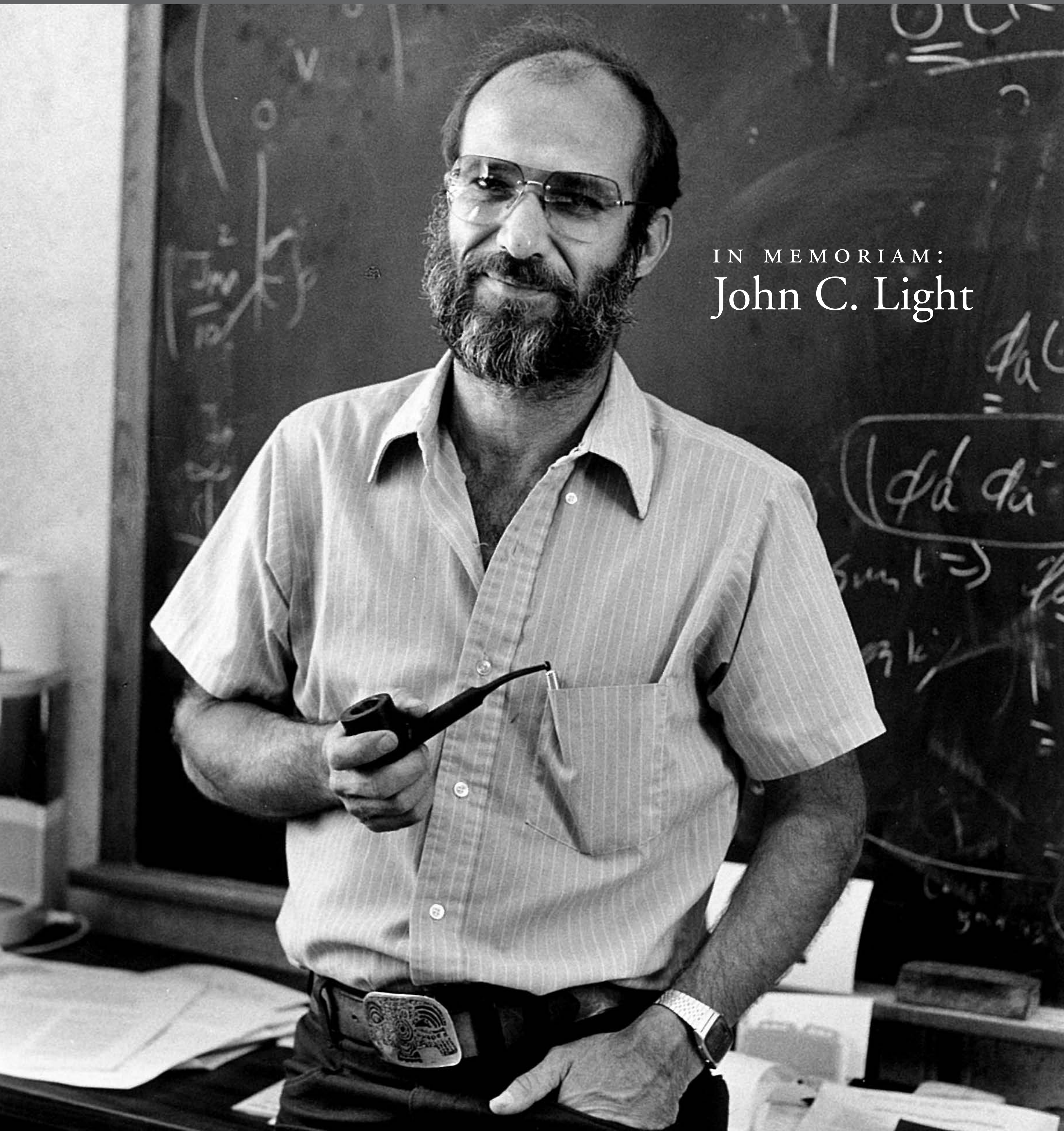
the chemists club

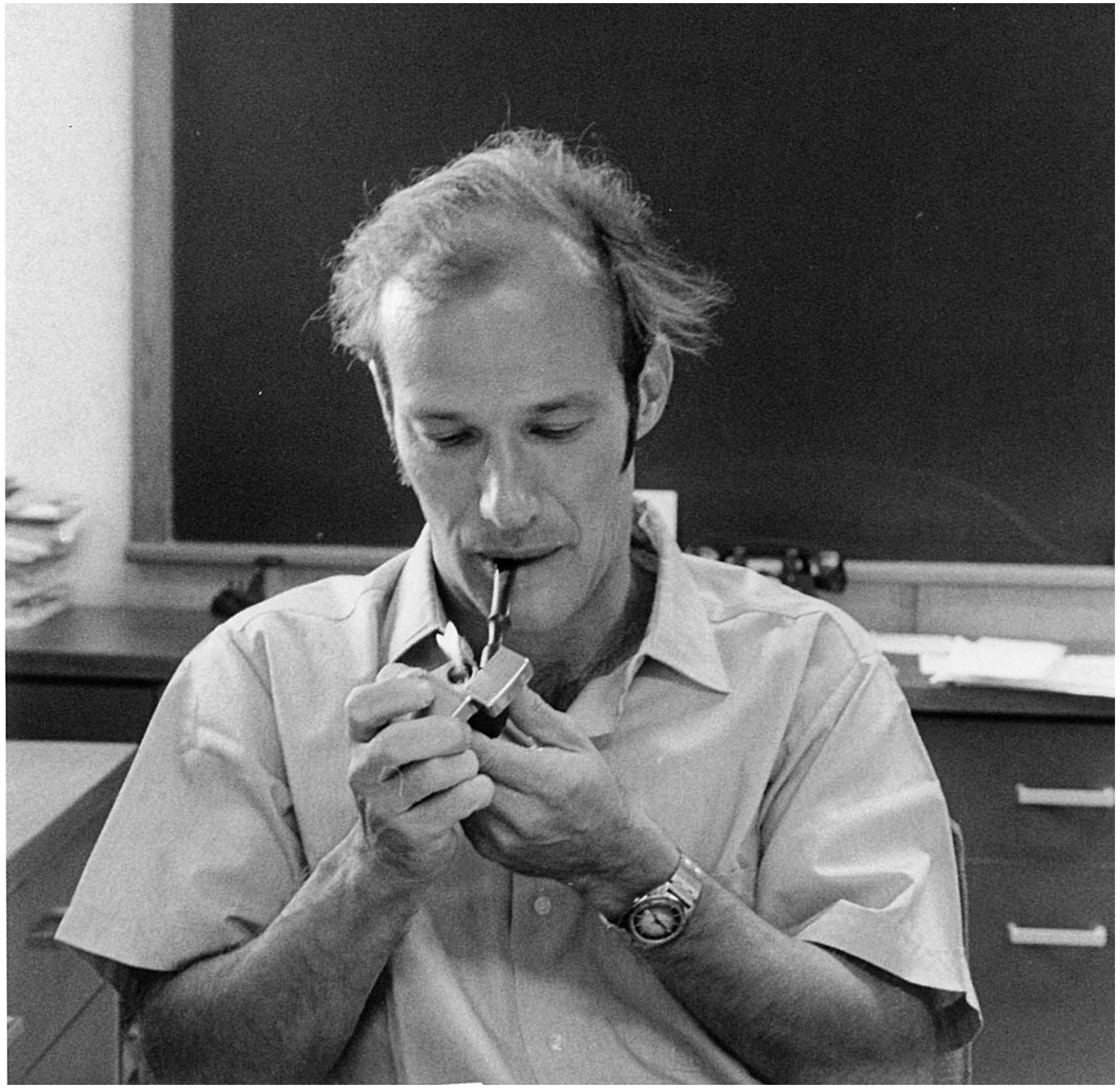
THE UNIVERSITY OF CHICAGO

Autumn 2016



IN MEMORIAM:

John C. Light



IN MEMORIAM:

John C. Light

By Stuart A. Rice

John C. Light, Emeritus Professor of Chemistry at the University of Chicago, died January 18, 2016, in a Denver hospital following a severe illness. He was 81. Born in Mount Vernon, New York in 1934, John earned a BA with honors from Oberlin College in 1956 and, as a National Science Foundation Predoctoral Fellow, a PhD in Chemistry from Harvard University in 1960. His dissertation research was in the field of statistical mechanics, under the direction of Marshall Fixman. John then spent two years, 1959-61, as a National Science Foundation Postdoctoral Fellow at the Service Chimie Physique II, Université Libre de Bruxelles, under the direction of Ilya Prigogine. It was there, in early 1961, that I met him and helped recruit him to the University of Chicago. He joined the University of Chicago faculty in the Fall of 1961 as an Instructor in Chemistry and the James Franck Institute (then the Institute for the Study of Metals), rising through the ranks to Professor in 1970, becoming Professor Emeritus in 2001, with the continuity of active service at the University of Chicago punctuated twice, by positions as a Visiting Professor at Yale in 1968 and as a Visiting Scientist at JILA in 1976. In 2004 John and his wife, Phyllis, moved to Nathrop, Colorado, where they could enjoy skiing, hiking, and John's new passion for horseback riding, the latter fulfilling a boyhood dream. Nevertheless, he remained active in science; I last saw him at a meeting in Telluride in the summer of 2014.

John was my friend for 54 years. Yet I find it difficult to describe a friend. It is not merely a matter of being too close to have perspective. The larger problem is to sum up in only a few words the personal traits, the accomplishments, and the hopes of a complex being. Where does one begin and where does one end?

John was a notably superb colleague, participating fully and enthusiastically in all Departmental and broader University activities. He was collegial, open-minded, and flexible on diverse issues, and always ready to lend a helping hand. He served as Director of the Materials Research Laboratory from 1970 to 1973, and as Chair of the Department of Chemistry from 1980 to 1982. John was also a successful educator and mentor; he had a close and supportive relationship with his 31 PhD students and 25 Postdoctoral Research Associates, the spirit of which is captured both by his saying that he learned much more from them than they learned from him and by his delight in their successful careers.

Simultaneously with his active research program, John served as Editor of the *Journal of Chemical Physics*, arguably the preeminent journal in its field, for 15 years, from 1983 to 1997. His editorship was marked by a considerable growth in the size of the journal both in number of papers published and diversity of topics covered, and by the implementation of modern submission and refereeing processes using programs that he wrote. Indeed, those of us who dealt with the *Journal of Chemical Physics* in that time period still believe that the submission system he put in place was far superior in simplicity and efficiency to the system later put in place by the AIP.

