Kelly Lindsey Vernon

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PROFESSIONAL SUMMARY

Electroanalytical chemist specializing in methodology development for single-entity electrochemistry of nanoscale electrocatalysts, using scanning electrochemical cell microscopy (SECCM) correlated with SEM, SEM-EDX, and TEM structural characterization. As a member of the NSF Center for Single-Entity Nanochemistry and Nanocrystal Design (CSENND), collaborate directly with research groups at Indiana University, Purdue University, and Temple University across all three active research projects. Experienced in cleanroom nanofabrication, multi-institutional project coordination, and multi-instrument analytical laboratory management. Contributed to 5 peer-reviewed publications, including 1 first-author paper, and 1 conference presentation.

EDUCATION

Ph.D. Candidate Chemistry, Texas A&M University, College Station, TX — Aug. 2022 – Present
Advisor: Professor Lane A. Baker
Prelim: *"Single-Entity Electrochemical Investigations of Nanoscale Electrocatalysts via Correlative Microscopy"*

B.S. Chemistry and Mathematics, Shorter University, Rome, GA — Aug. 2018 – May 2022
Minor in Physics
Capstone: *"Scilab Modeling of Discrete Dipole Approximation"*

PROFESSIONAL EXPERIENCE

***Graduate Research Assistant*, Department of Chemistry, Texas A&M University**
Advisor: Prof. Lane A. Baker — Aug. 2022 – Present

Member, NSF Center for Single-Entity Nanochemistry and Nanocrystal Design (CSENND) – collaborative, multi-institutional research spans all three projects below.

Research Project #1: *Optically Transparent Carbon Electrodes for Single-Entity Electrochemistry*

- Collaborated with **Willets group at Temple University** and **Ye and Skrabalak groups at Indiana University** (CSENND) to design and validate a correlative single-entity electrochemistry platform.
- Fabricated optically transparent carbon electrodes (**OTCEs**) via cleanroom **spin-coating** and **furnace pyrolysis** of transparent pyrolyzed photoresist film (T-PPF).
- Used **electrospray ionization** to deposit individual Au nanoparticles onto OTCEs; applied **SECCM** correlated with **SEM** to link electrochemical activity to individual particle structure.
- *Result:* OTCE performed better than commercial indium-doped tin oxide relative to Au by a −354 mV difference, had RMS roughness of 0.4 nm and 45-70% transparency in visible region – published first-author in *ACS Electrochem*. (2024).
- *Application:* Establishes OTCEs as a platform for simultaneous optical and electrochemical interrogation of single nanoparticle catalysts.

Research Project #2: *CO_2 Electroreduction Reaction (CO_2RR) on Cu Nanostructures*

- Collaborating with **Ye group at Indiana University** (CSENND), which supplies Cu tetrahedra (TD) and nanoparticle samples.

- Using **airspray deposition** to distribute Cu TD across support electrodes for isolated single-particle measurement.
- Applying **SECCM**, **SEM**, and **TEM** to compare single-particle CO_2RR activity against bulk analysis trends.
- *Application:* Identifies structure-activity relationships to guide design of more selective/efficient CO_2RR catalysts.

Research Project #3: *Hydrogen Evolution and Oxygen Reduction Reaction on Transition Metal-Intercalated MoS_2 Microsheets*

- Collaborating with **Li group at Purdue University** (CSENND); Li group synthesizes TM-intercalated MoS2 microsheets and performs **TEM/STEM**; I perform **SEM-EDX** compositional mapping and **SECCM** electrochemical measurements on the same samples.
- Developing a workflow pairing SEM-EDX elemental mapping with micron-scale, single-point SECCM to correlate TM intercalation/composition with HER/ORR activity.
- Exploring integration with Baker lab's SECCM-MS methodology to add chemical speciation *(technique combination under evaluation, not yet confirmed)*.
- *Application:* Guides design of TM-intercalated MoS_2 catalysts for more efficient/selective HER/ORR.

***Undergraduate Research,* Shorter University, Rome, GA**

Advisor: Dr. Daniel Clayton Sept. 2021 – May 2022

Research Project #1: *Scilab Modeling of Discrete Dipole Approximation (DDA)*

- Conducted independent senior capstone research under chemistry faculty advisor guidance, with the goal of modeling electromagnetic scattering by Au nanocubes.
- Self-taught **Scilab** programming with no prior coding experience; derived and coded the **DDA** mathematics to simulate electromagnetic scattering and absorption for particles of arbitrary geometry.
- *Result:* Implemented a working single-iteration DDA calculation for a **3x3 dipole lattice**, establishing the core computational framework; did not complete the iterative solver loop required for full nanoparticle simulation prior to graduation.
- *Application:* Intended to resolve localized electromagnetic field enhancement around Au nanoparticles to support interpretation of Raman signals in nanoparticle characterization; selected **Scilab** specifically to reproduce DDA modeling – previously reliant on costly commercial software – on a free, open-source platform, improving accessibility for future student researchers.

