Directors' Message To The Center

To members and friends of CDT, welcome to the seventh edition of CDT Monthly. This newsletter was developed to highlight the achievements of CDT fellows and faculty members, promote further interactions, and help members stay in touch.

In this issue, you will find:
- Kudos to our current fellows, students and faculty members
- CDT Spotlight article on the Yin Lab
- Dates for Spring 2022 CDT Seminar Series

We hope you enjoy reading this newsletter and learning more about the accomplishments and goals of CDT, our faculty, staff and students.

- Jenny Yang and Binghe Wang

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Year's end is neither an end
nor a beginning but a going on,
with all the wisdom that experience can instill in us.
~ Hal Borland

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Zhou Successfully Defends Dissertation

Congratulations to former CDT Fellow, Li Zhou (2015-2019), on successfully defending his PhD Dissertation titled, "Identifying Protein Substrates of E3 Ubiquitin Ligase By Orthogonal Ubiquitin Transfer (OUT)”, on November 29.

Drs. Jun Yin (Chair), Binghe Wang and Angela Mabb were members of his Dissertation Committee.

Li is currently working as a Graduate Research Assistant under the direction of Dr. Jun Yin in GSU’s Department of Chemistry.

Congratulations, Dr. Zhou!

Current CDT Fellows

As we come to the close of another school year, CDT wishes to acknowledge all current Fellows and their advisors:

Andrew Browne
Advisor: Dr. Suri Iyer

Emmanuel Buabeng
Advisor: Dr. Maged Henary

Amany Elsharkawy
Advisor: Dr. Yuan Liu

Thomas Evinger
Advisor: Dr. Jenny Yang

Jieqiong Fang
Advisor: Dr. Suri Iyer

Zachary Fultz
Advisor: Dr. Binghe Wang

Zongxiang Gui
Advisor: Dr. Jenny Yang

Mohammad Sazid Hassan
Advisor: Dr. Jun Yin

Jacques Kumutima
Advisor: Dr. Donald Hamelberg

Falguni Mishra
Advisor: Dr. Zhi-Ren Liu

Corbett Ouellette
Advisor: Dr. Yuan Liu

Success at SERMACS 2021

Dr. Maged Henary, CDT Core Faculty Member and GSU Associate Professor of Chemistry, hosted a symposium on November 13 as part of the three-day 2021 Southeastern Regional Meeting of the American Chemical Society (SERMACS) in Birmingham, Alabama.

The one-day symposium, titled "Synthesis of Fluorescent Probes and Their Applications from Sensing to Imaging”, was very well received and focused on the recent progress in fluorescence probes development in the UV, Visible and NIR windows and their wide applications for various fields such as bioanalytical, biological, optical imaging, and diagnostic and therapeutic applications.

Invited speakers included Drs. Christoph Fahrni (Georgia Institute of Technology), Jennifer Heemstra (Emory University), Salah Massoud (University of Louisiana at Lafayette), Y. George Zheng (University of Georgia), Shanlin Pan (University of Alabama), Clifton Stephenson (Loyola University), Marco Bonizzoni (University of Alabama), Kenneth Hanson (Florida State University), Gabor Patonay (Georgia State University), Jefferson Chan (University of Illinois, Urbana-Champaign), Pamela Lundin (High Point University), Keir Fogarty (High Point University), and Sajith Vijayan (University of Mississippi).

New National Academy of Inventors Fellow

Dr. Binghe Wang, Director of the Center for Diagnostics and Therapeutics and GSU Regents’ Professor of Chemistry, has been selected as a National Academy of Inventors (NAI) Fellow. The NAI Fellows Program was established to celebrate academic inventors who have demonstrated a prolific spirit of innovation in creating or facilitating outstanding inventions that have impacted the quality of life, economic development and the welfare of society.

Congratulations, Dr. Wang!
CDT Spotlight: The Yin Lab  
"OUT is IN"

Dr. Jun Yin, CDT Core Faculty Member and GSU Professor in the Department of Chemistry, is a leading forerunner in the area of ubiquitin (UB) research. He and his team of PhD students, who comprise The Yin Lab, are currently seeking to understand the cell signaling mechanism carried out by ubiquitin (UB) as a fundamental mechanism for a cell to cope with oxidative damage.

