

THE NEWSLETTER OF THE DEPARTMENT OF CHEMISTRY & BIOCHEMISTRY

the **TEST** TUBE

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REACTIONS IN PROGRESS

Over the last year, the department has witnessed some of our long term goals beginning to take shape. Since last summer, the faculty have secured an additional 6.3 million in external research funding, exceeding the 5.1 million from last year. Our department also welcomed 22 new graduate students this fall and brought our current total number of masters and Ph.D. student to 99, the highest number in the last seven years. We also saw a 70% increase in alumni donations from fiscal '17 to '18, a testament to the generosity of the alumni of this department. These funds are instrumental in not only attracting, but also retaining top talent from undergraduate students through faculty. As we continue building upon the success of previous years, we are also receiving significant university investment in our research and academic endeavors, helping us to keep this momentum going.

For renovations, university commitments have been secured for remodeling undergraduate and research labs, shared use instrument facilities, and for graduate student study space. These funds will also allow us to implement technological upgrades to the main foyer as well. In most cases, these renovations are bringing our department into alignment with our peer institutions.

For instrumentation upgrades, new equipment is continually being acquired by the department to further both graduate research and undergraduate education across all divisions. In the biochemistry division, a new Steris AMSCO 250LS autoclave has been purchased to be used by both graduate students for thesis research and undergraduate students as part of their undergraduate curriculum. The analytical teaching lab has had multiple upgrades over the last year. Along with the upgrades to the current UV-Vis Spectrometer, the facility also added an Agilent Capillary Electrophoresis (EC) system, an Agilent Microwave Plasma Spectrometer, and a Cary/Agilent Eclipse Fluorimeter. In the organic and inorganic labs, two new Nanalysis 60 MHz benchtop NMRs were purchased to allow undergraduate students to gain hands on experience collecting and analyzing experimental NMR spectra. In the X-ray facility, generous funding from both the Dean of Arts and Sciences and the Provost's office purchased a new Rigaku Synergy-i dual-source single crystal diffractometer and upgrades to the Rigaku MiniFlex II powder diffractometer. While the single crystal instrument is primarily a research grade instrument, the powder diffractometer has already been integrated into the advanced organic and inorganic undergraduate labs.

Regardless of the updates to space or new instrumentation, all of these updates serve to continue advancing our department's mission of preparing the next generation of chemists for what lies ahead.

ALUMNI DONATIONS

This past fiscal year, the department has been graced by the generosity of our alumni in the form of increased giving for student scholarships and to the research endeavors of the faculty and their students. In particular, we would like to express our most sincere gratitude to Mrs. Alice and Dr. Ming Sun for the largest individual alumni donation to the department in the last decade. Their donation to the department will be used to help support qualified faculty when applying for national funding (NSF, DOE, NIH, ect.) by enhancing research activities with the department. These funds will provide internal seed funding for program costs, research equipment purchases, and graduate fellowships. Also, their donation was submitted to the Texas Higher Education Coordinating Board for matching as part of the Texas Research Incentive program ("TRIP"), ultimately increasing the value of their donation.



Mrs. Alice and Dr. Ming Sun with President Lawrence Schovanec (center)



INSIDE THIS ISSUE The 18th Henry J. Shine Lecture An Excellent Year Shaping the Future Sepsis Detecting Chip Staff Awards Department Grant Awards

THE 18th HENRY J. SHINE LECTURE

On October 23rd and 24th, we had the honor of welcoming Nobel laureate, Dr. Richard R. Schrock back to Texas Tech University to present the 18th Henry J. Shine lecture. In both of his lectures, My Path to a Nobel Prize in Chemistry and Recent Advances in Olefin Metathesis Chemistry Dr. Schrock took the audience on a Journey through his life and work in olefin metathesis that ultimately resulted in him receiving the highest scientific honor in chemistry.

The Shine Endowed Lecture series allows the students and faculty the unique opportunity to interact with some of the top chemists in their respective fields, if not all of chemistry. However, we must also acknowledge that none of this would have possible without the generous support of Dr. Henry Shine, a grant from the Plum Foundation, and a multitude of donations to the Shine Endowed Lecture series. For everyone that has played a role in making this lecture series possible, we would like to sincerely thank you.



(L-R) Dean Brent Lindquist, Prof. Yehia Mechref, Prof. Henry Shine, Prof. Richard Schrock, Prof. Michael Findlater

AN EXCELLENT YEAR

Story by Glenys Young, Office of Communications & Marketing

After Prof. Yehia Mechref became chairman of the Texas Tech University Department of Chemistry & Biochemistry on June 1, 2017, he kicked off his new role by overseeing a huge boom in the department's research funding. Over the course of the summer, eight faculty members received a total of \$5.1 million in grants, including two awards worth more than \$1.3 million by Mechref himself. Apparently he didn't want to let his first year end any less impressively.

