

BIOCHEMISTRY @ IOWA

Fall 2015

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Message from the Chair

Dear Friends of Iowa Biochemistry,

The breadth of the educational mission of our department is vast.

In the past year, Marc Wold and the faculty in our one-semester biochemistry course taught 568 students. Two hundred twenty-one enrolled in the live fall semester, 260 in the online spring semester, and 87 in the online summer semester. We had about 80 students take the full year undergraduate biochemistry course live and another 30 take it online (starting in the spring semester and continuing in the fall semester).

We continued to teach our senior majors and our first year graduate students two semesters of biophysical chemistry. We taught a first year biochemistry class for all of the dental and pharmacy students, taught a technical communications course and a laboratory biochemistry course for our majors, and mentored undergraduate students, graduate students, post-doctoral fellows and faculty members in our laboratories. The medical biochemistry course was folded into an integrated foundations course for first year medical and physician assistant students—biochemists continue to teach almost as many lectures in the new curriculum as we did in the previous curriculum. Indeed, Peter Rubenstein and Daniel Weeks have major roles in developing and overseeing the rollout of the medical curriculum that was launched in August of 2014.

Many colleagues around the country fret that as curricula are integrated across disciplines, people will lose sight of what is biochemistry. They might, but only if we don't do our jobs as educators.

I'd like to ask, what in our living world isn't biochemistry? Is fertilization of an egg biochemistry? Of course it is. Is formation of an idea biochemistry? Though we don't know enough about how ideas are formed, encoded or retrieved, most of us would comfortably bet on involvement of sets of biochemical reactions in every mental transaction and in virtually every phenomenon that occurs in living things from the tundra to the earth's atmosphere.

Biochemistry is interesting because it is so messy. We don't have a periodic table or 1st or 2nd laws of biochemistry. However, we can conceptually organize why things are the way they are by invoking two rules: 1) that biochemistry doesn't violate any rules of chemistry or physics, and 2) that biological processes are genetically encoded and arose by mutation and selection.

As our department moves forward, we're going to keep discovering and characterizing biological phenomena at the molecular level and we're going to try to enlighten all of our students to the wonders of biochemical phenomena from the most well known to the most mysterious. Here's to biochemistry!

Best,



Roy J. Carver Chair and
Head of Biochemistry

DEPARTMENT OF BIOCHEMISTRY

BIOCHEMISTRY FACULTY

Charles Brenner, Head
Lori Wallrath, Vice Chair
Dale Abel
Sheila Baker
John Dagle
Brandon Davies
Kris DeMali
Adrian Elcock
Ernesto Fuentes
Pamela Geyer
Catherine Musselman
Andrew Norris
David Price
Miles Pufall
Peter Rubenstein
Michael Schnieders
Debra Schwinn
Madeline Shea
Maria Spies
M. Ashley Spies
Eric Taylor
M. Todd Washington
Daniel Weeks
Ronald Weigel
Marc Wold

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Subramanian Ramaswamy
Nancy Stellwagen
Joseph Walder
Meng Wu
Liping Yu

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Thomas Conway
John Donelson
Alice Fulton
Rex Montgomery
Bryce Plapp
Arthur Spector
Earle Stellwagen
Charles Swenson

BIOCHEMISTRY STAFF

Matthew Benge
Briana Horwath
Judy Means
Maren Rogers
Paul Rogers

Rosemary Stratton

BIOCHEMISTRY STORES

Justin Rogers
Don Boehme
Lori Streb
Troy Struzynski

FACULTY HONOR



M. Todd Washington has been promoted to Full Professor of Biochemistry and of Radiation Oncology. Todd began working in the Department as an Assistant Professor in September of 2003 after completing a PhD at Ohio State and a postdoctoral fellowship with Professors Louise and Satya Prakash that focused on lesion-bypassing polymerases at the University of Texas Medical Branch, Galveston. He was promoted to Associate Professor in July 2009. Dr. Washington has established a high powered and internationally visible research program on the function and structure of non-classical DNA polymerases, which are responsible for replicating damaged DNA.