UB is a small protein that is connected to other proteins in a cell to regulate cellular processes. Mitochondria are “powerhouses” in a cell for energy production, but at the same time, they are “heavy polluters” that release reactive oxygen species (ROS) to their local environments and inflict damage to the cell. As humans age, our cells are less capable in managing ROS produced by mitochondria, and the accumulated damage could result in brain damage and heart failure at the end of the human life span. For self-protection, cells initiate a process called mitophagy with enzymes such as E3 UB ligases flagging the damaged mitochondria with UB so they can be isolated and removed before they release a substantial amount of damaging ROS in the cell.

The Yin Lab, which includes Tomaya Carpenter, Xuan Fu, Christopher Gibbons, Mohammad Sazid Hassan, Savannah Jacobs, Geon Jeong, In Ho Jeong, Ruochuan Liu, Sydney Nelson, Britton Ody and Li Zhou, is working on a project to assemble an integrated technology platform with a combined use of protein engineering, reactivity-based chemical probe design, and protein analysis methods to explain the mechanisms of mitophagy regulation that result from protein modification by UB. Their work will indicate the cellular steps underpinning ROS response and reveal how the breakdown of such processes may contribute to human aging. This project also includes an integrated outreach program which will provide substantial research training opportunities to K-12 students from local communities in Atlanta. The highly diverse student body in the urban areas of the city will benefit from early exposure to the development of science and technology and the rewarding career opportunities in chemically-driven biological research.

Protein modification by UB plays an essential role in sensing damaged mitochondria and signaling their removal by mitophagy. Various E3 UB ligases have been found to be recruited to damaged mitochondria and decorate them with UB chains to induce mitophagy. Currently, the ubiquitination targets of the E3s are not well characterized, so the E3 regulated mitophagy pathways are undefined. Furthermore, E3s can assemble a network of UB chains of diverse linkages around damaged mitochondria, but little is known about how the UB chains are trimmed and edited by deubiquitinating enzymes (DUBs) to counteract the UB chain extension reaction catalyzed by the E3s.

Under Dr. Yin’s leadership, the Yin Lab plans to fill these knowledge gaps by profiling the substrates of various E3s at the initiation phase of mitophagy with an innovative proteomic platform known as orthogonal UB transfer (OUT). OUT will enable the identification of the direct substrates of the E3s to map the associated cell signaling pathways regulating mitophagy. By comparing the substrate profiles of various E3s, the Lab will differentiate the roles of E3s in mitophagy regulation.

In addition, the Lab has developed an innovative method to synthesize linkage-specific UB chains and UB substrate conjugates based on unnatural amino acid (UAA) incorporation and plans to use the UB conjugates as probes to capture DUBs that regulate mitophagy. By accomplishing the research plan, the Lab team expects to map the protein ubiquitination pathways regulating mitophagy and identify DUBs interacting with the E3s in editing diverse linkages of UB chains for proper encoding of the mitophagy signals.

In June 2021, Dr. Yin was awarded a three-year NSF grant to continue the study of elucidating cell signaling by orthogonal ubiquitin transfer. The significance of the work of the Yin Lab is to develop powerful technologies to map cell signaling pathways mediated by UB transfer, elucidate the actions of E3s and DUBs in mitophagy signaling, and decipher the cellular mechanisms underlying mitochondria quality control to neutralize damage by ROS. CDT wishes Dr. Yin and the Yin Lab continued success!
CDT Thanks You

CDT wishes to thank Dr. Wei Wang, R. Ken and Donna Coit Professor and Co-Director of the Arizona Center for Drug Discovery at the University of Arizona, and everyone who attended his online seminar titled, "Exploration of Chemical Tools to Study Chemistry and Biology" on November 9.

Thanks also goes to Dr. Youssef Zaim Wadghiri, Associate Professor in the Department of Radiology at NYU Grossman School of Medicine; and Director of the Preclinical Imaging Core at NYU Langone Health, and everyone who attended his seminar on November 30.

Dr. Wadghiri’s presentation, "At the Crossroads of Imaging Modalities to Study Experimental Models of Human Diseases", was held online and in-person in PSC 124.

Video links of both seminars are now available on the CDT website: cdt.gsu.edu

Spring 2022 CDT Seminar Series

It’s that time again! The dates shown below are now available for the Spring 2022 CDT Seminar Series:

January 12, 26
February 23
March 23
April 13, 20
June 8

For the Spring semester, CDT Seminars will be held on Wednesdays from 4:00-5:00pm.

Both in-person and online seminars will continue to be offered, based on the speaker’s preference. All in-person seminars will be held in PSC 124.

If you would like to host or participate as a guest speaker, please email cdt@gsu.edu.