!
Summer 2014 saw the first Chemistry Internship program. This program was developed to help connect Chemistry Majors with companies seeking interns. Our hope is that it will become a one-stop shop for Chemistry Undergraduates seeking research experience. For more information, please visit: http://chemistry.oregonstate.edu/content/osu-chemistry-internship-2014-summer-program

Chemistry Researchers: on the Cover

Associate Professor May Nyman’s laboratory was recently featured on the cover of Chemistry A European Journal for their work on the stability of uranyl polyoxometalates changes as a function of the encapsulated species, which was quantified by experiment and theory. For more information, see the Full Paper by M. Nyman, A. Navrotsky et al. http://onlinelibrary.wiley.com/doi/10.1002/chem.201400426/abstract

Nyman’s lab was also featured on the cover of the European Journal of Inorganic Chemistry for their work in the degradation of nerve gas upon encountering a net of polyoxoniobate Lindqvist ions. For more information, see the Full Paper by M. Nyman, et al. http://onlinelibrary.wiley.com/doi/10.1002/ejic.v2014.14/issuetoc

Paul Weatherford was born in Santa Barbara, California. He has had a fairly colorful resume that didn’t really include lab work until recently. In 1994, he moved to Corvallis to work as a wildland Firefighter and Hazmat response volunteer for Corvallis Fire. In 2003, he returned to school and worked intermittently as a Lab tech in one of the clean rooms at HP until completing his associates degree.

Paul accepted the position of Science Storekeeper in February 2014. In his spare time he is a PADI DiveMaster helping teach scuba diving and showing divers new areas to dive, and also volunteers at the Oregon Coast Aquarium as a research diver. He enjoys camping, fishing and spending time with his two daughters.

Loren Johnson, Chemistry’s newest Lab Preparator, was born and raised in the Black Hills of South Dakota. In 1980 he graduated from the South Dakota School of Mines and Technology in Rapid City South Dakota. His graduate research involved characterizing aluminum hydrolysis polymers.

As an ink chemist he helped design 3 chemlabs and contributed to over 10 patents. Later on he became involved in intellectual property helping identify patentable ideas, evaluating patents, helping engineers write disclosures, helping attorneys with technical aspects of patent applications, and developing and driving the overall IP strategy for the areas he was responsible for.

In his semi-retired hours, he likes to hike, bicycle, garden (ornamentals), read science fiction and build stuff from wood. Presently, he is a dabbler in things electronic, photography, stereoscopy, fishing, art (such as pottery and jewelry) and kayaking. He says, “Any day I can either learn something new or create something is a good day.”
Corinne Brucks grew up in the Beaverton area. She became interested in Chemistry at a young age (6-7th grade). One of the advantages she notes from being homeschooled was that she was able to devote considerable time to her interests in Chemistry. She wrote long reports on chemistry topics and read multiple books on the subject from her local library – including a book series on each element and “The Periodic Kingdom” which she particularly enjoyed. She initially enrolled at Cottey College in Nevada, Missouri where she got an Associate Degree in Science. It was a professor at Cottey (Dr. Ganga Fernando) who was a key mentor that got the ball rolling for Corinne, providing her first research opportunity and encouraging her to apply to summer undergraduate research internships. Corinne is particularly grateful to Dr. Fernando for her help. Corinne always planned to return to OSU to complete her BS degree because of the strong reputation for its science program, and she loves OSU and Corvallis. Her favorite classes so far at OSU have been Inorganic Chemistry (CH 411 & CH 412) and Dr. Ji has been her favorite Chemistry instructor. She has had multiple research opportunities at OSU. Her minor in computer science was inspired by a summer internship through our NSF Center for Sustainable Materials Chemistry (led by OSU Chemistry Professor Doug Keszler) in Professor Paul Cheong’s lab. Last summer, she completed another CSMC internship down at the University of Oregon in Professor Mark Lonergan’s lab. She is currently working on an Undergraduate Research, Innovation, Scholarship and Creativity (URISC) supported project with Professor Sean Burrows on applying MATLAB to create algorithms for making the best biosensors. After graduation, she wants to go to graduate school in Chemistry. Her dream job would be to be a professor where she can teach and do research. She comments that she “enjoys explaining concepts to people.” While not studying chemistry, Corinne likes to do ballroom dancing on campus. Corinne is another wonderful example of the high caliber students that we attract to OSU Chemistry and we are so proud of her successes.

Stefan Lucchini was born in Indiana where he lived for his first six years. He subsequently moved around (Florida then British Columbia then Washington DC) before finally settling in the Lake Oswego area 16 years ago. He wanted to come to OSU to take advantage of our in-state tuition and because he was interested in research. He has a deep commitment to giving back to society – believing that we exist for the sake of making societal progress (the idealized world of “Star Trek”). At OSU, he has been surprised how much the professors will do to foster his growth. He has worked particularly closely with Distinguished Emeritus Professor Darrah Thomas and Distinguished Professor Doug Keszler – commenting “I was surprised how important I was to them… they have been insanelly supportive.” In fact, his life-long goal is to “follow in the footsteps of Dr. Ken Hedberg and Dr. Thomas by continuing to do research as long as possible.” His favorite courses so far have been in the Physical Chemistry series and his favorite professor has been Professor Wei Kong. Professor Kong “stays true to the material, doesn’t dumb it down – very pure.” Stefan is already following through on his commitment to giving back to society by serving as an Undergrad Research Ambassador. He gives talks to new students to get them excited about science. Once he graduates he plans to get a masters degree in Chemistry before pursuing his PhD. After school he would like to first work in industry (his dream job is working at Intel), but would like to end his career as a professor. Stefan’s energy, passion and excitement are infectious. It is students like him that make OSU an amazing place and we congratulate Stefan for all his hard work!

