

Kyle Finner

Postdoctoral Scholar
Infrared Processing & Analysis Center
California Institute of Technology
Pasadena, USA

kylefinner@gmail.com
1-747-609-8272

RESEARCH INTERESTS

Gravitational lensing – Dark matter – Large-scale structure
Merging galaxy clusters – Diffuse radio emission – Telescope instrumentation

EDUCATION

Yonsei University, Seoul, South Korea

February 2021 Ph.D., Astronomy

Thesis title: Understanding the Growth of Galaxy Clusters: Weak-lensing Mass Distributions of Radio Relic Merging Galaxy Clusters

Supervisor: Prof. Myungkook James Jee

February 2018 M.S., Astronomy

Thesis title: A Weak-lensing Analysis of the Double Radio Relic Galaxy Cluster PLCKG287.0+32.9

Supervisor: Prof. Myungkook James Jee

University of Victoria (UVic), Victoria, Canada

May 2015 B.Sc., Honours Combined Physics and Astronomy with work experience

Thesis title: Star Formation Rate Enhancements for Primary and Secondary Galaxies in Mergers

Supervisor: Prof. Sara Ellison

May 2007 B.A., Economics and Greek and Roman Studies

PROFESSIONAL EXPERIENCE

May 2021 – Present

Postdoctoral Scholar, California Institute of Technology

- Investigating the systematics of IR weak lensing and their impact on future surveys with the Euclid and Roman space telescopes.

February – May 2021

Visiting Researcher, Harvard-Smithsonian Center for Astrophysics

- Weak-lensing analysis of a double radio relic merging galaxy cluster.

June 2015 – March 2016

Research Assistant, Yonsei University

- Developed Python scripts to measure HI line-widths.
- Inferred distances to galaxies via the Tully-Fisher relation.
- Investigated pre-processing of galaxies in the Virgo cluster filament structure.

January 2015 – April 2015

Honours Project – Statistical analysis of SDSS galaxy mergers, UVic

- Accessed SDSS tables with MySQL queries embedded in Python scripts.
- Performed statistical analysis of galaxies in merging events.
- Investigated star formation rate enhancements induced in merging galaxies.

April 2014 – January 2015

Co-I, SWEEP – Search for White Dwarf Eclipsing Exoplanets, UVic

- Created a simulation for white dwarf / exoplanet orbits in Python.
- Modeled the light curve of an exoplanet transiting a white dwarf.
- Collected photometric data at the Plaskett, 1.8m telescope (20 nights).
- Reduced the images in IRAF and produced photometry with SExtractor.

May 2012 – December 2014

Volunteer, UVic, Bob Wright Building Observatory

- Conducted tours of the Observatory at UVic.
- Operated the 0.8m telescope.
- Promoted astronomy to the public.

August 2012 – January 2013

Co-op Student, Tokyo University of Marine Science and Technology, Tokyo, Japan

- Processed oceanographic data using MATLAB.
- Wrote MATLAB scripts to process data.
- Gave weekly PowerPoint presentations on progress and findings.

August 2008 – September 2010

Foreign Language Teacher, Busan, South Korea

- Taught English to grades 1-9.

PUBLICATIONS

2022 Astrophysical Journal

<https://arxiv.org/abs/2210.12165>

- HST and HSC Weak-lensing Study of the Equal-mass Dissociative Merger CIZA J0107.7+5408

Finner, Randall, Jee, Blanton, Cho, Clarke, Giacintucci, Nulsen, van Weeren

2022 Astrophysical Journal

<https://arxiv.org/abs/2109.06879>

- Multiwavelength Analysis of A1240, the Double Radio Relic Merging Galaxy Cluster Embedded in an 80 Mpc-long Cosmic Filament