M. Ashley Spies has been promoted to Associate Professor of Biochemistry in the Carver College of Medicine and Medicinal & Natural Products Chemistry in the College of Pharmacy. Ashley moved to Iowa as an Assistant Professor in July of 2012. He received his PhD in Biochemistry from the University of Kansas in 1997. From 1997 to 2000, he held a MONBUSHO fellowship at Osaka University with Dr. Katsuyuki Tanizawa on quinone cofactor biosynthesis. In 2000, he joined Dr. Michael Toney's laboratory at the University of California, Davis, focusing on on alanine racemase enzymology. Dr. Spies continues to conduct cutting edge research on structure-based drug discovery.



Andrew Norris was named Associate Director of the Fraternal Order of Eagles Diabetes Research Center. Dr. Norris is a physician-scientist whose research is focused on the causes and treatments of diabetes across the lifespan. He received his PhD in molecular biophysics and his MD from Washington University School of Medicine in St. Louis. Dr. Norris trained in diabetes research and pediatric endocrinology at the Joslin Diabetes Center and Boston Children's Hospital, and in lipid biochemistry with **Arthur Spector**.

Peter Rubenstein was elected Fellow of the American Association for the Advancement of Science (AAAS) "for distinguished contributions to the fields of actin cytoskeletal biochemistry and cell biology and to innovations in the teaching of basic science in medical education." Dr. Rubenstein joins **Marc Wold**, **Charles Brenner**, and **David Price** among current primary faculty members who are AAAS Fellows.



Catherine Musselman received a National Science Foundation CAREER Award for her project entitled "CAREER: The structural basis of the multivalent readout of histone PTMs and PTM/interaction mediated modulation of nucleosome dynamics." Dr. Musselman aims to dissect fundamental epigenetic mechanisms by which the eukaryotic genome is regulated.

S AND AWARDS



L to R: Dean Debra Schwinn, Pamela Geyer, and Charles Brenner.

Pamela Geyer received the Carver College of Medicine's Collegiate Teaching Award for 2014-2015. Professor Geyer has demonstrated excellence in teaching for the past two and a half decades at the University of Iowa. Professor Geyer has had an enormous impact on graduate education at the University of Iowa, chairing a task force that re-shaped the graduate curriculum that is in place today.

Among current Biochemistry primary faculty, Dr. Geyer joins Drs. **Peter Rubenstein, Adrian Elcock, Lori Wallrath,**

Dan Weeks, Todd Washington, and **Kris DeMali** as recipients of the CCOM Collegiate Teaching Award. This is the 5th consecutive year a Biochemistry faculty member has received this award.

Madeline Shea was recognized as an Outstanding Educator at the 2014 Medical Education Celebration Day in November 2014. In Dr. Brenner's nomination for Professor Shea, he wrote "For more than a decade, Madeline's lectures on hemoglobin function to Carver College students were as central to the fall semester as home games at Kinnick. She taught thousands of doctors how the energetics of protein conformation underlie molecular medicine."



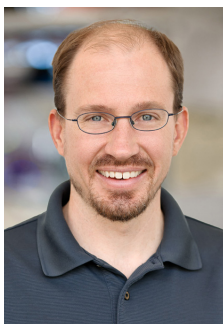
L to R: Dean Debra Schwinn and Madeline Shea

Brandon Davies received an Iowa Center for Research by Undergraduates (ICRU) 2015 Distinguished Mentor Award. Recipients, who were nominated by mentees, are provided funding for one ICRU Research Fellow for the academic year following their selection.

Dr. Davies was also awarded a 2015 Carver Trust Medical Research Initiative Grant for an innovative project on regulation of lipoprotein lipase.



Kris DeMali was awarded a new NIH R01 entitled "Cadherins and Cell Stiffening." Dr. DeMali's goals are to understand how cytoskeletal rearrangements and metabolism are integrated.



Eric Taylor was awarded a new NIH R01 entitled "Regulation of Hepatic Gluconeogenesis by the Mitochondrial Pyruvate Carrier." Dr. Taylor's goals are to determine the molecular mechanisms regulating pyruvate transport and to determine whether inhibition of pyruvate will improve glycemic control in models of type 2 diabetes.



Visiting Professorship

Marie Migaud of Queen's University Belfast, was awarded the Helen C. Levitt Endowed Visiting Professorship to perform



research in collaboration with Dr.

Charles Brenner. Dr. Migaud is a synthetic organic chemist who specializes in nucleosides and nucleotides. She has developed new synthetic technologies that have allowed her to produce novel analogs of nicotinamide riboside and, in collaboration with Dr.

