

William J. Oldroyd

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EDUCATION

Northern Arizona University (NAU)
Astronomy and Planetary Science, PhD

Aug 2018 – Present
Flagstaff, AZ

Brigham Young University (BYU)
Physics-Astronomy, BS; Minors: Mathematics, Spanish, Geology

Aug 2010 – Dec 2011 & Apr 2014 – Apr 2018
Provo, UT

SCHOLARSHIPS, GRANTS, AND AWARDS (7 of 21)

- NAU Graduate Student Government Poster Symposium Competition, 2nd Place Poster 2021
- NAU Graduate Student Government Conference Presentation Competition Session Winner 2021
- American Astronomical Society Division for Planetary Sciences Hartmann Student Travel Grant 2020
- American Astronomical Society Division on Dynamical Astronomy Student Registration Grant 2020
- NAU 3 Minute Research Presentation “Most Surprising Research”/Peoples’ Choice Award 2019
- BYU Office of Research and Creative Activities Student Research Grant 2016-2017
- BYU Physics Departmental Scholarship 2016-2017

PUBLICATIONS

Refereed (2)

- **Oldroyd, William J.**; Trujillo, Chadwick A., “Outer Solar System Perihelion Gap Formation Through Interactions with a Hypothetical Distant Giant Planet,” *AJ*, 162, 39, August 2021
- Chandler, Colin Orion; Kueny, Jay K.; Trujillo, Chadwick A.; Trilling, David E.; **Oldroyd, William J.**, “Cometary Activity Discovered on a Distant Centaur: A Non-Aqueous Sublimation Mechanism,” *ApJL*, 892, L38, Apr 2020

Non-Refereed (22)

- **Oldroyd, W. J.**; Trujillo, C. A., “Planet X Can Cause the Outer Solar System Perihelion Gap,” *AAS DDA* #52, 502.04, Jun 2021
- **Oldroyd, W.**; Robinson, T., “Maximizing Orbital Constraints for Directly Imaged Exoplanets,” *AAS* #237, 516.03, Jan 2021
- Michael S. P. Kelly; Henry H. Hsieh; Colin Orion Chandler; Siegfried Eggl; Timothy R. Holt; Lynne Jones; Mario Jurić; Timothy A. Lister; Joachim Moeyens; **William J. Oldroyd**; Darin Ragozzine; and David E. Trilling, “Community Challenges in the Era of Petabyte-Scale Sky Surveys,” *Planetary Science and Astrobiology Decadal Survey 2023-2032 White Paper*; *BAAS*, 53, 495, Nov 2020/May 2021
- **Oldroyd, W. J.**; Trujillo, C. A., “Outer Solar System Perihelion Gap Formation through Perturbations from an Undiscovered Giant Planet,” *AAS DPS* #52, 304.04, Oct 2020
- Chandler, C. O.; Kueny, J. K.; Trujillo, C. A.; Trilling, D. E.; **Oldroyd, W. J.**, “Cometary Activity Discovered on Centaur 2014 OG392,” *AAS DPS* #52, 404.02, Oct 2020
- Vera C. Rubin Observatory LSST Solar System Science Collaboration; R. Lynne Jones; Michelle T. Bannister; Bryce T. Bolin; Colin Orion Chandler; Steven R. Chesley; Siegfried Eggl; Sarah Greenstreet; Timothy R. Holt; Henry H. Hsieh; Željko Ivezić; Mario Jurić; Michael S. P. Kelly; Matthew M. Knight; Renu Malhotra; **William J. Oldroyd**; Gal Sarid; Megan E. Schwamb; Colin Snodgrass; Michael Solonoi; and David E. Trilling, “The Scientific Impact of the Vera C. Rubin Observatory’s Legacy Survey of Space and Time (LSST) for Solar System Science,” *Planetary Science and Astrobiology Decadal Survey 2023-2032 White Paper*; *BAAS*, 53, 236, Sep 2020/May 2021
- **Oldroyd, W. J.**; Trujillo, C. A., “Constraining the Outer Solar System Perihelion Gap,” *AAS DDA* #51, 501.04, Aug 2020

