

Abel Lawrence Peirson

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Education

- Stanford University** — *Ph.D in Physics* 2017 - Sep 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 using Bayesian deep learning and computer vision.
 - 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 in relativistic plasma 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

- Google Research, Brain Team** — Mountain View, CA June - Sep 2022
Student Researcher
- Working with Rohan Anil and Ehsan Amid on practical optimization for deep learning.
- 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 RNNs 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

Selected Invited Talks

- Tests of gravitational milli-lensing in the blazar PKS 1413+135*, Max Planck Institute for Radio Astronomy, 2022
- 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**: Python — C/C++ — PyTorch — JAX — 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)
- **AA 214** (Numerical Methods for Compressible Flows)
- **CS361** (Engineering Design Optimization)
- **EE263** (Linear Dynamical Systems)

Teaching

Stanford PHYS113 — *Computational Physics* (Lecturer and Teaching Assistant)
Stanford PHYS100 — *Introduction to Observational Astrophysics* (Teaching Assistant)

Winter 2021
Spring 2019

First and Co-Authored Publications

Testing High-Energy Emission Models for Blazars with X-ray Polarimetry
A.L.Peirson, I.Liodakis, R.W.Romani [ApJ](#), 931, 59, 2022

A Deep Ensemble Approach to X-ray Polarimetry
A.L.Peirson, R.W.Romani [Neurips ML4PS workshop](#), 2021

New Tests of Millilensing in the Blazar PKS 1413+135
A.L.Peirson, I.Liodakis, A.C.S.Readhead et al. [ApJ](#), 927, 24, 2022

Towards Optimal Signal Extraction for Imaging X-ray Polarimetry
A.L.Peirson, R.W.Romani. [ApJ](#), 920, 40, 2021

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

The Polarization Behavior of Relativistic Synchrotron Self-Compton Jets [Code]
A.L.Peirson, R.W.Romani. [ApJ](#), 885, 1, 2019

Prospects for Detecting X-ray Polarization in Blazar Jets
I.Liodakis, A.L.Peirson, R.W.Romani. [ApJ](#), 880, 1, 2019

The Polarization Behavior of Relativistic Synchrotron Jets
A.L.Peirson, R.W.Romani. [ApJ](#), 864, 2, 2018

Dank Learning: Generating Memes Using Deep Neural Networks [Code][Techcrunch][The Next Web]
A.L.Peirson & E.M.Tolunay, [1806.04510](#), 2018

Publications

Polarized X-rays from a magnetar
R.Taverna, et al. (IXPE collaboration, incl. A.L.Peirson) [Science](#), submitted, 2022

X-ray polarization detection of Cassiopeia A with IXPE
J.Vink, et al. (IXPE collaboration, incl. A.L.Peirson) [ApJ](#), accepted, 2022

Angling for X-ray pulsar geometry with polarimetry
V.Doroshenko, et al. (IXPE collaboration, incl. A.L.Peirson) [Nature Astronomy](#), accepted, 2022

Polarized X-rays Constrain The Disk-Jet Geometry in a Black Hole X-ray Binary
H.Krawczynski, et al. (IXPE collaboration, incl. A.L.Peirson) [Science](#), submitted, 2022

Simultaneous space and phase resolved X-ray polarimetry of the Crab Pulsar and Nebula
N.Bucciantini, et al. (IXPE collaboration, incl. A.L.Peirson) [Nature Astronomy](#), accepted, 2022

Limits on X-ray Polarization at the Core of Centaurus A as Observed with the Imaging X-ray Polarimetry Explorer
S.R.Ehlert, et al. (IXPE collaboration, incl. A.L.Peirson) [ApJ](#), accepted, 2022

The Relativistic Jet Orientation and Host Galaxy of the Peculiar Blazar PKS 1413+135
A.C.S.Readhead et al. (incl. A.L.Peirson) [ApJ](#), 907, 61, 2020

Transverse Beam Phase-Space Measurement Experience at CTF3
D.Gamba, L.Martin et al. (incl. A.L.Peirson Serratos) [IPAC2017](#), 2017

Whitepapers & Textbooks

Neural Network Analysis of X-ray Polarimeter Data
A.L.Peirson, *The Handbook of X-ray and Gamma Ray Astrophysics*, [Springer Nature](#), 2022

The X-ray Polarization Probe Mission Concept
K.Jahoda et al. (incl. A.L.Peirson) *Decadal Survey on Astronomy and Astrophysics*, [1907.10190](#), 2020