Cho, Jee, Smith, **Finner**, Lee

- 2022 Astrophysical Journal <https://arxiv.org/abs/2109.00593>
- Discovery of a double radio relic in ZwCl 1447.2+2619: A rare testbed for shock acceleration models with a peculiar surface brightness ratio
- Lee, Jee, **Finner**, Hyeonghan, Kale, Yoon, Forman, Kraft, Jones, Chung
- 2021 Astrophysical Journal <https://arxiv.org/abs/2010.02226>
- Exemplary Merging Clusters: Weak-lensing and X-ray Analysis of the Double Radio Relic, Merging Galaxy Clusters MACS J1752.0+4440 and ZWCL 1856.8+6616
- Finner**, Hyeonghan, Jee, Wittman, Forman, van Weeren, Golovich, Dawson, Jones, de Gasperin, Jones
- 2021 Monthly Notices of the Royal Astronomical Society <https://arxiv.org/abs/2105.11906>
- Radio Relics in PSZ2 G096.88+24.18: A connection with pre-existing plasma
- Jones, de Gasperin, Cuciti, Hoang, Botteon, Bruggen, Brunetti, **Finner**, Forman, Jones, Kraft, Shimwell, van Weeren
- 2020 Astrophysical Journal <https://arxiv.org/abs/2006.13535>
- Toward Solving the Puzzle: Dissecting the Complex Merger A521 with Multiwavelength Data
- Yoon, Lee, Jee, **Finner**, Smith, Kim
- 2020 Astrophysical Journal Letters <https://arxiv.org/abs/2007.15660>
- Evidence of runaway gas cooling in the absence of supermassive black hole feedback at the epoch of cluster formation
- Hlavacek-Larrondo, Rhea, Webb, McDonald, Muzzin, Wilson, **Finner**, Valen, Bonaventura, Cooper, Fabian, Gendron-Marsolias, Jee, Lidman, Mezcua, Noble, Russel, Surace, Trudeau, Yee
- 2020 Astrophysical Journal <https://arxiv.org/abs/2007.08244>
- FIRST RESULTS FROM THE ASKAP-EMU PILOT SURVEY: Discovery of a Radio Relic in the Massive Merging Cluster SPT-CL~2023-5535
- Hyeonghan, Jee, Rudnick, Parkinson, **Finner**, Yoon, Lee, Brunetti, Brüggen, Collier, Hopkins, Michalowski, Norris, Riseley
- 2020 Astrophysical Journal <https://arxiv.org/abs/2006.13535>
- Toward Solving the Puzzle: Dissecting the Complex Merger A521 with Multi-wavelength Data
- Yoon, Lee, Jee, **Finner**, Smith, Kim
- 2020 Astrophysical Journal <https://arxiv.org/abs/2002.01956>
- Constraining the Mass of the Emerging Galaxy Cluster SpARCSJ1049+56 with Infrared Weak Lensing
- Finner**, Jee, Webb, Wilson, Perlmutter, Muzzin, Hlavacek-Larrondo
- 2019 Astrophysical Journal <https://arxiv.org/abs/1812.08797>
- Multiwavelength Analysis of the Merging Galaxy Cluster A115
- Kim, Jee, **Finner**, Golovich, Wittman, van Weeren, Dawson

2019 Astrophysical Journal Supplement <https://arxiv.org/abs/1711.01347>

- Merging Cluster Collaboration: Optical and Spectroscopic Survey of a Radio-selected Sample of 29 Merging Galaxy Clusters:

Golovich, Dawson, Wittman, Jee, Benson, Lemaux, van Weeren, Andrade-Santos, Sobral, de Gasperin, Bruggen, Bradac, **Finner**, Peter

2017 Astrophysical Journal <https://arxiv.org/abs/1710.02527>

- MC²: Subaru and Hubble Space Telescope Weak-lensing Analysis of the Double Radio Relic Galaxy Cluster PLCK G287.0+32.9

Finner, Jee, Golovich, Wittman, Dawson, Gruen, Koekemoer, Lemaux, Seitz

OBSERVATIONS

Principal Investigator

2022 Cycle 24 **Chandra** PI (223ks, upcoming)

- Observations of a merging galaxy cluster at $z=0.3$.

2021 **Gemini South** GMOS (1 hour, in progress)

- Long-slit spectroscopy of a ring galaxy.

2020B **Subaru** HSC PI (2hours, 1 publication)

- Imaging of Bullet-like cluster.

2019A/B **MMT**/Hectospec – PI (2 nights, 3 publications)

- Fiber spectroscopy to secure redshifts of cluster galaxies.

Co-Investigator

2022B **Subaru** HSC Co-I (5 hours)

- Optical imaging of two merging clusters.

2022 **HST** Cycle 30 Co-I (8 orbits)

- Optical imaging of 4 dissociative merging clusters.

2021 A021 **XMM-Newton** Co-I (135ks)

- Observations of MACSJ1752.

2021 A021 **XMM-Newton** Co-I (156ks)

- Observations of Abell 746.

2021 A021 **JVLA** Co-I (20 hours)

- Observations of the radio relics of Abell 746.

