



Letter from the Department Head

Greetings alumni and friends!

My first year as the department head has been a mixed experience, some exciting and some challenging. Over this period, I have seen several of our faculty members continue to succeed in their research careers. Among those success stories was Brian Leonard, who received NSF funding on his project related to 2D materials. John Hoberg and Bruce Parkinson served as co-PIs on a DOE grant that was awarded last summer and involves the design and characterization of covalent organic framework based materials. This past year, Caleb Hill published his research in the highly reputed journal *Nano Letters* while Franco Basile co-authored a paper in *Nature Communications*. Franco Basile also received an NSF grant as co-PI on Epigenetics last summer, and this spring was the recipient of an A&S Extraordinary Merit in Research award.

I am happy to welcome Kui Chen who joined our department last fall as an APL to both coordinate undergraduate teaching laboratories in the physical and analytical divisions as well as instruct some of our lower level chemistry classes. In addition, Laura Oliveira recently accepted our assistant professor position in the inorganic division and will be joining us this coming fall. I would also like to welcome Casie Phillips who joined our office staff last year to help us better coordinate our business operations. Over the past year, the department was also able to acquire several new pieces of instrumentation for our undergraduate teaching laboratories using program fee funds. These include an FTIR and a fluorescence spectrometer, a bomb calorimeter and an HPLC system.

I also experienced firsthand some of the major challenges that our department is currently dealing with. Chemistry has lost 10 colleagues in just the last five years to retirements, resignations and reappointment denials and is currently down to 11 faculty and 4.25 APLs. This has forced us to cancel our advanced general chemistry curriculum (CHEM 1050 and 1060 that served majors and engineering) due to faculty shortage. While the department has been currently covering several of its course offerings with overload teaching as well as having its senior graduate students serve as course instructors, this approach is not sustainable and is significantly compromising the quality of instruction. In addition, the department continues to struggle with the maintenance and billing of several of its major research instrumentation including a MALDI-MS, an XPS and possibly a TEM system due to lack of personnel support. While these instruments remain key to ongoing research activities in the department and across campus, a lack of proper oversight renders their continued operation difficult and uncertain.

On a somber note, Lew Noe passed away on October 30th last year in Laramie. Lew was a faculty in the physical division and also the Chemistry head during his tenure in the department. We deeply appreciate his contributions and leadership and our thoughts and prayers remain with the loved ones he leaves behind. This spring also saw the worldwide outbreak of the coronavirus disease which likely will adversely impact the physical and financial health of our community in the coming months. Nevertheless, the Chemistry faculty has already done a commendable job adapting to online teaching and continues to develop innovative approaches to high quality instruction.

And finally, a big *Thank You* to all our alumni and friends for their generous donations over the years. These funds continue our support our mission of teaching, research and service in impactful ways. Your gifts go toward awards, student travel to meetings and helping students with financial needs among supporting us meet other goals. So please continue to help us out with your generous gifts at <http://www.uwyo.edu/chemistry/giving.html>. Also, please continue to send us your stories and accomplishments by email or otherwise to help celebrate them with our community.

