BMB Active Site News

Est. 1968 Fall 2023

Message from the Department Head

Dear Alumni and Friends of the Department of Biochemistry and Molecular Biophysics,

I am very pleased to present to you the latest issue of "BMB Active Site News" after a 3-year hiatus in producing the newsletter. In the intervening time, several important events affected the shape of the department. As you will read about on the following pages, Dr. Jerry Reeck passed away in summer 2021 and Dr. Larry Davis retired in 2020. The department celebrated Jerry's life and professional achievements, and Larry's distinguished career with two events that sadly had to be delayed due to then ongoing COVID-19 pandemic with social restrictions. In 2022, two more faculty departed the department, Dr. Gregory Finnigan and Dr. Ho Leung Ng, and Dr. John Tomich retired in spring 2023. As a result of these events, the department became reduced in size, but we continue performing successful federally funded research, as you can discover in the news that follows. Our teaching mission has been supported by two Instructors, Dr. David Meekins and Dr. Anton Khmelnitskiy, and a teaching laboratory manager, Allen Friedrichs, who all joined in 2021 and 2022. Biochemistry majors have been enjoying excellent advising by a new member of the department, Janae Mooty who joined in the fall of 2021. As the chief student advisor, Janae has been working hard to help the Biochemistry undergraduate programs with student recruitment, retention, and ultimate academic success. You can learn about Janae's advising philosophy further in this newletter. Finally, I am happy to report that a new faculty member is joining BMB this fall. Dr. Shijiao Huang is our new Assistant Professor and joins us from the University of Michigan. Shijiao's research program is focused on the cellular biochemistry of aging, and you will learn more about her achievements and plans in the next newsletter issue.

We are sending our warmest greetings to all our Alumni and Friends! If you happen to visit Manhattan, please remember to stop by.

Michal Zolkiewski

Focus on Student Success:

Message from BMB's Chief Undergraduate Advisor, Janae Mooty

The mission of academic advising in our department centers on advisors and advisees working together as the students progress through college. The key aspect of the mission is the ability for advisor and advisee to create a relationship built on trust, communication, and a sense of purpose. Kansas State University promotes educational development through the service of the advisors on campus. The term 'development' means the student is in a constant state of learning about themselves, their career goals, their academic choices, and their overall sense of purpose, thus evolving over time. The academic advisor is a guide throughout the students' journey, striving for the advancement of student success.

My advising philosophy centers on the mission of Kansas State University and the department. Through inclusive practices, I focus on equity and diversity while developing a relationship with my students. As a mutual foundation of trust and commitment is created, students are more expressive in their interests and concerns which allows for an open and dynamic environment to be established. When students are progressing through college, they are participating in multiple activities, challenges, and opportunities which allows their identities to grow and mature. My approach to advising is teaching students how to take ownership of their academic choices and understand how to relate those choices beyond the classroom. A strength of my advising practice is to guide students along their developmental continuum where they realize their purpose and sense of belonging. Each student is unique and every student has their own academic goals and desires. Given the different needs of my students, I strive to implement strategies and structure my advising based on the goals and requirements of the student.

Symposium to Celebrate the Career of Dr. Larry Davis

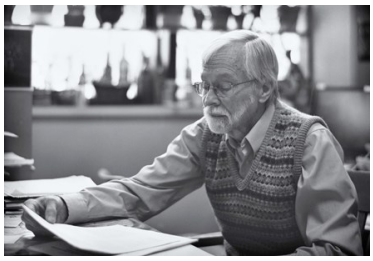


Photo courtesy of Pinakin Sukthankar

Professor Lawrence (Larry) C. Davis retired in spring 2020 after 45 years of teaching, research and service in the Department of Biochemistry and Molecular Biophysics. Larry received a Bachelor of Science in Chemistry from Haverford College and Ph.D. in Molecular Biology from Albert Einstein College of Medicine. He joined KSU in 1975 as an Assistant Professor and rose through academic ranks on the Manhattan campus. His research has been focused on the biochemical process of conversion of atmospheric nitrogen into nitrogen-containing compounds (known as nitrogen fixation) and on the mechanism of an essential nitrogen fixation enzyme, nitrogenase. More recently, Larry has been involved in research on bioremediation and phytoremediation: ways of decontaminating water and soil using natural metabolic capabilities of microorganisms and plants.

