

SIDNEY KIMMEL MEDICAL COLLEGE AT THOMAS JEFFERSON UNIVERSITY

# IN THE LOOP

DEPARTMENT OF BIOCHEMISTRY & MOLECULAR BIOLOGY | *SPRING 2020*



**Jefferson**

Philadelphia University +  
Thomas Jefferson University

HOME OF SIDNEY KIMMEL MEDICAL COLLEGE



## From the Chair

Friends and Colleagues,

This issue of *In The Loop* was in the final stages of production before the coronavirus outbreak. The pandemic has affected our lives in ways that we could not have imagined, making the pre-pandemic world seem distant and unfamiliar. Our next issue of *In The Loop* will almost certainly read quite differently, but please enjoy this look back at the months leading up to our current state of affairs. I hope that you and your loved ones remain safe and healthy, and I am looking forward to the day when we emerge from this with a greater sense of our collective resilience.

With warm regards,

**From my front row seat, I continue to be amazed at the achievements of my colleagues in the Biochemistry and Molecular Biology Department.** As you flip through the following pages I think you will be amazed as well, especially when you consider that these are just examples. Not only will you read about some of the transformational discoveries that our faculty have made, but also about some of the well-deserved awards and other forms of recognition they have received.

By all objective measures, the Biochemistry and Molecular Biology

Department continues on the remarkable trajectory that began during the tenure of my predecessor as Chair, Dr. Jeffrey Benovic. For example, the Blue Ridge Institute for Medical Research ranks U.S. medical colleges and their individual Departments. Among all the Biochemistry Departments across the country, we ranked 84th when Dr. Benovic was named Chair in 2005. By the time he stepped down in 2017, we had risen to 43rd in the Blue Ridge rankings. We have just received notice from Blue Ridge that for 2019 we are ranked 26th!

While the excitement about our rankings is palpable in the Department, we are even more excited about the new colleagues we have acquired. We have shared stories of some of these new recruits in previous issues of *In The Loop*, but in this issue you can read about Drs. Lin Guo, Marco Trizzino and Elise Fouquerel. All three of these new faculty members join us directly from very successful fellowship positions and they have individually established vibrant research groups at Jefferson.

Stay tuned and stay in touch. I really appreciate hearing your thoughts and ideas.



### **Steven B. McMahon, PhD**

Professor and Chair  
Department of Biochemistry and Molecular Biology  
Sidney Kimmel Medical College

Senior Associate Provost, Programmatic Science  
Thomas Jefferson University

## **Thomas Jefferson University Department of Biochemistry and Molecular Biology**

### **Steven B. McMahon, PhD**

Professor and Chair  
Senior Associate Provost,  
Programmatic Science

### **Peter Ronner, PhD**

Professor and Vice Chair for Education

### **Gino Cingolani, PhD**

Professor and Vice Chair for Research

### **Diane Merry, PhD**

Professor and Vice Chair for Faculty  
Development and Engagement

### **Emad Alnemri, PhD**

Thomas Eakins Professor

### **Teresa Alnemri, PhD**

Research Assistant Professor

### **Jeffrey Benovic, PhD**

Thomas Eakins Professor

### **Anshul Bhardwaj, PhD**

Research Assistant Professor

### **Erik Debler, PhD**

Assistant Professor

### **Elise Fouquerel, PhD**

Assistant Professor

### **Miki Fujioka, PhD**

Research Instructor

### **Howard Gamper, PhD**

Research Assistant Professor

### **Ya-Ming Hou, PhD**

Professor

### **James Jaynes, PhD**

Professor

### **Hideko Kaji, PhD**

Professor

### **James Keen, PhD**

Professor

### **Yohei Kirino, PhD**

Associate Professor

### **Alexander Mazo, PhD**

Professor

### **Svetlana Petruk, PhD**

Research Assistant Professor

### **Anna Pluciennik, PhD**

Research Instructor

### **Michael Root, MD, PhD**

Associate Professor

### **Charles Scott, PhD**

Research Assistant Professor

### **Dmitry Temiakov, PhD**

Associate Professor

### **Philip Wedegaertner, PhD**

Professor

### **Eric Wickstrom, PhD**

Professor

### **Edward Winter, PhD**

Professor

# 2019 BMB Retreat Held at Kanbar Campus Center



The 2019 Department of Biochemistry and Molecular Biology Retreat was held on May 17, 2019, at the Kanbar Campus Center, Jefferson's East Falls Campus. Following opening remarks by Dr. McMahon, graduate students, postdocs and faculty delivered eleven exceptional oral presentations. Posters on a broad array of research topics were exhibited during morning and afternoon poster sessions, and retreat attendees enjoyed an engaging student-led activity during the afternoon session.

Keynote speaker, Benjamin A. Garcia, PhD, Professor of Biochemistry and Biophysics and Director of Quantitative Proteomics at University of Pennsylvania, presented on "Quantitative Proteomics for Understanding Epigenetic Cancer Mechanisms." Dr. Garcia's research interests revolve around developing novel mass spectrometry methods to analyze post-translational modifications of proteins and epigenetics. His work has resulted in over 250 publications and he has been recognized with numerous honors including the American Society for Mass Spectrometry Biemann Medal in 2018.

With over 100 attendees, the retreat was an invaluable opportunity to learn about ongoing research endeavors, and an ideal setting to coalesce with peers. The day-long program concluded with a wine and hors' oeuvres reception, and networking among faculty, students, staff, and invited guests.

Our sincere appreciation to the retreat planning committee, speakers, participants, attendees and hosts at East Falls, for a successful event.



## Recent Awards and Honors

The Department of Biochemistry and Molecular Biology faculty members garnered multiple awards in recognition of their research and educational accomplishments during the 2018-2019 academic year.



### PUBLISHED ARTICLE

In April 2019, **Emad Alnemri, PhD**, the Thomas Eakins endowed Professor of Biochemistry and Molecular Biology, published an article in *Nature Communications* titled *Gasdermin pores permeabilize mitochondria to augment caspase-3 activation during apoptosis and inflammasome activation*.