Best Regards, Debashis



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UW

College of Arts and Sciences
Department
of Chemistry

BASILE GROUP RESEARCH

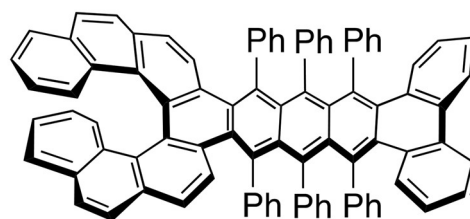
It has been a while (since 2016) since I reported news from our research group, so I guess one is overdue! Our research group has changed a bit in terms of research projects, instrumentation and people during these last 4 years. During these last years, we successfully secured funding from the National Science Foundation (NSF) for 5 different projects including imaging-Mass Spectrometry, Lipidomics and Metabolomics of bacteria and bees (2 different projects), and an ambitious, multi-lab project to map the microbiome of the state of Wyoming (metaproteomics and meta-metabolomics of ecosystems). Another collaboration, funded by NIH, aims at detecting modified proteins in bacteria. The group highlight during this period has been the acquisition of a state-of-the-art high accuracy/high resolution Fourier Transform Orbitrap Mass Spectrometer (a.k.a., the Orbi), which was made possible through funding from NSF-EPSCoR. We are blown away on a daily basis by the ability of the Orbi to collect high resolution MS data, after years of working with low-resolution quadrupole-based MS systems. This instrument has enabled our lab to analyze highly complex mixtures of metabolites, lipids and proteins (peptides) and answer fundamental questions in chemical biology, biochemistry and microbial ecology. We are also acquiring a new GC-High Resolution (Time-of-Flight) Mass Spectrometer in the Spring 2020 as part of our bee metabolomics/lipidomics research. So yes, we are very busy keeping our new instruments going, while at the same time juggling all the research projects and collaborations. Current group members include graduate students Andrew Goodenough (imaging MS; ambient MS), Brandon Saiz (Metaproteomics), Shelby Wakefield (microbial metabolomics/chemical biology), Banani Mondal (bee metabolomics/lipidomics-I), Kalpana Subedi (protein lipidation), and Hunter Taylor (bee metabolomics/lipidomics-II). Dr. Mitch Helling, who graduated from my group in 2019 (Ph.D.) has remained in the group as a Post-doctoral fellow doing complex measurements of meta-metabolomics of ecosystems and helping me keep the lab running efficiently!



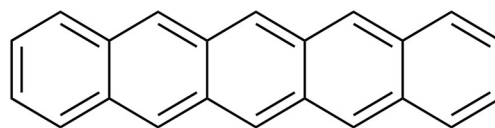
The Basile research group in 2018 excited with their new Orbi mass spectrometer!

CLENNAN GROUP RESEARCH

The Clennan group members during Spring semester 2020 include a postdoctoral associate, Shambhavi Tannir, and three undergraduates, Madison McConnell, Elana TerAvest, and Ryan Miller. We are working on an NSF project to study Heliacenes which are twisted polyaromatic hydrocarbon surrogates of the well-established pentacene semiconductor.



Heliacene

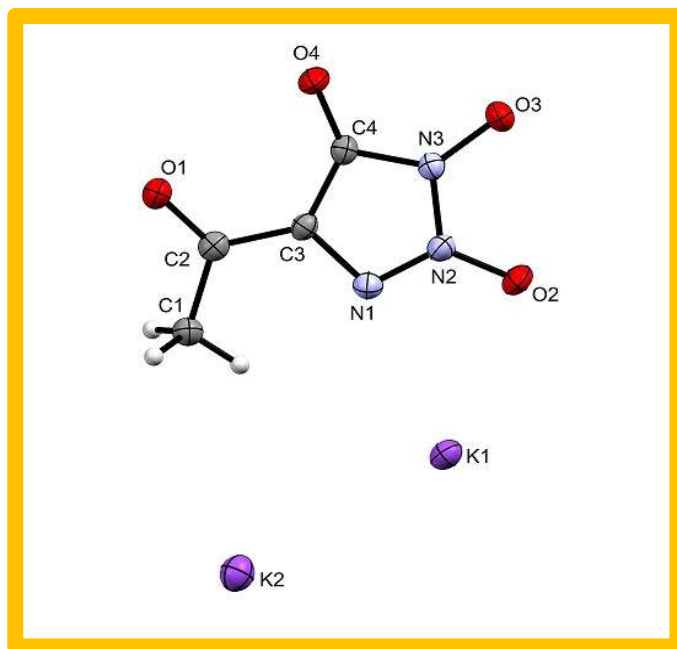


Pentacene

The group published two papers last year and Ed attended the Photochemistry Gordon Research Conference in July and organized a Physical Organic Symposium at the El Paso regional ACS meeting. Ed is also the editor of the Journal of Sulfur Chemistry.