Creative scientists are fortunate in that they do something that is visible and that stands or falls on its own merits. The very visibility of an individual's contributions is in many senses the best memorial since it mirrors the individual's development and vividly shows strengths and weaknesses. John Light was one of the pioneer developers of the modern theory of quantum dynamics of small systems as applied to chemical reactions, inelastic collision processes, and more. His contributions, which are marked by a keen eye for innovative and practical analyses, are remarkable for both scope and significance as they helped guide the evolution from general but approximate descriptions of reactions such as the phase space (statistical) theory of chemical kinetics to accurate, fully quantum calculations of reactions of small molecules and of molecule-surface interactions. The methodological advances and computational techniques that he and his students devised include exponential expansions, short iterative Lanczos propagation, transition state wave packet propagation, time-independent scattering via R-matrix propagation, discrete variable representation, and more. Many of these advances have been incorporated into standard practice and are widely used. In particular, John's pioneering development of the discrete variable representation led to a significant extension of the dimensionality of systems amenable to exact quantum treatment via provision of a versatile and efficient means of executing multidimensional bound state and scattering calculations.

Creative scientists are fortunate in that they do something that is visible and that stands or falls on its own merits.

It is impossible for me to end this obituary without commenting on the very warm personal relationship I had with John. I met him during a trip to Brussels in 1961 and, for whatever reason, the chemistry was good. We became friends immediately and remained good friends for 54 years. John was a warm and generous person, loyal to his friends and the institutions he served, an always rational voice in a sometimes irrational, even chaotic, environment. He will be missed.

Stuart A. Rice is the Frank P. Hixon Distinguished Service Professor, Emeritus, in the Department of Chemistry and the James Franck Institute. Since joining the University of Chicago in 1957, he has carried out theoretical and experimental research in diverse areas of physical chemistry, resulting in the publication, with coworkers, of more than 700 research papers and four books.

A Former Doctoral Student Remembers John Light

By Birgitta Whaley

When I first met John Light as a prospective student visiting the Chemistry Department at the University of Chicago in 1979, he and his students were one of a few groups working on the formidable problem of making full three-dimensional quantum reactive scattering calculations. This was the clearly the place to be for anyone interested in pursuing understanding of quantum dynamics of physical and chemical systems and their implications. John's broad scientific knowledge, with his razor sharp quantitative insight and depth of understanding, in combination with his enthusiasm for the process of scientific discovery and willingness to try out new ideas, was very inspiring for a beginning student. I had no hesitation in signing on to his group; it would clearly be exciting and lead in new directions, no matter what specific projects I worked on. This turned out to be true for me and many other PhD students and postdocs who worked with John.