Dr. Alnemri's research found that gasdermin E might be important in controlling cancer. In many breast, gastric and colorectal cancers, gasdermin E gene expression is much lower than in healthy cells. Why cancers might turn down the expression of this gene was unknown. In previous research, Dr. Alnemri and colleagues found that gasdermin E participates in the cell death program when a cell death enzyme called caspase-3 cleaves it. The researchers discovered that the cleaved gasdermin E creates holes in the outer membrane of the cell. The holes cause the cell to swell and burst. The scientists thought a similar mechanism could be at work in cancerous cells. (Full article: [EurekaAlert.org](http://EurekaAlert.org))



Andrew Aplin, PhD and Emad Alnemri, PhD

### RESEARCH AWARD

**Emad Alnemri, PhD**, was recently presented with the Sidney Kimmel Cancer Center 2020 Achievement in Basic Science Award. Dr. Alnemri and his team have provided many fundamental advances in the field of cell death over the course of several decades. His work started with the analysis of caspases and the Apaf1 complex in apoptosis and was followed by analysis of inflammasome complexes and necroptosis. More recently, Dr. Alnemri has studied the regulation of pyroptosis, cell death involving the release of inflammatory cytokines and damage-associated molecular patterns. These recent discoveries have explained the link between apoptosis and pyroptosis, and may ultimately provide the basis for targeted therapies to trigger pyroptosis in melanoma.



Jeffrey Benovic, PhD,  
and Karen Knudsen, PhD

### TEACHING AWARD

**Jeffrey L. Benovic, PhD**, received the 2019 SKCC Impact Award. Since 2015, Dr. Benovic has served as the Associate Director for Education, where he oversees all of the Sidney Kimmel Cancer Center's education and training programs. Dr. Benovic received this award for his outstanding mentoring and training of dozens of postdoctoral and predoctoral fellows at Thomas Jefferson University over the course of his career.



Jeffrey Benovic, PhD,  
and Mark Tykocinski, MD



Richard Neubig, MD, PhD, and  
Jeffrey Benovic, PhD

### RESEARCH AWARD

**Jeffrey L. Benovic, PhD**, received the Sidney Kimmel Medical College Research Career Achievement Award. This award is presented to faculty who demonstrate exceptional leadership in, and contributions to, a field of basic and/or clinical/translational research over the span of an academic career. In addition, Dr. Benovic received Theodore M. Brody Distinguished Lecturer Award for a lecture titled, "Dissecting G Protein-Coupled Receptor Signaling". Theodore M. Brody was the founding chair of Michigan State University's Pharmacology and Toxicology Department and served as acting chair for the next twenty years, in which he made seminal research discoveries regarding the actions of cardiac glycosides.

### PUBLISHED ARTICLE

**Elise Fouquerel, PhD**, recently published an article in *Molecular Cell* titled "Targeted and persistent 8-oxoguanine base damage at telomeres promotes telomere loss and crisis." Chronic oxidative stress accelerates telomere shortening and is thought to result from telomeric DNA damage. By developing a chemoptogenetic tool to selectively target 8-oxoguanine damage to telomeres, Fouquerel et al. demonstrate that this DNA lesion directly drives telomere shortening and impairs replication. 8-oxoguanine lesion induces telomere losses and promotes chromosome fusions and overall genomic instability.



Gino Cingolani, PhD,  
and Mark Tykocinski, MD

### FACULTY AWARD

The Michael and Melina Pellini Award for Innovation in the Biomedical Sciences was presented to **Ya-Ming Hou, PhD**. Each year, this Sidney Kimmel Medical College faculty award is given to one faculty member for the elucidation/description of a specific discovery, technique, or instrument/device that has led to new concepts or approaches to experimentation or patient care.



Ya-Ming Hou, PhD, and Mark Tykocinski, MD

### RESEARCH AWARD

**Gino Cingolani, PhD**, received the 2019 Provost Award for Basic Research. This award recognizes a faculty member for significant contribution to their field through basic research.

[more >](#)

## Recent Awards and Honors



James Keen, PhD,  
and Karen Knudsen, PhD

### TRAINING AWARD

**Steven B. McMahon, PhD**, received the Yun Yen, MD, PhD, and Sophie Yen Thesis Prize for Distinguished Training in Translational Research. This prize is awarded annually to a member of the Faculty of the Jefferson College of Life Sciences who provides outstanding laboratory mentorship and training that enhances opportunities for interdisciplinary research, teamwork and career development for their trainees, and that bridges the gap between basic and clinical research.



Steven McMahon, PhD and Gerald Grunwald, PhD

### LIFETIME ACHIEVEMENT

**James Keen, PhD**, received the Lifetime Achievement and Sidney Kimmel Cancer Center (SKCC) Member of the Year Award, an award given annually to an outstanding member of SKCC. Matt Huesser said about Dr. Keen during the award presentation: "Dr. Keen joined the Molecular Pharmacology and Structural Biology PhD Program at Thomas Jefferson University and Jefferson Medical College in 1991, serving as the Director of the program. From 1991 until 2004, he chaired Pre and Postdoctoral Training Programs at the Kimmel Cancer Institute, and in 1997, he was appointed Deputy Director, Kimmel Cancer Institute, by Dr. Carlo Croce, serving in this role until 2004. From 2004 through 2010, Dr. Keen began serving as Dean of the Jefferson College of Graduate Studies and a Senior Officer at Thomas Jefferson University. His contributions to the SKCC and Thomas Jefferson University are endless. He has served in this role for over 27 remarkable years. Upon his arrival, he became and still serves as the Director of the Bioimaging Shared Resource Facility."

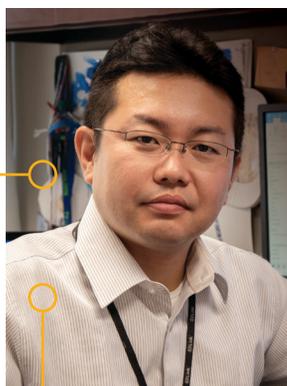


### KEYNOTE

**Diane Merry, PhD**, was the keynote speaker at the 22nd Annual CAMP Symposium. The symposium was a one-day event held at the University of Pennsylvania. This event featured a lecture by Dr. Merry, a prominent CAMB Alum, graduate student talks representing the wide range of CAMB research, poster sessions and alumni career panels.

### APPOINTMENT

**Yohei Kirino, PhD**, Associate Professor of Biochemistry and Molecular Biology, was appointed Associate Editor of *Frontiers in Genetics* journal. *Frontiers in Genetics* publishes rigorously peer-reviewed research on genes and genomes relating to all the domains of life, from humans to plants to livestock and other model organisms. Led by an outstanding Editorial Board of the world's leading experts, this multidisciplinary, open-access journal is at the forefront of communicating cutting-edge research to researchers, academics, clinicians, policy makers and the public.