Brenner, she aims to develop a chemical biology toolkit to probe the intricacies of NAD metabolism in vertebrate systems. She will begin her one-year visiting professorship in November 2015.

Emeritus Accolades

Rex Montgomery received a University of Iowa 2014 Inventor Award for his invention of "Biodegradable De-Icer/Anti-Icer Formulations." The intellectual



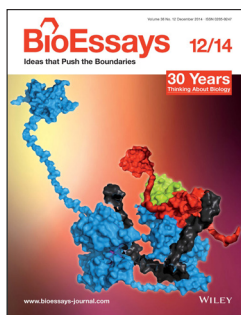
property has been licensed to Heritage Park Research LLC by the University of Iowa Research Foundation.

Staff Welcome

The office welcomed **Matthew Bengé** this past spring. Matthew is the new Senior Accountant, assisting the department with finances.



PUBLICATION HIGHLIGHTS



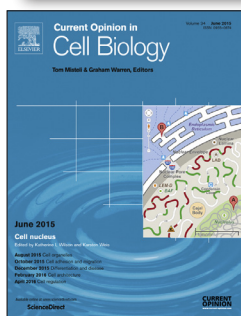
Marc Wold's laboratory was featured on the December 2014 cover of *BioEssays*. The article entitled "Replication protein A: Single-stranded DNA's first responder" reviews recent discoveries that show that replication protein A (RPA), the major eukaryotic single-stranded DNA-binding protein, binds DNA dynamically. It also proposes a new model for RPA binding and discusses the importance of dynamic binding in the processing of single-stranded DNA intermediates and genome stability. Former graduate student **Ran Chen** was first author of this work.

Pamela Geyer's laboratory was featured on the June 2015 cover of *Current Opinion in Cell Biology*. The review entitled "Networking in the nucleus: A spotlight on LEM-domain proteins" highlights a prominent family of nuclear lamina proteins that carries the LAP2-emerin-MAN1-domain (LEM-D). Recent investigations suggest that LEM-D proteins form hubs within the nuclear lamina that integrate external signals important for tissue homeostasis and maintenance of progenitor cell populations. Former graduate student **Lacy Barton** was first author of this work.

Charles Brenner's laboratory was recognized in an *IowaNow* article for an article entitled "Calorie Restriction-Mediated Replicative Lifespan Extension in Yeast is Non-Cell Autonomous" that was published in the January 2015 issue of *PLoS Biology*. The study revealed evidence that baker's yeast cells not only extend their own lifespan in response to calorie restriction but also communicate with other cells to share the benefit of calorie restriction. Former Postdoc **Szu-Chieh Mei** was first author of this work.

Lori Wallrath, Liping Yu, and collaborators co-authored a *PLoS Genetics* article entitled "Myopathic lamin mutations cause reductive stress and activate the Nrf2/Keap-1 pathway." Their findings revealed new mechanisms of pathology and potential therapeutic targets. **Lori Wallrath,**

Thomas Magin (2014 UI Levitt Visiting Professor, University of Leipzig, Germany) and colleagues co-authored a *Journal of Investigative Dermatology* article entitled "A Drosophila model of Epidermolysis Bullosa Simplex" in which fruit flies were used to identify pathological mechanisms of blistering skin disease caused by mutant keratins.



Departmental Outreach

Catherine Musselman has established a collaboration with the Workplace Learning Connection, an organization that provides high school students from around the region the opportunity to perform internships in her laboratory. Students will gain 45-90 hours of laboratory experience for which they will receive academic credit. This experience will provide students with a tangible research experience in the basic sciences, allowing them to explore their interest and opportunities to pursue an education and career in a STEM related field. Catherine had four students from Iowa City high schools working in her laboratory this past summer.

Lori Wallrath gave the sixteenth Mary Murphy, BVM, PhD Endowed Lecture in Biology at Clarke University in Dubuque, IA. Her seminar, entitled "The Nuclear Envelope: Setting Boundaries on Human Disease" showed how mutations in nuclear envelope proteins cause diverse diseases such as muscular dystrophy, heart disease and early aging syndromes.

Charles Brenner presented the Ackerson Student Lectureship for the Biochemistry Department and Redox Biology Center at the University of Nebraska in Lincoln, NE. His seminar was entitled "How Nicotinamide Riboside Promotes Weight Loss."



