Shalini Kurinchi-Vendhan

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Caltech · Astrophysics · Research · Writing

skurinch.github.io/astrolit

Astrophysical simulations tell a story by allowing us to picture how the Universe and its galaxies came to be. Similarly, I always endeavor to create a narrative about my research that can reach a wide audience.

Education

2019 – 2023 **Caltech | B.Sc. Astrophysics + English (minor)**

Astrophysics: Cosmology · Stars · Interstellar Medium · High-Energy Astrophysics · Structure and Dynamics of Galaxies · Radiative Processes · Discrete Mathematics · Feedback Control Systems · Mathematical Chaos · Methods of Computational Mathematics · Mathematical Methods of Physics · Computational Physics · ***English:*** American Modernism · Novels of Education · Russian Literature · Poetry Writing · 19th-Century British Literature · Premodern Literature · Writing in Astronomy · History of Books · Fiction Writing · Journalism & Storytelling

2015 – 2019 **Morris Hills High School | Magnet Program for Mathematics & Science**

Graduated as the valedictorian. Took courses in research and data analysis and completed an independent research project as part of the program.

Research Experience

Max Planck Institute for Astronomy · Fulbright Scholarship

Heidelberg, Germany ● September 2023 – July 2024

Annalisa Pillepich

Exploring the presence of supermassive black holes in jellyfish galaxies with the cosmological simulation IllustrisTNG, while auditing advanced astrophysics courses at Heidelberg University.

Caltech (TAPIR) Theoretical AstroPhysics Including Relativity and Cosmology

Pasadena, CA ● September 2019 – June 2023

Philip F. Hopkins

Explored black holes, dark matter, and galaxy evolution using state-of-the-art cosmological simulations, as part of the theoretical astrophysics group at Caltech as well as in summer internships.

Harvard & Smithsonian Center for Astrophysics · Prize Fellowship

Cambridge, MA ● June 2022 – August 2022

Francesca Civano, Laura Brenneman

Explored the co-evolution of AGN and their host galaxies by measuring the spins of accreting black holes. Utilized X-ray data from the *Chandra* Observatory.

Carnegie Observatories – Theoretical Astrophysics Center

Pasadena, CA ● June 2021 – August 2021

Andrew J. Benson

Investigated halo collapse in different dark matter theories using *N*-body numerical simulations and the semi-analytic model *Galacticus*.

Dark Cosmology Center – Niels Bohr Institute

Copenhagen, Denmark ● June 2020 – August 2020

Michaela M. Hirschmann

Analyzed the role of AGN feedback in quenching local, isolated dwarf galaxies with the cosmological simulation IllustrisTNG, combined with synthetic emission line models. Subsequently explored quiescence in early, massive galaxies in the simulations.

Summer Science Program in Astrophysics
Socorro, NM ● June 2018 – July 2018
Adam W. Rengstorf, William Andersen
Competitive high school summer program. Predicted the orbit of a potentially hazardous near-Earth asteroid with research-grade telescope. Ran numerical simulations to determine its chance of impact. Data published by the Minor Planet Center of the IAU.

Publications

On the origin of star-formation quenching in massive galaxies at $z \gtrsim 3$ in IllustrisTNG
S. Kurinchi-Vendhan, M. Farcy, M. Hirschmann, F. Valentino, November 2024, MNRAS, arXiv:2310.03083

What causes the formation of discs and end of bursty star formation?
P. F Hopkins et al. incl. S. Kurinchi-Vendhan, October 2023, MNRAS, arXiv:2301.08263

Collapse of Fuzzy Dark Matter in Simulations
S. Kurinchi-Vendhan, X. Du, A. J. Benson, May 2022, *Caltech Undergraduate Research Journal*.

