

Abel Lawrence Peirson

Kavli Institute for Particle Astrophysics and Cosmology, Stanford CA 94305

✉ alpv95@stanford.edu [in](https://www.linkedin.com/in/abel-lawrence-peirson-v) [abel-lawrence-peirson-v](https://www.linkedin.com/in/abel-lawrence-peirson-v)
🌐 www.alpeirson.com [github](https://www.github.com/alpv95) www.github.com/alpv95
🆔 orcid.org/0000-0001-6292-1911

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
Student Researcher

June - Sep 2022

- Working with Rohan Anil and Ehsan Amid on practical optimization for deep learning.

G-Research — London, UK
Quantitative Researcher

June - Sep 2021

- Quantitative research intern working on forecasting capital markets.

Peirson & Freedman — Stanford, CA
Co-founder

Aug 2018 - Present

- Conceived and designed iOS app [Dank Learning](#) that uses RNNs to generate memes.

Wonderfest — Bay Area, CA
Science Envoy

June 2019 - June 2020

- 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

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