ARULSAMY RESEARCH

Research Scientist Navamoney Arulsamy and his team of undergraduate students worked on a project dealing with the reactions of nitric oxide with β -keto hydroxamates. They isolated a new type of heterocyclic salts, namely, potassium 5-acyltriazoliumtriolate. Continuing on the original finding by Elayna Mahone, a former undergraduate student in our lab, Jacob Paulson and Tucker Skoric optimized reaction conditions for better yields. Currently, Abigail Blesi is working on deducing the exact reaction pathway of the synthetic reactions and also studying the NO donor properties of the new products. Abigail is an INBRE Undergraduate and we are also thankful to the Wyoming NASA Space Grant Consortium for supporting our research. Arulsamy visited the Medical College of Wisconsin, Milwaukee, WI, and worked in the EPR laboratory of Dr. Bill Antholine gaining valuable experience in the operation of various EPR spectrometers. Arulsamy also taught the Advanced Inorganic Chemistry Laboratory course (CHEM 4100) in the fall semester. This laboratory course introduces synthetic and characterization techniques to undergraduate students. Last year, he offered a new experiment concerned with the synthesis and spectroscopy of two inorganic complexes that are used as electroluminescent materials in digital devices such as the *iPhones*. The students were stunned to observe that the colorless complexes emit bright green and red colors under UV light or when electricity is passed through them. Arulsamy managed the Bruker APEX2 X-ray diffractometer and Bruker EMX EPR Spectrometer. Both of them are working well, although they suffered major failures primarily due to wear of critical components. The Mettler Toledo TGA/DSC 1 located in PS 240 is now working and used in undergraduate laboratory teaching. The X-ray and EPR lab remains an indispensable resource to chemistry researchers on campus. Arulsamy presented a chemistry demonstration to illustrate the *1937 Hindenburg Airship disaster* to the fifth grade students of Slade Elementary in Laramie.



ZHOU GROUP RESEARCH

Zhou's group continues the research effort on the growth of rare earth-based oxides and supported metal particles as catalytic materials for their applications in energy production. The group currently has three graduate students in Chemistry (Linze Du, Daniel Braedt, and Jintao Miao). We would like to congratulate Elfrida Ginting who successfully defended her PhD thesis last fall. Daniel and Jintao both recently passed the Preliminary Exam for the PhD study. The group was delighted to have Chloe Tolbert and Bailey Kane (undergraduate students in Chemistry) for research in fall 2019 and we welcomed two new undergraduate student members (Aaron Erickson and Qinlan Lang) this spring. In the past year, the group presented research results in peer-reviewed journal articles as well as national/regional conferences. Of particular note, Linze was awarded the 1st place winner in the poster presentation at the 2019 Rocky Mountain American Vacuum Society Meeting. Daniel was the recipient of the travel award to the 17th International Congress on Catalysis that will be held this June in San Diego, CA. The group is thankful for the financial support from the Wyoming Carbon Engineering Initiatives."

UPDATES FROM L.A.M.P.

Chemistry faculty member Ginka Kubelka and Department Head Debashis Dutta were accepted as Fellows in the yearlong Learning Actively Mentoring Program (LAMP) educational development program. Dutta and Kubelka began their LAMP training with an immersive, weeklong Summer Institute in Sheridan, Wyoming. They gained skills in numerous active learning modalities including team-based learning. Throughout the month of July, Dr. Kubelka planned a detailed instructional strategy for implementation of novel active learning strategies, such as think-pair-draw that align with her student learning outcomes for Organic Chemistry. Moreover, Ginka developed her own knowledge survey assessment. This will allow Ginka to understand her students' self-assessment skills and to gain meaningful data about student learning and metacognitive growth over the course of the semester.



Dr. Kubelka and Dr. Dutta (far left) engage in discussion at a recent LAMP workshop.

Chemistry undergraduate student Tyler Myers and graduate student Veronica Spaulding have traveled throughout the state of Wyoming over this prior year in order to facilitate hands-on science learning for K-12 students.

In the picture below, Tyler Myers assists a group of students in determining the age of different, planetary surfaces.



Veronica Spaulding worked with a team of 7th grade students to assist them in real problem solving regarding an old landfill that is leaching toxic chemicals.



