Charles D. Kocher ***Curriculum Vitae*** charlesdkocher@gmail.com

Contact

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Education

Stony Brook University, Stony Brook, NY. GPA: 3.95 2019 - 2024
Ph.D. in Physics
Thesis: *Characterizing the Nonequilibrium Driving Forces Responsible for the Emergence of Life*

Brown University, Providence, RI. GPA: 4.00 2015 - 2019
Sc.B. with Honors in Mathematical Physics and Sc.B. in Mathematics. *Magna Cum Laude.*
Thesis: *Quantum Chaos in Simple Systems*, with Antal Jevicki

Research Appointments

Postdoctoral Associate, Ken Dill group, Laufer Center, *Stony Brook University*	2024 - Pres.
Graduate Research Assistant, Ken Dill group, Laufer Center, *Stony Brook University*	2020 - 2024
Undergraduate Research Assistant, Particle Astrophysics Group, *Brown University*	2015 - 2019
DOE Science Undergraduate Laboratory Internship, *Brookhaven National Laboratory*	2018

Honors and Awards

Max Dresden Prize for Outstanding Theoretical Physics Thesis, *Stony Brook Physics Dept.*	2024
R. Bruce Lindsay Prize for Excellence in Physics, *Brown Physics Dept.*	2019
Goldwater Scholarship Honorable Mention, *Barry Goldwater Foundation*	2018
Henry Parker Manning Prize Examination, First Place, *Brown Math. Dept.*	2018
Charlotte Gutfleish and Frances Sorrow Endowed Scholarship, *Brown University*	2017 - 2019
Thomas R. 1977 and Cynthia M. Reusché 1977 Endowed Scholarship, *Brown University*	2016 - 2019
Undergraduate Teaching and Research Award, *Brown University*	2016

Teaching

Guest Lecturer, PHY558: Physical and Quantitative Biology, Stony Brook University	2023
Teaching Assistant, PHY558: Physical and Quantitative Biology, Stony Brook University	2022
Teaching Assistant, PHY302: Electromagnetic Theory II, Stony Brook University	2021
Teaching Assistant, PHY303: Mechanics, Stony Brook University	2020
Teaching Assistant, PHY134.L69: Classical Phys. Lab. II Online, Stony Brook University	2020
Teaching Assistant, PHY134: Classical Phys. Lab. II, Stony Brook University	2020
Private tutoring: All levels of physics and math, upper-level engineering	2020 - Pres.
Teaching Assistant, PHY133: Classical Phys. Lab. I, Stony Brook University	2019
Math Resource Center Tutor, Department of Mathematics, Brown University	2016 - 2019
Teaching Assistant, CSCI0530: The Matrix in Computer Science, Brown University	2016

Professional Societies

Associate Member, *Sigma Xi* 2019 - Pres.

Publications

ORCID: 0000-0001-5032-5186
Google Scholar: `https://scholar.google.com/citations?user=oX7OY3AAAAAJ`
Github: `https://github.com/cdkocher`

Under Review

1. **C. D. Kocher** and K. A. Dill, *The prebiotic emergence of biological evolution.* Accepted by Royal Society Open Science.

2. **C. D. Kocher** and K. A. Dill, *Origins of Life: The Protein Folding Problem all over again?* Accepted by PNAS, in press.

Papers

1. **C. D. Kocher** and K. A. Dill, *Origins of life: First came evolutionary dynamics.* QRB Discovery, E4, (2023). doi:10.1017/qrd.2023.2

2. **C. D. Kocher** and K. A. Dill, *Darwinian evolution as a dynamical principle*, *PNAS* **120**, 11, (2023).

3. J. Aalbers *et al.* (LUX-ZEPLIN Collaboration), *First Dark Matter Search Results from the LUX-ZEPLIN (LZ) Experiment*, *Phys. Rev. Lett.* **131**, 041002, (2023) arXiv:2207.03764 [hep-ex].

4. **Charles Kocher**, Luca Agozzino, and Ken Dill. *Nanoscale Catalyst Chemotaxis Can Drive the Assembly of Functional Pathways*, *J. Phys. Chem. B* 2021, **125**, 31, 8781–8786. DOI: `10.1021/acs.jpcb.1c04498`

5. D. S. Akerib *et al.* (LUX-ZEPLIN Collaboration), *Simulations of Events for the LUX-ZEPLIN (LZ) Dark Matter Experiment*, *Astropart. Phys.* **125**, 102480, (2021), arXiv:2001.09363 [physics.ins-det].

6. D. S. Akerib *et al.* (LUX-ZEPLIN Collaboration), *The LUX-ZEPLIN (LZ) Radioactivity and Cleanliness Control Programs*, *Eur. Phys. J. C* **80**: 1044 (2020), arXiv:2006.02506 [physics.ins-det].