In the 1970s John was very well known for his pioneering contributions to microscopic theories of chemical kinetics and his work on the full quantum description of chemical collisions, in particular the 3D reactive scattering problem. But, as I experienced firsthand, John was not one to allow himself to be defined by any one area. He was very imaginative and creative, always thinking ahead and throwing out a long rope to think of potential applications for the latest technical developments in his group on seemingly unrelated scientific topics.

A prime example was his inspired application of discrete variable representation, first developed in the context of scattering theory with graduate student Jim Lill and postdoc Greg Parker in the early 1980s, to bound state molecular problems. This has since had a great impact on modern computational methods for analysis of bound state energetics and dynamics of small molecules in the chemical community.

For a young scientist, it was also interesting to talk to John about science and its community and organization more generally. During my PhD years at Chicago there were many ties between John's group and the theoretical division at Los Alamos National Laboratories. As I learned more about the organization of science in the United States, I saw that John was a role model for effortless integration of university-based fundamental scientific research with the mission-oriented projects at national laboratories.

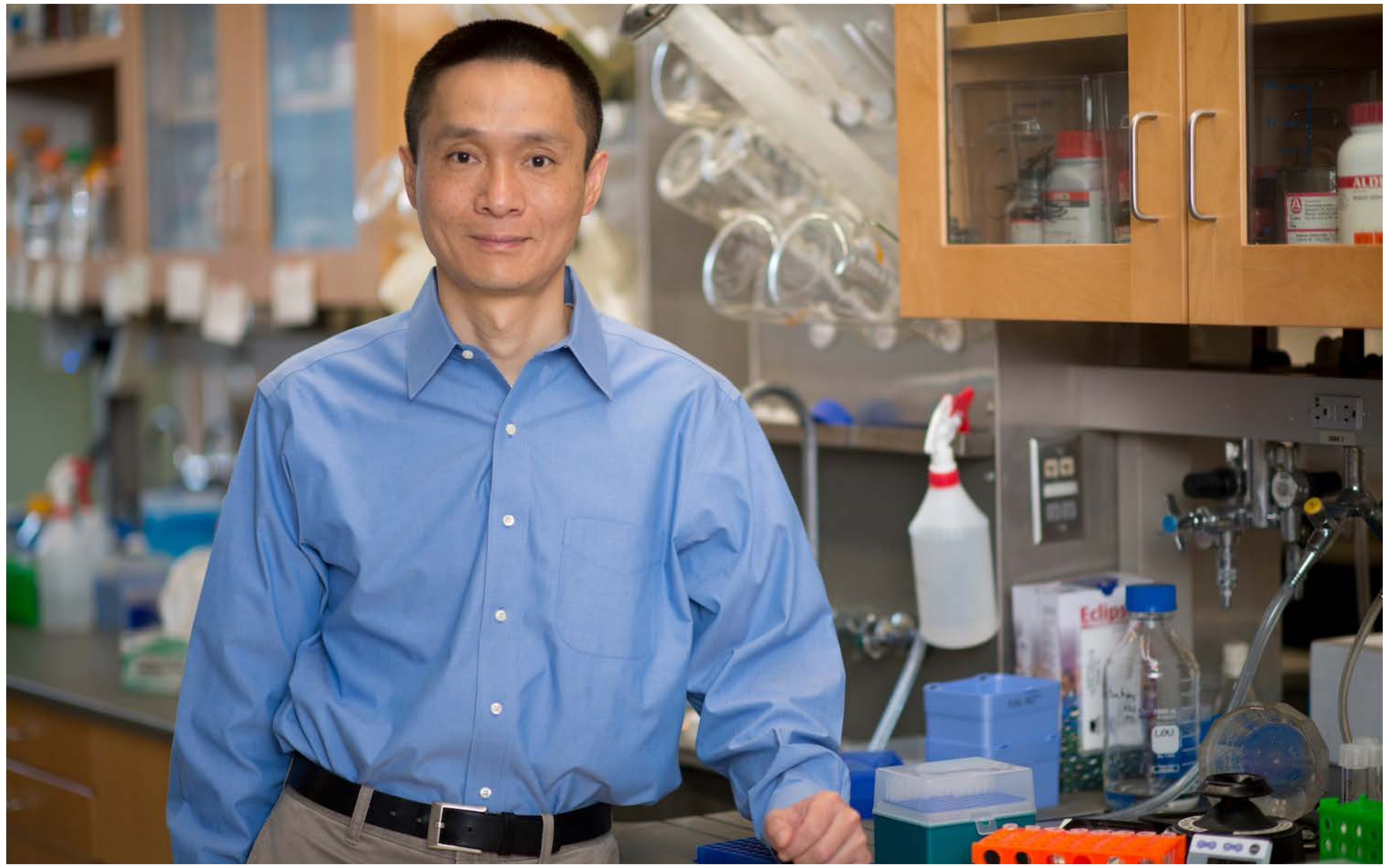
As a research advisor, John encouraged intellectual rigor and discipline by example. He worked closely with his students and postdocs but also showed grace, humor, and enthusiasm for our independent work. He thought nothing of working through equations, poring through pages of computer output, holding sheets of paper up to the light to assess the similarity of graphs, even asking for the computer code we used. Hard data analysis would often be followed by a chat session of "what if" or an introduction to the latest topic he had been reading about. The late afternoon hours, fueled by an apparently bottomless cup of black coffee, were particularly productive times for brainstorming about new challenges separated at least one leap from the research at hand.

John was also extremely personable, with a great sense of humor. He was inclusive in his interactions with his group and respectful of every single one of his students. We could always stop when going by his open door, which was conveniently located not only on a main corridor in the James Franck Institute but also close to the all-important third-floor coffee machine. I think that I speak for many of his former students in saying that John made our PhD experience hugely enjoyable as well as rewarding.

