DIVISION OF BIOLOGICAL CHEMISTRY
AMERICAN CHEMICAL SOCIETY

NEWSLETTER

http://www.divbiolchem.org/

Secretary: T. D. Meek *Fall 2018*

Message from the Chair: Craig Townsend, Ph.D.

My term as Chairman of the BIOL Division concludes at the end of the calendar year. Over four years as Chair-Elect and then Chair, I have been impressed by the dedication that your elected officers have shown and their desire for success of the DBC. It is a complex business running a large section of an even larger national organization. I am deeply grateful for their help, and to previous Chairs Ben Liu and Dewey McCafferty for their perspective and advice. I will pass the gavel to Anne-Francis Miller, who has more than ably served as the Chair-Elect and will bring strong leadership to this office.

In the last four years I have attended every National Meeting of the Society and focused mostly on the DBC and its scientific program. In a time of electronic journals, databases and ever more powerful search engines, I am struck how much more we know about less. We read more narrowly led by the problem at hand. Meetings attended are more often than not specialist. Yes, National ACS Meetings are impersonally large and present an ever larger number of parallel sessions. The “central science” is a big tent, but these meetings can feel like a loud bazaar competing for your attention. It is the neglected generalist, however, the broadly informed scientist that is nourished and recharged by attending these meetings. Even taking part in mostly the DBC scientific sessions, the breadth, quality and intellectual inspiration I have found stimulating and enjoyable. I advocate to all of you to attend an ACS meeting for the generalist in you, in all of us. Refresh your knowledge and technique base. By participating you also support the wider community of biological chemists. Without involvement, there is no community.

The Program Chairs are essential to the enterprise. I particularly want to thank Shana Kelly and Liz Hedstrom in the last two years and their predecessors for enormous personal effort on the behalf of all of us to ensure breadth, opportunities to showcase talented young scientists and organize consistently strong awards symposia (the ones in Boston this past August were outstandingly good) and topics of particular interest as, for example, standing-room-only sessions touching on the applications of CRISPR. The mantle passes to Phil Bevilacqua as head of the Program Committee for 2019.

I ask you please to talk to non-members and lapsed ACS members and encourage them to join the DBC. Aim for five new members. The cost is still a meager $15/yr. And, encourage especially younger colleagues and students to begin to take part in the professional life of the biological chemistry community.

Tom Meek and I have overlapped during these past three years and I am especially grateful for his historical insight, excellent humor and deep commitment to the welfare of the DBC. During our term Alanna Schepartz was

selected as the new Editor of Biochemistry, who has worked hard with the DBC to ensure that the central strengths and audience of this major journal continue to flourish. Not only has the journal *Biochemistry* become more involved in the programmatic aspects of the DBC, but so has *ACS Chemical Biology* and *ACS Infectious Diseases* and editors Laura Kiessling and Courtney Aldrich. We welcome the greater connection between National Meetings and scientific programs with publications and recognition of noteworthy accomplishment by not only well-established scientists but also emerging talent. After one major lecture or symposium at each of the Spring and Fall meetings, with the help of the sponsoring journal, we have instituted a late-afternoon reception open to all Division members to gather for some light refreshment and a chance to meet, to meet your Officers, journal editors and speakers. I encourage you to end your day with us, meet old friends, make new ones and network (listen up graduate students and postdocs!).

Others who leave the DBC leadership team with our thanks for an excellent job include: Jimmy Hougland as head of the Nominating Committee, and we welcome Vickie DeRose as the incoming head of this committee. We also thank Squire Booker and Michelle Hamm for their steadfast service on the Advisory Committee. Thank you all very much for your service and commitment to the Division.

The DBC leadership team met at the Boston meeting, and here are outcomes of our discussion. The DBC team agreed to, and is pleased to support the following conferences: Bioinorganic GRS (Jan 31 – Feb 3, 2019), Metals in Biology GRC (Jan 27 – Feb 2, 2019), 26th Enzyme Mechanisms Conference (50th Anniversary; Jan 6-9, 2019), 26th American Peptide Symposium (APS)/11th International Peptide Symposium; Symposium "New Wave in Peptide Science" (June 22 – 27, 2019).

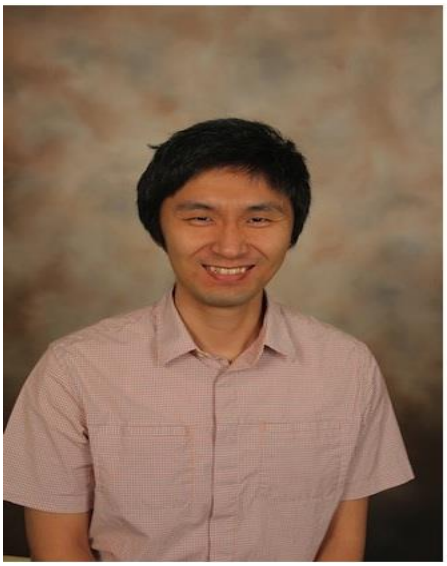
We invite you to gather with us in Orlando (March 31–April 4, 2019) for some great science at the spring National meeting in a sunny and warm place.