Chris Heron has been selected as one of our Undergrads of the Quarter for Spring 2014. Chris was born in Corvallis, OR. Prior to coming to OSU, Chris was in the United States Army – serving 3 separate tours in Iraq and was stationed in both Georgia and Colorado – finishing at the rank of Staff Sergeant. After 7 years in the military, Chris decided to return back to school and enrolled at Columbia Gorge Community College in Hood River for one year. He then came to Oregon State University as a biology major. His time as a life sciences major was short lived – once he took Professor Margie Haak’s CH 221 course he was hooked on chemistry. He commented that Margie was an excellent presenter and she stimulated him to think about everything. Chris also had a wonderful lab course experience in CH 361/362 which he describes as “just fabulous.” He particularly commented that Professor Emile Firpo was “fun and had great energy” and that “you learned a ton” from him. The labs were key for Chris as it helped the lecture classes really make sense – they made him feel like “now I really get it!” The P Chem series was really hard, but both Professors Glenn Evans and Wei Kong were great. He loved Professor Kevin Gable’s dry sense of humor in O Chem. He has been doing research in Professor David Ji’s lab recently. Chris describes the research environment as “very inviting and stimulating… Professor Ji has been very open with his lab.” His time at OSU has been supported through the US GI Bill from his military service. Outside of class, Chris enjoys racing bicycles with the OSU team on campus. This year, he has started flying with the OSU Flying Club. He hopes to earn his pilot license prior to graduation and become a crop duster. The FAA now wants crop dusters to have a chemistry background and that job will allow him to get enough hours to achieve his long term goal of being a pilot for a major airline. Chris comments that OSU has a fabulous chemistry (and science) program and all the fac-
Chadd Armstrong has been selected as one of our Undergrads of the Quarter for Fall 2013. Chadd is a non-traditional student who returned to school after the 2008 economic downturn. Having moved around the Pacific Northwest growing up, he graduated from Lebanon Union High before following a professional career in other states. Embarking initially at LBCC seeking a diagnostics imaging certificate, his General Chemistry Instructor there (Ron Backus) inspired him – “Chemistry is the physics of the small.” He went on to take Organic Chemistry from Brigid Backus who further motivated him to pursue a higher level of education. Since transferring to OSU, Chadd states that he has especially enjoyed KC Walsh in Physics and Claudia Maier in Chemistry. Professor Maier’s CH 422 course was “very clear, precise” and “methodical.” He has also enjoyed ATS 320 “Man’s Impact on Climate” which he describes as a very interesting and worthwhile class. He became involved in research, while still at LBCC, during a summer research fellowship at Trillium Fiber Fuels where he became acquainted with Professor & Reser Faculty Scholar Vince Remcho (one of the four co-founders of this company). While at OSU, Chadd has been conducting research in Professor Remcho’s lab. Research provides Chadd with that day to day exposure to real-world chemistry problems that helps to tie everything together. He enjoys working with grad students because the experience has helped grow his confidence in his own abilities. From his prior work experiences, he has brought more computer programming into the Remcho lab. Graduating this June, he will have been fortunate enough, from scholarships and fellowships, to finish without having taken on any debt. After graduation, he plans to go on to Grad School to get a PhD in Chemistry on the west coast. He really enjoys research in applied fields and his long term goal is to work in a national lab or a university where he can conduct research and teach. In his free time, Chadd likes to travel, visiting family and friends, all of who are very important to him.

Chadd describes OSU as a “fantastic school” and he feels very invested here. We are so grateful to have talented students like Chadd as Chemistry majors and we want to congratulate him on his successes. It is future alumni like Chadd that make OSU Chemistry an amazing place!

Cassandra Lew has been selected as one of our Undergrads of the Quarter for Spring 2014. Cassandra grew up in Rock Springs, WY where she has lived her entire life prior to coming to OSU. She graduated from Rock Springs High School and it was a high school teacher (John Gamble) that peaked her interest in chemistry – commenting that she really enjoyed how applicable his classes were (she took 2 years of chemistry from Mr. Gamble). Cassandra accredits much of her success to the support and encouragement she has received from friends and family. She decided to come to OSU because of its reputation as an excellent science school and the generous scholarships she received. While Cassandra is only a freshman (one of the first freshmen to ever win Undergrad of the Quarter), she has already found her way into a research lab. She has been working with Professor Sandra Loesgen where she loves how hands on the science is and the real world applications of it all. When describing her research experience to date, Cassandra said “Sandra has been awesome!” All her professors at OSU have been helpful. She particularly enjoyed Professor Chris Beaudry’s O Chem course last term. Cassandra is excited for the future chemistry classes she will have the opportunity to take at OSU. After graduation, she would like to pursue a career in forensic chemistry and work in a lab. We are so excited to have talented, enthusiastic students like Cassandra in our program. Congrats to her for this award and we wish her continued success during her time at OSU!

