

THOMAS J. BARRETT, PHD

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SUMMARY

My research career has covered a diverse range of topics, including ecological radiation studies, nanocomposite fabrication, polymer fiber spinning, biosensor development, and computational chemistry. I am currently developing digital twin and machine learned models to represent the synthesis of Molecularly Imprinted Polymers (MIPs), synthetic recognition elements that can be used for a range of biological sensing and drug delivery applications.

EDUCATION

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| 2019 - 2024 | PhD Mechanical Engineering (Materials Science) Northeastern University |
| 2016 - 2018 | MS Mechanical Engineering (Mechanics) Northeastern University |
| 2012 - 2016 | BS Mechanical Engineering University of Rochester |

EXPERIENCE

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| Feb. 2025 - Current | Postdoctoral Researcher, Christian-Albrechts-Universität zu Kiel Kiel, Germany <ul style="list-style-type: none">Developed electrospun polymer composites for cell grafting and tricuspid valve reconstruction.Developed a generalized polymerization application for the development of Molecularly Imprinted Polymers using RDKit, Python, GROMACS, and Autodock Vina.Developed analytical and generative machine learning models using PyTorch and E3NN. |
| Sep. 2024 – Jan. 2025 | Research and Development Intern, Applied Plastics Norwood, MA <ul style="list-style-type: none">Assisted in the development of PTFE coatings using Design of Experiments and oversaw mechanical analysis. |
| Jan. 2019 – Aug. 2024 | Graduate Research Assistant, Northeastern University Boston, MA <ul style="list-style-type: none">Developed a multiscale model to model the behavior of polymer – carbon nanotube composites using Molecular Dynamics, Finite Element Analysis, Python, and C++.Performed experimental development and analysis of composite samples for cast films and gel spun fibers. |

SKILLS

Experimental Wide Angle X-ray Diffraction (WAXD), Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM), Dynamic Mechanical Analysis (DMA), Atomic Force Microscopy (AFM), Electrospinning, Wet and Gel Spinning, Design of Experiments (DOE)

Computational Python (**PyTorch**, pip integration and packaging, **RDKit**), C++, Bash, Molecular Dynamics (**GROMACS**, LAMMPS), Molecular Docking (**Autodock** Vina, gnina), Finite Element Analysis (Abaqus)

ACADEMIC MANUSCRIPTS

Barrett TJ, Li M., Gouhier T., Rilov G., Helmuth B., Choi F., Filin S., Müftü S. Fine-scale spatial heterogeneity dictates temperature extremes on coastal rock surfaces. *Ecological Modelling*, 2025.

Barrett TJ, Minus ML. Nose-Hoover integrators at-a-glance: Barostat integration has a demonstrable effect on uniaxial tension results. *Journal of Chemical Theory and Computation*, 2025.

Barrett TJ, Minus ML. *pothos*: A Python package for polymer chain orientation and microstructure evolution monitoring. *Journal of Chemical Theory and Computation*, 2025.