The formal German term for a PhD advisor is *Doktorvater*, literally, "doctor father," (maybe today one would translate this more neutrally as "PhD parent"). As a good PhD parent, John welcomed all his group members to his home on many occasions, and his wife, Phyllis, and sons, David, Robert, and Eric, were known to many of us. Some of us were also asked to housesit while he and Phyllis were away, which led to great friendships with their many pets. I have very fond memories of Mr. Chips, a golden retriever mix with large brown eyes who could always persuade me, a novice dog sitter at the time, to go for a W-A-L-K upon arrival to the house. As a member of John Light's research group, we became members of an extended family, as so many of us appreciated and relived when we gathered in Chicago this past May to remember John, his science, and his life.

John was a wonderful research advisor, mentor, friend, and colleague to many students and postdocs, not only those whom he supervised directly. We shall continue to remember John as a great scientist, an inspiring mentor and scientific role model, and as a dear friend.

Birgitta Whaley (PhD 1984) is Professor of Chemistry, co-director of Berkeley's Quantum Information and Computation Center, and senior faculty scientist at Lawrence Berkeley National Laboratory. She works at the interface of chemistry, physics, and biology, focusing on quantum information science and quantum computation, measurement, control, and simulation of complex quantum systems, and quantum effects in biological systems.



Chuan He to Lead New Center of Excellence in Genomic Science

NIH-funded research center will map RNA modifications

Chuan He, John T. Wilson Distinguished Service Professor and Howard Hughes Medical Investigator, has been selected by the National Human Genome Research Institute to lead the Midwest's first Center of Excellence in Genomic Science at the University of Chicago. Funded for five years by the NIH, each CEGS addresses a specific technological problem concerning the vast store of data amassed during the Human Genome Project. Under He's direction, the Center for Dynamic RNA Epitranscriptomes, one of seven active CEGS in the United States, will focus on RNA modifications. He's ambitions for the Center are not minor: he aims to discover "paradigm-shifting technologies that will pave the way for future biological research."

The ideas driving the Center emerge from several years of work by He and other groups at the University of Chicago, especially his collaboration with Center co-director Tao Pan, Professor of Biochemistry and Molecular Biology. "Around 2008, we began working on the idea that RNA modifications could affect gene expression," He says. Modifications to DNA, which produce changes in encoding and expressing genes without changes to the genome sequence, have been studied for half a century. In contrast, analogous modifications on RNA, which are also dynamic and reversible, have only become a focal point in the past five years, after He and his lab found a means by which methylation marks could be removed from RNA when they discovered the first RNA demethylase in 2011.

Now that over a hundred different posttranscriptional RNA modifications have been recognized, He explains, "We lack a reliable, accurate, sensitive, quantitative method to figure out where the modifications are so that we can correlate their presence to different biological outcomes. We want to develop a method for every modification."

The Center will occupy preexisting facilities in the Gordon Center for Integrative Science, the same building that He credits with prompting his shift to biological chemistry. "Before 2008, I was more a chemist. When I moved here, I started talking to colleagues in other fields," he says. The Center offers similar opportunities for collaboration and mutual growth for its participants, which already includes faculty from several departments. (ICH)

Freed in Theory

Karl F. Freed converses with Irene C. Hsiao in his office, 4 October 2016

Karl F. Freed, Henry G. Gale Distinguished Service Professor Emeritus and professor at the University of Chicago since 1968, spoke to the *Chemists Club* on 4 October 2016. He is a Fellow of the American Physical Society and the American Academy of Arts and Sciences, a Guggenheim Fellow, an Alfred P. Sloan Fellow, and a Camille and Henry Dreyfus Teacher-Scholar-Fellow. He has been awarded the Marlow Medal of the Faraday Division of the Royal Chemical Society, the American Chemical Society Award in Pure Chemistry, and the Polymer Physics prize of the American Physical Society. He currently works on protein folding, the influence of monomer structure and interactions on the thermodynamics of glass formation in polymer systems and thin, dense polymer films, and solvation and other complex phenomena in multicomponent self-associating systems.

How do you define chemistry?
G.N. Lewis, who was a professor at Berkeley around the early 1900s was asked once to define chemistry, and his answer was, "What the people in my department are doing." I think it's a good answer.*

What first interested you in the subject?
I was interested more in math and science generally. I enjoyed chemistry, found physics a little bit difficult. I was always interested in quantitative things.

Why?
Genes. Accidents.

What makes you come in every day?
I'm trying to solve important, long-standing problems that nobody else can solve.

What problems are you trying to solve?
We're working on problems of polymer films.

What problems do they have?
Well, there's no theory describing the properties of thin polymer films based on a molecular description. We have a theory that we've developed for bulk polymer systems. Bulk is defined as thick enough or big enough so that the properties are not going to change as you make them larger. How the density varies with temperature. How they change with pressure. These are basic thermodynamic properties. How the specific heat changes with pressure or temperature. So these are bulk properties, where you ask for the properties of the whole.

[The theory] describes a number of things very well, so I have felt for a long time it should be able to describe thin films, but we needed more understanding to try to extend that theory for films. We're trying to put together an analytical theory based on a model which is quite reasonable to predict a certain set of properties. We're interested in the glass transition temperature—when things have cooled down so that they're very, very slow.

What does theory look like?
A huge formula. You start with a physical problem. You translate it into mathematics. And you solve the mathematics. I start with a model that works for bulk polymers and that describes certain properties of bulk polymers. I'm trying to describe the properties

of polymer films. We have films on everything: paint, lubrication, in fabricating computer chips. Any thin layer of something on another substance.

Does that mean that paint when it's in the bucket is not a film but only when you've painted it?
Yes. Only when it's dry, it's a film.

So a film is not a substance in itself but a substance in a certain state.
Yes.

Why does it develop particular properties in that state? What are those properties?
Polymers, when they cool down, become solid-like. Technically, they're glasses. And the properties of polymer films change drastically from the bulk.

Is there a specific dimension?
When polymers get below about a hundred nanometers, their properties change a lot.

Any polymer?
Many polymers. I can't say every. [Paul] Nealey has done a lot of work in that area. [Juan] De Pablo has done simulations. When they make smaller and smaller patterns on the circuitry, polymers that were nice and solid suddenly become soft and goopy, and the things just collapse.

Does that mean they're liquids?
As glasses, polymers are technically still liquids, but they're so thick, like window glass, that for most practical purposes, they're a solid. Glasses technically have no sheer viscosity at zero frequency.

Paint is a film, but it's not a very smooth film. At least on one side, the wallboard is rough, so it's not a very neat film, but it is a film. You can put oil on water, a very thin layer, and that's sort of a film, although it doesn't have much integrity. You could think of putting oil on water and doing something chemically, and you would have a very thin film.

What would I have to do?
I don't know. I'm just thinking.