This past spring Mechref not only received an invitation to become a standing member of a National Institutes of Health (NIH) study section, a group of nationally recognized scientists that makes recommendations on the scientific merits of proposals under consideration for NIH funding. Mechref received the university's first NIH Shared Instrumentation Grant, thanks to a collaborative effort with the Texas Tech University Health Sciences Center (TTUHSC). And in May, he received one of only three consortium grants from the NIH's National Cancer Institute for his new Joint effort to find a predictor for liver cancer. To cap off an exceptional semester, Prof. Mechref was awarded the 89th Horn Professorship, the highest honor Texas Tech can bestow upon one of its faculty members. This

brings the number of active Horn Professors in Chemistry and Biochemistry department to four.

To continue reading more about Prof. Mechref incredible year follow the link http://www. depts.ttu.edu/artsandsciences/ news/Faculty/faculty-news-Mechref2018.php



SHAPING THE FUTURE THROUGH EXPERIENCE

As part of TTU's strategic vision for the future, there is a strong push for the creation of unique experiences for each student during their time as an undergraduate. Emerging research is showing a correlation between a student's experience outside of the classroom and their success after leaving the University. Here in the Chemistry and Biochemistry department, our history of engagement with undergraduate students in research outside of class, has uniquely positioned us to help lead this effort. This year alone, we have more than 25 undergraduate students conducting cutting-edge research in various labs throughout the department. The majority of these students are supported either by national funding agencies, TTU research initiatives, by the department or they may conduct research voluntarily to gain experience. These "internships" give students a taste of actual research and introduce them to situations that are not always experienced in the classroom (i.e. My reaction didn't work, what do I do now?). These experiences are vital in helping guide students down a career path in chemistry that fits with their goals for life.

Along with research experiences for undergraduate students, the Chemistry and Biochemistry department has also been a participating member of the Welch Summer Scholar Program for over 20 years. The 5-week program, which is sponsored by the Welch Foundation, gives rising Junior and senior high school students from across

the state of Texas the opportunity to experience research first hand. Along with conducting their own supervised research, the students are exposed to a variety of other cutting edge research endeavors at TTU outside of the Chemistry department through invited lectures and field trips. They also gain experiences in scientific communication through a written report and poster presentation at the end of the program.

It is through these various hands-on research experiences that our faculty, graduate students, and staff have an opportunity to shape the future of Chemistry and give valuable experiences to our undergraduate students.



The 2018 Welch Summer Scholars and their mentors.

RESEARCHERS' SEPSIS-DETECTING CHIP PROVES SUCCESSFUL IN HUMAN STUDY

Story by Glenys Young Office of Communications & Marketing

Two years after inventing a microfluidic chip believed to help detect a life-threatening blood infection, researchers in the Texas Tech University Department of Chemistry & Biochemistry and the Texas Tech University Health Sciences Center (ITUHSC) are confirming that their life saving product successfully works for human patients.

The chip, invented by associate professor Dimitri Pappas and graduate student Ye Zhang, detects sepsis, a potentially fatal condition in which the body's immune system goes into overdrive trying to kill a blood-borne bacterial infection. While sepsis is easily treatable with antibiotics, it was not easy to detect. The previous method, a bacterial culture to find the bacteria responsible for the infection, could take anywhere from two to 15 days. Even the short end of that time frame can be longer than it takes for a person to die from sepsis.

The chip takes a different approach. Instead of looking for the bacteria causing sepsis, it looks for the activation of certain white blood cells, which indicate the body is trying to fight an infection. Using less than a drop of blood, the chip can detect sepsis in as little as four hours.

Working with Dr. John Griswold, professor and chair emeritus in the TTUHSC Department of Surgery, the team has reported in two recently published papers in the Journals Analyst and Analytical Chemistry, that there is a 98 percent accuracy in detecting sepsis.

"Patient samples are usually where a project fails," Pappas said. "We were able to detect sepsis and in many cases track improvement in health using patient blood. It is extremely gratifying to see the idea work so well in a clinical study."

To continue reading about this exciting study visit: https://today.ttu.edu/posts/2018/07/sepsis-papers











Jeanne Bertonazzi - Glass



Scott Hiemstra - Machine



Vince Wilde - Electronics

The Chemistry and Biochemistry Shops (Glass, Machine, and Electronic) are the 2018 recipients of the TTU Guns Up! Award, which recognizes a team of employees that foster cooperation with other employees to increase productivity and efficiency within the University and have also improved customer service and morale. This award marks the first time a team of staff from the Chemistry and Biochemistry department have been so recognized.

DEPARTMENT GRANT AWARDS



Professor Michael Latham

Prof. Latham received an incredible three awards in 2018. The first award was from the Cancer Research and Prevention Institute of Texas (CPRIT) for his grant titled Structural and Functional Characterization of the DNA Double Strand Break Procession Complex of Mre11-Rad50 for a total amount of \$459.184 over 3 years. The second award was from the Welch Foundation for his proposal Uncovering Allosteric Coupling in a DNA Damage Repair Complex with Methyl-based NMR Spectroscopy. The award total is \$195,000 for 3 years. The third award is a R35 from the National Institute of Health (NIH) for his grant application entitled Structural Biology Studies of a Large DNA Repair Complex. This award is funded at \$1,798,573 for 5 years. All of these awards are a direct response to the clear and present need to understand the intricate nature of DNA repair.