2019B **Subaru** HSC Co-I (4 hours)

- Weak-lensing quality imaging of low- z merging galaxy clusters

2019 Cycle 37 **GMRT** Co-I (8 hours)

- Band 5 observation of ZwCL J1447.2+2619

PRESENTATIONS

August 2022

IAUGA, Busan, South Korea

- Investigating the Systematics of IR Detectors for Weak Lensing
- Weak Lensing Analysis of Thirty Merging Galaxy Clusters

June 2022

AAS 2022, Pasadena, USA

- Weak Lensing Analysis of Thirty Merging Galaxy Clusters

September 2020

IPAC, Caltech, Pasadena, USA (Remote)

- HST Infrared Weak-lensing Analysis of the Emerging Galaxy Cluster SpARCSJ1049+56 at $z=1.71$

May 2020

Harvard-Smithsonian Center for Astrophysics, Cambridge, USA (Remote)

- Weak Lensing Characterization of Dark Matter Substructures in Radio Relic Merging Clusters

July 2019

Tracing Cosmic Evolution with Clusters of Galaxies, Sesto, Italy

- Multiwavelength Reconstruction of the Merging Scenarios of Radio Relic Clusters

May 2019

LSST @ ASIA, Sydney, Australia

- Ongoing and Future Investigations of the Merging Scenarios of Galaxy Clusters

January 2019

EAO Subaru Science Workshop, Daejeon, South Korea

- MC²: Reconstructing the Merger Scenario for Massive Galaxy Clusters with Subaru Weak Lensing

August 2018

30th General Assembly of the IAU, Vienna, Austria

- Infrared Weak-Lensing Analysis of the Emerging Galaxy Cluster SPARCSJ1049+56 at $z=1.7$

October 2017

Diffuse Synchrotron Emission in Clusters of Galaxies, Leiden, The Netherlands

- A Weak-lensing Analysis of the Double Radio Relic Galaxy Cluster PLCKG287.0+32.9

October 2017

Korean Astronomy Society Fall Meeting, Yeosu, South Korea

- A Weak-lensing Analysis of the Double Radio Relic Galaxy Cluster PLCKG287.0+32.9

April 2017

Korean Astronomy Society Spring Meeting, Changwon, South Korea

- Where is the Dark Matter in the Double Radio Relic Galaxy Cluster PLCKG287.0+32.9?

January 2017

University of Victoria, Victoria, Canada

- The Dark Matter Distribution of the Merging Galaxy Cluster, PLCKG287.0+32.9, by Weak-lensing Analysis

January 2017

American Astronomy Society 229th Meeting, Grapevine, USA

- The Dark Matter Distribution of the Merging Galaxy Cluster, PLCKG287.0+32.9, by Weak-lensing

November 2016

Korean Institute for Advanced Study, Seoul, South Korea

- A Weak-lensing Analysis of the Merging Galaxy Cluster PLCKG287.0+32.9

April 2016

Korean Astronomy Society Spring Meeting, Busan, South Korea

- Introduction to weak-lensing theory and the surface mass distribution from weak lensing for PLCKG287.0+32.9

October 2015

SKA in Seoul, Seoul, South Korea

- Mapping the 3D Structure of the Virgo Cluster Filaments with the Tully-Fisher Relation

March 2015

UVic HonoursFest Poster Conference, Victoria, Canada

- Star Formation Rate Enhancements for Primary and Secondary Galaxies in Mergers

June 2014

RASC, Annual General Assembly, Victoria, Canada

- Search for White dwarf Eclipsing Exo-Planets, (SWEEP) at the DAO

AWARDS

2020 BK21 Prize for outstanding research paper

2019 Travel Grant to the LSST@Asia conference in Sydney, Australia

2016, 2017, 2018, 2019 Outstanding International Student Scholarship, Yonsei University

2017 BK21 Prize for Master's Thesis

2015 HonoursFest Top Presenter – Physics and Astronomy, University of Victoria

2013 Physics and Astronomy co-op thesis first place, University of Victoria

2012 Don Ingham Memorial Scholarship, University of Victoria

SKILLS AND KNOWLEDGE

Computer Software, Languages, and Operating Systems

- Expert in Python.
- Created automated pipelines that go from raw images to science-ready products to calibrated weak-lensing shear measurements.
- IRAF, DS9, Source Extractor, SCAMP, SWarp, STIFF, MATLAB, COMSOL, Mathematica, GalSim, Drizzlepac
- Workable knowledge of IDL, HTML, SQL, JavaScript, Java, C++
- OS X, Linux, Windows, DOS

Observation/Research

- Photometry with both IRAF and Source Extractor
- MMT Hectospec spectroscopy
- Imaging with the 0.8m UVic and the 1.8m Plaskett telescopes
- Radio observations with Korean VLBI Network
- Subaru (Hyper) Suprime-cam data reduction for weak-lensing analysis
- Hubble Space Telescope Optical/IR data reduction/analysis
- XMM Newton SAS and Chandra CIAO data reduction/analysis
- Extensive lab work using predictive calculations and comparing them to experimental results
- Quantitatively examine uncertainties and errors and propagate them to results
- Understand physical laws and principles and able to use analytical methods to examine the physical world
- Proficient at research using online, library, and collaborative sources