

# DANIEL PATRICK WOODS

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## EDUCATION

### Doctor of Philosophy in Biomedical Engineering

August 2023 – Expected May 2028

Vanderbilt University

GPA: **3.93**/4.00

### Master of Science in Biomedical Engineering

May 2023

University of Tennessee Knoxville

GPA: **3.90**/4.00

### Bachelor of Science in Honors Biomedical Engineering

May 2022

University of Tennessee Knoxville

GPA: **3.78**/4.00

Minor in American Sign Language

## RESEARCH INTERESTS

Development of flexible, transparent neurotechnology to record neural circuits during complex behavior across species.

Keywords: Neuroscience, biomedical engineering, brain-computer interfaces, electrophysiology

## RESEARCH EXPERIENCE

### Vanderbilt University – Department of Biomedical Engineering

Nashville, TN

Graduate Research Assistant – Gonzales Lab

May 2024–present

- Fabricate polymer-based transparent and flexible microelectrodes for acute recordings in mice and nonhuman primates
- Develop cleanroom protocol for layering, patterning, deposition, and etching of probe designs
- Create adaptable guide tube based acute implantation approach for penetration of flexible probes in nonhuman primates

### Vanderbilt University – Department of Biomedical Engineering

Nashville, TN

Graduate Research Assistant – Constantinidis Lab

August 2023–May 2024

- Conducting experiments on visual working memory tasks to record from various parts of the macaque cortex. Using electrophysiological recordings to analyze developmental changes of neuronal activity using MATLAB.
- Trained in primate housing, handling, and task training including the use of eye tracking software and retractable electrodes for recording

### University of Tennessee Knoxville – Psychology Department

Knoxville, TN

Research Assistant

August 2021–June 2023

- Conducted study characterizing the effect of cholinergic modulation of breathing within the prefrontal cortex of B6 mice in response to systemically administered fentanyl and microinjected neostigmine
- Analyzed whole-body plethysmography and EEG data to study the neurochemical effects of opioid use on the brain
- Developed and used MATLAB scripts for spectral analysis and variability to assess neurological and respiratory data and characterize impact of opioids and acetylcholinesterase inhibitors on mice
- Wrote and conducted protocol for microinjections of subjects, procedure for using whole-body plethysmography chambers, and analysis of data
- Presented findings at American Society for Pharmacology and Experimental Therapeutics Annual Meeting 2023

**University of Tennessee Space Institute – Center for Laser Applications***Research Intern***Tullahoma, TN**

June–August 2021

- Characterized diamond-like-carbon films for optimizing hydrophilicity and transparency for anti-fogging lens applications in laparoscopy
- Performed pulsed laser deposition for synthesis, and Raman spectroscopy, atomic force microscopy, contact angle/surface energy measurements, and spectrophotometry for characterization
- Presented findings to research center and associated faculty of the department, as well as at national and regional conferences

**University of Tennessee Knoxville – MABE Department***Undergraduate Research Assistant***Knoxville, TN**

November 2020–May 2021

- Assisted in research project developing a social robot caretaker for Alzheimer's patients
- Conducted literature review assessing the state of social robotics in elderly care published in International Conference on Social Robotics

**TEACHING EXPERIENCE****Vanderbilt University – Department of Biomedical Engineering****Nashville, TN***Graduate Teaching Assistant*

August 2023–May 2024

**Biomedical Engineering Lab II**

- Assist in weekly lab sessions by organizing equipment needed for the course, distribute class materials, and troubleshoot technical issues
- Grade weekly assignments and distribute comments on reports

**University of Tennessee Knoxville – Engineering Fundamentals Department****Knoxville, TN***Graduate Teaching Assistant*

August 2022–May 2023

**Computer Methods for Engineering Problem Solving**

- Instruct, grade, and support 200 first-year engineering students in the course EF 105 – “Computer Methods for Engineering Problem Solving”, teaching Excel and MATLAB skills
- Prepare learning material, lectures, and class activities to be used 6 times throughout the week during instruction
- Met with various students weekly during individual sessions to ensure all students are retaining material

**UNIVERSITY INVOLVEMENT****Graduate Student Council – Vanderbilt University****Nashville, TN***Recruitment Chair*

August 2024–present

- Organized travel, lodging, transportation, meals, interviews, and tours of 60 prospective BME PhD students for the department's interview weekend

**Biomedical Engineering Department Representative**

August 2023–August 2024

- Meet monthly with the entire graduate student council to discuss department needs, funding, plan for upcoming events, and communicate with administration
- Meet monthly with department student association to relay university wide announcements and changes