Throughout his career at KSU, Larry has been a devoted, enthusiastic and effective instructor, teaching multiple biochemistry courses at all levels. He developed novel teaching methods and published on various topics in science education. He served as the Graduate Program Director and the Chair of the interdepartmental Graduate Biochemistry Group for 14 years, advising and guiding generations of students towards advanced degrees in biochemistry. He was major professor for 24 graduate students, many of whom have established successful research programs of their own. He was a strong advocate for historically underrepresented students and mentored over 30 undergraduates in his research laboratory, including those in the Developing Scholars Program, of which he was an ardent supporter.

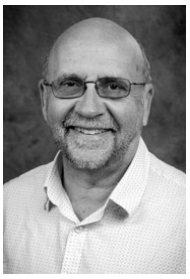
Dr. Shen

Dr. Zou

After a hiatus caused by the COVID-19 pandemic, students, coworkers, faculty, and friends gathered on the KSU campus on October 8, 2021, to celebrate Larry's career. The symposium featured scientific presentations by two of Larry's former graduate students: Dr. Bingui Shen (Professor and Chair, Department of Cancer Genetics and Epigenetics, Beckman Research Institute of City of Hope, Duarte, California) and Dr. Lee Zou (Professor of Pathology, Harvard Medical School, Charlestown, Massachusetts).

Larry Davis has dedicated his career to the science of biochemistry and to the biochemical education at KSU. We sincerely thank him for his collegiality, his research contributions, and for helping to shape the academic programs in the Department of Biochemistry and Molecular Biophysics.

Rembembering Gerald Reeck



The department was saddened by the death of Professor Gerald Reeck in July, 2021. Jerry joined the Department of Biochemistry in 1974, after earning a Ph.D. at the University of Washington and carrying out postdoctoral research at the National Institutes of Health. During his 47 years as a faculty member at K-State, Jerry contributed to many aspects of research, teaching, service, and administration. He carried out research primarily on functions of proteins, beginning with human HMG proteins and histones in cell nuclei, later on protease inhibitors from plant seeds, and most recently with proteins in the salivary glands of aphids that aid in their feeding on plants. He enjoyed international travel to meet with research collaborators, with several extended stays in China to develop research projects. Jerry served as a mentor for many graduate students and postdocs, and received the Distinguished Graduate Faculty Award from the university in 1989. He served on many committees for the department, college and university, including several terms in the Faculty Senate. In administrative roles, Jerry served as the Associate Dean of the Graduate School (1989 – 1991) and as Associate Dean of the College of Arts and Sciences (1998 – 2004). Jerry taught many biochemistry courses to undergraduate and graduate students, most notably many offerings of General Biochemistry, a graduate course on Proteins, and a course for university honors students. Jerry began teaching General Biochemistry by distance learning before the internet and email were available, sending and receiving homework and exams to students by US mail. He later developed the course for delivery by internet and taught it to thousands of students across the country.

On August 31, 2022, the Department of Biochemistry and Molecular Biophysics held a research symposium to honor Jerry's memory. The symposium featured remarks and memories of Jerry by former students, coworkers, and friends. Former Head of the Department of Biochemistry, Dr. Thomas Roche reminisced about arriving to Kansas State University at the same time as Jerry and their early research endeavors. Two presentations were given by Jerry's recent doctoral graduates, Dr. James Balthazor (Associate Professor, Department of Chemistry, Fort Hays State University, Hays, Kansas) and Dr. Christopher Miller (Founder, Tritica Biosciences, Manhattan, Kansas). The symposium concluded with unveiling of Jerry's portrait by Dr. Richard Beeman in the departmental conference room.

Two BMB Professors Receive NIH-MIRA Grants

Two BMB professors, Brian Geisbrecht and Michael Kanost, have received grants from the NIH "Maximizing Investigators' Research Award" (MIRA) program for established investigators. According to the National Institute of General Medical Science (NIGMS), the goal of MIRA is to fund a single grant to support the NIGMS-relevant program of research in an investigator's laboratory, to "provide investigators with greater stability and flexibility, thereby enhancing scientific productivity and the chances for important breakthroughs." The MIRA grant provides a five-year award, with flexibility to pursue new ideas and opportunities as they arise during the course of research, because the grant is not tied to specific aims.