Musselman lab high school student summer interns, L to R: Sean Chi, Ankit Choudhury, Christian Jung, and Catherine Musselman.

FUTURE in Biomedicine

[Fostering Undergraduate Talent - Uniting Research and Education]

The 7th annual FUTURE in Biomedicine program brought 25 Faculty Fellows and students from primarily undergraduate institutions in Iowa to conduct research and pursue collaborations with UI faculty. Four Faculty Fellows worked with Biochemistry hosts: Gary Coombs from Waldorf College worked with **Lori Wallrath**; Heriberto Hernandez from Grinnell College worked with **Mike Schnieders**; two Fellows from Drake University, Adina Kilpatrick and Jerry Honts, pursued a joint collaboration with **Madeline Shea**.

In addition, Dulce Chavez from St. Mary-of-the-Woods College, the first recipient of the Giannini Women-in-Science Summer Research Fellowship honoring former colleague **Theresa L. Giannini**, studied with Jerrold Weiss, Professor of Internal Med. & Microbiology.

Please visit medcom.uiowa.edu/biochem for more fun notes on this year's FUTURE program.



Mike Schnieders with FUTURE Fellow, Heriberto Hernandez, PhD, and students Julia Rumley and Alitza Shutt.

Postdoctoral Achievements

Emma Morrison (Musselman laboratory) received an Arnold O. Beckman Postdoctoral Fellows Award for her project entitled "Multivalent readout of histone PTMs in chromatin regulation by BPTF: A structural and dynamic perspective" which aims to investigate the combinatorial readout of multiple histone post-translational modifications by the linked PHD finger and bromodomain molecule of BPTF. Beckman Postdoctoral Awards support postdoctoral scholars who have the highest potential for success in an independent academic career in chemistry and life sciences.



Lawrence Gray (Taylor laboratory) received a most outstanding entry for the Carver College of Medicine Health Sciences Research Week poster competition for his poster entitled "Regulation of Hepatic Gluconeogenesis by Mitochondrial Pyruvate Carrier 1" on which he proposes to elucidate the mechanisms regulating MPC activity in the liver and to determine how this activity is altered in type 2 diabetes.

Lynne Dieckman, a postdoc in the Musselman laboratory and 2012 MCB PhD graduate with Todd Washington, began her independent career as Assistant Professor in the Department of Chemistry at Creighton University in Omaha, NE this fall.



GRADUATE STUDENT NEWS



Allison (Xun) Chi (Davies laboratory), received an Early Career Investigator Travel Stipend Award for travel to the Kern Lipid Conference held August 3-5, 2015 in Colorado. Allison presented a poster based on her first author paper entitled "Angiopoietin-like 4 modifies the interactions between lipoprotein lipase and its endothelial cell transporter GPIHBP1" published in the May 2015 issue of *The Journal of Biological Chemistry*.

John Pryor (Washington laboratory, 2012 PhD), won the 2014 Clarence Berg Award, given every two years to a student who demonstrates "scholarship, integrity, cooperativeness, consideration, and willingness to help others." John was an American Heart Association-funded graduate student who focused on the role of replication accessory factors in promoting translesion DNA synthesis. John is a Lineberger Cancer Center Postdoctoral Fellow in Dale Ramsden's laboratory at the University of North Carolina.



Karina Kruth (Rubenstein laboratory, 2013 PhD) was awarded the 2014 Subramanian Award for best PhD thesis in the Department of Biochemistry. Karina is currently a postdoctoral scholar in Dr. Diana Zepeda-Orozco's laboratory in the Department of Pediatrics researching how to characterize the role of the mitochondrial pyruvate carrier (MPC1) in the kidney to better understand how its regulation affects glucose metabolism.

