Alexander Madurowicz, PhD

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EDUCATION

Doctor of Philosophy in Physics   Fall 2017 — Spring 2023
    Stanford University
    GPA: 3.9
    Thesis: Universal Optical Instrumentation for Exoplanet Atmospheres
        Full PDF Document   Video of Defense Presentation

Bachelor of Arts in Physics   Fall 2013 — Spring 2017
    University of California Berkeley
    GPA: 3.9
    Olsen's Scholarship Recipient   2015 — 2016
    Deans Honors   Spring 2014

RESEARCH EXPERIENCE

Graduate Research Assistantship   Fall 2017 — Spring 2023
    Stanford University
    - Designed and executed multiple independent and collaborative research projects
resulting in multiple first author publications
    - Utilized distributed supercomputer resources to analyze large datasets and run
expensive computational models
    - Traveled to remote locations to perform astronomical observations on site

Research Assistant   Summer 2015 — Spring 2017
    Lawerence Berkeley National Laboratory
    - Designed, built, and tested an inductive thermometer for a cryogenic half-wave plate
    - Refurbished microKelvin cryogenic dewar
    - Designed and built close circuit water cooling system for helium compressor

PUBLICATIONS

The Infrared Colors of 51 Eridani b: Micrometeoroid Dust or Chemical Disequilibrium?
    The Astronomical Journal, Volume 165, Number 6 (2023).

Integral Field Spectroscopy with the Solar Gravitational Lens
    The Astrophysical Journal Volume 930 Number 1 (2022).

Resolving Exo-Continents with Einstein Ring Deconvolution
    arxiv:2003.13918

GPI 2.0: Optimizing Reconstructor Performance in Simulations and Preliminary Contrast
Estimates
    Proceedings of SPIE Volume 11448, Adaptive Optics Systems VII; 114482H (2020).

Asymmetries in adaptive optics point spread functions
    J. of Astronomical Telescopes, Instruments, and Systems, 5(4), 049003 (2019).

Characterization of lemniscate atmospheric aberrations in Gemini Planet Imager Data
    Proceedings of SPIE Volume 10703, Adaptive Optics Systems VI; 107036E (2018).

PRESENTATIONS and CONFERENCE POSTERS

UC Berkeley Center for Integrative Planetary Science Seminar   November 2023
    Forthcoming invited talk regarding the solar gravitational lens

Spirit of Lyot   2022
        Poster for "Integral Field Spectroscopy for the Solar Gravitational Lens"

SPIE Astronomical Telescopes and Instrumentation Adaptive Optics Systems VII   2020
        Presentation on "GPI 2.0: optimizing reconstructor performance in simulations and
preliminary contrast estimates"
        Virtual Presentation Video

Adaptive Optics for Extremely Large Telescopes 6   2019
        Poster for "Asymmetries in adaptive optics point spread functions"

SPIE Astronomical Telescopes and Instrumentation Adaptive Optics Systems VI   2018
        Poster for "Characterization of lemniscate atmospheric aberrations in Gemini Planet
Imager Data"

Annual Meeting of the American Physical Society   April 2017
        Presentation on "Development of an Inductively Coupled Thermometer for a Cryogenic
Half-Wave Plate"
        Award: "Best Undergraduate Presentation"

TEACHING and MENTORING
Teaching Assistantship   Winter 2022
        Stanford University Physics 23 "Electricity, Magnetism, and Optics"
        - Standard introductory course assistantship involving hosting discussion session with
practice problems, office hours for special help, and grading homework and exams

Teaching Assistantship   Winter 2021
        Stanford University Physics 16 "The origin and development of the cosmos"
        - Similar assistantship with greater flexibility in designing customized discussion
problems and materials

Teaching Assistantship   Fall 2018
        Stanford University Physics 15 "Stars and Planets in a Habitable Universe"
        - Similar to Physics 15 with a different astrophysical focus

Undergraduate Mentorship   Summer 2021 — Summer 2022
        For Avi Kaplan-Lipkin
        Publication: Multiwavelength Mitigation of Stellar Activity in Astrometric Planet Detection
        The Astronomical Journal, Volume 163, Number 5
        Involved regular meetings, introductory test problems, literature review, sharing of
programming practices, debugging, sharing insights, paper draft commentary, general
knowledge transfer, and other mentorship activities.

PUBLIC OUTREACH and COMMUNICATION
Frontier Space Spotify Podcast Guest Appearance   June 2022
        Solar Gravitational Lens for Exoplanet Surface Imaging and Interstellar Communication

Weekly Space Hangout Youtube Podcast Guest Appearance   May 2022
        Bringing Exoplanets into Focus, Bit by Bit

Wonderfest "Ask A Science Envoy" Public Zoom Presentation   April 2022
        Imaging Extrasolar Planets

KPOO FM89.5 Radio Interview   October 2021
        Scintillating Science with DJ Marilynn Fowler

IN POPULAR MEDIA

Stanford News   May 2022
      Stanford scientists describe a gravity telescope that could image exoplanets

KIPAC Highlights   May 2022
      The telescope at the edge of the solar system

Scientific American   May 2022
      Our Sun Could Someday Reveal the Surfaces of Alien Earths

Inverse Magazine   May 2022
      This futuristic telescope would use Einsteinian physics to find Earth 2.0

MISCELLANEOUS ACADEMIC PROJECTS

Exoplanetary Atmosphere Journal Club Leader   Fall 2020
      Organizational leadership experience. Coordinating and preparing presentations discussing the Zhang (2020) Review, advertising the meeting cross-institutionally to interested researchers

Comparative Topography of Terrestrial Solar System Bodies   Fall 2019
      Project for GEOLSCI 222 "Planetary Systems": Empirical analysis of the statistical distributions of elevations for all solar system bodies for which this data is available

Limitations of the Universal Approximation Theorem   Spring 2019
      Essay for APPhys 293 "Theoretical Neuroscience": A simple proof the powerful flexibility of neural networks as approximate functions, and an elaboration around why they can still fail despite this

Insulator-Conductor Transition in Liquid Metal Hydrogen   Winter 2019
      Essay for Phys 212 "Statistical Mechanics": Theoretical and computational estimates of the phase transition of hydrogen in pressures and temperatures relevant to the interiors of giant planets

Interpolating Brown Dwarf Atmosphere Models with Machine Learning   Fall 2018
      Project for CS 229 "Machine Learning": Multi-linear matrix interpolation on a non-uniform grid for various atmospheric model parameters

PSF Classification with Deep Neural Networks   Winter 2018
      Project for CS 230 "Deep Learning": Custom architecture binary classifier with hand-labeled data from astrophysical research

The CNB is probably not the Dark Matter   Fall 2017
      Essay for Phys 361 "Cosmology": Estimates regarding the cosmic neutrino background

Cloud Atlas Earth Visualization   Summer 2017
      Personal project: geospatial data assimilation, map projections, and a raspberry pi

OTHER ASSORTED SKILLS

Python, UNIX, LaTeX, Jupyter, Tensorflow, MATLAB, Mathematica, LabVIEW, AutoCAD, Adobe Creative Suite, HTML, CSS, PHP