ILLINOIS INSTITUTE OF TECHNOLOGY

CHEMISTRY ELEMENTS

A publication of the Department of Chemistry at Illinois Tech

Announcing the Return to a Full Chemistry Department

Photo by Bonnie Robinson

Department of Chemistry group photo, Welcome Lunch 2015–16

Fall 2015

Letter from the Chair

I am pleased to present our third issue of *Chemistry Elements* and to announce a change that we are most proud of. After two decades as a composite academic unit with Biology and Physics, Chemistry is now an independent, stand-alone department. In February, the Illinois Tech Board of Trustees approved the reestablishment of an independent Department of Chemistry effective with the 2015-16 academic year. It is a milestone accomplishment and the fruit of strategic planning and hard work by administration, faculty, staff, and students. It coincides with some other landmark events–the 125th birthday of Illinois Tech, inauguration of a new president, and beginning tenure for a new provost–pointing to positive energy for change!

I am excited as we open a new chapter in the long and rich history of chemistry at Illinois Tech. As chairman, I am committed to work with all stakeholders to strengthen this new department. We have a strategic plan that defines our vision and mission, sets goals, and lays out an action plan that will lead to a strong, sustainable chemistry department. I am enthusiastic to share the vision, mission, and plan for the department.

VISION: The Illinois Tech Department of Chemistry will be a model for scholarship, innovation, and education in the chemical sciences.

MISSION: **a)** Provide distinctive and relevant education in the chemical sciences at the undergraduate and graduate levels and **b)** carry out world-class research and scholarly work with relevance to contemporary problems facing society and industry.

PLAN:

Strengthen academic programs: In order to attract students who want to be competitive in the 21st-century job market, we are currently undertaking a major revision of our curriculum, and we are looking into new 4+1 co-terminal degree programs (combined B.S. + M.S. programs).

Identify research niche areas: We have identified two departmental niche areas of strength that we aim to develop further: materials chemistry and biological chemistry. A number of chemistry faculty members are engaged in materials research with emphasis on materials for energy applications (covering design and synthesis, characterization, evaluation, and modeling) and biological chemistry (including drug discovery, stem cell research, and nanopore sensing for detecting biomolecules and toxins).

Enhance infrastructure: We are working with Institutional Advancement to upgrade the chemistry instrumentation facility and acquire several research-grade instruments, and we are writing grants for this purpose. Our strong collaborative ties with Argonne National Laboratory provide us with further access to sophisticated instrumentation required for research projects. We recently renovated our Computational Chemistry Laboratory, increasing its capability for teaching and research. This lab now complements our two state-of-the-art computational clusters, making the department an attractive destination in this area. A major renovation of the Life Sciences Building is in progress, to be renamed the Robert A. Pritzker Research Center. Robert E. Frey (CHEM '65) has made a significant pledge toward the renovation of Life Sciences, including the chemistry suite, which will be named in his honor.

Grow faculty, increase enrollment, and expand research volume: Our goal is to increase the core faculty size to 16, add two endowed chairs, and ensure a strong representation of women and minorities. We need two additional research faculty in our areas of strength: materials/energy, and biological chemistry. The recent arrival of two new lecturers—Courtney Sobers and Dan Mueller—strengthens teaching and student support for the department, and a search is on for a tenure-track faculty member to start in fall 2016.

Improve student enrollment: We continue to improve the quality and visibility of our undergraduate program and are actively engaged with the Admissions Office (new program brochures, a video, and enhanced Web presence). We are proactive in making connections with select high schools and junior colleges in the Chicago area to attract quality students. While we have a sufficient number of M.S. and Ph.D. students and strong enrollment in our professional master's programs, we would like to attract more high-quality domestic students to these programs through competitive offers of graduate stipends and fellowships. We are first stepping up our efforts to increase research funding, and are also active in fundraising to create new named fellowships to attract and retain top chemistry students.