### PUBLISHED ARTICLE

**Yohei Kirino, PhD, and team**, recently published two articles. The first, published in *RNA Biology* titled "Exploration of CCA-added RNAs revealed the expression of mitochondrial non-coding RNAs regulated by CCA-adding enzyme." The second article was published in *PLOS Genetics* titled, "Genome-wide identification of short 2',3'-cyclic phosphate-containing RNAs and their regulation in aging."





### GRANT RECIPIENT

**Anna Pluciennik, PhD**, received a 2-year grant from the Gies Foundation to study the molecular mechanisms of CAG triplet repeat instability that is the causal mutation in Huntington's disease (HD). She proposes to investigate protein assemblies on CAG-extrahelical structures and R-loops in HD

patient-derived induced pluripotent stem cells using *in vitro* and *in situ* methods. These studies have the potential to identify novel factors that could be targeted for therapeutic modulation of CAG instability in HD.

Gerald Grunwald, PhD, Karen Schindler, PhD, and Michael Blank, PhD



### ALUMNI AWARD

**Karen Schindler, PhD**, Jefferson College of Life Sciences (JCLS) alumnus and former graduate student in the laboratory of Dr. Edward Winter, received the 2019 JCLS Distinguished Alumni Award. This award was established in 1983 to recognize the outstanding professional achievements of graduates of Jefferson College of Life Sciences (formerly Jefferson College of Biomedical Sciences) and to foster communication between current and former students. The award was presented at this year's JCLS Alumni Day which took place on April 13, 2019, where Dr. Schindler was invited to present on her career achievements and meet current students and postdoctoral fellows, alumni, and faculty. Dr. Schindler received her PhD in 2005, and is currently an Associate Professor with tenure in the department of Genetics at Rutgers University, New Brunswick. Her work on meiotic development is supported by multiple research grants from the National Institutes of Health.

Mark Tykocinski, MD, Jeffrey Benovic, PhD, Steven McMahon, PhD, Ya-Ming Hou, PhD, and Dmitry Temiakov, PhD.



### GRANT RECIPIENTS

**Ya-ming Hou, PhD, Jeffrey Benovic, PhD, and Dmitry Temiakov, PhD**, received MIRA Award. The bulk of funding for research in basic science Departments at Jefferson comes from the National Institutes of Health (NIH). Competition for these federal funds is fierce, with funding rates sometimes as low as 10%. As a result, scientists spend a disproportionate amount of time writing grant applications, rather than conducting their research and publishing their findings. NIH officials recognize this concern and have attempted to create mechanisms for correcting the situation. One of the most important initiatives that NIH has created is a grant funding mechanism termed the Maximizing Investigators' Research Award (MIRA). As recipients of this award, NIH officials have targeted scientists whose stature and track record indicate they deserve an elevated level of freedom from the burdens of grant writing. In short, MIRA recipients are intended to be the scientists whose research is most likely to make transformative discoveries. From the NIH announcement, one of the main intents in creating the MIRA program is to "More widely distribute funding among the nation's highly talented and promising investigators to increase overall scientific productivity and the chances for important breakthroughs".

At Jefferson, three scientists have recently been awarded MIRA grants, and all three are distinguished members of the Department of Biochemistry and Molecular Biology. These MIRA recipients are Drs. Ya-ming Hou, Jeffrey Benovic, and Dmitry Temiakov. We are fortunate to have these scientists as our colleagues and delighted that the value of their research has been recognized by NIH.

#### Dr. Benovic R35

R35GM122541

**TITLE:** Regulation of G protein-coupled receptor signaling and trafficking

**PROJECT PERIOD:** 08/01/17-07/31/22

**TOTAL PROJECT AWARD AMOUNT:** \$2,535,000

#### Dr. Temiakov R35

R35GM131832

**TITLE:** Molecular Mechanisms of Mitochondrial Transcription and Replication

**PROJECT PERIOD:** 06/01/19-05/31/2024

**TOTAL PROJECT AWARD AMOUNT:** \$2,667,600

#### Dr. Hou R35

R35GM134931

**TITLE:** tRNA in codon usage

**PROJECT PERIOD:** 03/01/20-02/28/2025

**TOTAL PROJECT AWARD AMOUNT:** \$2,985,099

# Inaugural Jeffrey L. Benovic Award and Lectureship

**T**he Inaugural Jeffrey L. Benovic Award and Lectureship was held on November 19, 2018, at Jefferson's Center City Campus. This lectureship, established in 2018 by the Department of Biochemistry and Molecular Biology at Jefferson, honors the contributions of Jeffrey L. Benovic, PhD, a scientist whose insights helped shape our understanding of G protein-coupled receptors in normal physiology and disease. Dr. Benovic, an outstanding teacher, colleague, mentor and leader, has forged the Department of Biochemistry and Molecular Biology and Sidney Kimmel Center at Jefferson.

Dr. Benovic began his scientific career at Penn State, where he earned his undergraduate degree in Biochemistry. After working as a research assistant at the Fox Chase Cancer Center and Miles Laboratories, he entered graduate school at Duke. In the laboratory of Dr. Robert Lefkowitz at Duke, Dr. Benovic contributed to landmark studies characterizing the fundamental biochemistry of the beta-2-adrenergic receptor ( $\beta 2AR$ ). However, it was the discovery of the beta-adrenergic receptor kinase in 1986 and the extended GPCR kinase (GRK) family in 1989, that sparked more than three decades of cutting-edge research into the function and regulation of GPCRs. After finishing his postdoctoral studies in the Lefkowitz lab in 1989, Dr. Benovic joined the faculty of the Fels Institute for Cancer Research at Temple University School of Medicine. Shortly

*Ultimately, these studies form the conceptual basis for superior therapeutic agents currently under development for the treatment of heart failure and asthma.*

thereafter, Dr. Benovic moved his growing research team to Thomas Jefferson University. At Fels and Jefferson, they discovered additional members of the GRK family and expanded their studies of another family of proteins critical for this pathway, the arrestins. These and other discoveries have provided knowledge critical to the promising field of biased ligand



pharmacology. Very recent studies by the Benovic lab have demonstrated biased signaling properties through both the  $\beta$ 2AR and CXCR4 receptors, and have identified allosteric modulators of  $\beta$ 2AR that bias signaling towards either arrestin-dependent or G protein-dependent pathways. Ultimately, these studies from the Benovic group and their colleagues, including Drs. Kobilka and Lefkowitz, form the conceptual basis for superior therapeutic agents currently under development for the treatment of heart failure and asthma.

