ISABEL J. KAIN

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EDUCATION

Candidate for Bachelor of Science in Physics Expected April 2021
Northeastern University, Boston, MA
Minor in Mathematics, Geology

AWARDS

PEAK Experience Summit Award Competitive research funding awarded by the Office of Undergraduate Research at Northeastern University.

Dean's Scholarship A competitive merit-based scholarship, for which the top 10-15% of Northeastern Universitys incoming class are considered.

Presidential Global Scholarship The Presidential Global Scholars Program supports outstanding students who are seeking to participate in a global co-op program.

EXPERIENCE

European Organization for Nuclear Research (CERN) August - December 2019
Advisor: Prof. Toyoko Orimoto

Developed test framework for new electronics and calorimeters for the Compact Muon Solenoid (CMS) Electromagnetic Calorimeter (ECAL). This included: developing firmware and for a CAEN DT5495 trigger board to control test data acquisition, and frontend development for a new VICE++ card for testing of specific electronic components.

NASA Goddard Space Flight Center June - August 2019
Advisor: Dr. Eliad Peretz

Developed mission architecture for space missions, including Remote Occulter, Orbiting Configurable Artificial Star (ORCAS) missions. Used Python to analyze and visualize data, and calculate expected performance and constraints for spacecraft. Wrote manuscripts to present mission specifications and advocate for funding.

MIT Kavli Institute for Astrophysics and Space Research July 2017 - January 2019
Advisor: Prof. Elisabeth Newton

Investigated planetary system K2-25 with aim of explaining unusually high eccentricity of transiting planet K2-25b, using TTV analysis to probe existence of non-transiting companion that could be pumping eccentricity. Built Python pipeline to analyze transit photometry of eccentric planet K2-25b using MCMC fitting of orbital parameters. Prepared visualizations and text for publication of results, accepted for publication in The Astronomical Journal.

PAPERS AND PUBLICATIONS

Isabel J. Kain, Elisabeth R. Newton, Jason A. Dittmann, Jonathan M. Irwin, Andrew W. Mann, Pa Chia Thao, David Charbonneau, Jennifer G. Winter. ***The Young Planetary System K2-25: Constraints on Companions and Starspots***. *AJ* (2020).

Pa Chia Thao, Andrew W. Mann, Marshall C. Johnson, Elisabeth R. Newton, Xueying Guo, **Isabel J. Kain**, Aaron C. Rizzuto, Paul A. Dalba, Eric Gaidos, Jonathan M. Irwin, Adam L. Kraus. ***Zodiacal Exoplanets in Time (ZEIT). IX. A Flat Transmission Spectrum and a Highly Eccentric Orbit for the Young Neptune K2-25b as Revealed by Spitzer***. *AJ* (2020).

John C. Mather, Eliad Peretz, Jonathan Arenberg, Simone D'Amico, Michele Cirasuolo, Matthew Greenhouse, Anthony Harness, Sergi Hildebrandt, Tiffany Hoerbelt, **Isabel Kain**, Wolfgang Kausch, Stefan Kimeswenger, Carey Lisse, Stefan Martin, Dr. Stefan Noll, Prof. Norbert Przybilla, Prof. Sara Seager, Stuart Shaklan, Richard Slonaker, Prof. Ignas Snellen, Phil Willems. ***Orbiting Starshade to Observe Exoplanets with Ground-based Telescopes***. Under review.

John C. Mather, Eliad Peretz, Jonathan Arenberg, Simone D'Amico, Michele Cirasuolo, Matthew Greenhouse, Anthony Harness, Sergi Hildebrandt, Tiffany Hoerbelt, **Isabel Kain**, Wolfgang Kausch, Stefan Kimeswenger, Carey Lisse, Stefan Martin, Dr. Stefan Noll, Prof. Norbert Przybilla, Prof. Sara Seager, Stuart Shaklan, Richard Slonaker, Prof. Ignas Snellen, Phil Willems. ***Orbiting Starshade: Observing Exoplanets at visible wavelengths with GMT, TMT, and ELT***. *BAAS* (2019).

Eliad Peretz, John Mather, **Isabel Kain**, Richard Slonaker, John OMeara, Sara Seager, Tiffany Hoerbelt. ***Orbiting Configurable Artificial Star (ORCAS) for Visible Adaptive Optics from the Ground***. *BAAS* (2019).

Eliad Peretz, **Isabel Kain**, Ryan Caine, Liz Cantlebary, John C Mather, John Carr, Tobias Hanrath, Kevin Hall. ***A Theoretical Investigation and Meta-Analysis of Solar-Powered Spacecraft for Science Space Missions***. Under review.

