About the Ziegler Awards

The Waldemar T. Ziegler Awards were established by the family and friends of the late Waldemar T. Ziegler to honor his lifelong commitment to academic excellence and research.

Ziegler was on the faculty of the School of Chemical Engineering from 1946 until his retirement in 1978, when he was named Regents' Professor emeritus. He died in 1996, leaving behind a legacy of outstanding research in the fields of cryogenics and thermodynamics. Ziegler was instrumental in establishing both the School's and Georgia Tech's reputations for outstanding research.

Two individual Ziegler Awards are presented annually to graduate students. The Ziegler Award for Best Paper began in 1998, and the Ziegler Award for Best Proposal began in 2005.

Georgia Tech College of Engineering
School of Chemical and Biomolecular Engineering

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2023 Ziegler Awards

August 30, 2023
Georgia Tech's School of Chemical and Biomolecular Engineering

Ziegler Award for Best Paper

Rajas Poorna (Advisors: Drs. Saad Bhamla and Marcus Cicerone)

"Toward Gene-Correlated Spatially Resolved Metabolomics with Fingerprint Coherent Raman Imaging" (*Journal of Physical Chemistry B*)

Raman spectroscopy (RS) can noninvasively characterize the molecular vibrations in a sample, such as a cell, by probing it optically. RS has long been known to provide sufficient information to discriminate distinct cell phenotypes. Omics approaches can distinguish subtler differences in cell states than RS alone, but can be expensive, time-consuming, and destructive.

Here, we demonstrate a proof-of-concept method to significantly increase the obtainable cell-state resolution (over RS alone) using Raman imaging and dimensionality reduction. We have identified the *C. elegans* hermaphrodite gonad as an ideal model system for this study since it is highly regulated (which minimizes inter-individual variation), and since egg maturation can be observed spatiotemporally in this system. Broadband coherent anti-Stokes Raman scattering (BCARS) microscopy enables us to obtain a Raman image of the gonad of a live, anaesthetized worm at sub-cellular resolution in under 30 minutes. We demonstrate that BCARS spatio-spectral signatures show cell-state discrimination capacity comparable to or better than transcriptomics in this system, evincing that BCARS has potential as a fast, non-invasive omics surrogate.

***Bio**: Rajas Poorna is a third-year PhD student in Bioengineering (Chemical Engineering) with a BS/MS in physics. His work generally focuses on developing very low-cost medical devices by exploiting alternative physical mechanisms. His thesis work is on developing a <$100 biofluid Raman spectrometer to help bring universal medical diagnostics to the point of care.*

Ziegler Award for Best PhD Proposal

Victor Brandão (Advisor: Dr. Carsten Sievers)

"Microenvironment Engineering for the CO_2 Reduction Reaction Over Copper Electrocatalysts"

The energy sector is responsible for approximately 75% of greenhouse gas emissions worldwide. Within this sector, the chemical industry alone is the second-largest contributor to these emissions. In response to growing concerns over increasing carbon footprint and global temperatures, there has been a growing interest in decarbonizing the chemical industry to meet net zero emissions goals by 2050. Recently, the electrochemical conversion of CO_2 has attracted significant interest as a pathway to lower carbon emissions and generate multi-carbon feedstocks for the chemical industry. However, challenges with the selectivity of this reaction remain due to lack of mechanistic understanding bridging reaction microenvironment control to product distribution.

The primary aim of this talk is to investigate the influence of different reaction parameters on the CO_2 reduction reaction mechanism in order to enhance multi-carbon product selectivity. The effect of temperature on the reaction will be discussed as a key step to better design electrolyzers that operate under typical heat transfer limitations. I will show how a temperature-induced reaction pathway can impact product formation based on surface species dynamics as tracked by in-situ spectroscopic techniques. Future directions on the use of modulated potential regimes and ultrasound irradiation will be explored as possible avenues to tune the reaction microenvironment and maximize multi-carbon product selectivity in the operation of CO2RR electrolyzers.

Bio: Victor Brandão is a third-year Ph.D. candidate in the Sievers lab. His research focuses on investigating the mechanism of the electrochemical conversion of CO_2 to value-added multi-carbon products. Victor was born and raised in Rio, Brazil, where he earned his BS in Chemical Engineering from the Military Institute of Engineering, working on kinetic models for biomass combustion in autothermal reactors. Victor is an IHE-LeaD fellow and has been recognized in ChBE for his Exemplary Academic Achievement (2022), Outstanding Performance on the Qualifying Exam (2022), and as Outstanding Graduate Teaching Assistant (2023).