

Jack Yu

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EDUCATION

California Institute of Technology · Pasadena, CA Expected Jun. 2029
B.S. Physics · GPA: 4.1

Albuquerque Academy · Albuquerque, NM 2020 – 2025

EXPERIENCE

William N. Lacey SURF Research Fellow — Cushing Lab · Caltech Summer 2026
Pasadena, CA

- Modeled lattice anharmonicity in Na_3PS_4 using density functional theory (DFT) to investigate ion transport mechanisms.
- Designed and integrated a thermoelectric temperature-controlled stage for Laser-driven Ultrafast Impedance Spectroscopy (LUIS) to enable temperature-dependent studies of phonon-mediated ion transport.

Student Researcher — Experimental Gravity Group (EGG) · Caltech Jan 2026 – Present
Pasadena, CA

- Designed and simulated experimentally viable non-Gaussian photonic quantum states using Strawberry Fields (TensorFlow backend) and QuTiP.
- Formulated and optimized high-dimensional optical circuit parameters for multi-mode beam splitter and squeezer networks under realistic photon-loss and noise models.
- Accelerated large-scale optimization by leveraging Caltech's high-performance computing cluster to parallelize computationally intensive parameter searches and fidelity evaluations.

Optoelectronics Intern · Sandia National Laboratories — III-V Photonics Center Jun 2024 – Sep 2025
Albuquerque, NM

- Conducted R&D for the DARPA H6 program, developing and characterizing a piezo-tunable etalon for chip-scale atomic clocks through frequency stability and noise analysis.
- Characterized VCSELs using probe-station measurements and device modeling to optimize laser performance.
- Designed, constructed, and characterized a Littman-Metcalf external cavity diode laser (ECDL) for AR coating evaluation.

PROJECTS

Hexagonal Non-Gaussian State Generation · Python, QuTiP, Strawberry Fields 2026
Caltech EGG

- Designed and optimized multi-mode photonic circuits to generate a target non-Gaussian quantum state.
- Parameterized circuit architecture, squeezing profiles, and mode allocations to maximize fidelity under photon loss.
- Implemented high-dimensional numerical optimizations and large-scale quantum state simulations in Python.

External Cavity Diode Laser (ECDL) System · SolidWorks, Python 2024 – 2025
Sandia National Labs

- Designed and constructed a Littman-Metcalf ECDL for AR-coating characterization; machined custom flexure mounts.
- Developed measurement protocols for frequency stability and mode-hop-free tuning characterization; modeled vacuum-compatible optomechanical components in SolidWorks.

PUBLICATIONS

D. K. Serkland, A. J. Grine, P.-S. Wong, **Jack Yu**. *Noise Characterization of VCSELs for Atomic Clocks and Magnetometers*. Proceedings of SPIE, Vol. PC13911, Vertical-Cavity Surface-Emitting Lasers XXX, 2026.

TECHNICAL SKILLS

Programming & Tools	Python, Java, Git, LaTeX, MATLAB
Quantum Simulation	QuTiP, Strawberry Fields, Quantum Optics Modeling, Numerical Optimization
Scientific Computing	NumPy, SciPy, PyTorch, TensorFlow, DFT
Engineering & CAD	SolidWorks, KiCad, PCB Design, 3D Printing, Manual Machining
Experimental Laboratory	Optical Alignment, Laser Characterization, VCSEL Testing, Instrumentation Control

SELECTED AWARDS

- AIME Qualifier** — American Mathematics Invitational Examination
- NISCA All-American** — Top 100 in the US, 200 Medley Relay, Jun 2025

EXTRACURRICULARS

NCAA Division III Varsity Swim Team · Caltech 2025 – Present

Chamber Music Ensemble (Piano) · Caltech Present