Michael Hughes has been selected as one of our Undergrads of the Quarter for Fall 2013. Michael grew up in San Jose and went to Westmont High School. He is a non-traditional student who came to OSU while he was living in Medford, OR because of his interest in Animal Science and the benefits of OSU’s in-state tuition. While taking CH 12X as a requirement for Animal Science, he fell in love with Chemistry because “it felt like a puzzle” and “dissected the world in a way that made sense to him.” He was excited about the possibility to “explore the world” in ways he hadn’t thought of before. He got interested in undergraduate research over two years ago – working in Professor John Simonsen’s lab in Wood Science on cellulose nanocrystals. His favorite courses have been the integrated labs as they help to show the connection between lecture and practical science. Dr. Chris Pastorek is his favorite instructor during his time here. When not working lab or taking courses, he enjoys spending time with his wife and young daughter. He plans to attend UC-Santa Barbara this fall for graduate school in Chemistry. After obtaining his PhD degree, he wants to continue to stay engaged in research. We are so proud of students like Michael who have found their passion in Chemistry!
Walter Loveland presented a symposium at the 247th ACS National Meeting and Exposition where he was awarded the prestigious 2014 Glenn T. Seaborg Award for Nuclear Chemistry. This award recognizes and encourages research in nuclear and radiochemistry or their applications and is the highest honor awarded to nuclear chemists. Some of Walt's other awards include the Sigma Xi Award for Research, the FA Gilfillan Award for Research, the Beaver Champion Award and the Outstanding Referee Award from the American Physical Society.

Loveland was honored for his pioneering work on the use of radioactive beams for producing neutron-rich nuclei and his investigations of heavy residues in nuclear reactions. Walt has spent his 50+ year career studying large-scale nuclear collective motion, through observations of heavy ion fusion, other ways of preparing hot heavy nuclei and studies of the fission process. Through his work as a chemist at the reactor lab, Loveland used activation analysis to study meteorites, particulate air pollution and stable activable tracers.

One of Dr. Loveland’s graduate students who attended the meeting, Spencer Barrett said, “It was an honor to be present and support Dr. Loveland when he received the Seaborg award. Before coming to OSU I hadn’t been involved in the nuclear field so when I first met Dr. Loveland, he was just a professor to me. Now, after attending a day and a half of talks during the symposium in his honor at the ACS meeting in Dallas, I realize what he has meant to this field and how much of a contribution and influence he's made. I'm glad I have the opportunity to work with and learn from him.”

Paul Cheong has had a busy year. He’s received the NSF CAREER Award, the 2014 Emerging Scholar Award from Phi-Kappa-Phi and has been chosen to represent the ACS at the 2014 European Young Investigators Symposium.

The NSF CAREER Award is a grant from the National Science Foundation that supports junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations.

The Phi-Kappa-Phi Emerging Scholar award was established in order to recognize non-tenured faculty for outstanding research or creative activity in their field of study.

When asked how he felt about all this recognition, he responded that he was humbled and very honored, but stressed that he never could have done it alone. “Without the support of my colleagues and the hard work of my students and postdoc, none of this would be happening.”

Mas Subramanian was the 2013 recipient of the FA Gilfillan Award for Distinguished Scholarship in Science. This award recognized a faculty member whose scholarship and scientific accomplishments extend over a substantial period of time at the university and is widely recognized by peers. An accomplished researcher in solid-state chemistry, Mas is internationally recognized for breakthrough scientific discoveries involving superconductors, dielectrics, magnetism, catalysis, theromelectrics and fluorination chemistry. His research involves designing new inorganic solid state functional materials for emerging application in electronics, energy conversion and the environment.

Part of receiving this award is presenting the annual FA Gilfillan Memorial Lecture. Mas’s lecture was titled, “Pathways to Discovery: Designing a New Colorful Materials World” and was presented on Tuesday, May 6, 2014 at LaSells Stewart Center. It focused on his most recent research; his team’s discovery of a new blue pigment. A durable blue pigment has been about 200 years in the making and has far-reaching energy saving applications due to it’s heat reflecting properties.

To watch the lecture, please visit: https://media.oregonstate.edu/media/t/0_9c1vv4g3

Congratulations, Mas!
A good recipe depends on high-quality ingredients. That’s as true in industry (electronics, food products, chemical manufacturing) as it is in our kitchens. So when two Willamette Valley chemists developed methods for producing industrial chemicals with exceptional purity, they saw a business opportunity. The result is a new company: Valliscor. Co-founded in 2012 by Rich G. Carter, professor and chair of the Oregon State University Department of Chemistry, and industrial chemist Michael Standen, Valliscor produces organic building blocks for the pharmaceutical, electronics and biotech sectors. Its first product is a compound known as bromofluoromethane (BFM). BFM is a critical ingredient in the synthesis of fluticasone propionate, the active component in two popular medications: Flonase, a nasal spray; and Advair, an asthma inhaler. “The company was created to exploit the synergy between industrial know-how and academic innovation,” says Carter. “Valliscor harnesses licensed technology from Oregon State and from industrial partners to provide unique and cost-effective solutions for producing high-value chemicals. We can provide ultra-high purity materials that are superior to those offered by our competitors.” Before founding Valliscor, Carter and Standen had collaborated on numerous projects over the past 10 years, including the commercialization of an “organocatalyst” called Hua Cat, an advance in environmentally friendly chemical manufacturing. The OSU Research Office and the Advantage Accelerator program have been key to the company’s growth, Carter adds. “We’ve had great mentorship and guidance from the Advantage Accelerator leadership: Mark Lieberman, John Turner and Betty Nickerson. When we get stuck on a problem, they are just a phone call away.” The Oregon Nanoscience and Microtechnologies Institute (ONAMI) supported the company in 2013 with proof-of-concept funding and guidance from commercialization specialists Jay Lindquist and Michael Tippie and from Skip Rung, ONAMI executive director.
Glenn Evans began his career at OSU in 1977. Hair was big, bell bottoms were wide and the Bucky Ball hadn’t been discovered yet. He started out teaching a variety of freshman level and graduate courses, taking up Physical Chemistry courses in the late 90’s. Around 2000, he started to cover more and more of the sequence and by 2005 was teaching all three terms. Hard and fast statistics don’t exist on just how many students Glenn has taught in his 37 years at the front of the classroom, but it’s estimated to be somewhere between five and ten thousand.