So do you have a lab?
No, I do everything here.

Have you ever had a lab?
No, OSHA rules prevent me from having a lab.

What? Why would that be?
Just joking. I've always been here. I've always done theory.

Does your work ever aim towards an application?
Oh, yeah. A lot of times when we've developed a theory, we'll look for experimental data. I also collaborate with Tobin Sosnick in the biochemistry department on protein folding.

Is that related to your work on polymers?
Occasionally. Proteins are polymers. There are many amino acids, which are –*mers* (*mers* means "units," *polymers* means "many units"). So proteins are polymers. A lot of biological people don't like to believe that, but they are. They're extremely complicated because they're made up of 20 amino acids, and typical industrial or synthetic polymers may be made up of one or two or three kinds of monomers, so they're much simpler in some ways. We're interested in the fact that proteins fold up into special structures, and there are some which don't fold.

What are they for?
They do some work which is generally not known, and they can do the work because they're not structured. They interact with other proteins; they wrap themselves around the protein and tell it to do something.

Are you working with actual proteins?
We've been worried about real proteins. Sosnick does a lot of experiments on particular proteins, [such as] ubiquitin. The basic problem we work on is describing how proteins go from a denatured state to the folded natural state, and we also worry about how to characterize proteins that are not folded—the unfolded ones that are either too smart or too stubborn to stay folded.

So they were just dud proteins until now?
They were working on protein folding, and these were just not useful. Just like when [Alexander] Fleming discovered penicillin, he was working in a lab where they were trying to grow these nasty things to study how to deal with them. He was a sloppy experimentalist, and he was getting things contaminated, and he noticed how this green mold would kill things. He said, Hey, this is interesting. So sometimes the opposite of what you're doing is useful.

If it's all theory, how do you know when it's right?
There's a large body of experimental data that we can compare with. We can also make predictions of what experiments would show if they were done. We sometimes have people do those experiments to test or challenge us.

But how do you begin to approach such a problem?
I've been interested in the problem of describing polymers in bulk for many, many years. So this is just a problem which came to my attention, that people were doing experiments and finding strange behavior that they couldn't solve, they couldn't understand. That's what I like.

Strange behavior?
No! Difficult problems, like an analogue of the crossword puzzle. It's a challenge, it's difficult, and that's what I enjoy doing.

What does an insight look like for you?
Sometimes you get pieces that come together, but there are lots of pieces. It's a very, very complicated jigsaw puzzle or crossword puzzle, and there are lots of pieces before it all fits, and sometimes you put in a piece that you think fits perfectly, but it's not the right one, and it throws the whole thing off. It's very frustrating, of course.

It might help you if you look up the definition of film or polymer in Wikipedia, and you can tell me what the standing definition is, and I can cringe or whatever.

How has the department changed since 1968?
Recently, the size has grown almost 50%, and the areas that are encompassed has grown enormously. There's a lot more biological work, a lot more interest in materials, more theory, more technology, driving the ability to do new things.

Everyone seems to be pushing more towards application.
Funding agencies are pushing more towards applications. But I have colleagues, coworkers, who know about the applications, and they can put it in the proposal, and I don't have to worry about it!

Do you have advice for those pursuing chemistry?
They have to love it and be willing to work hard. They have to feel they can do well in it, because there's no sense in working on something that you're not making a contribution to. You might as well do something else. There's also no sense in just adding another example. Or fighting with a problem that nobody can solve and that nobody will solve in their lifetime.

Would you say there is a problem you have solved that brought you the most satisfaction or the most pride?
No, I love many of my children.

What about the inverse?
There are some problems that I don't think were worth that much.

> We worry about how to characterize proteins that are not folded—the unfolded ones that are either too smart or too stubborn to stay folded.

They weren't necessarily wrong, but they didn't make a big impact. But that's normal. You don't hit a home run every time.

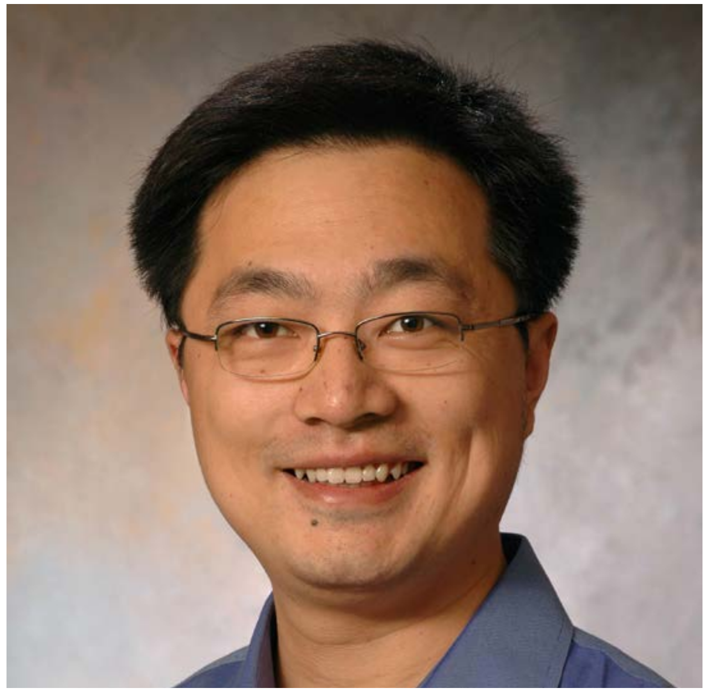
It's just like when I taught Gen Chem—before the first exam, I tell them I strive for an average of 50 with a standard deviation of 20, and they're horrified.

That is terrible!
That's normal. There are people who get things right maybe 30% of the time, and they get millions of dollars for it. Take baseball players.

Are you a baseball fan?
That's irrelevant! But if you get things right half the time, you're doing well. It's the real world. You don't get things right 90% of the time. In science, we want to challenge people, make them think. If you have an exam with the average in the 90s, you didn't have to think. Venture capitalists, if they get 3 in 10, they're doing really well. So I think we bring up students poorly by putting emphasis on getting 100%, and the exams—the GREs, the SATs—are geared to the one who's fast. The fast one is not necessarily the one who's successful at dealing with problems. My exams were geared to an open amount of time, as much as you need. My TA would sit with them, and they'd take their work with them, and when nobody was doing any writing, they'd say, "All right, it's time. Let's go for a beer." And everybody would happily go to Jimmy's.

Is there anything else you think people would find interesting about you or your work?
I don't know what they would find interesting.