This lectureship endowment is only the most recent recognition that Dr. Benovic and his research have received. His studies have been funded by the National Institutes of Health, the American Heart Association and others. From the NIH, Dr. Benovic has received both the R35 Outstanding Investigator Award and the R37 Merit Award. Recently, Dr. Benovic received the Julius Axelrod Award from the American Society for Pharmacology and Experimental Therapeutics, and he has served on the Editorial Boards of *Molecular Pharmacology*, *Journal of Biological Chemistry*, *Journal of Cell Biology*, *Biochemistry* and *Cell*. He is rated among the most highly cited scientists in Biology and Biochemistry, according to the Thomson Institute for Scientific Information.

At Jefferson, Dr. Benovic has had many leadership roles in the Sidney Kimmel Cancer Center and the Sidney Kimmel Medical College. He currently serves as the Thomas Eakins Professor of Biochemistry and Molecular Biology at Jefferson.

Lectureship awardees and keynote speakers included two Nobel Laureates, Dr. Robert J. Lefkowitz and Dr. Brian K. Kobilka.

Dr. Lefkowitz, Investigator, Howard Hughes Medical Institute/James B. Duke Professor of Medicine and Professor of Biochemistry and Chemistry at Duke University Medical Center, presented on "Seven Transmembrane Receptors." A physician-scientist who made teaching rounds in general medicine for 30 years, he is best known for his studies of G protein-coupled receptors, a field which he has pioneered for 50 years.

Dr. Kobilka, Professor of Molecular and Cellular Physiology, Hélène Irwin Fagan Chair in Cardiology, Stanford University School of Medicine, presented on "Structural Insights into G Protein-Coupled Receptor Activation." Research in his lab focuses on the structure and mechanism of action of G protein-coupled receptors.

Drs. Lefkowitz and Kobilka both received the 2012 Nobel Prize in Chemistry.

To conclude this distinguished event, a celebratory reception was held at the Philadelphia Museum of Art with Dr. Benovic's family, friends, and colleagues in attendance.

**Jeffrey L. Benovic  
Award & Lectureship**

Monday, November 19, 2018  
2:00 PM to 5:00 PM

**Connelly Auditorium**  
Dorrance H. Hamilton Building  
Thomas Jefferson University  
1001 Locust Street  
Philadelphia, PA 19107

**Keynote Speakers:**

**Robert J. Lefkowitz, MD**  
Investigator, Howard Hughes Medical Institute  
James B. Duke Professor of Medicine & Professor of Biochemistry & Chemistry  
Duke University Medical Center  
**2012 Nobel Laureate in Chemistry**  
"Seven Transmembrane Receptors"

**Brian K. Kobilka, MD**  
Professor of Molecular & Cellular Physiology  
Hélène Irwin Fagan Chair in Cardiology  
Stanford University School of Medicine  
**2012 Nobel Laureate in Chemistry**  
"Structural insights into G protein-coupled receptor activation"

A lectureship endowed to honor  
**Jeffrey L. Benovic, PhD**  
Thomas Eakins Professor  
Department of Biochemistry  
and Molecular Biology  
Sidney Kimmel Medical College

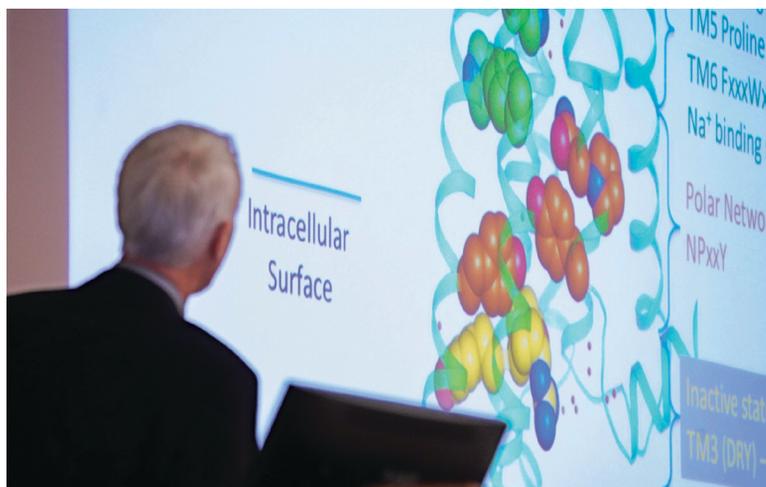
**Jefferson**  
Philadelphia University + Thomas Jefferson University  
HOME OF SIDNEY KIMMEL MEDICAL COLLEGE



Robert Lefkowitz, MD, Jeffrey Benovic, PhD, Brian Kobilka, MD



Mark Tykocinski, MD, Jeffrey Benovic, PhD, Steven McMahon, PhD



## Emad Alnemri, PhD, Named National Academy of Inventors Fellow

by Meredith Farrell, SKCC



**E**mad S. Alnemri, PhD, Thomas Eakins Professor of Biochemistry and Molecular Biology, Sidney Kimmel Cancer Center – Jefferson Health (SKCC), was named a fellow of the National Academy of Inventors (NAI), in December 2018.

The NAI Fellows Program, established in 2012, highlights academic inventors and innovators. Election to NAI Fellow status is the highest professional accolade bestowed solely to academic inventors who have demonstrated a highly prolific spirit of innovation in creating or facilitating outstanding inventions that have made a tangible impact on quality of life, economic development, and the welfare of society.

Those elected to the rank of NAI Fellow are named inventors on U.S. patents and were nominated by their peers for outstanding contributions to innovation in areas such as patents and licensing, innovative discovery and technology, significant impact on society, and support and enhancement of innovation.

Dr. Alnemri is an internationally renowned leader in the field of programmed cell death (apoptosis). In the past 25 years, he has led groundbreaking research on the molecular pathways of apoptosis resulting in the discovery of many human caspases, protease enzymes that cleave cellular proteins during apoptosis and inflammation. His research on the function of inflammatory caspases led to the discovery of several inflammasome complexes that are important for production of inflammatory cytokines during inflammation and innate immune responses to pathogens.

