

# Lucien Tsai

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## Education

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- × **Princeton University**, Princeton, NJ *Aug 2024 ··· Expected May 2029*
  - Ph.D. Candidate in Civil and Environmental Engineering & Materials Science, GPA 3.75/4
  - *Relevant Coursework*: Structural Optimization, Statistical Mechanics, Random Heterogeneous Materials, Materials Characterization, Tensor Calculus, 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

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### 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

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### Graduate

- × **Paulino Research 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  $\kappa$ -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

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× **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

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× **Experimental**

- Dynamic Mechanical Analysis, Electron Microscopy, X-Ray Scattering, Rheometry, Instrumentation Design

× **Computational**

- MATLAB, Python, Mathematical Programming, FEM, DFT, CAD

## Publications

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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)

## Presentations

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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.