When asked what Dr. Evans loved most about teaching, he replied, “The “aha” moment when a student sees something and tells me “That wasn’t so hard” almost in a defiant way; private counselling of students (talking them through their anxieties); office hours during which students interact with each other as well as me; in lectures when I say things provocatively to elicit a response and their laughter; exposing the lessons of life embedded in science; among many others. Perhaps the most interesting and most privileged part of lecture is looking out over a sea of faces (with their varying degrees of enthusiasm) and seeing the future and the person I once was.”

Glenn retired in 2010. Four years later, a student decided that he needed to be recognized. During the 2014 Commencement Luncheon, Biochemistry and Biophysics student Omar Rachdi took the platform and read the following speech.

“Two back surgeries, two flights of stairs slipped down in one fell swoop to reveal degenerative disc diseases and scoliosis, two lives lost that cripple me from within because of the differences between the Moroccan culture and the American culture, and only two years have passed. My undergraduate years have been very full of hard and life-changing experiences. However, I would not be where I am today without the guidance and mentorship of Dr. Glenn Evans.

After my second back surgery, I felt demoralized. I did not have the capacity to believe in myself or my abilities until the end of my fall term Physical Chemistry course junior year. Dr. Glenn Evans knew of my physical difficulties and sat me down after the final exam took place. I will always remember him telling me, “You got talent kid. Real talent. You sure you haven’t thought about doing this as a profession?” Regardless of the score I received on that exam, having a person of Dr. Evans stature tell me something like that made a large impact. That moment is the time when I can say that my “spark” turned on inside of me, and for this past year, all that I have tried to do is pass that spark onto others. Whether it be through being a teaching assistant for Biochemistry or Physical Chemistry, the mentoring programs that I have built within the College of Science, or just in everyday conversation, I will always carry with me the kind acts that Dr. Evans has done for me and try to pass them on to others.

Dr. Evans has had a large impact on not just myself, but several other students. If there was a way to incorporate the impact he has had in his career on the lives of his students, his “H-index” would be that of Linus Pauling, and other great scientists that have graced our earth.”

Track all our Social Media at chemistry.oregonstate.edu
Ken Hedberg; OSU’s 94-Year-Old Enigmatic Researcher
Originally printed in The Daily Barometer, 2/5/14 by Dacotah-Victoria Splichalova

He tells everyone to “just call me Ken.” Professor Ken Hedberg is an Oregon State University alumnus and the longest emeritus faculty researcher to continue researching after retirement for nearly 30 years.

Hedberg was born in Portland on Feb. 2, 1920. His father only completed eighth grade, and his mother didn’t continue her education after high school. “Both of my parents were incredibly smart,” Hedberg said. When the Great Depression hit, Hedberg’s father lost his job, which put the family in financial straits. Hedberg recalls the lights being shut off in his home for periods of time; food rationing became a reality. This experience left a strong imprint on Hedberg.

“My father said to me in my early teens that with every dollar I made, he would match for my college education,” Hedberg explained, “but then the depression hit us and with my father being out of work for such a long time—I knew that this promise would not come to be.” Readjusting through a series of moves across the state, Hedberg, his mother and his sister moved to Corvallis with the goal in mind for the Hedberg children to attend OSU, while Hedberg’s father took a job working on the coast. “I was so impressed by how my mother and father came together to see what options they had in order to do the best for our family,” Hedberg said.

In order to meet this goal, Hedberg’s mother ran a boarding house within their home. “It was a lot of work for my mother — the cooking the cleaning,” Hedberg recalled. “Almost 75 years later, I wouldn’t be seated here nor carrying out my research if my mother didn’t work as hard as she did.”

Graduating OSU in the 1940s, Hedberg attended graduate school at the California Institute of Technology in Pasadena, Calif., where he first met Dr. Linus Pauling, a fellow OSU graduate and head of the department of chemistry at the California Institute of Technology. For the young graduate student, Pauling took note of Hedberg’s talents and intelligence and pushed Hedberg to pursue research that he was interested in. Pauling supported Hedberg by cultivating channels of opportunities and became a close, lifelong mentor and friend. Upon completing his Ph.D., Hedberg was awarded the Guggenheim Fellowship and Fulbright Scholar Program within the same year carrying out his research in Oslo.

