

Abel Lawrence Peirson

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Education

Stanford University — *Ph.D in Physics* 2017 - 2023
Thesis: High Energy Polarization Statistics and Geometry.
GPA: 4.0 (in required coursework).

University of Oxford — *MPhys in Physics* 2017
First Class Honours with Distinction – top 10% of graduating class.
College: Christ Church

Fellowships, Honors & Awards

Stanford Data Science Scholar (\$100k+) — Stanford, USA 2021

Future Investigator in NASA Earth and Space Science and Technology (\$160k+) — Stanford, USA 2019

Roach Prize for the most outstanding undergraduate across the sciences — Oxford, UK 2017

Hooke Prize for the most outstanding member of Christ Church in the sciences — Oxford, UK 2017

Oxford International Strategy Scholarship — Oxford, UK 2016

Christ Church Academic Scholarship — Oxford, UK 2014-2017

Gold, British Physics Olympiad — London, UK 2013

Research

Kavli Institute for Particle Astrophysics and Cosmology — Stanford University, CA *July 2018 - Present*
with Prof. Roger Romani

- Set current state of the art in X-ray polarization recovery by developing novel computer vision techniques.
- Improved NASA IXPE polarization sensitivity by > 30% (Code adopted as official data analysis pipeline).
- Created fast quadratic program + nested sampling approach to fit gravitational microlenses.
- Designed testable (and fittable) emission models to explain observed polarization phenomena in relativistic jets.

Wu Tsai Neurosciences Institute — Stanford University, CA *Mar 2018 - Jun 2018*
with Prof. Shaul Druckmann

- Developed biologically inspired recurrent neural network to reproduce path integration in the drosophila fly brain.

NeuroAI Lab — Stanford University, CA *Dec 2017 - Mar 2018*
with Prof. Dan Yamins

- Found transfer-learning certain affine transformations of images does not improve accuracies in object classification, using RotNet and ImageNet datasets.

Department of Physics — University of Oxford, UK *Sep 2016 - May 2017*
with Prof. Garret Cotter

- Modelled blazar spectra and investigated how they change travelling across different intergalactic media.
- Placed limits on whether the Cherenkov Telescope Array will constrain the existence of axion-like particles.

CLIC Test Facility — CERN, Switzerland *June - Aug 2016*
with Prof. Philip Burrows

- Used beam dispersion to improve CTF3's Quadrupole scan and reduce uncertainty in the beam energy spread.
- Designed and implemented new fitting program to enhance beam analysis pipeline.

Plasma and Fusion Laboratory — University of Science and Technology of China, Hefei *June - Aug 2015*
with Prof. Xuan Sun

- Improved plasma confinement in the KMAX axisymmetric tandem mirror machine by applying a bias voltage.

Selected Experience & Outreach

- G-Research** — London, UK June - Sep 2021
Quantitative Researcher
- Quantitative research intern working on forecasting capital markets.
- Peirson & Freedman** — Stanford, CA Aug 2018 - Present
Co-founder
- Conceived and designed iOS app [Dank Learning](#) that uses neural networks to generate memes.
- Wonderfest** — Bay Area, CA June 2019 - June 2020
Science Envoy
- Selected as one of 10 graduate students from Stanford and Berkeley.
 - Communicated science to public audiences as part of the Bay Area-wide Wonderfest program
- Stanford Diversity and First Generation Office** — Stanford, CA Oct 2018 - Oct 2020
First Generation and Low Income Student Mentor
- Mentoring undergraduates from underprivileged backgrounds in all matters of student life.

Selected Invited Talks

- Optimal Signal Extraction for IXPE and an Application to Blazars*, Naval Research Laboratory Colloquium, 2021
- Towards Optimal Signal Extraction for IXPE*, Third Science Collaboration Meeting (SCM03), 2021
- The Polarization Behavior of Synchrotron Self-Compton Emission in Blazars*, Understanding the Multiwavelength Blazar Variability - Workshop, Stanford, 2019
- AI in Design, Used Future: Symposium by Current Obsession*, Pratt Institute NY, 2018
- [Episode 68, The NVIDIA AI Podcast](#), 2018

