**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

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|---|---|
| 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

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|---|---|
| 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

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|---|---|
| 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

# Publications

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

## Papers

1. **C. D. Kocher** and K. A. Dill, *Origins of Life: The Protein Folding Problem all over again? PNAS* **121**, 34, e2315000121, (2024). doi:10.1073/pnas.2315000121

2. **C. D. Kocher** and K. A. Dill, *The prebiotic emergence of biological evolution. R. Soc. Open Sci.* **11**:240431. (2024). doi:10.1098/rsos.240431

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

4. **C. D. Kocher** and K. A. Dill, *Darwinian evolution as a dynamical principle*, *PNAS* **120**, 11, e2218390120, (2023). doi:10.1073/pnas.2218390120

5. 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].

6. **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`

7. 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].

8. 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].

9. 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].

10. 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].

11. 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].

12. 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].

13. **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`

## 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. 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.

5. **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. PNAS volume 121 no. 34, to which we contributed the cover image: `https://www.pnas.org/toc/pnas/121/34`.

2. 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`

3. 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`

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

5. 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`

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`.