Dr. Alnemri is the recipient of the 2011 Jefferson Medical College Research Career Achievement Award. He has authored or co-authored more than 180 peer-reviewed publications. In 2008, he was named an ISI (Thomson Reuters) Highly Cited Researcher in Molecular Biology and Genetics, and in 2013, a Stanford University study named him as one of the top 400 highly influential biomedical researchers evaluated from 1996 to 2011. His work has been cited more than 67,000 times, according to Google Scholar. Dr. Alnemri holds 34 U.S. and 11 foreign patents and has over 9 technologies that are sublicensed to Conatus Pharmaceuticals, Inc., a publicly traded company.

He recently received a \$3M grant from the National Institutes of Health (NIH), and a \$300,000 grant from the Dr. Ralph and Marian Falk Medical Research Trust to study a novel caspase-3 substrate called DFNA5 he discovered two years ago. One of the aims of his new research is to examine the role of DFNA5-mediated cell death in tumor recognition by the immune system with the goal of developing more effective and durable anticancer therapies.

With the election of the 2018 class, there are now more than 1,000 NAI Fellows, representing more than 250 research universities and government and nonprofit research institutes. The 2018 fellows are named inventors on nearly 4,000 issued U.S. patents, bringing the collective patents held by all NAI Fellows to more than 35,000 issued U.S. patents.

The 2018 fellows were inducted in a ceremony on April 11, 2019, at the Space Center Houston during the NAI Eighth Annual Meeting. Andrew H. Hirshfeld, U.S. Commissioner for Patents for the United States Patent and Trademark Office, provided the keynote address for the ceremony.



## Advancing Our Department's Unwavering Commitment to Discovery and Teaching

The Department of Biochemistry and Molecular Biology extends a warm welcome to new faculty members. Each bring unique expertise to our research activities.

### ELISE FOUQUEREL, PhD



After having completed fellowship training at the University of Pittsburgh and graduate studies at the University of Strasbourg, Dr. Elise Fouquerel joins Jefferson as an Assistant Professor of Biochemistry and Molecular Biology. Her research focuses on understanding the role of the PARP1 enzyme at telomeres. Dr. Fouquerel brings expertise in genome integrity, DNA damage repair pathways, telomere biology and PARP1 function, all of which are central areas of focus in our Department and within the growing DNA damage group in SKCC. According to Dr. Steven McMahon, Chair of Biochemistry and Molecular Biology, "PARP1 itself has emerged as a highly relevant drug target in cancer patients and Dr. Fouquerel's work will certainly inform the rational design of PARP1-directed therapeutic strategies."

Dr. Fouquerel's recent research has been published in *Nature Structural and Molecular Biology*, *Cell Reports*, and *Nature Communications*. In addition, her laboratory has already received funding from the NIH in the form of a K99/R00 Pathway to Independence Award.

**Dr. Fouquerel's lab is located in the Bluemle Life Sciences Building, Room 830.**



### JULIA KAY, BFA

Julia Kay comes as a Dean's Assistant from Jefferson, Kanbar College of Design, Engineering and Commerce. She received her BFA from Temple University in 2017 and pursued a career in Higher Ed administration while continuing to support department Chairs. Ms. Kay is passionate about Jefferson University's mission of improving lives through academic programs of excellence, exceptional clinical practice and student engagement.

### MARCO TRIZZINO, PhD



Dr. Trizzino joins Jefferson as an Assistant Professor of Biochemistry and Molecular Biology after completing post-doctoral training at The Wistar Institute and the Perelman School of Medicine at the University of Pennsylvania. Dr. Trizzino earned his PhD in Biology and Biotechnology from Sapienza University in Rome, where he developed molecular genomic tools to discover the molecular phylogenetics of recently radiated aquatic insect species. During his post-doctoral fellowship, he discovered a new transcriptional enhancer regulatory axis that regulates myeloid differentiation. Moreover, he discovered that a component of chromatin remodeling complexes regulates RNA polymerase II dynamics and tumorigenesis. In addition, Dr. Trizzino's post-doctoral work revealed a novel role for transposable elements as regulators of tissue-specific gene expression.

Dr. Trizzino's research focuses on understanding the transcriptional regulation of cell fate determination, with the goals of defining the function of chromatin remodelers and transcription factors in neural development, and unveiling how transposable elements rewire gene regulatory networks in mammals in both normal and diseased states. His recent research has been published in *Molecular Cell*, *Genome Research*, *Cell Reports*, *BMC Genomics* and *Cancer Discovery*.

**Dr. Trizzino's lab is located in the Bluemle Life Sciences Building, Room 826.**

### LIN GUO, PhD



Dr. Lin Guo comes to Jefferson as Assistant Professor of Biochemistry and Molecular Biology. Dr. Guo completed her post-doctoral fellowship at the Perelman School of Medicine at the University of Pennsylvania. Dr. Guo earned her PhD in Chemistry from the University of Pennsylvania, where she developed single-molecule spectroscopic methods to study protein folding and peptide-membrane interaction. During her post-doctoral fellowship, she developed biophysical tools to characterize the liquid droplet phase, hydrogel phase, and fibrils of the ALS disease proteins FUS and hnRNPA1. More importantly, she discovered that nuclear-import receptors can also function as chaperones and protein disaggregases to rapidly reverse aberrant phase transitions of ALS disease-linked RNA-binding proteins with prion-like domains.

Dr. Guo's post-doctoral research was supported by the Ellison Medical Foundation, the American Federation for Aging Research, and the Alzheimer's Association. In 2017, Dr. Guo was awarded a Target ALS Springboard Career Development Fellowship to support her transition to an independent faculty position. Dr. Guo was also selected as a *Stat Wunderkind*, a designation that "honors the brightest young minds and best researchers in health and medicine." Some of her recent research has been published in *Cell*, *Science*, *Molecular Cell* and *Neuron*. Dr. Guo's research focuses on understanding the molecular mechanisms underlying aberrant phase transitions implicated in neurodegenerative diseases and leveraging our understanding of phase transition to develop strategies with therapeutic potential to prevent and reverse these toxic events.

**Dr. Guo's lab is located in Jefferson Alumni Hall, Room 411G.**

# Welcome to New BMP Students



JENNY CAREY

Mount St. Mary's University

INTERESTS: Neurodegeneration,  
Neuropharmacology

"Initially, I was interested in becoming a pharmacist; however, my undergraduate advisor introduced me to the idea of science as a career by giving me an opportunity to work in his research laboratory. It was there that I found my love for scientific research and he encouraged me to pursue research science as a career. After graduating, I worked as a research technician and my PI helped me discover my passion for researching neurological disorders. I'm interested in the biochemical mechanisms of human diseases and how we can utilize these processes to create better pharmacological treatments. In college, my favorite non-science course was public speaking; it taught me valuable skills to help me better present my ideas to a group of people. During my free time, I enjoy being outdoors as much as possible by going on hikes, traveling, and playing sports."



