APRIL Q. **CHENG**

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Education

Massachusetts Institute of Technology (2021-2024) *Cambridge, MA*

- Candidate for B.S. in Physics and Minor in Mathematics • GPA: 5.0/5.0

Canyon Crest Academy (2016-2020) *San Diego, CA*

- GPA: 4.7/4.0 • ACT: 36/36 • 5/5 on 11/11 AP exams

Honors & Awards

2023	**Recipient,** 2023 Astronaut Scholarship	*Orlando, FL*
2023	**Summer Undergraduate Research Fellowship,** Laser Interferometer Gravitational-wave Observatory	*Caltech*
2023	**Recipient,** 2023 DGRAV Travel Grant for APS April meeting	*Minneapolis, MN*
2020	**Gold medal,** Global e-Competition on Astronomy and Astrophysics	*Online*
2019	**Silver medal,** 12th International Olympiad on Astronomy and Astrophysics	*Keszthley, Hungary*
2018	**Silver medal,** 11th International Olympiad on Astronomy and Astrophysics	*Beijing, China*
2017, 2019	**1st place,** Southern California Science Olympiad State Tournament, Astronomy event	*Pasadena, California*

Relevant Coursework

Physics	General Relativity, Special Relativity, Quantum Physics I-III, Statistical Physics, Advanced Electromagnetism
Astrophysics	Astrophysics I (grad), Astrophysics II (grad), Cosmology
Mathematics	Differential Equations, Linear Algebra, Group Theory, Real Analysis, Complex Analysis, Probability and Statistics
Computer Science	Introduction to Computer Science, Advanced Algorithms

Research

Interests: cosmology, gravitational wave astrophysics, compact stellar remnants, fast radio bursts, physics education

Understanding FRB-galaxy Cross Correlations with Cosmological Simulations *Cambridge, MA*

MIT Kavli Institute • Advisors: Kiyo Masui, Shion Elizabeth Andrew *Aug 2023 -*

- Simulate the cross correlation of fast radio bursts with galaxies in the Millenium-TNG simulation

Using Mass-Spin Correlations to Probe the Tidal Spin-up of Binary Black Holes *Pasadena, CA*

Caltech LIGO SURF • Advisors: Alan Weinstein, Jacob Golomb *Jun 2023 - Aug 2023*

- Fit the mass-spin correlations of the binary black-hole population with an astrophysically-motivated heuristic model
- Project the feasibility of detecting such a correlation with future detectors, including 3rd-generation detectors

Systematic Analysis of Astrophysical Models in Gravitational-wave Population Analyses *Cambridge, MA*

MIT LIGO • Advisor: Salvatore Vitale *Sep 2022 - Jun 2023*

- With hierarchical Bayesian inference, infer the branching fractions between binary black-hole formation channels using gravitational-wave data
- Make future projections and investigate systematic biases of the inference using simulated data

Ray Tracing Axion-Photon Conversion in Neutron Star Magnetospheres *Cambridge, MA*

MIT Center for Theoretical Physics • Advisors: Tracy Slatyer, Joshua Foster *Feb 2022 - Aug 2022*

- Develop an end-to-end ray tracing code of the conversion of QCD axions into photons in a neutron star magnetosphere

Understanding the Spread of Dark Matter in the Illustris TNG-100 Simulation *Cambridge, MA*

MIT Kavli Institute • Advisors: Mark Vogelsberger, Josh Borrow *Sep 2021 - Dec 2021*

- Investigate the anomalously large spread of dark matter particles in the TNG-100 simulation, tracing their trajectories through hash tables

Variability of Exoplanet Hosts as a Probe of Spin-disk Alignment *Remote*

MIT Disruptive Planets • Advisors: Julien de Wit, Ben Rackham *May 2020 - Sep 2020*

- Operated the SPECULOOS-N telescope through a remote desktop to take scheduled observations
- Analyzed 10,000+ lightcurves of TESS data using MIT Supercloud to correlate transit occurrence and stellar variability from stars' spin-disk alignment

Observing Qatar 1-b with Archival MicroObservatory Data *Remote*

Exoplanet Research Workshop *Apr 2020 - Dec 2020*

- Reduced 10 transits of exoplanet Qatar 1-b from archival MicroObservatory data, and contributed light curves to the AAVSO database
- Found quantitative filters for using citizen astronomy work for research

Hypohalous Acids in Water with Machine Learning and Density Functional Methods *San Diego, CA*

UC San Diego, San Diego Supercomputer Center • Advisor: Andreas Goetz *Jun 2018 - Aug 2018, Jun 2020 - Sep 2021*

- Developed polynomial many-body potentials for hypohalous acids (HOX) using machine learning and analyzed the performance of the model
- Produced optimized HOX clusters in order to benchmark the performance of various Density Functional Theory methods

Publications

1. **April Qiu Cheng** , Michael Zevin, Salvatore Vitale
   What You Don't Know Can Hurt You: Use and Abuse of Astrophysical Models in Gravitational-wave Population Analyses
   ApJ 955.2, 127 (Oct. 2023) arXiv:2307.03129 DOI:10.3847/1538-4357/ACED98

Presentations

Aug 2023	**Research talk,** LIGO SURF final presentation	*Pasadena, CA*
Jun 2023	**Research talk,** LIGO Rates and Populations call	*Remote*
Apr 2023	**Research talk,** APS April conference	*Minneapolis, MN*
Apr 2023	**Research long update,** Salvatore Vitale's group meeting	*Cambridge, MA*
Jan 2023	**Presentation on the theory of gravitational radiation,** MIT Physics Directed Reading Program	*Cambridge, MA*
Nov 2022	**Presentation on fast radio bursts,** Astrophysics II graduate course	*Cambridge, MA*
Jan 2022	**Presentation on the CMB power spectrum,** MIT Physics Directed Reading Program	*Cambridge, MA*
Sep 2020	**Research talk,** MIT Disruptive Planets group	*Cambridge, MA*
Aug 2018	**Research poster,** San Diego Supercomputer Center research intern presentation	*San Diego, CA*

Community Service and Outreach

MIT Physics Mentorship program *Cambridge, MA*

- Mentor undergraduate students in relativity (Fall 2022) and quantum physics (Spring 2023, Fall 2023)

MIT Physics Values Committee *Cambridge, MA*

- Discuss administrative changes and propose recommendations to the department to promote diversity, inclusion, and community well-being

MIT Undergraduate Women in Physics (UWiP) *Cambridge, MA*

Vice President of Advocacy, Publicity Chair *Feb 2021 - May 2023*

- Manage the UWiP website, communicate with the Physics Values Committee, and help organize social and mentorship events

MIT Educational Studies Program *Cambridge, MA*

- Taught a high school class on astronomy for Splash 2021, and relativity for Splash 2022

National Science Olympiad A-Team member *Online*

- Write and proctor Astronomy exams for various regional to national-level high school Science Olympiad tournaments (2020-)
- Helped write an astronomy textbook for high schoolers, contributing a chapter on celestial coordinates

Skills and Interests

Computational	Python (numpy, pandas, scipy, cupy, gwpopulation, matplotlib, Jupyter), C/C++, Linux, bash, LaTeX, Mathematica
Cluster Allocations	SDSC compute clusters (various, 2018-2021), MIT Supercloud (2021), LIGO Lab Cluster (2022-)
Research interests	Cosmology, gravitational wave astrophysics, compact stellar remnants, fast radio bursts, physics education