Hedberg enjoyed exploring and seeing all the sites that the Norwegian culture offered him. One warm summer evening in Oslo, Hedberg, a lover of chamber music, booked a ticket to attend an outdoor performance. While waiting in line to pick up his ticket, Hedberg looked over to see a young woman, a woman researcher who worked with him in his new lab. She too was picking up her ticket for the show. They entered together.

“Following, we went to a famous restaurant called Blom,” Hedberg said. “We had some snacks and munchies and walked our separate ways home.” That was the first evening of the rest of their lives.

The couple married. Sixty years later, Lise and Ken Hedberg have two children — who respectively graduated from Stanford University and Harvard University — and four grandchildren.

In the early years, Hedberg worked at Caltech. Yearning to leave the Southern California smog, Hedberg decided to return with his family to beautiful Oregon to carry out his research and teach chemistry at his alma mater in the 1960s. Hedberg retired from OSU in 1986. Monday through Friday, Hedberg still arrives in the mornings to work on his research.

Hedberg is considered a sort of phenomena in the chemistry department. He is an internationally recognized scientist and is one of the world’s pioneers in the development of electron diffraction and the study of molecular structures and intramolecular dynamics. Moreover, Hedberg is the only researcher in OSU history to remain continuously funded, while being retired.

“Ken’s been retired — but not retired — for almost as long as I’ve been here,” said Phillip Watson, professor of chemistry at OSU. Working for free, Hedberg continues to conduct his research at OSU and make scientific advancements within his field.
CORNALLIS, Ore. – Researchers at Oregon State University have discovered novel compounds produced by certain types of chemical reactions – such as those found in vehicle exhaust or grilling meat - that are hundreds of times more mutagenic than their parent compounds which are known carcinogens.

These compounds were not previously known to exist, and raise additional concerns about the health impacts of heavily-polluted urban air or dietary exposure. It’s not yet been determined in what level the compounds might be present, and no health standards now exist for them.

The findings were published in December in *Environmental Science and Technology*, a professional journal.

The compounds were identified in laboratory experiments that mimic the type of conditions which might be found from the combustion and exhaust in cars and trucks, or the grilling of meat over a flame.

“We don’t know at this point what levels may be present, and will explore that in continued research,” she said.

The parent compounds involved in this research are polycyclic aromatic hydrocarbons, or PAHs, formed naturally as the result of almost any type of combustion, from a wood stove to an automobile engine, cigarette or a coal-fired power plant. Many PAHs, such as benzopyrene, are known to be carcinogenic, believed to be more of a health concern that has been appreciated in the past, and are the subject of extensive research at OSU and elsewhere around the world.

The PAHs can become even more of a problem when they chemically interact with nitrogen to become “nitrated,” or NPAHs, scientists say. The newly-discovered compounds are NPAHs that were unknown to this point.

This study found that the direct mutagenicity of the NPAHs with one nitrogen group can increase 6 to 432 times more than the parent compound. NPAHs based on two nitrogen groups can be 272 to 467 times more mutagenic. Mutagens are chemicals that can cause DNA damage in cells that in turn can cause cancer.

For technical reasons based on how the mutagenic assays are conducted, the researchers said these numbers may actually understate the increase in toxicity – it could be even higher.

These discoveries are an outgrowth of research on PAHs that was done by Simonich at the Beijing Summer Olympic Games in 2008, when extensive studies of urban air quality were conducted, in part, based on concerns about impacts on athletes and visitors to the games.

Beijing, like some other cities in Asia, has significant problems with air quality, and may be 10-50 times more polluted than some major urban areas in the U.S. with air concerns, such as the Los Angeles basin.

An agency of the World Health Organization announced last fall that it now considers outdoor air pollution, especially particulate matter, to be carcinogenic, and cause other health problems as well. PAHs are one of the types of pollutants found on particulate matter in air pollution that are of special concern.

Concerns about the heavy levels of air pollution from some Asian cities are sufficient that Simonich is doing monitoring on Oregon’s Mount Bachelor, a 9,065-foot mountain in the central Oregon Cascade Range. Researchers want to determine what levels of air pollution may be found there after traveling thousands of miles across the Pacific Ocean.

This work was supported by the National Institute of Environmental Health Sciences and the National Science Foundation. It’s also an outgrowth of the Superfund Research Program at OSU, funded by the NIEHS, that focuses efforts on PAH pollution. Researchers from the OSU College of Science, the University of California-Riverside, Texas A&M University, and Peking University collaborated on the study.

Polycyclic Aromatic Hydrocarbons (PAH’s) are an organic compound containing only carbon and hydrogen—that are composed of multiple aromatic rings (organic rings in which electrons are delocalized). PAHs are neutral, nonpolar molecules; they are found in fossil fuels (oil and coal) and in tar deposits, and are produced, generally, when insufficient oxygen or other factors result in incomplete combustion of organic matter. PAH’s can also be found at high levels in cooked foods, e.g. in meat cooked at high temperatures over open flame. Some PAH’s have been discovered to have highly mutagenic and carcinogenic metabolites.
By: Gretchen Salois

Originally Printed in Modern Metals Magazine, January 2014 (used with permission)

Unlocking Aluminum: Scientists Gain a New Perspective in Understanding the Chemistry Behind Aluminum

If it works, go with it—but why? Why does a material work the way it does, in this case, aluminum. A detailed understanding of this metal’s water-based forms proved elusive until recently, when researchers unlocked a new world of potential for this ductile material. Now, the metal complex can be studied at a molecular level, creating possibilities for advances in numerous industries.