RECENT GRADUATES

Casey Andrews
(Elcock Laboratory)
Postdoctoral fellow
with **Adrian Elcock**
University of Iowa
Iowa City, IA

Ran Chen
(Wold Laboratory)
Postdoctoral fellow
with **David Gutmann**
Washington University
St. Louis, MO

Mohamed Gohneim
(Maria Spies
Laboratory,
University of Illinois)
Postdoctoral fellow
with **Nancy Kleckner**
Harvard University
Cambridge, MA

Xu Liu
(Fuentes Laboratory)
Postdoctoral fellow
with **Georges Mer**
Mayo Clinic
Rochester, MN

Yuan Pan
(Baker Laboratory)
Postdoctoral fellow
with **David Gutmann**
Washington University
St. Louis, MO

Xiaowen Sun
(MCB Student,
DeMali Laboratory)
Postdoctoral fellow
with **David Calderwood**
Yale University
New Haven, CT

Bo-Kuan Wu
(MCB Student,
Brenner Laboratory)
Postdoctoral fellow
with **Duojia Pan**
Johns Hopkins
University
Baltimore, MD

UNDERGRADUATE PROGRAMS

Ten Biochemistry Honors students presented research at the Eleventh Annual **Gene F. Lata** Undergraduate Research Symposium.

Grant Young (Wallrath laboratory) will attend medical school at the University of Iowa, Carver College of Medicine. **David Wadkins** (Elcock laboratory) will be getting his masters in bio-medical engineering at the University of Iowa. **Xin Xu** (Brenner laboratory) will attend the University of Minnesota to earn her Doctoral of Pharmacy degree.

Liam Hovey (Shea laboratory) will be matriculating in the Medical Scientist Training Program at the University of Washington in Seattle, WA. **Michael Turek** (Price laboratory) will attend the University of Wisconsin School of Medicine and Public Health in Madison, WI. **Alexander Hjelmaas** (Davies laboratory) will attend medical school at the University of Michigan. **Samuel Mueting** (Washington laboratory) will attend the University of Illinois College of Medicine.

Sarah Mayer (Weeks laboratory) will spend a year as an English Teaching Assistant in Colombia with the Fulbright program, then attend medical school at Washington University in St. Louis. **Brady Campbell** (Elcock laboratory) will travel to Kenya for 10 months where he will volunteer with Hopeful Africa, after which he plans on going to medical school.

The symposium also included the presentation of two undergraduate awards, made possible by a gift from **Alap Subramanian**. The H.G. Wittmann Scholar Award was presented to **Alexander Hjelmaas** and the H.G. Khorana Scholar Award was presented to **Sarah Mayer**, recognizing their exceptional understanding of biochemistry and its value to society.



2015 Lata Symposium Presenters: Front row, L to R: Yinjie Zhai, Grant Young, Xin Xu, Liam Hovey, and Sarah Mayer. Back row, L to R: David Wadkins, Michael Turek, Alexander Hjelmaas, and Brady Campbell. Inset: Samuel Mueting

Undergraduate Student Spotlight



Liam Hovey (Shea laboratory) received the 2015 Montgomery Biochemistry Scholar's Prize for his outstanding research accomplishments and excellent presentation at the Lata Symposium. Liam has presented his research twice at the Annual Biophysical Society Meetings, and twice at the Gibbs Conference on Biothermodynamics. He has received

several awards for his scholarship and research including the national Barry M. Goldwater Scholarship, UI CLAS Rhodes Dunlap Collegiate Fellowship, Donald Burton Award in Chemistry, CLAS Dewey Stuit Award and ICRU Fellowships. He was selected to be the sole undergraduate speaking at the afternoon CLAS Commencement ceremony in May 2015.

Maria Nunez Hernandez (Shea laboratory), **Mohammed Ismail** (Maria Spies laboratory), and **Nicholas McCarty** (Abel laboratory) were awarded 2015 Rex Montgomery Scholarship Awards for their outstanding academic record and commitment to research.

Sarah Gardner (Baker laboratory) was awarded a 2015 Fight for Sight Summer Student Fellowship for her project entitled "Identifying mechanisms of protein targeting essential for the assembly of the photoreceptor ribbon synapse."

Cara Larson (Wallrath laboratory) won a competitive "3 Minute Thesis" award explaining her research on the genetic basis of an infant death syndrome to a broad audience.

Grant Young (Wallrath laboratory) was featured on *IowaNow* for his achievements inside and outside the laboratory.

BSURF [Biochemistry Summer Undergraduate Research Fellowship]

BSURF is an opportunity for undergraduate students outside the University of Iowa to gain hands-on experience in an active research laboratory under the direction of an established scientist. Four BSURF students conducted research in Biochemistry labs this summer and presented their research at the Summer Undergraduate Research Conference, sponsored by the Graduate College.