Ian J. M. Crossfield, Natalia Guerrero, Trevor David, Samuel N. Quinn, Adina D. Feinstei4, Chelsea Huang, Liang Yu, Karen A. Collins, Benjamin J. Fulton, Bjrn Benneke, Merrin Peterson, Allyson Bieryla, Joshua E. Schlieder, Molly R. Kosiarek, Makennah Bristow, Elisabeth Newton, Megan Bedell, David W. Latham, Jessie L. Christiansen, Gilbert A. Esquerdo, Perry Berlind, Michael L. Calkins, Avi Shporer, Jennifer Burt, Sarah Ballard, Joseph E. Rodriguez, Nicholas Mehrle, Courtney D. Dressing, John H. Livingston, Erik A. Petigura, Sara Seager, Jason Dittmann, David Berardo, Lizhou Sha, Zahra Essack, Zhuchang Zhan, Martin Owens, **Isabel Kain**, Howard Isaacson, David R. Ciardi, Erica J. Gonzales, Andrew W. Howard, and Jos Vincius de Miranda Cardoso. ***A TESS Dress Rehearsal: Planetary Candidates and Variables from K2 Campaign 17***. *ApJS* (2018).

TALKS AND PRESENTATIONS

STEMSEAS Impact Study; Effect on Student Self-Efficacy and Inclusion in Geoscience — February 2020
Ocean Sciences Meeting 2020 (Poster)

Orbiting Configurable Artificial Star (ORCAS) — August 2019
NASA Summer Intern Poster Session (Poster)

The young planetary system K2-25: constraints on companions and starspots — January 2019
American Astronomical Society 233rd meeting (Poster)

The young planetary system K2-25: constraints on companions and starspots — August 2018
MKI Summer Undergraduate Research Symposium (Talk)

Multidimensional Habitability: an exploration into life beyond Earth May 2017
Boston Latin School Capstone (Talk)

SOFTWARE

K2-25: Transit photometry analysis pipeline 2017 - 2019
Github: https://github.com/isa-kain/K2-25

Analysis pipeline built to process 22 transit files of eccentric planet K2-25b, using an MCMC process to fit orbital parameters to the data. Also included are supplementary scripts and Jupyter Notebooks used throughout the research project.

vicegui: Web-hosted user interface for VICE++ board. 2019
Github: https://github.com/isa-kain/vicegui

Web GUI for VICE++ test board built using Vue webpack instance, hosted on Python Flask server.

H4DAQ: Data acquisition system for H4 test site. 2019
Github: https://gitlab.cern.ch/ecal-daq-upgrade/H4DAQ

Run-control software for test data acquisition setup, adjacent to SPS test beam. Written primarily in C++, contributed significant modifications and debugging.

H4WEBGUI: Web-hosted user interface for H4DAQ 2019
Github: https://gitlab.cern.ch/ecal-daq-upgrade/H4WEBGUI

Web-hosted interface for test data acquisition setup, adjacent to SPS test beam. Built primarily in Python and JavaScript, contributed significant modifications and debugging.

MENTORSHIP AND SCIENCE OUTREACH

Space Science Outreach Presenter 2019 - Present
Mentor: Dr. Sang Park

I give short talks on astronomy and space science to elementary school classrooms, in partnership with Dr. Sang Park, an engineer with NASA and the Harvard Smithsonian Center for Astrophysics. We prefer to speak at public elementary schools, but are happy to go wherever we are welcome. I have spoken in the following classrooms:
- 3rd grade class, Clark Elementary School, Swampscott, MA
- 5th grade class, Clark Elementary School, Swampscott, MA
- 3rd grade class, The Advent School, Boston, MA

Science Writer 2017 - Present
NU Sci Magazine

As a writer for NU Sci Magazine, Northeastern University's student-written, student-run science publication, I produce articles for a general audience encompassing a range of science topics. I also edit 5-10 articles per print publication, which entails communicating with writers throughout the drafting process. Previous articles that I have written include:
- The Science of Soap Bubbles
- Hubble Trouble, and Make it Double: Disagreement over one of the universe's most important constants
- Sorry, Not Aliens: Boyajian's Star Mystery Solved

Student Mentor 2019 - Present
Northeastern University Society of Physics Students (SPS)

I serve as a mentor and point of contact with underclassman physics students to provide advice and guidance, and to help them feel comfortable in the university environment. This is both through the official SPS Mentorship Program, and through more informal connections.

Museum Volunteer 2017 - Present
Harvard Museum of Natural History

As a volunteer, I answer visitor questions, help facilitate group visits and museum programs, and help staff annual events. Annual events often include science demonstrations, which have included an optics table with hands-on refraction activities, and a cockroach handling station.

Youth Fencing Coach 2016 - Present
Olympia Fencing Center

I teach beginner fencing group classes for children between 4-16 years old. This includes planning and leading 1-2 hour classes; keeping track of long-term student progress; personalizing conditioning programs for students' abilities, physical constraints, and fencing goals; interfacing with parents to inform them about their child's progress; administering basic medical care (e.g. bandaging and icing injuries); performing administrative duties; and refereeing fencing competitions.

Volunteer Fencing Coach 2020 - Present
Northeastern University

I am a volunteer fencing coach for Northeastern University Club Fencing. I design curriculum for and lead twice-weekly practices, including both general conditioning and fencing-specific drills, and coach at competitive meets.

PROFESSIONAL ASSOCIATIONS

American Astronomical Society
American Physical Society
Society of Physics Students
Association of Women in Mathematics