After more than 100 years of commercial use without a breakdown of aluminum at a molecular level, this latest breakthrough is significant. “Suddenly we have this solution-based, bottom-up approach starting from the molecular-level construct and that’s how cool this is—scientists have developed these protocols to perform targeted synthesis of aluminum hydroxide clusters (Al13) in water, which can be readily used as a ‘green’ solution precursor for large-scale preparation of aluminum oxide thin films and nanoparticles for electronics, catalysis, photovoltaics and corrosion prevention,” says Chong Fang, assistant professor at Oregon State University’s Department of Chemistry. Oregon State, The University of Oregon and the Center for Sustainable Materials Chemistry, have combined efforts to work on the metal’s breakdown.

Fang is one of nine researchers involved in the collaborative report, “Electrolytic synthesis of aqueous aluminum nanoclusters and in situ characterization by femtosecond Raman spectroscopy and computations.” Published in Proceedings of the National Academy of Sciences, the report lays out how a new electrolysis method is used to control precisely during aqueous cluster synthesis without steep pH gradients commonly associated with base titrations.

Bottom-up approach

Until now, there has been no effective way to study aluminum. “Before, researchers used a limited arsenal of tools to characterize certain types of aluminum species, but usually with limited access to detailed molecular-level structure and dynamics,” Fang says.

After silicon, aluminum is the second most abundant metallic element in the Earth’s crust, according to the U.S. Geological Survey. While plentiful in supply, it has only been produced for commercial use for a little more than 100 years. At one point in the mid-1800s, aluminum was harder to find and considered more valuable than gold. Today, however, aluminum is produced on a massive scale, with five companies operating 10 primary aluminum smelters in the U.S. The USGS reported the value of primary domestic metal production in 2012 was $4.32 billion.

Aluminum is obtained from bauxite, which contains a mixture of hydrous aluminum oxides difficult to extract from ore because of its high reactivity and high melting point. Producing aluminum is labor and resource intensive. Four tons of bauxite are required to produce two tons of alumina, resulting in one ton of aluminum, according to The Aluminum Association. Over the years, aluminum producers have reduced the amount of energy consumption per unit of aluminum by 70 percent. While expensive, this lightweight recyclable metal is used in a wide range of applications. Recycled aluminum is cheaper than aluminum produced from ore and promotes sustainability. It can be recycled over and over again without losing quality, according to The Aluminum Association, which also notes 75 percent of all aluminum ever smelted is still in use today.

Complementary uses

A silicon-based solar cell is typically used when working with aluminum films. Such films are useful in energy applications, particularly within the solar power sector. “It has been demonstrated that coating a thin aluminum-based film on top of a semiconductor can actually increase the light trapping and harvest sunlight more effectively. A good example is that Al2O3, thin film has gained popularity as a high-quality surface passivation material,” Fang says.

By uncovering this new approach to aluminum nanoclusters, Fang says the future holds new ways to generate new species of aluminum. “As far as we know, people have not extensively explored this territory using solution-based aluminum speciation, where you easily encounter a variety of complex potentials, different compositions,” he says. “Once water goes away after dehydration at an elevated pH, then you’re left with versatile metal oxide films. Those are the products that hold transformative impact as society shifts toward more sustainable, greener, cheaper ways of getting and using energy.”
OnTo Technologies Creates Better Battery Afterlife Options

By: Kim Thackray & Mike Lerner

Have you looked around and noticed that more and more items are powered by lithium ion batteries? All cell phones and laptops use lithium ion batteries, and automobiles and even ships are moving toward this technology. Advances in technology are making these batteries (and the products they power) smaller, lighter, and longer-lasting—but what happens to the batteries once they have outlived their usefulness? The current technology for handling used batteries follows two tracks: batteries are either ground up in order to extract the expensive components (nickel, cobalt), or...they go to the landfill. Good earth stewardship demands a better, lower-energy alternative. Dr. Steve Sloop (OSU, 1996), founder of OnTo Technology, is in the forefront of this field, helping to change the battery waste flow into a battery resource flow.

Working closely with researchers and students at Willamette University and OSU, OnTo Technology is developing direct recycling processes that entail disassembling used batteries into their reusable components, ensuring component quality, and then introducing these components back into the battery manufacturing process. The associated recovery technologies, which must continually evolve as lithium-ion battery technology evolves, use much less energy and create much less waste than current recycling methods. Although their new procedures are somewhat more labor-intensive, Steve calculates they use 1/62 as much energy (based on the Hess cycle calculation for smelting, boiling, and purifying the valuable components). If the energy used to originally extract these materials from the earth is included, the savings are even greater.

OnTo Technology came into being as a company in 2004, starting with a loan from the Oregon Department of Energy. This loan allowed Steve to hire a staff and to purchase equipment for pilot-plant scale research. A battery recall by Apple provided the raw materials required for initial testing. Interestingly, one of the first revenue streams for this fledgling company was reselling perfectly functional batteries (obtained in the recall but not on the recall list) on eBay. Since that time, OnTo Technology has largely moved away from the small consumer electronics batteries to work with automobile and ship batteries; a grant from the US Department of Energy, Vehicles Division supports this newer focus.