JUSTIN GUMAS

Temple University

INTERESTS: Structural Biology,  
Drug Discovery,  
Vaccinology

"My interest in drug discovery and structural biology led me to choose Biochemistry and Molecular Pharmacology. I am also confident that the broad skill set gained by studying biochemistry will allow me to adapt to my own changing research interests. Growing up, I was interested in bugs and animals, and my dad always tried to cultivate that curiosity. He was always willing to engage in conversations about various scientific topics, and I am certain those conversations led me to pursue a degree in the natural sciences. My favorite non-science course in college was called "Quest for Utopia". This course involved reading utopian literature and philosophy and then arguing in small groups, which was all and all a great time. Outside of the lab, I enjoy reading faith-based and philosophical literature, trying out new bars/breweries with friends, and hiking."



KARL HERBINE

Temple University

INTERESTS: Structural Biology,  
Pharmacology,  
Biochemistry of Proteins

"I'm particularly interested in the Biochemistry and Biophysics of proteins involved with the progression of diseases, namely neurodegenerative disorders. I chose to study Biochemistry and Molecular Pharmacology because it will allow me to expand our knowledge on the biochemical basis of diseases and then utilize that knowledge to develop stronger pharmacological methods to treat or cure them. Many professors influenced my ambitions in science, but I would have to give credit to my undergraduate research mentor and professor, Dr. Vincent Voelz. His passion and dedication for biophysics inspired me to pursue a PhD and a career in scientific research. When I'm not in the lab, I enjoy working out, biking, hiking, playing videogames, watching sci-fi movies and reading. I also enjoy listening to music and going to concerts when my favorite bands are in town."



**HANNAH HOAG**

**Rowan University**

INTEREST: *Cancer Biology*

"I chose this field because biochemistry, cell biology, and molecular biology have been my favorite subjects since I was in high school. In my rotation lab, I have been performing experiments that are attempting to validate protein interactions that the student I'm working under had previously obtained via mass spectrometry. I was interested in science for as long as I can remember, but some of my favorite professors in college introduced me to the idea of making science a career and pursuing a PhD. Outside of the lab, I like to read, spend time with my family and pets, watch movies, and hang out with my fiancé. Out of required non-science courses in college, I'd say "The History of Tea" was my favorite. We learned about Chinese history and drank tea every Friday. It was a nice break from science classes, and it made me a tea drinker."



**EDEN HORNING**

**LaSalle University**

INTEREST: *Neuropharmacology*

"Biochemistry and molecular biology were my favorite undergraduate courses. I discovered my desire to pursue a PhD in pharmacology, while participating in a post-graduate research fellowship at the U.S. Army Medical Research Institute of Chemical Defense. I would like to contribute to pharmacological discoveries to advance our treatment and understanding of neurodegenerative disorders. Dr. Gerald Ballough, Professor of Biology at La Salle University, introduced me to the idea of science as a career. During my free time, I like exploring new places, hiking, dining, kayaking, playing games, and dancing to live music with friends."



**ELIZABETH McDUFFIE**

**Temple University**

INTERESTS: *Cell Signaling Pathways*

"No one in my immediate family had been a part of the science field but as soon as I got to college and stepped into a research lab, I knew this where I wanted to be. I had incredible mentors throughout my undergraduate as well as graduate studies and I look forward to following their footsteps by pursuing a PhD. I was a Biochemistry major in undergrad at Rowan University and I absolutely loved my professors. The research scope is large and promising so I'm looking forward to becoming a part of next generation of Biochemists. As my non-science courses in college, my favorite were "History of Camden, NJ" and Calculus, even though they were polar-opposites. For fun, I love to cook, hang out with my Goldendoodle, exercise, and spend time with my family. One of my favorite places to visit with my siblings and friends is Ocean City, NJ."



**NATALIE WARNER**

**Stockton University**

INTERESTS: *Cell Biology, Cancer Biology, Molecular Biology, Cell Signaling*

"My grandmother worked at Aberdeen Proving Ground during the 1960s as a mathematician and introduced me to science. Her persistence and courage inspired me to pursue an education in the sciences and eventually a career in this field. Biochemistry and Molecular Pharmacology interests me because of its large applications! I am particularly interested in cell signaling and pathways. In my free time, I enjoy watching 90s sitcoms and cooking, aside from being in the lab."

## Selected Recent Publications

Gasdermins: novel mitochondrial pore-forming proteins. Rogers C, **Alnemri ES**. *Mol Cell Oncol*. 2019;6(5):e1621501.

Gasdermin pores permeabilize mitochondria to augment caspase-3 activation during apoptosis and inflammasome activation. Rogers C, Erkes DA, Nardone A, Aplin AE, Fernandes-Alnemri T, **Alnemri ES**. *Nat Commun*. 2019;10(1):1689.

Effects of Oncogenic  $G\alpha_q$  and  $G\alpha_{11}$  Inhibition by FR900359 in Uveal Melanoma. Lapadula D, Farias E, Randolph CE, Purwin T, McGrath D, Charpentier T, Zhang L, Wu S, Terai M, Sato T, Tall GG, Zhou N, **Wedegaertner PB**, Aplin AE, Aguirre-Ghiso J, **Benovic JL**. *Mol. Cancer Res*. 2019;17:963-973.

G protein-coupled receptor kinase 5 modifies cancer cell resistance to paclitaxel. Lagman J, Sayegh P, Lee CS, Sulon SM, Jacinto AZ, Sok V, Peng N, Alp D, **Benovic JL**, Sol CH. *Mol. Cell Biochem*. 2019;461:103-118.

Structural basis for the homotypic fusion of chlamydial inclusions by the SNARE-like protein IncA. **Cingolani G**, McCauley M, Lobley A, Bryer AJ, Wesolowski J, Greco DL, Lokareddy RK, Ronzone E, Perilla JR, Paumet F. *Nature Commun*. 2019;10(1):2747.

Molecular architecture of the inositol phosphatase Siw14. Florio T, Lokareddy RK, Gillilan R, **Cingolani G**. *Biochemistry*. 2019;58(6):534-545.