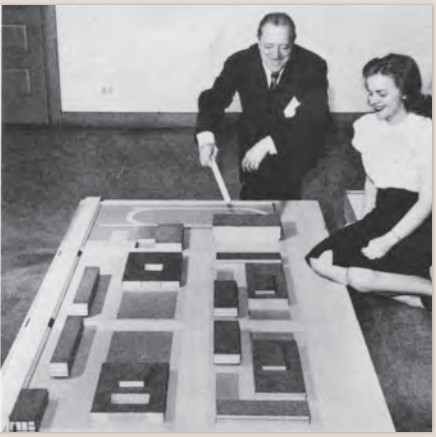
Increase visibility and reputation: Increasing the department's visibility and reputation is one of our priorities. We have begun by hiring outstanding new faculty who are contributing to distinctive, cutting-edge research and high-impact publications. We are improving our website as an important portal to the world. We aim to have a strong presence at professional meetings and to host events at Illinois Tech. For example, in September the department hosted a successful Midwest Enzyme Chemistry Conference here for the first time. During the summer semester, we held a spectroscopy workshop for high school teachers, and we hosted 20 students from the Brazil Scientific Mobility Program.

During the past academic year, we sponsored two chemistry shows and held a movie screening on a cancer drug discovery as part of the activities of the Undergraduate Student Chapter of the American Chemical Society. A number of chemistry faculty members gave invited talks at various professional meetings, and some graduate students were awarded the Fanta Graduate Student Fund to attend a professional conference. We have brought high-profile speakers for our Kilpatrick lecture series (most recently George Whitesides and Dan Nocera from Harvard, and Nobel Laureate Roald Hoffman from Cornell), and plans are under way for another Kilpatrick Lecture in 2016. I hope you will be able to join us for this signature event of Illinois Tech Chemistry.

I want to thank all of you for your continuing support, and I invite you to visit the campus to see many transformative changes taking place. I am looking forward to hearing from you and welcoming you in person.

M. ISHAQUE KHAN
Professor and Chair
Department of Chemistry

CHANGING LANDSCAPES **IN CHEMISTRY**



▲ Ludwig Mies van der Rohe points to his 1941 master plan of buildings on Mies Campus, including the Life Sciences Building.

The Chemistry Building, completed in 1946, was renamed Wishnick Hall in 1966 in honor of alumnus and trustee Robert I. Wishnick (CHE '14, LAW '17). In 1953 Wishnick won the Alumni Service Award, and a decade later, the Outstanding Alumnus Award. Wishnick is at right with his wife, Freda, and John T. Rettaliata, president of Illinois Tech. Wishnick Hall still houses some teaching and research labs. ▶

Chemistry lab photos from the 1940s

Chemistry student with Martin Kilpatrick. Kilpatrick was professor and chair of the Department of Chemistry from 1947–1960. ▶

In fall 2015 the computer cluster lab in the Department of Chemistry was renovated for recording lectures for online courses in computational chemistry. ▶

▲ New entrance to the Life Sciences Building, to be renamed the Robert A. Pritzker Research Center. Home to the new Chemistry department, this is the first aesthetic renovation to the building since it was designed.

Photo: LCM Architects/Photography by Gray City Studios

Department of Chemistry Hosts Midwest Enzyme Chemistry Conference

More than 200 faculty and students attended the 35th Midwest Enzyme Chemistry Conference (MECC), which was held on Saturday, September 12, 2015, in Hermann Hall Ballroom. This was the first time that Illinois Tech has hosted the event and the turnout was excellent, with a well-attended poster session (120 presenters) following the chaired sessions. Technical talks were on a wide range of topics concerning the role of enzyme dynamics in medical research and drug discovery.

MECC 2015 organizers Joe Kappock [left] and David Minh [right]. ▼

The MECC provides a forum for scientific exchange and collegial interactions among researchers working at the forefront of enzymology and its interface with biomedical and pharmaceutical science. The MECC attracts academic and industrial researchers from more than a dozen states. Oral presentations feature graduate students, postdoctoral fellows, and early-career faculty from the region.

Joe Kappock, assistant professor of biochemistry at Purdue University School of Agriculture, chaired this year's program. David Minh, assistant professor of chemistry at Illinois Tech, was the local arrangements chair.