When asked about the business model for his company, Steve explains that OnTo Technologies is not planning to become a battery manufacturer. Instead, their goal is to license battery recycling technology to a manufacturing partner; currently they are working with XALT, a major US based manufacturer of large format batteries for cars and boats, and other manufacturers as well. The scientists at OnTo are working to keep up with rapidly evolving battery technologies, in order to keep their partners in the forefront. Their main product is knowledge and expertise in this exciting field.

In addition, OnTo works with OSU Chemistry’s Dr. Mike Lerner and his group to characterize material structures and compositions at different points in the recycling process. This information helps guide OnTo’s process development. Collaborating for several years now on battery chemistry, Dr. Lerner and Dr. Sloop met 20 years ago when Steve was a doctoral student working with Mike.

Battery companies are not only interested in Steve’s ideas in order to save money on minerals. There is momentum in local and state governments to require battery recycling, in order to reduce the toxic load in landfills; California already has such laws. In addition, the marketing value of being considered a “green” manufacturer cannot be overstated. Steve believes recycling is inevitable; he is leading the way in developing the best way to do it.

Many challenges remain; some manufacturers still think it is crazy to consider processes that are so labor intensive when it is easier/cheaper to grind and smile, or discard, old batteries. In the future, an automated disassembly line may reduce the required labor. Right now, the scientists at OnTo Technologies continue to work on these challenges.

OSU-ChUIME Debate Watch Party

OSU Chemistry Undergraduate Mentoring & Empowerment (OSU-ChUIME) organized a watch party for the debate between Bill Nye and Ken Ham entitled, “Is creation a viable model of origins in today’s modern scientific era?” The debate was scheduled to last two and half hours, so we ordered pizza and gave people a place to watch the debate with fellow scientists and engineers.

The audience was primarily on the evolution side, cheering several times at points made by Bill Nye. Nye made several excellent arguments to show that the earth is much older than the 6,000 years asserted by Ken Ham. Nonetheless, Ken Ham reiterated many times throughout the night that he believes that the Bible is the literal word of God, and no one could ever convince him that the word of God is not true.

However, it didn’t seem like Bill Nye was there to change Ken Ham’s mind. Nye put a strong emphasis on reaching out to voters and kids during his chances to talk. He appealed to voters that the U.S. must continue to fund science education and warned that the U.S. could fall behind technologically if we do not keep science important in the classroom. For more information about the debate, or to watch a replay, visit http://debatelive.org/.

OSU-ChUIME hosted this event to give undergraduate and graduate science students a chance to intermingle and talk about issues relevant to the lives of both groups. For more information about the OSU-ChUIME program, contact Maduka Ogba (ogbao@onid.orst.edu) or Lindsay Wills (willsl@onid.orst.edu).
Fall 2013 Honor Roll
Chadd Armstrong
Dakota Backus
Monica Best
Scott Best
Corinne Brucks
Hyun Cho
Tora Cobb
Shannon Davis
Nicholas Diaz-Hui
Tony Duong
Brandice Durfee
Robert Figura
Elizabeth Gass
Erin Hanson
Timothy Hemphill
John Hergert
Joshua Holmes
Michael Hughes
Michael Jagielski
Jacob Kaufman
Thomas Ketsdever
Regina Kurapova
Derek Lafave
Jamy Lee
Cassandra Lew
Stegan Lucchini
Lindsey Michaud
Monica Mueller
Chen Ng
Dallas Niemeyer
Ania Pavitt
Gary Points
Jordan Rains
Ryan Rains
Tyler Richardson
Brian Riggs
Collin Ruark
Jason Sandwisch
Amy Smets
Karmin Taylor
Michael Walters
Clark Yeakle
Stephanie Youngblood
Tianqi Zhang

Winter 2014 Honor Roll
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Corinne Brucks
Abigail Chitwood
Tora Cobb
Andrea Domen
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Brandice Durfee
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Elizabeth Gass
Erin Hanson
John Hergert
Joshua Holmes
Michael Hughes
Michael Jagielski
Reid Kinser
Jamy Lee
Sarah Melancon
Lindsay Michaud
Monica Mueller
Chen Ng
Dang Nguyen
Dallas Niemeyer
Thu Pham
Gary Points
Jacob Ramsey
Jason Sandwisch
Allie Schultz
Kenneth Stout
Halley Todd
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Karen Zhen

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Jordan Bergstrom
Scott Best
Kristen Brewster
Corinne Brucks
Abigail Chitwood
Hyun Cho
Tora Cobb
Mark Delgado
Nicholas Diaz-Hui
Brandice Durfee
Robert Figura
Eaton Fong
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Adam Huntley
Michael Jagielski
Thomas Ketsdever
Reid Kinser
Alexandra Malone
Phillip Marks
Dang Nguyen
Philip Nguyen
Dallas Niemeyer
Thu Pham
Kristin Potter
Jacob Ramsey
Caitlin Riechmann
Brian Riggs
Jordan Roland
Jason Sandwisch
Kenneth Stout
Karen Zhen

2013 Department of Chemistry
Oregon State University, Corvallis, OR
The 3rd Year Analytical Chemistry Award was presented to Jamy Lee.

The Top Senior Inorganic Chemistry Award was awarded to Corrine Brucks.

The American Institute of Chemists Award was presented by John Simonsen and bestowed upon Michael Hughes.