7. D. S. Akerib *et al.* (LUX-ZEPLIN Collaboration), *Projected sensitivity of the LUX-ZEPLIN experiment to the* $0\nu\beta\beta$ *decay of* ^{136}Xe, *Phys. Rev. C* **102**, 014602, (2020), arXiv:1912.04248 [nucl-ex].

8. D. S. Akerib *et al.* (LUX-ZEPLIN Collaboration), *The LUX-ZEPLIN (LZ) Experiment*, *Nucl. Instrum. Meth. A* **953**, 163047, (2020), arXiv:1910.09124v2 [physics.ins-det].

9. D. S. Akerib *et al.* (LUX-ZEPLIN Collaboration), *Measurement of the Gamma Ray Background in the Davis Cavern at the Sanford Underground Research Facility*, *Astropart. Phys.* **116**, 102391, (2020), arXiv:1904.02112 [physics.ins-det].

10. **C. D. Kocher** and M. McGuigan, "Simulating 0+1 Dimensional Quantum Gravity on Quantum Computers: Mini-Superspace Quantum Cosmology and the World Line Approach in Quantum Field Theory," *2018 New York Scientific Data Summit (NYSDS)*, Upton, NY, 2018.
URL: `http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8538963&isnumber=8538938`

11. D. S. Akerib *et al.* (LUX-ZEPLIN Collaboration), *Projected WIMP Sensitivity of the LUX-ZEPLIN (LZ) Dark Matter Experiment*, *Phys. Rev. D* **101**, 052002, (2020), arXiv:1802.06039 [astro-ph.IM].

Presentations

1. **Charles D. Kocher** (Presenter) and Ken A. Dill, "The prebiotic emergence of biological evolution," APS March Meeting Session B37, March 4, 2024. Minneapolis, MN.

2. **Charles D. Kocher** (Presenter) and Ken A. Dill, "The dynamical principle of Darwinian evolution and its origin," Poster presentation, Gordon Research Seminar and Gordon Research Conference on Stochastic Physics in Biology, Jan. 2023. Ventura, CA.

3. **Charles D. Kocher** (Presenter) and Ken A. Dill, "How the drive for Survival of the Fittest might have arisen from a physico-chemical ratcheting process," APS March Meeting Session K04, March 15, 2022. Chicago, IL.

4. **Charles D. Kocher** and Ken A. Dill (Presenter), "Life originated when physical chemistry 'discovered' Survival of the Fittest dynamics," APS March Meeting Session A14, March 14, 2022. Chicago, IL.

5. Michael McGuigan (Presenter), Raffaele Miceli, **Charles D. Kocher**, Tri Duong, Christopher Kane, and Brandon Ortega, "Visualization and data analysis of quantum computations in high energy, nuclear and condensed matter physics," Invited Talk, Visualization and Data Analysis, Jan. 2019, Burlingame, CA.

6. Sarah Elghazoly (Presenter), **Charles D. Kocher** (Presenter), Raffaele Miceli (Presenter), and Michael McGuigan, "Visualization and quantum computation of Moiré superconductivity in bilayer graphene, carbon nanocones and nanostrips," Invited Talk, New York Scientific Data Summit, Aug. 2018, Upton, NY.

7. **Charles D. Kocher** (Presenter) and Michael McGuigan, "Simulating 0+1 dimensional quantum gravity on quantum computers: mini-superspace quantum cosmology and the world line approach in quantum field theory," Poster Presentation, New York Scientific Data Summit, Aug. 2018, Upton, NY.

Media

1. Praise for our paper *Origins of life: First came evolutionary dynamics* from Bengt Nordén, Chair of the Board of Editors for QRB Discovery: `https://doi.org/10.1017/qrd.2024.5`

2. John Templeton Foundation grant awarded to our group for our Origins of Life work: `https://www.templeton.org/grant/origins-of-the-principle-of-survival-of-the-fittest`

3. LZ's first results announcement video: `https://youtu.be/bN3GGWlqAp0`

4. Brown's press release for LZ's first results: `https://www.brown.edu/academics/physics/news/2022/07/brown-researchers-bring-us-one-step-closer-detection-dark-matter-first-results-new`

5. Interview in the Summer 2020 edition of the Brown University Physics Department's *Imagine* magazine: `https://www.brown.edu/academics/physics/imagine-brown-physics-magazine`.

6. January 2020 article at phys.org on my SULI mentor Michael McGuigan's work, featuring some of the results of my SULI project: `https://phys.org/news/2020-01-quantum-classic-physics-concepts.html`.