TECHNICAL SKILLS

Electrochemistry: SECCM, potentiostat operation (CH Instruments, PineNow)

Microscopy: SEM, SEM-EDX, TEM (correlative structural-electrochemical imaging), AFM, SICM

Fabrication: Cleanroom nanofabrication at *AggieFab* (spin-coating, furnace pyrolysis, mask aligner, photolithography, 4-point probe) (introductory: wet etching, LP-CVD, RIE)

Mass Spectrometry: ESI-MS (introductory through SECCM-MS), APCI-MS (teaching, analytical chemistry lab)

SELECTED PUBLICATIONS

1. **Vernon, K. L.**; Pungsrisai, T.; Wahab, O. J.; Alden, S. E.; Zhong, Y.; Choi, M. H.; Verma, E.; Bentley, A. K.; Bailey, K. O.; Skrabalak, S. E.; Ye, X.; Willets, K. A.; Baker, L. A. Optically Transparent Carbon Electrodes for Single Entity Electrochemistry. *ACS Electrochem*. **2024**. *1* (1), 93-102. DOI: https://doi.org/10.1021/acselectrochem.4c00048

2. Alden, S. E.; Wahab, O. J.; Zhang, L.; **Vernon, K. L.**; Zhu, B.; Bailey, K. O.; Ye, X.; Baker, L. A. Optically Transparent Carbon–Silicon Nitride Windows for Correlative Structural and Electrochemical Analysis of Nanomaterials. *Anal. Chem.* **2025**, *97* (22), 11798-11805. DOI: https://doi.org/10.1021/acs.analchem.5c01403
3. Leasor, C. W.; **Vernon, K. L.**; Wang, Y.; Baker, R. E.; Baker, L. A. 3-D printed accessories for nano/microelectrodes. *Anal. Methods.* **2025**, *17*, 5973-5981. DOI: 10.1039/D5AY00865D
4. Sridhar, S.; Nikolov, M. E.; Beutler, E. K.; Knobeloch, M.; Paranzino, B.; **Vernon, K. L.**; Zhong, Y.; Ye, X.; Baker, L. A.; Skrabalak, S. E.; Masiello, D. J.; Willets, K. A. Scattering vs Interference in Interferometric Scattering Spectroscopy of Plasmonic Nanoparticles. *J. Phys. Chem. Lett.* **2025**, *16* (18), 4410-4418. DOI: https://doi.org/10.1021/acs.jpclett.5c00261
5. Zhang, L.; Wahab, O. J.; Jallow, A. J.; O'Dell, Z. J.; Pungsrisai, T.; Sridhar, S.; **Vernon, K. L.**; Willets, K. A.; Baker, L. A. Recent Developments in Single-Entity Electrochemistry. *Anal. Chem.* **2024**. *96* (20), 8036-8055. DOI: https://doi.org/10.1021/acs.analchem.4c01406

SELECTED PRESENTATIONS (TOTAL 3 ORAL, 5 POSTERS)

Oral:

1. **Vernon, K. L.** "Beyond the Bachelor's Degree: What Graduate School is Like – and What I Do There." Shorter University Seminar, **CSENND-funded for recruitment**, Rome, GA, September 2026.
2. **Vernon, K. L.**; Pungsrisai, T.; Wahab, O. J.; Alden, S. E.; Zhong, Y.; Choi, M. H.; Verma, E.; Bentley, A. K.; Bailey, K. O.; Skrabalak, S. E.; Ye, X.; Willets, K. A.; Baker, L. A. "Optically Transparent Carbon Electrodes for Single-Entity Electrochemistry." Chemical Imaging GRC, Boston, MA, July 2025.
3. **Vernon, K.**; Pungsrisai, T.; Wahab, O.; Alden, S.; Choi, M. H.; Willets, K.; Baker, L. "Role of the Supporting Electrode in Single Entity Electrochemistry" SEAC Student Meeting at PITTCON 2024, San Diego, CA, February 2024

Posters:

1. **Vernon, K.**; Zhu, B.; Ye, X. Baker, L. PITTCON 2026, San Antonio, TX, March 2026.
2. **Vernon, K. L.**; Pungsrisai, T.; Wahab, O. J.; Alden, S. E.; Zhong, Y.; Choi, M. H.; Verma, E.; Bentley, A. K.; Bailey, K. O.; Skrabalak, S. E.; Ye, X.; Willets, K. A.; Baker, L. A. Chemical Imaging GRC, Boston, MA, July 2025.
3. **Vernon, K.**; Pungsrisai, T.; Wahab, O.; Alden, S.; Choi, M. H.; Willets, K.; Baker, L. PITTCON 2024, San Diego, CA, February 2024
4. **Vernon, K.**; Pungsrisai, T.; Verma, E.; Wahab, O.; Alden, S.; Choi, M.H.; Skrabalak, S.; Willets, K.; Baker, L.A. Center for Single-Entity Nanochemistry and Nanocrystal Design In-Person Meeting, Bloomington, IN, October 2023.
5. **Vernon, K.**; Pungsrisai, T.; Wahab, O.; Alden, S.; Choi, M.H.; Baker, L.A. Texas Electrochemistry Roundup, Austin, TX, August 2023

TEACHING EXPERIENCE

Spring 2023/2024	Teaching Assistant: CHEM 434 Analytical Instrumentation Lab
Fall 2022	Teaching Assistant: CHEM 119 Fundamentals of Chemistry I Lab

LEADERSHIP

2025 – 2026	CSENND Innovation Team Student Representative
2025	Chemical Imaging Gordon Research Seminar (GRS) Chair

2024 – 2026	Analytical Representative – TAMU Graduate Student Association of Chemistry
2024 – Present	Vice President of Internal Communication – Scientists at Local Schools
2023 – 2024	Secretary – TAMU Student Chapter of the Electrochemical Society

AWARDS & FELLOWSHIPS HONORS

- F.A. Cotton Endowed Memorial Graduate Travel Award, 2025.
- College of Arts and Sciences Doctoral Student Research, Travel, and Professional Development Award, 2024.
- National Science Foundation (NSF) Graduate Research Fellowship Program (GRFP) Honorable Mention, 2022.
- HOPE Scholarship, 2018-2022.
- Shorter University Dean's Scholarship, 2018-2022.

OUTREACH

Scientists at Local Schools (SALcS)
GSAC at Kids Klub
Chemistry Open House
L. J. Ringer Library Event

MENTORSHIP

Cesar Dominguez, *First Year Graduate Student* Oct. 2026 – Present