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Education

Carnegie Mellon University

Ph.D., Physics, 2019–Present.
Field: Nuclear and Particle Physics
M.S., Physics, 2021.

Case Western Reserve University

B.S., Physics, 2019.
B.A., Music, 2019.

Research

Department of Physics, CMU

2019–Present

Ph.D. Candidate (Advisor: Reinhard Schumacher)
Thesis: *Photoproduction of K_S^0 Pairs at GlueX* (in progress)

Department of Physics, CMU

2020

Research Assistant (Advisor: Michael Widom)
Project: *Cluster Variation Method Analysis of BCC Heusler Alloys*

Department of Physics, CWRU

2016–2019

Research Assistant (Advisor: Giuseppe Strangi)
Project: *Material Properties and Fabrication of Thin-Film Metamaterials*

Teaching

Department of Physics, CMU

2019–2020

Teaching Assistant, Basic Experimental Physics

Department of Physics, CWRU

2017–2019

Teaching Assistant, Honors Introduction to Electromagnetism

Awards and Fellowships

Michelson-Moreley Scholarship CWRU

2015–2019

Languages

English (native), French (intermediate), Spanish (beginner)

Skills

Rust, Python, C/C++, L^AT_EX, Mathematica, ROOT, MPI

Publications

ElKabbash, M., **Hoffman, N.**, Lininger, A. R., Jalil, S. A., Letsou, T., Hinczewski, M., Strangi, G., & Guo, C. (2023). *Fano resonant optical coatings platform for full gamut and high purity structural colors*. Nature Communications, **14**(1). DOI: 10.1038/s41467-023-39602-2

ElKabbash, M., Letsou, T., Jalil, S. A., **Hoffman, N.**, Zhang, J., Rutledge, J., Lininger, A. R., Fann, C.-H., Hinczewski, M., Strangi, G., & Guo, C. (2021). *Fano-resonant ultrathin film optical coatings*. Nature Nanotechnology, **16**(4), 440–446. DOI: 10.1038/s41565-020-00841-9

Hoffman, N., & Widom, M. (2021). *Cluster Variation Method Analysis of Correlations and Entropy in BCC Solid Solutions*. Metallurgical and Materials Transactions A, **52**(5), 1551–1558. DOI: 10.1007/s11661-021-06182-z

ElKabbash, M., Sreekanth, K. V., Fraiwan, A., Cole, J., Alapan, Y., Letsou, T., **Hoffman, N.**, Guo, C., Sankaran, R. M., Gurkan, U. A., Hinczewski, M., & Strangi, G. (2020). *Ultrathin-film optical coating for angle-independent remote hydrogen sensing*. Measurement Science and Technology, **31**(11), 115201. DOI: 10.1088/1361-6501/ab9fd8

ElKabbash, M., Ilker, E., Letsou, T., **Hoffman, N.**, Yaney, A., Hinczewski, M., & Strangi, G. (2017). *Iridescence-free and narrowband perfect light absorption in critically coupled metal high-index dielectric cavities*. Optics Letters, **42**(18), 3598. DOI: 10.1364/ol.42.003598

ElKabbash, M., Sousa-Castillo, A., Nguyen, Q., Mariño-Fernández, R., **Hoffman, N.**, Correa-Duarte, M. A., & Strangi, G. (2017). *Tunable Black Gold: Controlling the Near-Field Coupling of Immobilized Au Nanoparticles Embedded in Mesoporous Silica Capsules*. Advanced Optical Materials, **5**(21). DOI: 10.1002/adom.201700617

Talks

Jefferson Lab Users Organization Annual Meeting (upcoming)

June 25, 2025

Title: *Spectroscopy with K-short Mesons from GlueX* (invited)

PWA13/ATHOS8

May 28, 2024

Title: *Photoproduction of K_S Pairs at GlueX*

APS April Meeting

April 17, 2023

Title: *Photoproduction of Mesons Decaying into $K_S K_S$ at GlueX***Jefferson Lab Users Organization Meeting at APS**

April 16, 2023

Title: *GlueX/Hall D Overview* (invited)**APS Division of Nuclear Physics**

October 14, 2021

Title: *Meson and Baryon Photoproduction using $\gamma p \rightarrow K_S K_{Sp}$ at GlueX*

Work Experience

Engineer at Folio Photonics

2019

Activities included data reading/writing experiments on multilayer films and developing software for testing and automation. I was tasked with developing programs to scan through layered disks and measure layer positions and thicknesses, as well as programs which ran testing procedures on physical devices using LabVIEW.

Projects

laddu is a library for analysis of particle physics data. It is intended to be a simple and efficient alternative to some of the other tools out there. **laddu** is written in Rust with bindings to Python via PyO3 and maturin. The goal of this project is to allow users to perform complex amplitude analyses (like partial-wave analyses) without complex code or configuration files. It additionally supports the Message Passing Interface (MPI) protocol for parallelization in high-performance computing environments. **laddu** prioritizes the Parquet data format while providing methods to read and convert ROOT files.

Link: <https://github.com/denehoffman/laddu>

ganesh is a Rust crate providing common optimization algorithms as well a straightforward, trait-based interface to create extension algorithms. It provides pure-Rust implementations of the L-BFGS-B and Nelder-Mead minimization algorithms along with implementations of the Affine-Invariant Ensemble Sampler and Ensemble Slice Sampler for Markov chain Monte Carlo analyses.

Link: <https://github.com/denehoffman/ganesh>

modak is a Python library with a Rust backend used to generate data pipelines for scientific computing workflows. It uses a Rust-based task scheduler to create Python subprocesses which perform individual tasks such as data processing and plotting.

Link: <https://github.com/denehoffman/modak>

References

Dr. Reinhard Schumacher
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Dr. Curtis Meyer
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Dr. Mohamed ElKabbash
Quantum Photonics Group
Massachusetts Institute of Technology
melkabba@mit.edu