GORONCY RESEARCH

As manager of the nuclear magnetic resonance (NMR) facility, I am happy to report that the facility continues to enjoy popularity with faculty, researchers and students from many different departments of the University of Wyoming and other academic institutions, community colleges (such as Northwest College, Powell, WY), as well as industry. Besides maintaining the instruments, training and teaching, I have been involved in many interdisciplinary research projects. For example, the magnetic resonance imaging (MRI) equipment of this facility is being used to look at rocks and oil flow, in a collaboration with Stanford University, SLAC National Accelerator Lab, University of Illinois, University of Southern California, and the University of Wyoming (Center for Mechanistic Control of Water-Hydrocarbon-Rock interactions in Unconventional and Tight Oil Formations (DE-SC0019165, funded by the DOE)). Furthermore, I am fortunate to be co-PI of a \$50k project (EPSCoR Wyoming Microbial Ecology Collaborative RFP, NSF award EPS-1655726), that looks into the role of microbial and plant-derived carbon compounds in the formation of stable soil organic matter, with PI Mengqiang Zhu (Ecosystem Science and Management), and Co-PIs Franco Basile (Chemistry) and Linda van Diepen (Ecosystem Science and Management). Some of my other activities have been published in 5 co-authored papers, that are about the NMR structure determination of a non-labelled protein (Magnetochemistry 6, 16, 2020, doi:10.3390/magnetochemistry6010016), hydrogel networks (Biofabrication (accepted), 2020, doi.org/10.1088/1758-5090/ab7ef4), conversions of coal into fuels (Applied Energy 264, 114739, 2020, doi.org/10.1016/j.apenergy.2020.114739), and carbon nanofibers (Fuel 272, 117712, 2020, doi.org/10.1016/j.fuel.2020.117712; Journal of Cleaner Production 236, 117261, 2019, doi.org/10.1016/j.jclepro.2019.117621).

DEAN RODDICK & PATRICIA GOODSON

Patricia and I retired in May 2019 and moved to our retirement home in Pacific Grove, California last September. Now we get to pay California state income tax! **Phil Miller** defended his thesis last December, and **Tanner Remick** is working toward his defense with Elliott Hulley. A significant full paper detailing our work on ethylene dimerization catalysis was submitted to *Polyhedron* last December in honor of my Ph.D. advisor, **John E. Bercaw's** 75th birthday, which contained work by my former students **Suman Debnath, Sayanti Basu, Jeramie Adams**, and former undergraduate researcher **Brad Schmidt**. I have several more papers to work on in the upcoming years. Last November I co-Chaired the Regional ACS Meeting in El Paso Texas and got to visit that border city. Our retirement travel plans have been put on hold due to the corona virus lock-down, but Patricia and I are signing up for an extension class in French for a trip want to take next spring to France in celebration of Patricia's 60th birthday.

UPDATES FROM CARLA BECKETT

The past year has been busy as I have taught two courses each semester in addition to supervising the general chemistry teaching labs and teaching assistants. The ENZI STEM building is as wonderful as ever and such an amazing building to work in. I was able to put together a permanent lab manual for the CHEM 1000 course as well as a TA binder to go with it. That course should be much more streamlined now like the CHEM 1020 and 1030 courses. The corona virus shutdown of on campus teaching has allowed me to expand my technology skills. I have learned a lot in the past two weeks and will continue to learn as the semester continues I am sure. The teaching assistants and other faculty members have been wonderful to work with during this transition, and the students are also easy to work with.

LEONARD GROUP RESEARCH

The Leonard research group has had a lot of exciting changes over the last year. The group welcomed Joseph McBride as our newest graduate student. He joins current graduate students Daniel Harris and Andrew Smith and undergraduates Sarah Rich, Rene Mendez, Scott Lewis, and Hilarie Arellano. The group is still working on metal carbide materials, but we have also branched out into novel two dimensional layered compounds including a collaboration with Jifa Tian in physics on WS_2 and a recently funded project working on metal oxyhalide compounds with collaborations in chemistry, engineering, and physics.

Former group member Yagya Regmi recently took a position at Manchester Metropolitan University in their Fuel Cell Innovation Centre as a research Fellow. His wife Laurie also took a position at the same University allowing them to finally work together and start their academic careers.

The group was quite active last year going to several conferences. Dr. Leonard attended the national ACS meeting in Orlando, FL and presented a seminar about new phases of carbides discovered in our lab by James Thode. Dan, Andrew, and Dr. Leonard all went to Golden CO for a North American Solid State Conference which is the Gordon Research Conference equivalent for odd years. They presented two posters based on their research and made several connections with other members of the solid state community. Sarah and Brian also went to NORM in Portland Oregon where Sarah presented a poster on her quantum dot research and Brian gave a talk about carbide catalysts. Dr. Leonard also attended the joint RMRM-SWRM ACS regional meeting in El Paso in November.