Structural Basis of Protein Arginine Methyltransferase Activation by a Catalytically Dead Homolog (Prozyme). Hashimoto H, Kafkova L, Raczkowski A, Jordan KD, Read LK, **Debler EW**. *J Mol Biol*. 2019; [Epub ahead of print].

Substrate Affinity and Specificity of the ScSth1p Bromodomain Are Fine-Tuned for Versatile Histone Recognition. Blus BJ, Hashimoto H, Seo HS, Krolak A, **Debler EW**. *Structure*. 2019;27(9):1460-1468.

Targeted and persistent 8-oxoguanine base damage at telomeres promotes telomere loss and crisis. **Fouquerel E**, Barnes R, Uttam S, Watkins S, Bruchez M, Opresko PL. *Molecular Cell*. 2019;75:1-14.

Measuring UV photoproduct repair in isolated telomeres and bulk genomic DNA. **Fouquerel E**, Barnes, R, Wang H, Opresko PL. *Methods Mol Biol*. 2019;(1999):295-306.

Heterochromatin anomalies and double-stranded RNA accumulation underlie C9orf72 poly(PR) toxicity. Zhang Y-J, **Guo L**, Gonzales PK, Gendron TF, Wu Y, Jansen-West K, O'Raw AD, Pickles SR, Prudencio M, Carlomagno Y, Gachechiladze MA, Ludwig C, Tian R, Chew J, DeTure M, Lin W-L, Tong J, Daugherty LM, Yue M, Song Y, Andersen JW, Castanedes-Casey M, Kurti A, Datta A, Antognetti G, McCampbell A, Rademakers R, Oskarsson B, Dickson DW, Kampmann M, Ward ME, Fryer JD, Link CD, Shorter J, Petrucelli L. *Science*. 2019;363(6428):1-10.

Therapeutic dissolution of aberrant phases by nuclear-import receptors. **Guo L**, Fare CM, Shorter J. *Trends. Cell Biol*. 2019;29(4):308-322.

How to Untie a Protein Knot. Yin S, Dhital B, **Hou YM**. *Structure*. 2019;27(8):1190-1191.

tRNA Methylation Is a Global Determinant of Bacterial Multi-drug Resistance. Masuda I, Matsubara R, Christian T, Rojas ER, Yadavalli SS, Zhang L, Goulian M, Foster L, Huang KC, **Hou YM**. *Cell Systems*. 2019;8(4):302-314.

Codon-Specific Translation by m1G37 Methylation of tRNA. **Hou YM**, Masuda I, Gamper H. *Front. Genet*. 2019;9:713.

A unique role for clathrin light chain A in cell spreading and migration. Tsygankova OM, **Keen JH**. *J Cell Sci*. 2019;132(10):1-16.

Exploration of CCA-added RNAs revealed the expression of mitochondrial non-coding RNAs regulated by CCA-adding enzyme. Pawar K, Shigematsu M, Loher P, Honda S, Rigoutsos I, **Kirino Y**. *RNA Biol*. 2019;16(12):1-9.

Genome-wide identification of short 2',3'-cyclic phosphate-containing RNAs and their regulation in aging. Shigematsu M, Morichika K, Kawamura T, Honda S, **Kirino Y**. *PLoS Genet*. 2019;15(11):1-15.

A proximity ligation-based method to detect RNA-DNA association. Fenstermaker TK, Sun G, **Mazo A**, Petruk S. *Methods Mol Biol*. 2019;2008:121-129.

Epigenetic regulation affects gene amplification in Drosophila development. Kohzaki H, Asano M, Murakami Y, **Mazo A**. *Front Biosci*. 2020 (Landmark Ed 25):632-645.

Interaction between the BAG1S isoform and HSP70 mediates the stability of anti-apoptotic proteins and the survival of osteosarcoma cells expressing oncogenic MYC. Gennaro VJ, Wedegaertner H, **McMahon SB**. *BMC Cancer*. 2019;19(1):258.

Lung-Enriched Mutations in the p53 Tumor Suppressor: A Paradigm for Tissue-Specific Gain of Oncogenic Function. Barta JA, **McMahon SB**. *Mol Cancer Res*. 2019;17(1):3-9.

Impaired nuclear export of polyglutamine-expanded androgen receptor in spinal and bulbar muscular atrophy. Arnold FJ, Pluciennik A, **Merry DE**. *Sci Rep*. 2019;9(119):1-17.

Molecular Mechanisms and Therapeutics for SBMA/Kennedy's Disease. Arnold F, **Merry DE**. *Neurotherapeutics*. 2019;16(4):928-947.

Yeast mitochondrial protein Pet111p binds directly to two distinct targets in COX2 mRNA, suggesting a mechanism of translational activation. Jones JL, Hofmann KB, Cowan AT, **Temiaikov D**, Cramer P, Anikin M. *J Biol Chem*. 2019;294(18):7528-7536.

Genetic and Epigenetic Fine Mapping of Complex Trait Associated Loci in the Human Liver. Çalışkan M, Manduchi E, Rao HS, Segert JA, Beltrame MH, **Trizzino M**, Park Y, Baker SW, Chesi A, Johnson ME, Hodge KM, Leonard ME, Loza B, Xin D, Berrido AM, Hand NJ, Bauer RC, Wells AD, Olthoff KM, Shaked A, Rader DJ, Grant SFA, Brown CD. *Am J Hum Genet*. 2019;105(1):89-107.

Acetyl-CoA Metabolism Supports Multistep Pancreatic Tumorigenesis. Carrer A, Trefely S, Zhao S, Campbell SL, Norgard RJ, Schultz KC, Sidoli S, Parris JLD, Affronti HC, Sivanand S, Egolf S, Sela Y, **Trizzino M**, Gardini A, Garcia BA, Snyder NW, Stanger BZ, Wellen KE. *Cancer Discov*. 2019;9(3):416-435.

Netter Bioquímica Esencial. **Ronner P**. Elsevier España, Barcelona, España, 2020. Translated by Elsevier España. ISBN: 978-84-9113-515-9; eISBN: 978-84-9113-636-1. Print version (476 pages) available Aug 2019.

## Recent Grant Awards

Adding to the Department's extramural funding portfolio in 2019/20, faculty were awarded grants from both the private and federal sector.