◀ Poster session at the 2015 MECC, which included 120 presenters.

New Faculty Appointments

Daniel Mueller, lecturer in chemistry, joined the department in fall 2015. He received his Ph.D. in organic chemistry from the University of Illinois at Chicago, where he developed a new organic method for the synthesis of α-amino aldehydes. At the undergraduate level, Mueller concentrated his studies in organic synthesis and methodology. He enjoys teaching chemistry and has taught at several schools in the Chicago area: Harry S. Truman College, Concordia University-Chicago, and the University of Illinois at Chicago. He has also worked at Stepan Chemical Company in analytical chemistry. While Mueller was a graduate student at UIC, he served as safety manager for his lab and acquired extensive knowledge with analytical instrumentation as well as NMR. He is teaching general chemistry for the department.

Courtney Sobers, lecturer in chemistry, also joined the department in fall 2015. She started science research in her junior year of high school at Moffitt Cancer Center in Tampa, Fla., working with cyclin-dependent kinase inhibiting drugs to treat Mantle cell lymphoma. Since then, she has conducted research in traditional organic synthesis labs as well as more interdisciplinary chemical biology labs. While completing her Ph.D. at Northwestern University, she worked with and advised numerous undergraduate and post-baccalaureate students, further developing her passion for teaching science. She focused on developing the research skills of these students while providing academic and career advising. Sobers has worked as an instructor at both DePaul University and Harold Washington College in Chicago and has experience teaching everything from basic chemistry to organic chemistry lab to meteorology. Her interests include educational technology, improving versatility as an instructor, and developing management skills. Sobers is teaching organic chemistry labs in the department.

Illinois Tech Chemistry Hosts Spectroscopy Workshop

In late June 2015, assistant professors David Minh and Aditya Unni, and Lecturer Ben Zion, hosted local high school teachers for a workshop titled *Choose Your Own Adventure: Solving Real-World Problems with Spectroscopy*. The workshop was designed to complement new requirements in the advanced placement (AP) high school curriculum. Modern spectroscopic methods were covered, including photoelectron spectroscopy and strategies for teaching these methods in the high school setting. By attending, these teachers were awarded continuing education credit.

▲ Students enjoyed designing and performing two chemistry shows during the 2014–15 academic year. Here, Lecturer Ben Zion ignites a hydrogen balloon.

ALUMNI—Feel free to send us your news to share in the next edition of *Chemistry Elements* newsletter!

OUR ALUMNI—**WHERE ARE THEY NOW?**

Kadir Aydemir (Ph.D. CHEM '14) is now senior researcher at the Semiconductor Technologies Research Laboratories at TUBITAK (Scientific and Technological Research Council of Turkey). His responsibilities include chemical processes of integrated circuit microchip manufacturing. ▼

Matthew Seludo (CHEM '15), former undergraduate Kilpatrick Scholar, is now at Doctor's Data, Inc., where he works as an ion conductive plasma/mass spectrometry (ICP-MS) operator. ▼

Rachael Youngworth (CHEM '15) is now a graduate student at the University of Chicago in the chemistry department, where she is working in the area of computational chemistry. ▼

ALUMNI REFLECTION

The first time I enrolled at Illinois Tech, it was for my junior year as a chemistry major, in the spring 1948 semester. Wishnick had just been completed, and was in use for classes for the first time that semester. Dr. Henry Heald was president of Illinois Tech and Dr. Martin Kilpatrick was chairman of the chemistry department. There were many temporary buildings (Quonset huts) on campus. The row houses on Federal Street were converted to classrooms, and those on 33rd Street were the offices and laboratories of Armour Research Foundation. There were about 100 women undergraduates and 3,300 men, many of them veterans of WWII. There was no housing for women; we were all commuters. However, there were many of the usual college activities: newspaper, yearbook, athletic teams, and social events. The chemistry department sponsored a very active Student Affiliate Chapter of the American Chemical Society.