Finally, I would like to draw your attention to an important editorial that appeared this summer by John Gerlt and endorsed by the Editor of *Biochemistry*, Alanna Schepartz (*Biochemistry* **2018**, *57*, 4239-4240. doi:10.1021/acs.biochem.8b00705). Linking gene sequence information to protein function is a central problem of our time. Misannotation of function in commonly used databases is rife. UniProtKB alone allows easy correction of its database by members of the scientific community. Prof. Gerlt's proposal, endorsed as well here, is now adopted policy in the "Instructions to Authors" for *Biochemistry*, a change that they and we hope will become "viral" in the editorial policies of other biological journals. The goal is a simple one to include accurate access ID's for all experimentally characterized proteins in new manuscripts. To illustrate, an example was given: "Stromelysin-1 PDGF responsive element binding protein (SPBP, UniProtKB Q9UGU0)". As long as this clear linkage of functional analysis and UniProtKB accession number appears in a paper somewhere, manuscripts can be searched by UniProt and the documented functional information captured.

Congratulations to 2019 Division of Biological Chemistry Award Winners!

Professor Kenichi Yokoyama is the recipient of the **2019 Pfizer Award in Enzyme Chemistry** in recognition of his contributions to the elucidation of complex mechanisms and novel functions of enzymes involved in the biosynthesis of cofactors and natural products. One area of focus of the Yokoyama group has been radical-mediated enzyme catalysis. In the past decade, the scope of free radical reactions in enzymology has expanded significantly. In particular, a multitude of enzymes in the radical *S*-adenosyl-L-methionine (SAM) superfamily have been found to catalyze highly diverse and

chemically challenging reactions. The main focus of the Yokoyama lab has been radical SAM



enzymes involved in C–C bond formation during the biosynthesis of the carbon skeletons of cofactors and natural products. One of their most significant areas of contribution is elucidation of the mechanism of pterin backbone construction during molybdenum cofactor (Moco) biosynthesis, a pathway linked to a fatal metabolic disorder in humans and bacterial pathogenicity. In this study, the Yokoyama group characterized the radical SAM enzyme, MoaA, along with MoaC, another enzyme in the pathway, and identified a structurally novel cryptic biosynthetic intermediate, 3',8-cH$_2$GTP. Together with subsequent mechanistic studies, their results elucidated the functions of both MoaA and MoaC for the first time in the >30 years-long history of the study of Moco biosynthesis. Another area of Yokoyama lab contribution is the functional characterization of the radical SAM enzyme NikJ in the biosynthesis of antifungal nucleoside antibiotics such as the nikkomycins and polyoxins. In this study, NikJ was found to catalyze formation of the unique bicyclic nucleotide, octosyl acid 5'-phosphate, through radical-mediated C-C bond formation involving a redox-active Cys residue. This revelation allowed the Yokoyama lab to perform bioinformatic analyses of related pathways, which suggested potentials for genome mining discovery of novel antifungal nucleoside natural products. In both of these studies, radical SAM enzymes were found to install C-C bonds in unique positions within precursors. The lab is currently extending their efforts to the other steps of the pathways and the mechanism of action of antifungal natural products. The Yokoyama lab studies have expanded our understanding of carbon skeleton construction in metabolic pathways and demonstrated the impact of identifying novel enzyme functions and mechanisms on future development of novel therapeutics for infectious and metabolic diseases.

Prof. Neal K. Devaraj is the winner of the **2019 Eli Lilly Award in Biological Chemistry**. One of the most challenging questions in chemical biology is how non-living matter, such as simple organic molecules, can assemble to form life. The Devaraj group is approaching this problem through the synthesis of artificial cells, developing coupling reactions that drive the self-assembly, growth and reproduction of lipid

vesicle assemblies. To guide the work, they are developing chemical tools to blueprint the structure and function of modern cells. Using this combined approach, the lab strives to understand the prerequisite chemistry from which biology can emerge.

Devaraj and his lab synthesized the first artificial cell membrane that can sustain

continual growth. Unlike natural membranes, biomimetic systems cannot maintain growth owing to an inability to replenish phospholipid-synthesizing catalysts that are diluted during lipid expansion. The Devaraj lab created an artificial cell membrane that continually synthesizes all of the components needed to form additional catalytic membranes. Membrane growth can proceed indefinitely as the catalyst required for vesicle growth also autocatalyzes its own synthesis.

Another direction of his lab seeks to develop new tools for labeling and manipulating RNA. Mainstream methods for studying RNA utilize non-covalent interactions between the probes and the RNA of interest, which limits their robustness, especially for less abundant RNA targets. The Devaraj lab devised a method for the site-specific covalent labeling of RNA with functional reporters in a single conjugation step by exploiting a bacterial tRNA modifying enzyme, tRNA-guanine transglycosylase (TGT), and unnatural analogs of its native substrate preQ$_1$. RNA transglycosylation at guanosine (RNA-TAG) can incorporate a wide variety of probes targeted to a minimal 17-residue hairpin that can be encoded on any RNA. The use of covalent linkages will lead to robust methods to isolate RNA and label RNA.