**Biomedical Engineering Society****Knoxville, TN***Member/Treasurer*

August 2018–May 2022

- Managed finances of chapter for fundraising, travel, merchandise, and food from collecting membership fees and allocating funds
- Financed budget for conference travel costs of undergraduate cohort to the Annual Meeting for the Biomedical Engineering Society 2021
- Designed and distributed chapter merchandise of hats, stickers, pens, shirts to over 100 active members

**PUBLICATIONS/PRESENTATIONS**

- Woods, D., Yuan, F., Jao, YL., Zhao, X. (2021). Social Robots for Older Adults with Dementia: A Narrative Review on Challenges & Future Directions. Social Robotics. ICSR 2021. Lecture Notes in Computer Science, vol 13086. Springer, Cham. [https://doi.org/10.1007/978-3-030-90525-5\\_35](https://doi.org/10.1007/978-3-030-90525-5_35)
- Woods DP, Herzog RS, Sun QW, Glovak, ZT, Baghdoyan HA, Lydic R. Gain modulation by mouse prefrontal cortex diminishes fentanyl-induced respiratory depression. J Pharmacol Exp Ther 385: 2023 <https://jpet.aspetjournals.org/content/385/S3/139>
- Herzog RS, Woods DP, Sun QW, Glovak ZT, Baghdoyan HA, Lydic R. Decrease in respiratory rate caused by prefrontal cortex administration of fentanyl can be described using a gain modulation model. PSTR282.02/HH11. 2023 Neuroscience Meeting Planner. Washington, D.C.: Society for Neuroscience, 2023, Online. <https://www.abstractsonline.com/pp8/#!/10892/presentation/25135>
- R.L. Leonard, A.B. Bull, F. Xue, C.P. Haycock, S.K. Gray, C.W. Bond, P.E. Bond, J.C. McDearman, D.P. Woods, J. Mayfield, L.R. Brown, T.D. Giorgio, J.A. Johnson, Biocompatibility of antifogging SiO-doped Diamond-Like carbon laparoscope coatings, Applied Surface Science, Volume 634, 2023, 157606, ISSN 0169-4332, <https://doi.org/10.1016/j.apsusc.2023.157606>

### Poster Presentations

- Woods, D. et al (2021). Diamond-like Carbon Thin Films for Anti-fog Lens Coating in Laparoscopy. BMES 2021 Annual Meeting, Orlando, FL.
- Woods, D. et al (2021). Diamond-like Carbon Thin Films for Anti-fog Lens Coating in Laparoscopy. University of Tennessee EURēCA 2022.
- Woods, D. et al (2023). Gain modulation by mouse prefrontal cortex diminishes fentanyl-induced respiratory depression. ASPET 2023 Annual Meeting, St. Louis, MO.
- Woods, D. et al (2024). Flexible, transparent electrodes for acute recording in non-human primates. Vanderbilt Institute for Nanoscale Science and Engineering Nanoday. Nashville, TN.
- Woods, D. et al (2025). Flexible, transparent electrodes for acute recording in non-human primates. Society for Biomaterials Mid-South Regional Biomaterials Day. Nashville, TN.

### Oral Presentations

- Woods, D (2022). “A New Scope for Lab Grown Diamonds – Clearing the Optical Window for Laparoscopy.” University of Tennessee Chancellor’s Seminar Series, 4/19/2022.

### SKILLS

- Proficient in: MATLAB, Excel, AutoCAD, GraphPad Prism, SAS
- Primate housing/maintenance, eye tracking, electrophysiology
- Mouse maintenance, handling, stereotactic surgery, whole-body plethysmography, electrophysiology
- Photolithography, plasma cleaning, sputter and e-beam deposition, parylene coating

### AWARDS

• Distinction in Undergraduate Research	May 2022
• Cook Grand Challenge and Chancellor’s Honors Program Graduate	May 2022
• Outstanding GTA Award, Engineering Fundamentals	May 2023
• Russell G. Hamilton Scholar – Vanderbilt University	2023
• Dean’s Graduate Fellowship – Vanderbilt University	August 2023

### REFERENCES

**Daniel Gonzales, Assistant Professor**

Department of Biomedical Engineering

Vanderbilt University

daniel.gonzales@vanderbilt.edu

**Christos Constantinidis, Professor**

Department of Biomedical Engineering

Vanderbilt University

christos.constantinidis.1@vanderbilt.edu

**Ralph Lydic, Professor**

Department of Psychology

University of Tennessee Knoxville

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