My first Organic professor was Dr. B. B. Freud, and Instrumental Analysis was taught by Dr. Tykodi. They, with my other instructors, gave me a good foundation in chemistry that I appreciated when I became a teacher myself. After teaching high school science for two years, I again enrolled at Illinois Tech in 1961 to get an M.S. in chemistry, preparing me for a 32-year career in City Colleges of Chicago. Dr. Paul Fanta was my advisor, and at that time there was a large number of graduate students, in a very vital, interesting, productive department.

Through the years I came back to the chemistry department for occasional classes. I found many changes in the campus and the department (some good, some not so good), but overall, the vitality and innovation were impressive.

Marilyn J. Kouba (CHEM '50, M.S. '63)
Retired Professor, Department of Physical Sciences
Harold Washington College (City Colleges of Chicago)

Degrees awarded in 2014–15

Two Ph.D. degrees and one M.S. degree were awarded in chemistry this past academic year:

- **Qiang Ma**, in Braja Mandal's group, completed his Ph.D. dissertation entitled "Novel Electrolytes for Lithium-ion Batteries."
- In Joy Chong's group, **Yunwei Chen** completed his Ph.D. dissertation entitled "Studies on Synthetic Applications of Stereoselective and Regioselective Ring Opening Reactions of Aziridinium Ions."
- **Songyang Han**, in Aditya Unni's group, completed his master of science thesis on "Synthesis of Tetrazine-Based Covalent Organic Networks."

FACULTY NEWS

Associate Professor Xiyun "Richard" Guan was awarded tenure last spring semester 2015. He was invited to give a department seminar talk entitled "Nanopore Stochastic Detection: Diversity, Sensitivity, and Beyond" at the University of Saskatchewan Department of Biochemistry in Canada on September 25, 2014.

Assistant Professor Adam Hock received a continuation award from the Department of Defense for phase II of his STTR (Small Business Technology Transfer) project. Hock was an invited participant for the 2015 Department of Energy program review of the catalysis group at Argonne National Laboratory. He was also an invited participant at the 2015 ARPA-E (Advanced Research Projects Agency-Energy) Summit in Washington, D.C., February 2015, and the 2015 DOE Catalysis Contractor's Meeting in Annapolis, Md., July 2015. Hock also presented his work on single site catalysts at the 2015 North American Catalysis Society Meeting in Pittsburgh in June 2015.

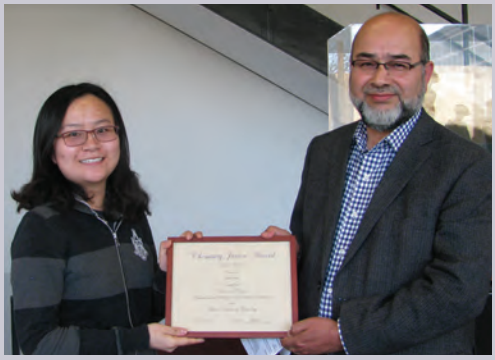
Professor and Chair M. Ishaque Khan gave an invited talk "Functional Nanomaterials: Potential and Promise" at the conference on Nanotechnology for Development of Advanced Energy Harvest and Storage Devices at the Masdar Institute of Science and Technology in Abu Dhabi, UAE, February 17–18, 2015.

Assistant Professor David Minh received a grant award from the National Institutes of Health for his project entitled "Sound-stage Virtual Screening Based on Implicit Ligand Theory." Minh gave an invited talk entitled "Absolute Binding Free Energies

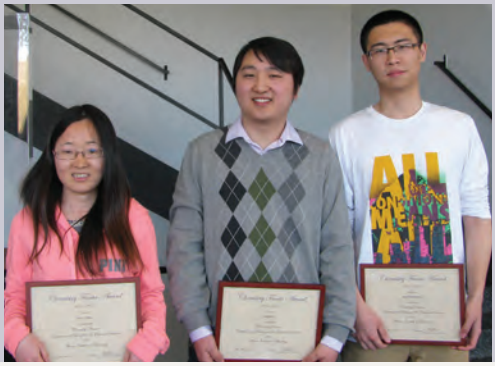
Spring 2015 Department Student Awards

2014–15 Chemistry Senior Award recipient Rachael Youngworth ▶

2014–15 Chemistry Junior Award recipient Dan Yin ▶



2014–15 Chemistry Fanta Award recipients [left to right] Shuo Zhou, Jingbai Li, and Xiaohan Chen. These students used their funding to present talks at the spring 2015 ACS Meeting in Denver. ▶