From left to right: Ashuvinee Elangovan from the University of Colorado Boulder (Weeks laboratory), Dominika Trzilova from the University of Maine (Geyer laboratory), Scott Mulder from Gustavus Adolphus College (Taylor laboratory), Lauren McDonough from Clarke University (DeMali laboratory), and **Peter Rubenstein**, Director of BSURF.



Alumni Accomplishments



Bradley T. Hyman, a 1982 PhD with **Arthur Spector** and a 1983 MD from the Carver College of Medicine, has been elected into the National Academy of Medicine (NAM). Election into the NAM is considered one of the highest honors in the fields of health and medicine and recognizes individuals who have demonstrated outstanding professional achievement

and commitment to service. Dr. Hyman is the John B. Penney Jr. Professor of Neurology at Harvard Medical School, and the Director of the Massachusetts Alzheimer's Disease Research Center at Massachusetts General Hospital.

John Rogers, a 1986 BS with **Charles Swenson**, and colleagues received the 2014 Science and Technology Award from the Human Proteome Organization for their contributions in the commercialization of isobaric labeling compounds for use in quantitative proteomics. John is a Senior Research and Development Manager for Pierce Protein Biology products at Thermo Fisher Scientific.

Michael Feldkamp, a 2010 PhD with **Madeline Shea**, and a team of graduate, business and law students from Vanderbilt University won top honors at a TechVenture Challenge, which teaches students how to bring patented

inventions by Vanderbilt faculty members to market. His team pitched Corafix, a fluorescently labeled selective inhibitor of the COX-2 enzyme which is overexpressed in many cancers. Michael is currently a postdoctoral fellow in Walter Chazin's laboratory at Vanderbilt University in Nashville, TN.

Bret Freudenthal, a 2010 PhD with **Todd Washington**, began his independent career as Assistant Professor in the Department of Biochemistry and Molecular Biology at Kansas University Medical Center in Kansas City, KS this fall.

Allyson Mayer, a 2013 BS with **Charles Brenner**, was awarded an NSF Fellowship for her thesis project entitled "The Role of Glucose Transporter 8 (GLUT8) in Hepatic Metabolic Control." Allyson is currently pursuing her PhD in Molecular Cell Biology under Drs. Brian DeBosch and Kelle Moley at Washington University School of Medicine in St. Louis, MO.

Lacy Barton, a 2014 PhD with **Pamela Geyer**, was awarded a Damon Runyon Cancer Research Foundation Fellowship for her project entitled "Mechanisms of directed cell migration in a complex in vivo environment." Damon Runyon fellowships are among the most recognized postdoctoral awards and a high accolade for an early career scientist. Lacy is currently a postdoctoral fellow in Ruth Lehmann's laboratory at New York University School of Medicine in New York, NY.

IOWA BIOCHEMISTRY APPAREL

Show your Biochem pride!

University of Iowa, Department of Biochemistry T-shirts are available in Black with Gold Biochemistry screen print or Gold with Black Biochemistry screen print in Adult S-XL and are \$10 each.

Polos are available in Black with a gold hawk embroidered at the chest in Men's M-XXL and Women's S-L. and are \$18.50.

Please add \$2 per order for shipping. Please indicate color, style, and size. Make checks payable to The University of Iowa.

Email biochem@uiowa.edu with any questions.

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address, degree,
graduation year,
& your UI mentor.



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UI FOUNDATION



Biochemistry has a new representative at the University of Iowa Foundation, **Madelynn Krall**. Madelynn is an Iowa City native and an alumna of the University of Iowa.

Private support, which has always been important for the Department, is critical today as state and national funding become increasingly difficult to secure. With help from private supporters, we can provide scholarships to graduate students and postdocs; invest in new, state-of-the-art equipment; fund seminar series and lectureships; and attract and retain outstanding faculty members. These generous gifts are the lifeline for our advancement and have never been more important.

Madelynn is available as a resource for friends of the department who are considering an outright or estate gift to biochemistry. Madelynn travels extensively, and would be happy to talk with alumni and friends of the department by phone (800-648-6973) or by email (madelynn-krall@uiowa.edu) about contributions to existing funds or initiatives, such as our campaign to endow graduate education.

Please visit www.givetoioowa.org/biochemistry.