Dr. Leonard attempted to take a sabbatical during the spring of 2020 in Aachen Germany working with Richard Dronskowski at RWTH. Unfortunately, after only three months, he was forced to return to Wyoming due to the Corona virus. Aside from his duties at UW, he also continues to serve as an Advisory Board Member for the journal Materials Research Express. He currently serves as the Councilor of the WY section of the ACS and was a co-Program chair of a regional joint ACS meeting in El Paso last year.

Below is a photo of Dr. Leonard working hard at the Orlando ACS conference.



We would like to hear from you!
If you would like to share your news in the next newsletter,
please email us at: chemistry@uwyo.edu. Thanks!

COVID-19 RESPONSE

The Chemistry department's faculty, staff, and students have been working hard to respond to the COVID-19 pandemic and adapt to online instruction for courses and labs.

John Hoberg, Associate Professor:

Dr. John Hoberg's online teaching has not only been innovative but has been student-centered. He has utilized the Big Blue Button software (the Conferences feature in WyoCourses) to enable students to collaborate and engage in interactive problem solving. Students join John in this space for class sessions but they also generate conferences on their own so that they can engage in small-group problem solving. This has enabled students to take co-ownership of the space and to feel autonomy in their learning.

Further, John uses practices Universal Design for Learning in his exam administration. He gives students 4 different options for engaging with the exam questions and submitting their responses. He enables them to generate their answers in the way that feels most comfortable to them (including video).

STUDENT AWARDS

Mr. Tyler Myers (B.S. Chemistry, 2020) and Ms. Nicole Collins (B.S. Chemistry, Zoology, 2020) have been named to the College of Arts & Sciences Outstanding Graduates list

(<https://www.uwyo.edu/as/outstanding-graduates/>) in recognition of their outstanding academic achievements at the University of Wyoming. Additionally, both students have also received a scholarship from the Hunton Endowment Fund. The scholarship is awarded to students who have demonstrated "great promise for the advancement and betterment of our society." Both Mr. Myers and Ms. Collins have participated in undergraduate research in Prof. Michael Taylor's lab, where they have worked on the development of new methods for selective chemical modification of proteins. Both are headed to graduate school for the fall of 2020: Mr. Myers will pursue a Ph.D. in Chemistry at Yale whilst Ms. Collins will pursue a Ph.D. in Chemical Biology at the University of Michigan. Congratulations to both, and best wishes for your future endeavors!

NEW CHEMISTRY GRADUATE STUDENTS

This year the Chemistry department welcomed three new graduate students!



Joseph McBride
Inorganic Chemistry



Mamon Sarkar
Organic Chemistry



Hunter Taylor
Bioanalytical Chemistry

NEW FACULTY & STAFF

DR. KUI CHEN



Dr. Kui Chen obtained his B. Sc. degree in Chemistry from Xiamen University in China. He then went on to earn his Ph. D. degree in analytical chemistry from the University of South Carolina in 2004. He came to the University of Wyoming with extensive teaching experience in general chemistry and analytical chemistry. In his current role at UW, Dr. Chen is in charge of running the analytical chemistry and physical chemistry laboratories. He also contributes to teaching the general chemistry courses at UW. His primary research interest is in the area of nanobiophotonics, integrating advances in nanofabrication with different optical spectroscopic modalities for bioanalytical and biomedical applications. During his free time, he likes to go jogging and biking. He hopes to complete a triathlon one day. Dr. Chen comes from a city in southeast China with a population of over 7 million and warm climate. But over the years, he has adapted to cold winters, driving in the snow and living in small town, USA.

