

# STEPHANIE KWAN

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## EDUCATION

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### Princeton University

July 2018 -

*PhD in Experimental High-Energy Physics*

- Anticipated thesis work on the Compact Muon Solenoid at CERN and the PTOLEMY experiment for detecting cosmic relic neutrinos in Gran Sasso, Italy, with a special focus on developing cutting-edge detector triggers in hardware and software to search for signals of new physics.
- Awarded the National Science Foundation Graduate Research Fellowship (NSF GRFP) in April 2019.

### California Institute of Technology

September 2014 - June 2018

*B.Sc Physics*

- Conducted three Summer Undergraduate Research Fellowships (SURFs) and research for credit during junior and first quarter of senior year.
- Relevant advanced coursework: Introduction to Particle Physics, Relativistic Quantum Field Theory (ongoing), Analog Electronics for Physicists, Senior Physics Laboratory Electronics track, Advanced Experimental Physics Design in Quantum Optics (winter quarter).
- Grading TA for Ph 2bc (Quantum Mechanics and Statistical Mechanics for non-physics majors) during senior year winter and spring quarters.

## SKILLS

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<b>Proficient</b>	Python, LaTeX
<b>Intermediate</b>	C, ROOT, Bash, Mathematica, Analog electronics
<b>Beginner</b>	C++, Vivado High-Level Synthesis

## RESEARCH EXPERIENCE

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### Research with Princeton CMS Group

July 2018-current

*Advisors: Prof. Isobel Ojalvo, Prof. Chris Tully*

- Developing novel high-speed, low-cost hardware implementations of machine learning algorithms to identify tau leptons at CMS's Level 1 Trigger in the High-Luminosity LHC.
- Analyzing raw data files to extract physics parameters of interest, and training multivariate analyses such as Boosted Decision Trees and Artificial Neural Networks using CMS's ROOT software.
- Implementing and optimizing multivariate analysis techniques on custom FPGA electronics using Vivado's High-Level Synthesis design suite.

### Research with Caltech CMS Group

July 2017-March 2018

*Advisors: Prof. Maria Spiropulu, Dr. Cristían Peña, Dr. Si Xie*

- Modified existing inclusive search for electroweak R-parity conserving supersymmetry using Razor variables in Higgs to diphoton decays produced in association with jets in proton-proton collisions at  $\sqrt{s} = 13$  TeV, to have event categories based on lepton multiplicity in final state
- Wrote and troubleshooted code in C++ and ROOT to extend a prior search to include event categories with leptons in final states

- Demonstrated improved signal sensitivity in leptonic search compared to inclusive search by plotting expected limits on supersymmetric particle production cross-sections
- Wrote new event selection code combining the inclusive and purely leptonic searches

### Research in Time-Domain Astronomy

July 2016-April 2018

*Advisors: Prof. Mansi Kasliwal, Dr. Ryan Lau, Jacob Jencson*

- Performed detailed case study of IC 10 X-2, a unique high-mass X-ray binary discovered for its high-amplitude, fast X-ray flares
- Created plots of X-2's time-domain properties using archival telescope data and literature, and performed various statistical analyses in Python
- Observed X-2 using the Palomar 200-Inch Telescope Wide-field Infrared Camera and TripleSpec instruments
- Prepared manuscript for 3 to 6 hours per week during junior year, developing hypothesis that IC 10 X-2 hosts a Luminous Blue Variable companion star
- Manuscript published in The Astrophysical Journal April 2018

### Summer Research in Applied Physics/Material Science

July 2015-September 2015

*Advisors: Prof. Harry A. Atwater, Dr. Sunita Darbe*

- Investigated high-refractive index high contrast gratings (HCGs) as replacements for the costly Bragg reflectors in the Atwater Group's ultra-high efficiency spectrum-splitting solar cell
- Developed original geometries for repeated elements in HCGs, based on considerations of Mie resonances and constraints of Atwater solar cell
- Used Synopsys RSoft electromagnetic wave simulations to model original HCG designs, with the goal of achieving high reflectivity in 200-nm bandwidths
- Optimized original HCG designs with systematic sweeps over tunable grating parameters

## PUBLICATIONS

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- **S. Kwan**, R.M. Lau, J. Jencson, M.M. Kasliwal, M. Boyer, E. Ofek, F. Masci, R. Laher. (2018) "An Optical and Infrared Time-Domain Study of the Supergiant Fast X-ray Transient Candidate IC 10 X-2." *ApJ* 856:38.

## HONORS AND AWARDS

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- Awarded the National Science Foundation's Graduate Research Fellowship Program (NSF GRFP) from 2020-2025, for research with the CMS Experiment.
- Awarded Princeton's James M. '91 and Teresa M. S. '91 Graduate Fellowship Fund for first year of study.
- Awarded Princeton's Joseph Henry Merit Award for first year of graduate study.
- Awarded Caltech's Center for Diversity Women Mentoring Women (WMW) 2018 Helen McBride Outstanding Mentee Award.
- Awarded the Caltech Y. Harry Gray and Patrick Hummel Travel Fund for travel to APS April Meeting 2018.
- Astronomy SURF project with Prof. Kasliwal was selected for funding from the Flintridge Foundation.
- High-energy physics SURF project with Prof. Spiropulu was selected for funding from the Caltech Associates.

## PRESENTATIONS

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- "Search for Supersymmetry With Razor Variables in Higgs to Diphoton Decays Produced in Association with Leptons and Jets in Proton-Proton Collisions at  $\sqrt{s} = 13$  TeV" **S. Kwan**, J. Mao, C. Peña, S. Xie, M. Spiropulu. APS April Meeting in Columbus, Ohio. April 2018.
- "Developing High-Contrast Gratings for Spectrum-Splitting Multijunction Photovoltaics." **S. Kwan**, S.

Darbe, H.A. Atwater. APS Conference for Undergraduate Women in Physics in UC San Diego. January 2016.

- “The Mid-IR Counterpart of IC 10 X-2: A Supergiant High-Mass X-Ray Binary.” **S. Kwan**, M.M. Kasliwal, R.M. Lau, J. Jencson. Southern California Conference for Undergraduate Research at UC Riverside. November 2016.

## EXTRACURRICULAR ACTIVITIES

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- Organizing networking and mentorship events during the semester with the Princeton Women in Physics (WiP) group, including two workshops with Princeton Undergraduate Women in Physics (UWiP) on applying to graduate programs, and a professional development event with a panel of postdoctoral researchers (September 2018 - current).
- Member of the 2019 Physics Graduate Open House Committee, responsible for organizing and facilitating visits of prospective graduate students (January - April 2019).
- Representative on the Physics Graduate Committee, which meets annually with the Physics Dean of Graduate Studies to discuss suggestions and concerns at the graduate level (October 2018 - current).
- Mentor and mentee with the 2018-19 mentorship programs of UWiP and Princeton Society for Physics Students (September 2018 - May 2019).
- Caltech Center for Diversity Women Mentoring Women program, mentor and mentee (October 2017 - June 2018).
- Health Advocate with American Red Cross Emergency Medical Responder training (September 2016 - June 2018)