**Born in 1875, Gilbert Newton Lewis made crucial discoveries in valence bond theory, thermodynamics, isotopes, and the interaction of light with matter. In 1912, he was appointed chair of chemistry department and Dean of the College of Chemistry at UC Berkeley, positions he held until his death in 1946. Though nominated many times, he was never awarded a Nobel Prize.*



Soft Silicon for Sensing and Stimulating Cyborg Cells

Bozhi Tian experiments on silicon to repair damaged tissue

Assistant professor Bozhi Tian, recently the recipient of an NIH New Innovator Award and a Presidential Early Career Award for Scientists and Engineers, has been dreaming about combining humans with electronics since his days as a graduate student in physical chemistry at Harvard. With a background in building nanoscale electronic devices and cellular engineering, Tian's latest discovery brings him a step closer to creating cyborg cells—moving beyond mere prosthetics to devices that can respond to light or stimulate muscle contractions. Though modest about the revolutionary potential of his work for biomedical use, Tian's energy and enthusiasm for his work is palpable.

Tian explains that all his work is driven by the pursuit of fundamental questions. "We were thinking of the molecular level structure and the mechanics of the device, which allows for its seamless integration with cellular components," he says, introducing his wireless electrical stimulator, a spongy, deformable silicon developed in his lab. While stiff materials prompt bodies to respond to the irritation with inflammation, soft materials move with the body's own tissue, limiting damage—and, as he puts it, "biological materials . . . like them."

While most researchers have placed their focus on soft polymers for tissue repair, Tian and his lab have concentrated on silicon, a traditionally hard material. "It has unique physical properties," he says, referring to its ability to interact with light and generate electrical impulses. "Because silicon is usually rigid, we wanted to discover a material as mechanically deformable as polymers that retains most of silicon's special properties. The conductivity of traditional silicon is somewhere between an insulator, like glass, and a metal, like gold. Because it's in-between, you have a lot of room to tune it, and if you can regulate it, the device becomes active and even multifunctional. For example, the output voltage from a silicon-based device can be modulated by changing the input voltage, which results in a kind of circuit. One nice thing about an active device is that you can also amplify a tiny amount of input signal into a big output."

A year ago, his lab succeeded in producing just such a material. Porous in nature, it combines deformability, biocompatibility, and biodegradability with the possibility of making devices that respond to light by generating heat and eventually electricity directly across a biological membrane—in other words, an ideal material with potential for repairing or replacing nerve tissue.

"We found that when we shone light onto a spongy silicon surface which attached to a cell membrane, the silicon could convert energy from the incident light into something like electrical stimulation," Tian says. "We're using light to modulate neural activity using spongy silicon as a transducer. One promising application is repairing photoreceptors in damaged retinas."

Another possible application the Tian lab is exploring is repairing peripheral nerve damage. "We could inject the spongy silicon into skeletal muscle and shine light on it. The silicon then stimulates the muscle like the original nerve," he explains. "Alternatively, we can combine a silicon-based network with a collagen-based conduit to promote nerve regeneration."

Tian and his group are in the early phases of their biomedical studies, moving from calibration of their material in vitro to in vivo studies in, for instance, blind mice. "We want to show the field that our material can have a good impact," he says. He also notes that his interest in exploring biomedical applications of their material emerges as an extension from their fundamental studies: "If we don't do it, no one will."

However, the majority of Tian's research is aimed at understanding the electrical behavior of biological systems, such as how cytoskeleton and motor proteins respond to localized electrical stimulation. "In the past, there were no tools to understand such processes from an electrical perspective," Tian says. Most of the information we have is superficial: for example, we have a plate of cells and near it we place some electrodes and see how the cells migrate. But we are trying to understand how it works on a molecular level."

On such a scale, direct measurement remains a significant challenge. "If we place a global electrode, everything becomes messy, and you can't see anything because you target the entire cell." But Tian has developed a way to observe the effects of electrical stimulation on cytoskeletal filaments within insect cells. "We designed a nanoscale solar cell and let the cell internalize the solar cell. Essentially, it is a wireless electrical stimulation device that can be placed inside the cell and targeted to a specific component. When we shine light, the tiny solar cell responds and generates a transient electrical output from the interior of the cell. Then we watch how the cell responses change from this electrical perturbation." This set of experiments is critical for understanding how the increasing use of implantable electronic devices may affect humans on a cellular or subcellular level.

> Porous in nature, Tian's material combines deformability, biocompatibility, and biodegradability with the possibility of making devices that respond to light by generating heat and eventually electricity directly across a biological membrane.

"For me, the exploration of a new frontier or the discovery of a new phenomenon is the most important thing. I like unexpected things and unconventional paths. I would not put application (at least at this career stage) as the major driving force of my research. There are a lot of mysteries, and we are trying to understand only one part." Furthermore, Tian admits, bioelectrics, the study of electrical behavior or phenomena in biological systems, is an open field with few players at present. "I don't want to work in a crowded field. If you work in a crowded area, even if it's a hot area, it's unlikely to be the first person to discover something. You feel nervous, and you always ask yourself, 'What if my work is scooped by someone else?' and you put that pressure on your students—and you will not sleep well. And then I would not enjoy science! I like to work on things that may become important only in 5 years, 10 years or even longer—that is how we can become real leaders. If we understand the origin of bioelectrics, we can understand a lot of things that have been mysteries for centuries, such as deep brain stimulation and acupuncture—we know that they work, but why?" (ICH)

FROM THE LABS

Jared Lewis has received the Camille Dreyfus Teacher-Scholar Award.

Richard Jordan has been named Paul Snowden Russell Distinguished Service Professor.

Bozhi Tian has received the NIH New Innovator Award, the ONR Young Investigator Award, a Presidential Early Career Award for Scientists and Engineers (PECASE), and an Alfred P. Sloan Fellowship.

Yossi Weizmann has received the Chicago Innovation Fund Award and National Science Foundation CAREER Award.

Aaron Dinner has been elected a Fellow of the American Physical Society.

Guangbin Dong has received the 2017 American Chemical Society Cope Scholar Award.

Hisashi Yamamoto has won the 2017 American Chemical Society Roger Adams Award and was elected President of the Japanese Chemical Society.

Steven J. Sibener was elected a Fellow of the American Vacuum Society and the American Chemical Society.

Yamuna Krishnan has received the 2016 Innovator Award from the American Women in Science Chicago.

