

Lucien Tsai

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Education

- **Princeton University**, Princeton, NJ *Aug 2024 ... Expected May 2029*
 - Joint Ph.D. in Civil and Environmental Engineering & Materials Science, GPA 3.55/4
 - *Relevant Coursework*: Statistical Mechanics, Random Heterogeneous Materials, Materials Characterization, Engineering Math, Differential Geometry, Scientific Computing
- **Harvey Mudd College**, Claremont, CA *Aug 2020 ... May 2024*
 - B.S. in Applied Physics, GPA 3.85/4
 - Departmental Honors in Physics, Graduated with High Distinction

Selected Honors & Awards

Graduate

- **NSF Graduate Research Fellowship**, \$37,000 awarded annually for 3 years *Jun 2025*
- **Gordon Y.S. Wu Graduate Fellowship**, selected by the Dean of Engineering on admission *Mar 2024*

Undergraduate

- **Jon A. Wunderlich Prize**, for creative achievement in physics, departmental award *May 2024*
- **Astronaut Scholar**, 68 students selected nationally, \$15,000 awarded *May 2023*
- **Friends of UTokyo Scholarship Recipient**, for international research at UTokyo, \$2,000 awarded *Apr 2023*
- **University Physics Competition Gold Medalist**, top 1.9% of papers selected internationally *Jan 2022*

Academic Research

Graduate

- **Paulino Group, Princeton University** *Aug 2024 ... Ongoing*
Graduate Researcher, Advisor: Prof. Glaucio H. Paulino, Dept. of Civil and Environmental Engineering
 - Designing disordered network metamaterials with tunable isotropic and anisotropic mechanical properties
 - Leveraging topology optimization to design lightweight yet stiff multiscale structures with the continuous embedding of the homogenized metamaterial microstructures

Undergraduate

- **Bassman Research Group, Harvey Mudd College** *Aug 2023 ... May 2024*
Thesis Student, Advisor: Prof. Lori Bassman, Dept. of Engineering
 - Characterized the preferential formation of isolated manganese regions in the CuZnMn brass system using atomistic simulations
 - Used density functional theory for energy computations, cluster expansions for computational acceleration, and Monte Carlo simulations for finite temperature studies
- **Physics of Soft Matter Lab, Harvey Mudd College** *Jun 2020 ... May 2024*
Undergraduate Researcher, Advisor: Prof. Mark Ilton, Dept. of Physics
 - Discovered the significant decrease in the energy efficiency of viscoelastic materials (synthetic elastomers and biological tendons) from highly rate-asymmetric stretching using a dynamic mechanical analyzer
 - First author paper published in the *Journal of the Royal Society Interface*
- **Mayumi Laboratory, University of Tokyo** *Jun 2023 ... Aug 2023*

UTSIP Student, Advisor: Prof. Koichi Mayumi, Institute for Solid State Physics

- Designed the synthesis of tough and highly stretchable hydrogels based on κ -carrageenan polysaccharide with chemical crosslinks
- Discovered the strain-induced orientation of the hydrogel's double helical aggregates as the primary toughening mechanism under macroscopic deformation using small and wide X-Ray scattering

- Lawrence Livermore National Laboratory

Jun 2022 ... Aug 2022

MaCI Intern, Advisor: Dr. Elwin Hunter Sellars, Materials Science Division

- Investigated the formation of cylindrical micelles from triblock copolymers under varying physical and chemical conditions as a template for SBA-15 mesoporous silica
- Characterized pore sizes, pore lengths, and particle morphologies using Brunauer–Emmett–Teller analysis and scanning electron microscopy

Teaching & Mentorship

- Summer Science Program, Teaching Assistant & Residential Mentor

Jun 2024 ... Aug 2024

- Mentored 36 rising high school seniors in their research project to determine the orbits of near-Earth asteroids for six weeks at New Mexico State University
- Trained individual teams on operating the Tortugas Mountain Observatory telescope and performing observations
- Assisted in teaching students the astronomy, physics, math, and python related to their research
- Supervised field trips, organized social events, and facilitated residential life

- Advanced Mechanics & Wave Motion (Physics 24A), Teaching Assistant

Jan 2024 ... May 2024

- Electromagnetic Theory & Optics (Physics 51), Teaching Assistant

Aug 2023 ... Dec 2023

- Mechanics & Wave Motion (Physics 24), Teaching Assistant

Jan 2023 ... May 2023

Skills

Experimental

- • • • • Dynamic Mechanical Analysis, Thermal Analysis, Surface Area Analysis, Scanning Electron Microscopy, Injection Molding, Instrumentation Design
- • • • • Small & Wide Angle X-Ray Scattering, Rheometry

Computational

- • • • • MATLAB, Python, Computer-Aided Design, Finite Element Analysis, Sensitivity Analysis, Principal Component Analysis, Cluster Expansions
- • • • • Unix, Density Functional Theory, Genetic Algorithm

Publications

1. **L. Tsai**, P. Navarro, S. Wu, T. Levinson, E. Mendoza, M. J. Schwaner, M. A. Daley, E. Azizi, M. Ilton, Viscoelastic materials are most energy efficient when loaded and unloaded at equal rates. *J. R. Soc. Interface* **21**, 2120230527 (2024)
2. C. Cabrera, B. Schussheim, A. Wu, R. Mittal, **L. Tsai**, A. Guler, M. Hall, Summer Science Program in Biochemistry - Characterization of the Cdc14 phosphatase homolog from *Claviceps purpurea*. *Purdue University Research Repository* (2020). <https://doi.org/10.4231/8RG5-FN11>.

Presentations

1. **L. Tsai**, G. H. Paulino, Disordered Network Metamaterials with Optimally Tailored Mechanics. *16th World Congress of Structural and Multidisciplinary Optimization* (2025). Kobe, Japan.
2. **L. Tsai**, P. Navarro, S. Wu, T. Levinson, E. Mendoza, M. J. Schwaner, M. A. Daley, E. Azizi, M. Ilton, Viscoelastic

materials are most energy efficient when loaded and unloaded at equal rates. *American Physical Society March Meeting* (2024). Minneapolis, MN.

3. **L. Tsai**, P. Navarro, M. Ilton, Viscoelastic materials are most energy efficient when loaded and unloaded at equal rates. *American Physical Society March Meeting* (2023). Las Vegas, NV.
4. **L. Tsai**, P. Navarro, M. Ilton, The Asymmetrical Stretching of Elastomers. *Frontiers in Soft Matter and Macromolecular Networks Symposium* (2022). San Diego, CA.