Telescope & Computing Allocations

- ALMA** — *High-frequency radio observations of IXPE targets*, 7-14 day (Co-I) 2021
- Nordic Optical Telescope** — *Multi-band polarization observations of IXPE targets*, 87ks (Co-I) 2021
- NuStar** — *Multi-Energy X-ray observations of IXPE blazar targets*, 140ks (Co-I) 2021
- Swift** — *Monitoring IXPE blazar targets with Swift*, 240ks (Co-I) 2020
- Google Cloud Platform** — *Parametric Density Estimation with Uncertainty using Deep Ensembles*, \$1000 2020
- XMM-Newton** — *Exploring the Synchro-Compton transition in CGRaBS J0211+1051*, 57ks (Co-I) 2019

Open Source Software (★494+)

- MulensModel**: Python package for modelling gravitational microlensing events. [[Code](#)][[Paper](#)][[Webpage](#)]
- SSCpol**: Polarized relativistic jet simulation in C with Python wrapper. [[Code](#)][[Paper](#)]
- Dank Learning**: 'Show and Tell' image captioning for meme generation in Tensorflow. [[Code](#)][[Paper](#)][[Webpage](#)]
- Software skills (extensive)*: Python — C/C++ — PyTorch — Tensorflow

Graduate Coursework

- **APPHYS293** (Theoretical Neuroscience)
- **CS379C** (Computational Models of the Neocortex)
- **CS238** (Decision Making Under Uncertainty)
- **STATS207** (Time Series)
- **CS224N** (Natural Language Processing)
- **CS230** (Deep Learning)
- **CME212** (Advanced Software Development)
- **EE364a & b** (Convex Optimization I & II)
- **PHYS266** (Statistical Methods in Physics)
- **CS106b** (Programming Abstractions)
- **CS361** (Engineering Design Optimization)
- **EE263** (Linear Dynamical Systems)

Teaching

Stanford PHYS113 — *Computational Physics* (Teaching Assistant and Lecturer)

Winter 2021

Stanford PHYS100 — *Introduction to Observational Astrophysics* (Teaching Assistant)

Spring 2019

Peer-Reviewed Publications

[9] *A Deep Ensemble Approach to X-ray Polarimetry*

A.L.Peirson, R.W.Romani [Neurips ML4PS workshop](#), 2021

[8] *New Tests of Millilensing in the Blazar PKS 1413+135*

A.L.Peirson, I.Liodakis, A.C.S.Readhead et al. [ApJ](#), 2021 (Accepted)

[7] *Towards Optimal Signal Extraction for Imaging X-ray Polarimetry*

A.L.Peirson, R.W.Romani. [ApJ](#), 920, 40, 2021

[6] *The Relativistic Jet Orientation and Host Galaxy of the Peculiar Blazar PKS 1413+135*

A.C.S.Readhead et al. [ApJ](#), 907, 61, 2020

[5] *Deep Ensemble Analysis for Imaging X-ray Polarimetry*

A.L.Peirson, R.W.Romani, H.L.Marshall, J.F.Steiner, L.Baldini. [NIMA](#), 986, 2020

[4] *The Polarization Behavior of Relativistic Synchrotron Self-Compton Jets* [[Code](#)]

A.L.Peirson, R.W.Romani. [ApJ](#), 885, 1, 2019

[3] *Prospects for Detecting X-ray Polarization in Blazar Jets*

I.Liodakis, A.L.Peirson, R.W.Romani. [ApJ](#), 880, 1, 2019

[2] *The Polarization Behavior of Relativistic Synchrotron Jets*

A.L.Peirson, R.W.Romani. [ApJ](#), 864, 2, 2018

[1] *Transverse Beam Phase-Space Measurement Experience at CTF3*

D.Gamba, L.Martin, A.L.Peirson Serratos et al. [IPAC2017](#), 2017

Whitepapers & Other Publications

[3] *Neural Network Analysis of X-ray Polarimeter Data*

A.L.Peirson, *The Handbook of X-ray and Gamma Ray Astrophysics*, Springer Nature, 2022

[2] *The X-ray Polarization Probe Mission Concept*

K.Jahoda et al. *Decadal Survey on Astronomy and Astrophysics*, [1907.10190](#), 2020

[1] *Dank Learning: Generating Memes Using Deep Neural Networks* [[Code](#)][[Techcrunch](#)][[The Next Web](#)]

A.L.Peirson, E.M.Tolunay, [1806.04510](#), 2018