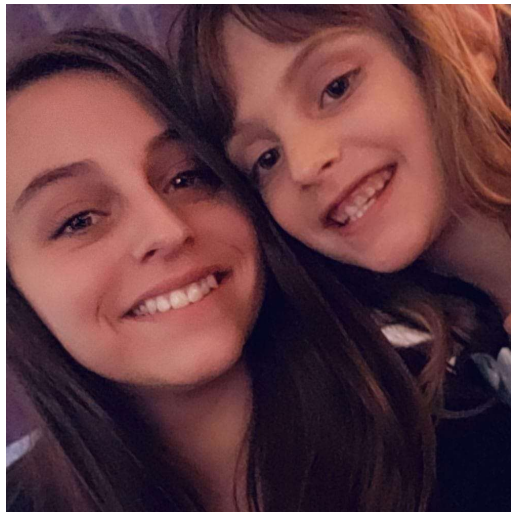
DR. LAURA DE SOUSA DE OLIVEIRA



I am excited to be joining the Department of at the University of Wyoming this year. I am a computational scientist interested in using computational strategies towards an atomistic understanding of nano- and bulk-scale phenomena. At UW, I will continue to investigate fundamental chemical and physical processes to advance scientific knowledge, and develop a computational laboratory focused on the computer-aided design of (smart) inorganic materials. Some of the lab's focus areas will include multi-scale heat transport in nanostructured materials; chemical, thermal and electronic properties of porous organic materials; and understanding how shape-shifting molecules (think molecular machines!) are affected by their environment. In 2017, I obtained a Ph.D. from the University of California, Riverside, advised by Prof. Alex Greaney. During my Ph.D. I worked on multiple projects, including several on thermal transport and a project on high-throughput molecular design, using a combination of classical molecular dynamics and first principles approaches. In 2017 I started a postdoc at the University of Warwick, in the UK, under Prof. Neophytos Neophytou, to study heat transport in nanostructured materials for energy generation applications.

NEW STAFF

CASIE PHILLIPS



My name is Casie Phillips and I am from Lander, Wyoming. I moved to Laramie, Wyoming a year ago in July to pursue my Bachelor's Degree in Accounting. I have been with the University of Wyoming for a little over a year now. I started with the Residence Life & Dining Services Department as their Accounts Payable. Before moving to the Physics, Astronomy, and Chemistry department, I was their HR/Payroll Liaison. Lastly, I have a beautiful five year old daughter who is in kindergarten at the UW Lab School.

UPDATES FROM GINKA KUBELKA

Over the last year I have been busy teaching Organic Chemistry II in the fall and Intro to Organic Chemistry in the spring. I've also been coordinating all Organic Chemistry Laboratories. As part of the year-long learning program as a LAMdebP fellow I have implemented active learning techniques in both my courses. The students enjoyed the active learning and felt like their learning improved. In order to make the lab experiments more joyful, I introduced a colorful experiment to the curriculum. Moving everything online has been a challenge this spring, but every challenge provides learning opportunities! I have created videos of the lab experiments which will be a great additional resource for the future as well.

ANDERSON GROUP RESEARCH

The Anderson research group continues its studies of the chemistry that occurs at liquid helium temperatures ($-452\text{ }^{\circ}\text{F}$) in crystals of molecular hydrogen doped with hydrogen atoms (reactive species) and other molecules. These studies explore the limits of chemistry at extremely low temperatures. Kelly Olenyik successfully defended her MS thesis in August of 2019 and has returned to her career in analytical chemistry in Casper, Wyoming. Kelly played a key role in finally wrapping up a project that Fred Mutunga (PhD, 2016) started back in 2014 on H-atom reactions with N_2O . Graduate student Aaron I. Strom is now in his second year and undergraduates Kaycee Fillmore, Sydney Hill, Joe Kinder, and Remy Policicchio have all performed undergraduate research in the group over the last year. Aaron and Dr. Anderson both gave talks at the International Symposium on Molecular Spectroscopy at the University of Illinois in June of 2019 and continue on with research into nuclear spin conversion. The group published two papers in 2019 and currently have two papers submitted or under review. Group alumnae Morgan Balabanoff (PhD, 2018) continues in her postdoctoral position with Dr. Alena Moon at the University of Nebraska, Lincoln working on developing an assessment targeting core concepts in general chemistry. Leif Paulson (PhD, 2011) works at the Department of Environmental Quality in Cheyenne and recently had to brush up on Mulliken term symbols for a paper we published that he worked on a long time ago with undergraduate REU students. Leif said it would make emeritus Prof. Harris proud. Cassie Kettwich (PhD, 2010) moved to Germany with her family for a year due to her husband's career in the military. Cassie has three kids (2 girls and 1 boy) and is currently home schooling her children on the unique properties of solid hydrogen. Finally, Paul Raston (PhD, 2007) is now a respected faculty member in the chemistry department at James Madison University in Virginia where he has built a helium droplet machine. Professor Raston was awarded a Cottrell Scholar Award in 2018 and has certainly matured a lot from his days in Laramie.