The Hypercube Award was presented to Joshua Holmes by Doug Keszler.

The Merck Award was presented to Derek Franco by Jeff Walker.

The NL Tartar Summer Research Project recipients were Donovan Adressa, Harrison Neal and Pieter Waldenmaier.

Milton Harris Summer Fellowships were awarded to Kyle Almие, Clement Bomnier, Joshua Flynn, Lin Huang, Minmoy Saha, Dylan Sures, Zhenyu Xing and Fereshteh Zandkarimi.

Dorothy and Rams Barnes Graduate Fellowships were presented to Nicholas Larkey, Yanli Wang and Peng Zhao.

The Whitley Graduate Fellowship in Material Sciences was awarded to Amila Liyanage.

The Benedict Fellowship for 2014 was awarded to Hanyang Zhang.

The Kuse/Dandeneau Fellowship was awarded to Lei Chen.

The Inaugural Max Deinzer Award was presented to Leah Chibwe.

The Ingram Award winner was Daniel McCauley-Walden.

The Benedict Award for Outstanding 2nd Year Graduate Students was awarded to Subir Goswami.

The Shoemaker Award was bestowed upon Breland Oscar and David Schiedler.

The Burrows group received Research Office funding for "Development of In-Situ Biosensors and Time-Resolving Laser Based Detection of Cancerous Biomarkers" Margie Haak, Rick Nafshun, and Chris Pastorek were promoted to Senior Instructor II.

Claudia Maier was promoted to Full Professor.

Kevin Gable and John Loeser were 2014 additions to the 25 Year Club.

Paul Cheong was selected to represent the ACS at the 2014 European Young Investigators Symposium.

Focus on ECampus Student

Robert Oehmke has just completed our Organic chemistry series, taking CH 331 and CH 332 online, then coming to Corvallis this summer to do the labs in CH 337. Robert is stationed at Sheppard Air Force Base in Texas as a First Assignment Instructor Pilot, and is also the executive officer to the commander of the 89th Flying Training Squadron. His career goal is to become a Pilot-Physician, a specialized field that requires both medical expertise and an understanding of the demands of being a pilot. Our online Organic chemistry program has helped him to prepare for medical school and study for the MCAT exam. Dr. Kristin Ziebart, his instructor for CH 337, says about Robert: "Robert was just an outstanding student in every way - inquisitive, thoughtful, hard-working, and extremely pleasant to be around. Robert naturally assumed a leadership role in the class, and I could see how he quickly earned the respect of the entire class.” In his (very little) spare time, Robert likes to see movies with his wife, bike, and rock climb. We wish Robert all the best in the pursuit of his new career.

Department Embarks on Year Long Strategic Planning Effort

The 2013-2014 academic year has been focused on establishing the future directions for the Department. A large part of that effort has been directed towards crafting a strategic plan. This process started over a year ago with talking points created by the Department’s executive committee. At our Fall Faculty retreat last September, the Department had an outside facilitator meet with the faculty for several hours to jump-start the process. A long-range planning working group was established. At each of our monthly faculty meetings, a portion of the time was dedicated to talking about the strategic planning. At the Department’s spring mini-retreat, we officially adopted a draft public document. A web version of the public draft document can be found at: www.chemistry.oregonstate.edu/draft_strategic_plan. The Department views this as a first step in a conversation with our students, alumni, donors, colleagues, constituents and administrators to formulate a final version of the document. Please send any comments you might have about the plan to our Department Chair at rich.carter@oregonstate.edu by September 15, 2014.
Aaron C Anderson BS (Adv Chem)
Chadd Armstrong BS (Adv Chem)
James Donald Barnes BS (Mat)
Kayla Marie Bell BS (For)
Jordan Daniel Bergstrom BS (For)
Monica Taylor Best BS (For)
Sierra Lynne Breckenridge BS (For)
Kristen Marie Brewster BS (Biochem)
Derek Francisco Franco BS (Pre-Med)
Nicholas Burke Goldring BS (Adv Chem)
Jared Michael Harzan (BS (Adv Chem)
Jacquelynn Helm BS (Adv Biochem)
Brad Hilt BS (Pre-Med)
Joshua Aaron Holmes BS (Adv Chem)
Michael Paul Hughes BS (Adv Chem)
Adam Paul Huntley BS (Adv Chem)

Ashley Christine Kastner BS (Env)
Nizan Kenane BS (Chem Eng)
Kevin Andrew Kovalchik BS (Env)
Jordane Elizabeth Lampi BS (Biochem)
Min June Lee BS (Adv Chem)
Stefan Enrique Lucchini BS (Mat)
Tsz Pang Lui BS (Adv Chem)
Phillip Gordon Marks BS (Chem Eng)
Nick A Martin BS (Adv Biochem)
Meghan Rose Megowan BS (For)
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Gary Lee Points BS (Biochem)
Jordan M Rains BS (For)
Stephanie Marie Sherman BS (Pre-Med)
Halley Lynne Todd BS (Bus)
Adeniyi Abiodun Adenuga (PhD)
Maha Daifullah Alghamdi (MS)

Lei Chen (MS)
Nathan D Collett (PhD)
Thomas Day (MS)
Rosa Lea Grajczyk (PhD)
Jae Seok Heo (PhD)
Amanda L Hoyt (MS)
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Melissa Luana Mc Intosh (MS)
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