

# Benjamin Cohen-Stead

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## EDUCATION

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<b>University of California, Davis</b> Ph.D. in Physics, Advisor: Professor Richard Scalettar	Davis, Ca 2016–2022
<b>Whitman College</b> B.A. in Physics	Walla Walla, Wa 2010–2014

## PROFESSIONAL EXPERIENCE

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<b>University of Tennessee Knoxville</b> Postdoctoral Research Associate Principal Investigator: Professor Steven Johnston	Knoxville, Tn 2022–current
<b>Los Alamos National Laboratory</b> Graduate Student Researcher Mentor: Dr. Kipton Barros – Project: Langevin Methods for Quantum Electron-Phonon Simulations	Los Alamos, NM 2020–2022
<b>Picarro, Inc.</b> Associate Data Scientist – Responsibilities: software development, algorithm design, data analysis	Santa Clara, Ca 2014–2016
<b>Picarro, Inc.</b> Data Science Intern	Santa Clara, Ca Summer 2014
<b>University of Rochester, Department of Physics</b> Physics REU Student, Mentor: Professor Stephen Teitel – Research: numerical investigation of two-dimensional granular systems	Rochester, NY Summer 2013

## AWARDS

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<b>UC-National Lab In-Residence Graduate Fellowship</b> National Lab: Los Alamos National Laboratory – Project: Langevin Methods for Quantum Electron-Phonon Simulations	2020–2022 Mentor: Dr. Kipton Barros
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## OPEN SOURCE CODES

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<b>SmoQyDQMC.jl:</b> <a href="https://github.com/SmoQySuite/SmoQyDQMC.jl.git">https://github.com/SmoQySuite/SmoQyDQMC.jl.git</a> Flexible implementation of the determinant quantum Monte Carlo algorithm for simulating Hubbard and electron-phonon interactions.
<b>JDQMCFramework.jl:</b> <a href="https://github.com/SmoQySuite/JDQMCFramework.jl.git">https://github.com/SmoQySuite/JDQMCFramework.jl.git</a> Julia package exporting a suite of types and routines useful for writing a determinant quantum Monte Carlo code.

**JDQMCMeasurements.jl:** <https://github.com/SmoQySuite/JDQMCMeasurements.jl.git>

Julia package implementing various correlation measurements that are frequently made in determinant quantum Monte Carlo simulations.

**StableLinearAlgebra.jl:** <https://github.com/cohensbw/StableLinearAlgebra.jl.git>

Exports numerically stable linear algebra routines used in determinant quantum Monte Carlo codes.

**Checkerboard.jl:** <https://github.com/cohensbw/Checkerboard.jl.git>

Implements the checkerboard approximation for representing exponentiated kinetic for tight-binding models.

**MuTuner.jl:** <https://github.com/cohensbw/MuTuner.jl.git>

Implements a method for tuning the chemical potential in grand canonical Monte Carlo simulations to achieve a target particle density.

**LatticeUtilities.jl:** <https://github.com/cohensbw/LatticeUtilities.jl.git>

Julia package for representing arbitrary periodic lattice geometries.

## PATENTS

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**Aggregate leak indicator display systems and methods**

US Patent Number: 10962437

Assignee: Picarro, Inc.

Date of Patent: March 30, 2021

Inventors: A. Nottrott, S. MacMullin, S.M. Tan, B. Cohen-Stead, C. Rella

## PUBLICATIONS

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- [1] B. Cohen-Stead, S. Malkaruge Costa, J. Neuhaus, A. Tanjaroon Ly, Y. Zhang, R. Scalettar, K. Barros, and S. Johnston, “SmoQyDQMC.jl: A flexible implementation of determinant quantum Monte Carlo for Hubbard and electron-phonon interactions”, *arXiv:2311.09395*, 2023.
- [2] B. Cohen-Stead, K. Barros, R. Scalettar, and S. Johnston, “A hybrid Monte Carlo study of bond-stretching electron–phonon interactions and charge order in BaBiO<sub>3</sub>”, *npj Computational Materials*, vol. 9, no. 1, p. 40, 2023. DOI: 10.1038/s41524-023-00998-6.
- [3] B. Cohen-Stead, O. Bradley, C. Miles, G. Batrouni, R. Scalettar, and K. Barros, “Fast and scalable quantum Monte Carlo simulations of electron-phonon models”, *Phys. Rev. E*, vol. 105, p. 065302, 6 Jun. 2022. DOI: 10.1103/PhysRevE.105.065302.
- [4] B. Cohen-Stead, K. Barros, Z. Meng, C. Chen, R. T. Scalettar, and G. G. Batrouni, “Langevin simulations of the half-filled cubic holstein model”, *Phys. Rev. B*, vol. 102, p. 161108, 16 Oct. 2020. DOI: 10.1103/PhysRevB.102.161108.
- [5] B. Cohen-Stead, N. C. Costa, E. Khatami, and R. T. Scalettar, “Effect of strain on charge density wave order in the holstein model”, *Phys. Rev. B*, vol. 100, p. 045125, 4 Jul. 2019. DOI: 10.1103/PhysRevB.100.045125.
- [6] A. Tanjaroon Ly, B. Cohen-Stead, S. Malkaruge Costa, and S. Johnston, “Comparative study of the superconductivity in the holstein and optical su-schrieffer-heeger models”, *Phys. Rev. B*, vol. 108, p. 184501, 18 Nov. 2023. DOI: 10.1103/PhysRevB.108.184501.
- [7] S. Malkaruge Costa, B. Cohen-Stead, A. T. Ly, J. Neuhaus, and S. Johnston, “Comparative determinant quantum monte carlo study of the acoustic and optical variants of the su-schrieffer-heeger model”, *Phys. Rev. B*, vol. 108, p. 165138, 16 Oct. 2023. DOI: 10.1103/PhysRevB.108.165138.
- [8] S. Karakuzu, B. Cohen-Stead, C. D. Batista, S. Johnston, and K. Barros, “Flexible class of exact hubbard-stratonovich transformations”, *Phys. Rev. E*, vol. 107, p. 055301, 5 May 2023. DOI: 10.1103/PhysRevE.107.055301.

- [9] O. Bradley, B. Cohen-Stead, S. Johnston, K. Barros, and R. T. Scalettar, “Charge order in the kagome lattice Holstein model: A hybrid Monte Carlo study”, *npj Quantum Materials*, vol. 8, no. 1, p. 21, 2023. DOI: 10.1038/s41535-023-00553-y.
- [10] P. M. Dee, B. Cohen-Stead, S. Johnston, and P. J. Hirschfeld, “Charge correlations suppress unconventional pairing in the holstein model”, *Phys. Rev. B*, vol. 107, p. 104 503, 10 Mar. 2023. DOI: 10.1103/PhysRevB.107.104503.
- [11] C. Miles, B. Cohen-Stead, O. Bradley, S. Johnston, R. Scalettar, and K. Barros, “Dynamical tuning of the chemical potential to achieve a target particle number in grand canonical Monte Carlo simulations”, *Phys. Rev. E*, vol. 105, p. 045 311, 4 Apr. 2022. DOI: 10.1103/PhysRevE.105.045311.
- [12] G. Paleari, F. Hébert, B. Cohen-Stead, K. Barros, R. Scalettar, and G. G. Batrouni, “Quantum monte carlo study of an anharmonic holstein model”, *Phys. Rev. B*, vol. 103, p. 195 117, 19 May 2021. DOI: 10.1103/PhysRevB.103.195117.