<b>Emad Alnemri, PhD</b>	NIH RO1	Regulation of the Cell Death Program by DFNA5
<b>Jeffrey Benovic, PhD and Charles Scott, PhD</b>	NIH PO1 with Rutgers University	Core A: Discovery Core
<b>Jeffrey Benovic, PhD</b>	NIH PO1 with Rutgers University	Project 3: Biased Targeting of GPCR Signaling Airway Disease
<b>Gino Cingolani, PhD</b>	NIH S10	A High-Throughput Crystallization Platform at Jefferson
<b>Gino Cingolani, PhD</b>	NIH R01 through University of Alabama at Birmingham	Heme and Hemoglobin Utilization by Mycobacterium Tuberculosis
<b>Elise Fouquerel, PhD</b>	NIH R00	Deciphering the Mechanisms of PARP1 Activity in Telomere Integrity
<b>Lin Guo, PhD</b>	Target ALS Foundation, Inc.	Developing Therapeutic Agents to Reverse Aberrant Phase Transitions of the ALS Protein: FUS
<b>Lin Guo, PhD</b>	Alzheimer's Association	Developing Protein Disaggregases and RNA Inhibitors for FTD Protein: FUS
<b>Lin Guo, PhD</b>	Dr. Ralph and Marian Falk Medical Research Trust	Developing Therapeutic Agents to Rescue Neurotoxicity of FUS Aberrant Phase Transition
<b>Lin Guo, PhD</b>	The Frick Foundation	Develop Protein Disaggregase and RNA Oligonucleotides to Mitigate Aberrant Phase Transition of FUS
<b>Ya-Ming Hou, PhD</b>	NIH R01	Discovery of Gram- Negative Permeable Chemical Probes for tRNA Methylation
<b>Ya-Ming Hou, PhD</b>	NIH R21	Mining the tRNA Genome by Live-Cell Imaging
<b>Tyler Kennedy Fenstermaker (Alexander Mazo, PhD)</b>	NIH F31	Recruitment of Transcriptional Machinery Following DNA Replication
<b>Yohei Kirino, PhD</b>	NIH R01	Dissection of the piRNA Biogenesis Pathway in Germ Cells
<b>Diane Merry, PhD</b>	NIH R01	Determining the Role of AR Transcriptional Function in SBMA
<b>Diane Merry, PhD</b>	Eagles Autism Challenge	Sex Chromosome Mediators of Autism Spectrum Disorder
<b>Anna Pluciunnik, PhD</b>	NIH R03	Neuronal DNA Repair Pathways in Huntington's Disease Pathophysiology
<b>Anna Pluciunnik, PhD</b>	Hereditary Disease Foundation	Crosstalk between DNA Repair Pathways in Huntington's Disease
<b>Anna Pluciunnik, PhD</b>	The Gies Foundation	Processing of CAG Extrusions and R-Loops in HD-Derived Induced Pluripotent Stem Cells
<b>Dmitry Temiakov, PhD</b>	NIH R01	Replication-Transcription Switch in Mitochondria
<b>Dmitry Temiakov, PhD</b>	NIH R01	Mechanisms of Transcription Initiation in Mitochondria
<b>Dmitry Temiakov, PhD</b>	NIH R35	Molecular Mechanisms of Mitochondrial Transcription and Replication
<b>Philip Wedegaertner, PhD</b>	NIH R01	G Protein Regulation of Golgi Structure and Function
<b>Eric Wickstrom, PhD (with Madhukar Thakur, PhD)</b>	KOP Therapeutics Corp	Product Development for Cancer Therapy Targeting an Unrecognized Oncogene mRNA
<b>Eric Wickstrom, PhD</b>	NIH R41	microRNA-21 Blockade of Triple Negative Breast Cancer

NIH (National Institutes of Health)

Department of Biochemistry & Molecular Biology  
233 South 10th Street, Room 350  
Philadelphia, PA 19107

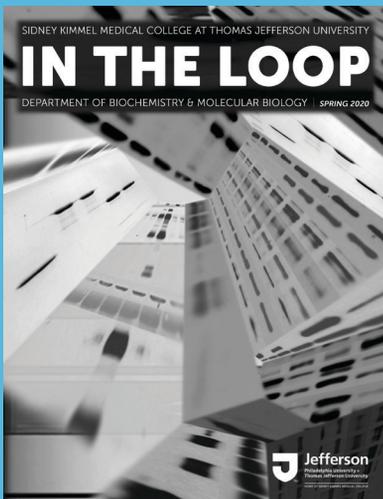
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## ON THE COVER

Proteins analyzed by western blotting, as compiled from recent publications by members of the Department of Biochemistry and Molecular Biology (Drs. Emad Alnemri, Jeffrey Benovic, Gino Cingolani, James Keen, Ya-Ming Hou, Diane Merry, Steven McMahon). Images were modified and grouped into a single compositional design by Julia Kay.



## FACULTY SPOTLIGHT

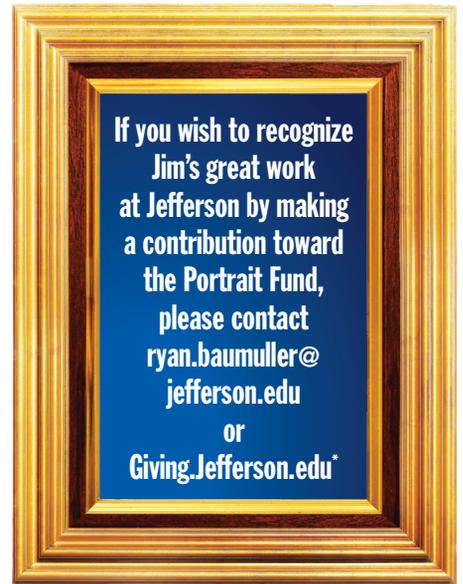
### Dr. James J. Keen Portrait



Dr. James Keen with his granddaughter, Eleanora

The Department of Biochemistry and Molecular Biology is excited to announce that our long-time colleague Dr. James will be honored with a faculty portrait.

In addition to his role as a faculty member in our Department, Dr. Keen served as the Dean of the Jefferson College of Graduate Studies from 2004-2010. This portrait recognizes Dr. Keen for his service as Dean, his outstanding contributions to our understanding of membrane receptor recycling, and his leadership roles in the Sidney Kimmel Cancer Center. The next issue of *In the Loop* will include a full feature on the unveiling of Dr. Keen's portrait.



*\*Click on "Make a Gift," select "Other" in the "Choose your designation" menu and specify "James Keen Portrait."*

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