Professor Bill Poirier

Prof. Bill Poirier has been awarded a supplement of \$30,998 to his NSF grant entitled CDS&E: Massively Parallel Quantum Dynamics: Computing many accurate quantum states for real molecular applications. This brings the total award to \$529,007 through July 2020 and will continue to support his research into improving the accuracy, reliability, and true predictive power of molecular simulations.



Professor Clemens Krempner

Prof. Krempner received an award from the Department of Energy (DOE) for his grant application entitled Inverse Frustrated Lewis Pairs as Transition Metal Free Catalysts for Hydrogenations of Organic Carbonyl Compounds, CO2 and CO. This award is funded at \$500,000 for 3 years and will focus on using CO2 and CO as possible feed stocks for organic molecule synthesis.



Professor Dimitri Pappas

Prof. Dimitri Pappas received a CPRIT High-Impact/High-Risk Research Award (HIHRRA) for his grant application entitled **Microfluidic Cancer Assay for Liquid Biopsies and Early Detection**. This award is funded at \$200,000 for 2 years and will allow his research on sepsis to progress forward. This is also the only HIHRRA awarded to TTU during cycle 2 of 2018.



Professor Guigen Li

Horn Prof. Li's Welch grant proposal Chiral GAP Catalysts for Asymmetric Reactions will be renewed for the next 3 years for a total award amount of \$330,000. This is the highest level of funding for a Welch grant and is direct reflection of the Welch Foundation's interest in Dr. Li's research on GAP chemistry.



Professor and Chair Yehia Mechref

Horn Prof. Mechref, in collaboration with Prof. David Lubman (University of Michigan) were awarded a new UO1 grant from the NIH-National Cancer Institute (NCI) entitled Screening of Glycan Markers in Serum for Early Detection of HCC in Different Etiologies of Disease. This award includes researchers from TTU, the University of Michigan, the University of Texas MS Anderson Cancer Center, UT Southwestern, and Indiana University. The award total is \$1,999,790 for 4 vears. This award is one of only three awards given by the NIH-NCI to create an Alliance of Glycobiologists for Cancer Research Translational Tumor Glycomics Laboratories.

The second award Prof. Mechref received this past summer was from NIH (a S10 BRS Shared Instrumentation Grant). This S10 award is the first one received by TTU and represented true synergistic activity between TTU and TTU/HSC. The S10 award will provide \$600K; The CH Foundation will provide \$150k, TTU/ HSC \$100k and TTU \$50k. This new instrument will enable the Center for Biotechnology & Genomics to provide genomic sequencing with increased speed at a reduced cost that will benefit researchers at TTU, TTU/HSC, and the region. The success of this application is a true testament to the partnership across institutions and The CH Foundation which is always supportive of TTU system.



Professor William Hase

Horn and Robert A. Welch Chair Prof. Hase has received funding from NSF as a collaborator with Prof. Yong Chen in the Computer Science department. The grant proposal was titled Elements: Software: NSCI: Empowering Datadriven Discovery with a Provenance Collection, Management and Analysis Software Infrastructure. The total awarded amount was \$599,982, while Prof Hase's share was \$89,997.

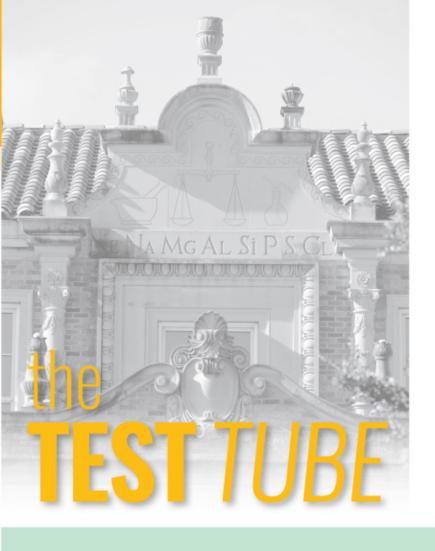


THE COINAGE METALS DONATION PAGE

As with any remodeling project, funds are a necessary part of the equation and it is not always possible to do everything at once. While we have been extremely appreciative of previously received monies for small projects from the University, we are looking towards the future and what would be possible with more of our proposed projects finished and being fully utilized by our undergraduates, graduate, faculty, and staff. As we continue to strive for student excellence and research recognition, your support is always appreciated and will be used to the fullest.

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MAKING BONDS

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We would like to hear from you.
If you would like us to share some news
or just update your contact information,
please let us know!

Send us an Email, Letter or Use our online form: chem.ttu.edu/Alumni **OUR VISION** The Department of Chemistry & Biochemistry is committed to providing high quality education in the chemical and biochemical sciences for undergraduate and graduate students, producing research contributions that are recognized nationally and internationally, and making service contributions at all levels.

the TEST TUBE CO-EDITORS: Dr. Robert D. Long Dr. Daniel K. Unruh