Presentations and Talks

2024 — **GASPISA: Physical Processes Shaping the Stellar & Gaseous Histories of Galaxies – Poster Presentation + Flash Talk in Pisa, Italy**
"Star Formation, Quenching, and AGN Activity in IllustrisTNG at High Redshifts and in Dense Environments"

2021 – 2023 — **American Astronomical Society Meeting Poster Sessions** · Award
AAS 240: "The Spherical Collapse of Fuzzy Dark Matter in 3-D Simulations"
AAS 241: "The Role of Black Hole Feedback in Quenching Simulated Dwarf Galaxies"

2020 – 2022 — **Caltech Summer Undergraduate Research Fellowship Seminar Day** · Award
"Black Holes and the Death of Galaxies: An Exploration with Simulations"
"The Spherical Collapse of Fuzzy Dark Matter in 3-D Simulations"
"Connecting Galaxy Evolution to Black Hole Spin with the *Chandra* X-Ray Telescope"

2022 — **Southern California Conference in Undergraduate Research**
"Connecting Galaxy Evolution to Black Hole Spin with the *Chandra* X-Ray Telescope"

Honors and Awards

2023 — **Fulbright Scholarship – U.S. Student Award to Germany**
Prestigious grant for scholars, journalists, and students to engage in research projects and cultural diplomacy abroad.

2023 — **National Science Foundation Graduate Research Fellowship Program**
Awarded, but declined. Five-year fellowship that provides financial support to outstanding graduate students who have demonstrated the potential to be high-achieving scientists.

2023 — **AAS 241 Chambliss Astronomy Achievement Student Award**
For presenting exemplary research at the poster session of the American Astronomical Society meeting.

2023 **Paul Studenski Memorial Prize**
Travel award to explore England and study the history and literature of early-modern female writers, and to do creative writing of my own.

2022 **Samuel N. Vodopia and Carol J. Hasson SURF Fellow**
For designing an outstanding summer research proposal.

2022 **Margie Lauritsen Leighton Prize**
Presented to a Caltech undergraduate woman in physics/astronomy for academic excellence and leadership.

2022 **Hallett Smith Prize in Literature**
Outstanding critical essay: "*Middlemarch* by George Eliot: Dorothea the Dryad."

2021 **Doris S. Perpall Speaking Award – 2nd Place**
Selected from over 250 students for presenting research on Caltech's SURF Seminar Day, for excellence in communication skills. *Semi-finalist in 2020 and finalist in 2022.*

Teaching and Outreach

2024 **"How Do the Tails of Jellyfish Galaxies Form?" STRUCTURES Blog Post**
Collaborated with Eric Rohr and Elad Zinger on a science education article.

2023 – 2024 **Science Education and Outreach as a U.S. Fulbright Student in Germany…**
- **Astronomy Month at the Deutsch-Amerikanisches Institute in Heidelberg:** Prepared talks and organized a storytelling program for children with astronomy themed picture books, crafts, and family activities.
- **MeetUS:** Lead classroom discussions about culture & education in the United States and different parts of the world at a vocational school for young women.
- **Reach the World:** Shared my travel experiences with K-12 classrooms in New York City through writing articles for a blog and video conferences.

2019 – 2023 **Teaching at Caltech…**
- **Physics Teaching Assistant – Waves, Quantum Physics, and Statistical Mechanics:** Graded and designed solutions for homework sets; addressed student feedback.
- **Hixon Writing Center:** Lead small group workshops and one-to-one meetings with students to help improve their writing across humanities and STEM disciplines. Trained in giving advice for academic writing.

2022 **Theater Production at the Festival of Wonder – Museo delle Scienze in Italy**
"The Feminist Birth of Climate Science," a collaboration with the University of Trento.

2021 – 2023 **Reading Partners**
Worked one-to-one with K-4th grade students who are behind grade-level to teach literacy skills and encourage life-long confidence in reading.

2019 – 2023 **Storytelling for Scientists**
Performed narratives about my passion for science with the Los Angeles community.
- "The Feminine Mystique in Astronomy"
- "Saturn and Desert Mice"