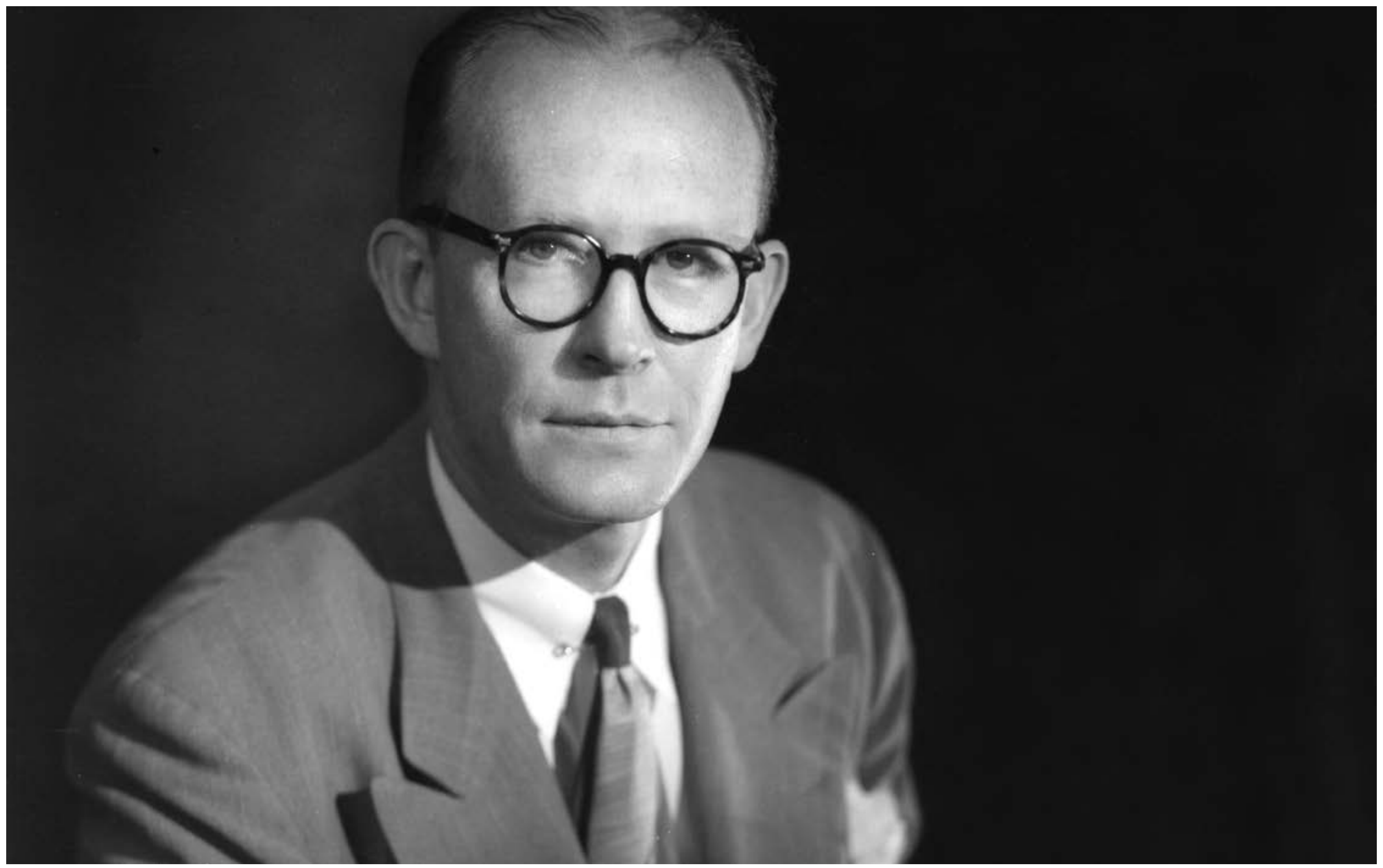
Ray Moellering is the recipient of the 2015 Cancer Research Foundation Young Investigator Award, the V Scholar Award from the V Foundation for Cancer Research, and the Mary Kay Foundation Cancer Grant.

Stay in Touch

The Department of Chemistry encourages alumni to connect with current chemistry students and each other on LinkedIn. The department's group, called the University of Chicago Department of Chemistry Network, can be found at tinyurl.com/7efp2t2.

Also connect with us on Facebook and Twitter @uchicagochemistsclub!

Willard Libby's Discovery of Radiocarbon Dating Honored by the American Chemical Society



On October 10, the American Chemical Society designated the University of Chicago a National Historic Chemical Landmark for Willard Libby's discovery of radiocarbon dating. Libby (1908-80) was born in Colorado and educated in California, receiving both his BS and PhD in chemistry from the University of California, Berkeley. After working on the Manhattan Project, Libby joined the faculty at the University of Chicago as a professor of chemistry and the Institute for Nuclear Studies (now the Enrico Fermi Institute) in 1945. Libby published "Atmospheric Helium Three and Radiocarbon from Cosmic Radiation" as a one-page Letter to the Editor in *Physical Review* in 1946. Building on physicist Serge Korff's discovery that the reaction between neutrons produced by cosmic rays hitting the atmosphere results in the formation of radioactive carbon-14 particles, Libby postulated that, if

the amount of radiocarbon in an object containing living matter could be measured, the object's age could be determined using the half-life of radiocarbon. Over the next several years, Libby developed his method, revealing results of early experiments in his 1947 Science paper, "Radiocarbon from Cosmic Radiation," publishing a monograph, *Radiocarbon Dating*, at the University of Chicago Press in 1952, and receiving the Nobel Prize in Chemistry for his work in 1960. Libby's discovery of an objective dating method has had lasting impact in archaeology and geology. To honor Libby's far-reaching influence, David Mazziotti, Professor of Chemistry, and Kathleen D. Morrison, Professor and Chair of the Department of Anthropology, delivered lectures on radiocarbon dating before Diane Grob Schmidt, ACS Immediate Past President, presented a plaque commemorating Libby's work. (ICH)

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Yining Han
Ziwei He
Kade Head Marsden
Margaret Hudson
Pengfei Ji
Jaehyeok Jin
Alison Johnson
Kelliann Koehler
Brian Koronkiewicz
Nathan Layle
Gihoon Lee
Nanzhu Li
Zhenghan Liao
Nicholas Ludwig
Michael Mellas
Ryan Menssen
Polina Navotnaya
Andriy Neshchadin
Abraham Ng
Marek Piechowicz
Alexandra Raeber
Erik Reinhart
Anand Saminathan
Erik Schaumann
Xianghang Shangguan
Hailing Shi
Donghyuk Suh
Alan Swartz
Rebecca Thompson
Ruyi Wang
Hang Yin
Julia Zinkus