2015–16 Kilpatrick Awards

◀ 2015–16 Undergraduate Kilpatrick Scholar Dan Yin

◀ 2015-16 Undergraduate Kilpatrick Scholar Paloma Corro

◀ Matt Weimer, 2015–16 Kilpatrick Fellow. Weimer has been working on research with Assistant Professor Adam Hock's group in the area of ALD (Atomic Layer Deposition).

Chemistry Major Receives College of Science 2015 Summer Research Award

Chemistry major and 2014–15 Kilpatrick Scholar John Clark was awarded 2015 summer research funding from the College of Science. He worked with Assistant Professor David Minh to compare different clustering algorithms to process molecular dynamics simulation data for use in Implicit Ligand Theory (ILT)-based binding affinity calculations.

▲ Assistant Professor David Minh and undergraduate chemistry student John Clark (CHEM 5th year) discuss computational chemistry.

Between Ligands and Rigid Protein Conformations: Precise Estimation and Improved Activity Classification" at the 1st Zing Computational Chemical Biology conference in Cairns, Australia, August 6–9, 2015, and at the University of Queensland, Australia. He was also an invited speaker for the 250th ACS National Meeting in Boston, August 16–20, 2015, where he gave a talk on "Predicting the Mechanism of Anthocyanin-induced Insulin Sensitization with Molecular Modeling."

Assistant Professor Andrey Rogachev gave an invited talk entitled "Theoretical Study of Sandwich-like Aggregates of Buckybowls" at the 10th Congress of the World Association of Theoretically Oriented Chemists in Santiago, Chile, October 5–10, 2014. He then gave a seminar at the Theoretical Chemistry Institute Seminar, Department of Chemistry, University of Wisconsin-Madison, November 6, 2014. Last summer he gave two invited talks: at the Northeast Regional ACS Meeting, NERM 2015, in Ithaca, New York, June 10–13, 2015, on "Highly-reduced Corannulene Aggregates with Different Alkali Metals: Different Geometries Within the Same Electronic Structure" and at the International Conference on Chemical Bonding, ICCB 2015, Kauai, Hawaii, July 2–6, 2015, entitled "7Li-NMR of Corannulene Sandwich-like Aggregates: Playing with Records."

Associate Chair Rong Wang was promoted to full professor beginning fall semester 2015. She was the invited speaker at the April 2015 Chicago ACS Meeting, where she gave a talk on "Collagen-based Nanocomposite Materials and Their Applications."

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Chemistry Alumna Susan Solomon Inducted into the 2015 Illinois Tech Hall of Fame!

Chemistry alumna Susan Solomon (CHEM '77), now MIT professor, was inducted into the Illinois Tech Hall of Fame on September 17, 2015, for her work in atmospheric chemistry. Solomon attended the downtown gala event that evening. ▶

Chemistry Alumni Return to Campus

Chemistry alumni returned to campus on September 18, 2015, for a tour of the department, a luncheon, and the ceremony inaugurating Alan W. Cramb as the ninth president of Illinois Tech.

Alumni Mike Tufano (CHEM '75) and Ted Erikson (CHE '52, CHEM MS '59) toured the chemistry labs. [From left] Lecturer Courtney Sobers, Chairman Khan, Mike Tufano, Ted Erikson, and Associate Chair Rong Wang. ▶

[From left] Ishaque Khan, Mike Tufano, Lab Coordinator Zabel Panosyan, Ted Erikson, and Rong Wang. ▶

Graduate student Matt Weimer discusses with alumni his research and instrumentation in Professor Hock's lab. ▶