

Caroline S. Gorham, Ph.D.

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PERSONAL STATEMENT

I am a forward-thinking technologist with extensive multi-disciplinary academic research experience spanning computational materials science, condensed matter physics and thermal transport engineering. I am an aspiring data scientist who seeks complex problems, learns quickly, and is a confident project leader. I thrive on delivering novel ideas and their solutions via in-depth research, analytics, technical writing and data-driven presentations.

WORK EXPERIENCE

Postdoctoral Research Associate 02/2020 – PRESENT
Oak Ridge National Laboratory Oak Ridge, TN

- Characterization of topological points in phonon dispersions, via computation of Berry curvatures.
- Interrogation of the phenomenological Ginzburg-Landau framework for superconductors
- Assessed the viability of read-out mechanisms for topological quantum computation schemes to reliably measure the quantum state of devices.

Postdoctoral Research Associate 09/2018 – 01/2020
Carnegie Mellon University Pittsburgh, PA

- Developed generalizations of quantum Hall effects (QHE), from 2D to 4D, using quaternion numbers, to understand frustrated ground states in vicinity of 4D/3D quantum phase transitions.
- Proposed a basis for interpretation of orientational entropy in topologically close-packed (TCP) and glassy solids, in vicinity of an "ideal glass transition."

Graduate Research Assistant 08/2015 – 08/2018
Carnegie Mellon University Pittsburgh, PA

- Described a topological framework for glass transitions and the structure of glasses, using four-dimensional quaternion (Q) order parameters.
- Performed Monte-Carlo simulations of 4D/3D quaternionic condensed matter, which provided evidence for the existence of a topological-ordering transition.
- Anticipated a solidification phase diagram, in the vicinity of a crystalline-to-glass transition, by considering Heisenberg duality characteristics inherent in quaternion order parameters. This enabled a fresh perspective on the "ideal glass transition," and thermal conductivity behavior of crystalline and glassy solid states.

Systems Engineer I 10/2010 – 10/2011
Raytheon Intelligence, Information & Services (IIS) Aurora, CO

- Produced test procedures to ensure high-value functionality of ground control systems
- Integrated system level components for net-centric, next-generation, ground control system (GPS-OCX)

EDUCATION

2014-2018 **Carnegie Mellon University**, Ph.D. Material Science & Engineering Pittsburgh, PA
Thesis: On the formation of crystalline and non-crystalline solid states and their thermal transport properties: A topological viewpoint via a quaternion orientational order parameter

2013-2014 **Carnegie Mellon University**, M.Sc. Mechanical Engineering Pittsburgh, PA

2012-2013 **University of Virginia**, Graduate Research Assistant: Mechanical Engineering Charlottesville, VA

2007-2010 **King's College London**, B.Eng. Mechanical Engineering, 1st Class Honors London, UK

TECHNICAL SKILLS

PROFICIENT	Python, MATLAB, github, linux
INTERMEDIATE	Machine Learning, C, bash, SQL, html
BEGINNER	Ruby on Rails, CSS

ONGOING EDUCATION

IN PROGRESS - 2020	Neural Networks and Deep Learning (Coursera)
2020	IBM Data Science Certification (Coursera)
2020	Ruby on Rails: An Introduction (Coursera)

CERTIFICATIONS & LICENSES

2020	Securities Industry Essentials (SIE)
2011	EIT, Mechanical Engineering

MISCELLANEOUS

2018	Best Materials Science Ph.D. Thesis (Paxton Award)
2013/17	NASA Space Technology & Graduate Research Fellowship
2013	NSF Graduate Research Fellowship (Honorable Mention)

AFFILIATIONS

2018	Pittsburgh Quantum Institute (PQI)
2014	American Physical Society (APS)
2012	Society of Women Engineers (SWE)
2012	Materials Research Society (MRS)

1st AUTHOR PUBLICATION LIST

2019	Quantized Hall Effect Phenomena and Topological-Order in 4D Josephson Junction Arrays in the Vicinity of a Quantum Phase Transition arXiv:1903.11945 (hep-th)
2019	A New Perspective on the Kauzmann Entropy Paradox: A Crystal/Glass Critical Point in Four-and Three-Dimensions MDPI Proceedings 46, 23
2019	Crystallization in 3D: Defect-Driven Topological Ordering and the Role of Geometrical Frustration Physical Review B, 99, 144106
2019	Topological Description of the Solidification of Undercooled Fluids and the Temperature Dependence of the Thermal Conductivity of Crystalline and Glassy Solids Above Approximately 50 K J. Phys.: Condensed Matter, V31
2018	SU(2) Orientational Ordering in Restricted Dimensions: Evidence for a Berezinskii-Kosterlitz-Thouless Transition of Topological Point Defects in Four Dimensions J. Phys. Comms., V2.7
2014	Ion irradiation of the native oxide/silicon surface increases the thermal boundary conductance across aluminum/silicon interfaces Physical Review B 90, 024301
2014	Density dependence of the room temperature thermal conductivity of atomic layer deposition-grown amorphous alumina (Al ₂ O ₃) Applied Physics Letters 104, 253107