Dr. Geisbrecht's MIRA award to investigate inhibitors of enzymes that act in the innate immune system represents an extension and expansion of two NIGMS-funded R01 awards. The new grant will fund research to investigate the structure, function, and mechanisms of a novel class of neutrophil serine protease inhibitors expressed by the pathogenic bacterium Staphylococcus aureus. It will also provide resources to continue similar investigations of a family of myeloperoxidase inhibitors expressed by various staphylococcal species, as well as collaborative studies on other heme-containing peroxidases. Finally, this award will also provide long-term support for Dr. Geisbrecht's work toward understanding structural, functional, and mechanistic questions of proteases and proteolytic complexes of the complement and coagulation systems found in the bloodstream. This research will rely heavily on structural methods enabled by previous NIGMS support, including use of X-ray crystallography resources at the Advanced Photon Source at Argonne National Laboratory in Chicago and nuclear magnetic resonance spectrometry housed in the Mary L. Vanier Biomolecular NMR Facility in Chalmers Hall. Ultimately, this work will provide us with an improved biochemical understanding of proteins and protein-protein complexes that serve critical and early roles in innate immunity and inflammation.

Dr. Kanost's MIRA award to investigate the biochemistry of immune responses of insects replaces two NIGMS R01-equivalent awards, including a grant that had been funded for 31 years, most recently as a 10-year R37 award. The new grant will fund research to investigate how bacterial peptidoglycan triggers activation of protease cascades in insect immunity, how the redox environment of insect hemolymph is regulated during an immune response, and molecular mechanisms of iron-withholding as an immune response in insects. The research will use a large caterpillar, *Manduca sexta* (the tobacco hornworm) as a model system and will take advantage of the genome sequence of this insect and the foundation of knowledge and reagents built up in this system by the Kanost laboratory and collaborators over years of study. The MIRA grant will fund some new equipment for the laboratory and will provide a stable budget for five years and reduce the time needed for writing different proposals and progress reports. The work will add fundamental biochemical understanding of the innate immune system of insects, which can be applied to insect vectors of diseases and agricultural pests.

Timothy Durrett and Ruth Welti Receive Collaborative Grant to Advance Biofuel Production and Agricultural Economy

Timothy Durrett, associate professor of biochemistry and molecular biophysics, and Ruth Welti, distinguished professor of biology and ancillary professor of biochemistry and molecular biophysics, received nearly $1.9 million in a five-year collaborative grant from the U.S. Department of Energy.

The focus of this grant is to improve oilseed crops for use as biofuels and other bioproducts by working to better understand how changing the biochemistry of oilseed plants alters their oil production. The research group is working with camelina and pennycress — non-food oilseed crops — that can be used as cover crops by farmers. They stressed that these can be integrated into a traditional rotation and do not interfere with food production.

As part of the collaboration, Durrett is working to more efficiently produce transgenic plants. Current research methods alter the biochemistry of plants at random places within their DNA and Durrett hopes to make the genetic engineering process more predictable and efficient. While Welti, director of the Kansas Lipidomics Research Center at K-State, is analyzing how the oils are changing in the altered plants. *Photo and story courtesy of K-State News.*

K-State Biochemistry Molecular Biophysics
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BMB Graduate Student was Awarded the Sarachek Honors Fellowship for Outstanding Academic and Research Work

Linah Alkotami, doctoral candidate in biochemistry, was awarded the $17,600 Alvin and RosaLee Sarachek Predoctoral Honors Fellowship in Molecular Biology. The Sarachek fellowship was established by RosaLee Sarachek and the late Alvin Sarachek, Wichita, to recognize resident graduate students enrolled in a doctoral program at Kansas State University who have demonstrated exceptional research and academic accomplishments. An interdisciplinary faculty selection committee determines the award recipients.

Alkotami's research aims to genetically modify the seed oil composition of two non-food winter oilseed crops — Camelina sativa and pennycress — to produce large amounts of acetyl-triacylglycerols, or acetyl-TAG. Acetyl-TAG oil has reduced viscosity and can be used without the costly processing required for regular vegetable oils in many industrial applications, such as 'drop-in' biofuels, biodegradable lubricants and food emulsifiers. Alkotami has successfully generated transgenic plants with seeds that accumulate 93-98% of acetyl-TAG without compromising germination and seed viability. Timothy Durrett, associate professor of biochemistry and molecular biophysics, is Alkotami's major professor. *Photo and story courtesy of K-State News.*

- KSU Biochemistry & Molecular Biophysics On the Web: www.k-state.edu/bmb
- Connect with K-State Alumni Association: www.k-state.com
- Support BMB through K-State Foundation: https://ksufoundation.org/how-to-give/
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- To give online: https://giving.ksufoundation.org/campaigns/15136/donations/new
  - Specify a designation: Biochemistry and Molecular Biophysics Excellence Fund (F17870).