PhD recipients

Summer 2015

Landon Durak
Ge Feng
Zachary Hund
Dan O'Hanlon
Andrew Sand
Noumaan Shamsi
Lei Wang
Xiao Wang
Miao Yu
Teng Zhang

Autumn 2015

Erik Hoy
Nathan La Porte
Wenxin Li
Nian Liu
Xingyu Lu
Thomas Montgomery
James Payne
Julius Reyes
Chen Zhang
Hao Zhang
Tianyue Zheng

Winter 2016

Charles Heaps III
Ka Cheong Lau
Nicholas Rubin
Hao Yang

Spring 2016

Karan Bhuripanyo
Michael Boles
James Dama
James Henderson
Sang Yun Lee
Ruibin Liang
Lan Luo
Anthony Martinez
Ved Singh

Summer 2016

Kai Chen
Wing-Yeung Lau
Kuangda Lu
Christopher Poon
Erica Sturm
John Zimmerman

Student Honors

Barnard Memorial Fellowship
Zhiyao Zhou

Chenicek Fellowship
Alison Johnson

Closs Teaching Award
Natalie Chan
Jonathan Keim
Huw Rees

Cross Prize
Mary Andorfer
Igor Fedin

Gilbert Memorial Prize
Joe Gair

Goodman Fellowship
Grant Langlois
Erik Reinhart

Knock Prize
Alison McManus (Chemistry)
Peter Chen (Biological Chemistry)
Allen Zhu (Biological Chemistry)

Knock Scholarship
Yuanwen Jiang

Nachtrieb Memorial Award
Joseph Solomon

Norton Prize
Kuangda Lu

Olshansky Memorial Fellowship
Yifan Gu

PSD Teaching Prize
He Ma

Sellei-Beretvas Fellowship
Margaret Hudson

Shiu Department Service Award
Rebecca Black
Boxuan Zhao

Sugarman Teaching Award
Paul Calio
Sara Hess
Laura Watkins

Swift Fellowship
Hailing Shi

Viol Fellowship
Jonathan Raybin

Windt Memorial Fellowship
Zekai Lin

Yang Cao-Lan-Xian Best Thesis
James Dama (Physical)
Hao Zhang (Organic/Inorganic)

John Light Memorial Fellowship Donors

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Mr. Charles D. Rich and Ms. Lesley Rich
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Ms. Laurie F. Walker and Dr. Robert B. Walker

ALUMNI NEWS

Congratulations to **Robert A. Moss** (PhD 1963)**,** Louis P. Hammett Professor of Chemistry Emeritus at Rutgers University, who has been named the 2017 recipient of the James Flack Norris Award in Physical Organic Chemistry by the American Chemical Society. Gerhard L. Closs, his advisor, received the Norris Award in 1974.

David Stubbe (SB 2005) has been appointed Assistant Professor of Physics at the University of California, Merced. Best wishes for the coming years!

IN MEMORIAM
Marios Kosmas (PhD 1978)
John J. Oleksik (PhD 1987)

Please send your news to Irene C. Hsiao, Editor, at chemistsclub@gmail.com.

WELCOME TO OUR NEWEST FACULTY

Timothy Berkelbach
Neubauer Family Assistant Professor
Theoretical Chemistry

Guangbin Dong
Professor
Organic Chemistry

Jiwoong Park
Professor
Materials and Physical Chemistry

Stuart Rowan
Professor
Materials Chemistry

JOHN LIGHT MEMORIAL FUND

On May 14-15, the Department held a memorial service and symposium in honor of Professor John Light, who passed away earlier this year. Using his bequest, the Department has established the John Light Memorial Fellowship in Theoretical Chemistry, which will support an exceptional graduate student in theoretical chemistry.

The Department welcomes your contributions to this fellowship. Please send a check, with the fellowship noted, to:
THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY
ATTN: VERA DRAGISICH
5735 SOUTH ELLIS AVENUE
CHICAGO, IL 60637

Any questions may be directed towards vdragisi@uchicago.edu

CHEMISTRY EVENTS
The calendar of named lectures, as well as the most up-to-date information about Department of Chemistry lectures and events, can be found online at event.uchicago.edu/chem/index.php.

the chemists club

Autumn 2016

Dear friends,

Every fall brings the promise of new faces and new discoveries. The new academic year has made a strong showing, with an impressive influx of both students and faculty. We were pleased to welcome the largest ever cohort of graduate students in the history of the department—at 68, nearly twice the size of the average entering class. Their presence reflects the ongoing expansion of the department and its strengthening in several growing subfields of chemistry. This summer, we were also delighted to bring on board four new faculty—Timothy Berkelbach in theory, who comes to us from Princeton, Guangbin Dong in organometallic chemistry from UT Austin, Jiwoong Park in nanomaterials from Cornell, and Stuart Rowan in functional soft materials, who is moving from Case Western. We look forward to sharing their discoveries with you in the coming years.

In October the department had the opportunity to celebrate Willard Libby's groundbreaking discovery of radiocarbon dating when the American Chemical Society designated this development a National Historic Chemical Landmark. Developed in Kent Laboratories, Libby's method was a transformative advance to archeology and historical studies and was recognized with a Nobel Prize in Chemistry in 1960.

We also use this issue to remember John C. Light, our friend and respected colleague since 1961, who passed away in January of this year. An outstanding theoretician, John served as editor of the *Journal of Chemical Physics* from 1983-97, director of the Materials Research Laboratory from 1970-73, as well as chair of the department from 1980-82. He was a fellow of the American Physical Society, the American Association for the Advancement of Science, and the American Academy of Arts and Sciences. John was also a beloved teacher, mentoring 31 graduate students and 25 postdoctoral fellows, as well as countless numbers of undergraduates with warmth and wit during his years at Chicago. A memorial symposium was held in his honor this spring, and the department has established the John Light Memorial Fellowship to support a graduate student in theoretical chemistry. We are honored to include in this issue poignant remembrances of John by Stuart Rice and Birgitta Whaley.

Shortly before this issue went to press, we were informed of the passing of our esteemed colleague, Robert Gomer. We will commemorate his achievements in the next issue of the *Chemists Club*.

We send our warmest wishes for the new year.

Best regards,

Viresh Rawal
Professor and Chair

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