Applying the lessons learned from their earlier work in chemoselective lipid synthesis, his lab has recently developed traceless chemistries to assemble lipid natural products from within living cells. This approach allows unequivocal association of specific lipids generated in vivo with their cellular function. His lab's initial studies have focused on generating ceramides, one of the most enigmatic classes of molecules within the realm of bioactive lipids. The Devaraj lab found that delivery of fully saturated ceramides significantly reduces cell viability while there is no reduction in cell viability following delivery of monounsaturated ceramides. These observations highlight the importance of species-specific study of ceramides and demonstrate the power of chemical tools to circumvent the limitations of endogenous lipid synthesis pathways to uncover the function of individual lipid molecules in vivo.

DBC Elections. November 2019 was elections month, not only nationally but also for the DBC! In addition to voting in favor of the DBC by-laws, the following were elected for DBC officer positions. Congratulations to all!:

Chair Elect: Sheila David

Secretary: Hazel Holden

Program Committee: Kate Pletneva

Nominating Committee: Tim Stemmler

Advisory Committee: Kay Ahn, Ruma Banerjee

Craig Townsend

Chairman
Division of Biological Chemistry

257th ACS National Meeting, March 31 – April 4, 2019, Orlando, FL

The ACS Division of Biological Chemistry will organize a program of talks and posters for the ACS Spring National Meeting in New Orleans, LA. The program will consist mainly of oral sessions composed of short 20 minute talks and poster sessions. Program Chair: Phil Bevilacqua , The Pennsylvania State University.

Travel Awards: The Division offers travel awards for graduate students and postdoctoral fellows to attend the National Meetings. The level of support is $750,

which can be used to offset travel costs and registration fees. Detailed information about these awards can be found on the Travel Awards page.

Spring 2019 Program Preview (to be published in C&E News January 2019.

Travel Awards

The division offers travel awards for graduate students and postdoctoral fellows to attend the 257st ACS National Meeting in 2019. **The deadline for submission is January 15, 2019, and submission details may be found here(**(http://www.divbiolchem.org/awards/travel-awards)**)** The level of support is $500, which can be used to offset travel costs and registration fees. Detailed information about these awards is provided later in this Newsletter and on the division website.

Regional ACS Meetings

Support for Meetings

The Division of Biological Chemistry provides grants to support symposia at ACS Regional meetings and for conferences in research areas of interest to the division membership**.** Members interested in applying for support from the Division for a symposium or conference during 2019-2020 should submit an outline for the event as an e-mail attachment to the Treasurer Christy Chow (cchow@wayne.edu). These proposals will be reviewed twice a year at the Division's business meetings, which are held during the Spring and Fall ACS national meetings. The deadlines for receipt of applications are **March 1** and **August 1** for review at the Spring and Fall meetings, respectively. Unfortunately, due to increased numbers of funding requests, proposals received after a given deadline will only be considered at the business meeting held after the next deadline. These awards are intended to provide Division members with new forums in which to present their work as well as to support focused conferences in biochemistry and chemical biology. Proposals that are judged not to meet these objectives, such as requests for blanket support of regional ACS meetings, are unlikely to be funded. Currently for 2018/19, the Division will provide support for the following symposia and meetings held this year:

Travel Awards to Attend the 257st ACS National Meeting

The division offers travel awards on a competitive basis for graduate students and postdoctoral fellows to attend the meeting and present a poster on their research in the DBC. The selected awardees will be reimbursed up to $500 for travel and registration expenses. Receipts must be submitted along with a request for reimbursement after the meeting. No more than two awards will be made to one laboratory for any single ACS meeting. In addition, **please note that no individual can win more than one division travel award in his/her lifetime.**

How to apply for a Travel Award

(1) Fill in the Travel Award Application (next page).

(2) Attach a printed copy of your abstract.

(3) Attach a one page CV.

(4) Attach a signed letter of recommendation from your faculty advisor.

(5) Send **ONE COMPLETE PDF FILE** of this material as *single* EMAIL attachment to the Program Chair Phil Bevilacqua (pcb5@psu.edu). Be sure to use a subject line of **"ACS Travel Awards"** in your electronic application.

The deadline for submission of an

application for a travel award to the 257st ACS National Meeting (Orlando, FL) is January 15, 2019.

Application for a Travel Award for Graduate Students and Postdoctoral Fellows

Deadline: January 15, 2019 (New Orleans, LA)

Name: _____ Advisor: _____

Department _____ Graduate Student: _____ Postdoctoral Fellow: _____

Institution: _____ Street: _____

City, State, Zip: _____

Tel: _____ E-mail: _____

Is an Abstract attached? _____ Is a CV attached?

Is the advisor's recommendation letter (one page) attached?