- **Oldroyd, W. J.**; Robinson, T., “Orbital Solutions for Revisit Optimization of Directly Imaged Exoplanets,” AAS #235, 320.04, Jan 2020
- Chad Trujillo; David Trilling; David Gerdes; Matthew Holman; Larissa Markwardt; Scott Sheppard; Cesar Fuentes; Mario Juric; Edward Lin; Andrew McNeill; Michael Mommert; **William Oldroyd**; Matthew Payne; Darin Ragozzine; Andrew Rivkin; Hilke Schlichting; and Megan Schwamb, “Deep Ecliptic Exploration Project (DEEP) Observing Strategy,” EPSC Abstracts, 13, EPSC-DPS2019-2070, Sep 2019
- **William Oldroyd** and Chadwick Trujillo, “The Outer Solar System Perihelion Gap,” EPSC Abstracts, 13, EPSC-DPS2019-1255-1, Sep 2019
- David Trilling; David Gerdes; Chad Trujillo; Scott Sheppard; Cesar Fuentes; Hilke Schlichting; Andrew McNeill; Mario Juric; Matt Holman; Ed Lin; Larissa Markwardt; Michael Mommert; **William Oldroyd**; Matt Payne; Darin Ragozzine; Andrew Rivkin; and Megan Schwamb, “The Deep Ecliptic Exploration Project (DEEP): A new NOAO survey of the faint outer Solar System,” EPSC Abstracts, 13, EPSC-DPS2019-395-1, Sep 2019
- **Oldroyd, William Jared**; Trujillo, Chad, “Computationally and Observationally Constraining the Outer Solar System Perihelion Gap to Help Find Planet X,” AAS DDA #50, 201.01, June 2019
- Trujillo, C. A.; Sheppard, S. S.; **Oldroyd, W. J.**, “2017 VO34,” MPEC, 2019-F101, March 2019
- Sheppard, S. S.; Trujillo, C. A.; **Oldroyd, W. J.**; Tholen, D. J., “2018 AX18,” MPEC, 2019-C98, Feb 2019
- Trujillo, C. A.; Sheppard, S. S.; Thirouin, A.; **Oldroyd, W. J.**, “2017 WH30,” MPEC, 2019-C97, Feb 2019
- Sheppard, S. S.; Trujillo, C. A.; **Oldroyd, W. J.**; Tholen, D. J., “2017 SN132,” MPEC, 2019-C96, Feb 2019
- Trujillo, C. A.; Sheppard, S. S.; **Oldroyd, W. J.**; Tholen, D. J.; Thirouin, A., “2017 OG69,” MPEC, 2019-C95, Feb 2019
- Sheppard, S. S.; Trujillo, C. A.; **Oldroyd, W. J.**; Tholen, D. J.; Williams, G. V., “2018 VG18,” MPEC, 2018-Y14, Dec 2018
- **Oldroyd, William Jared**; Ragozzine, Darin; Porter, Simon, “More Sophisticated Fits of the Orbits of Haumea's Interacting Moons,” AAS DDA meeting #49, 402.03, Apr 2018
- **Oldroyd, W. J.**; Radebaugh, J.; Stephens, D.; Lorenz, R. D.; Harvey, R. P.; Karner, J., “Modeling Meteorite Heat Transfer in an Antarctic Environment,” LPSC #49, LPI Contribution 2083, 2794, Mar 2018
- **Oldroyd, W. J.**; Radebaugh, J.; Stephens, D. C.; Lorenz, R.; Harvey, R.; Karner, J., “Modeling the Thermal Interactions of Meteorites Below the Antarctic Ice,” AAS DPS meeting #49, 113.01, Oct 2017
- **Oldroyd, W. J.**; Radebaugh, J., “Searching for a Hidden Population of Iron Meteorites Below the Antarctic Ice,” LPSC #48, LPI Contribution 1964, 2967, Mar 2017

RESEARCH EXPERIENCE

NAU Graduate Research

- The Outer Solar System Perihelion Gap Aug 2018 – Present
 - Modeled gravitation effects of Planet X on the outer solar system using N-body simulations
 - Utilized a variety of statistical tests and modeling to determine significance of the perihelion gap
- Observational Survey for Planet X Aug 2018 – Present
 - Recovered newly discovered outer solar system objects using LDT and Magellan
- Deep Ecliptic Exploration Project (DEEP) Sep 2018 – Present
 - Developed characteristic survey sky pattern
 - Carried out survey observations with DECam
- Orbital Solutions for Revisit Optimization of Directly Imaged Exoplanets Dec 2018 – Present
 - Developed a model for maximizing orbit determination efficiency

- Asteroid Family Spectral Slope Modeling to Constraining Space Weathering Rates Dec 2018 – Present
 - Developed models using Markov Chain Monte Carlo statistical techniques
- Legacy Survey of Space and Time Solar System Science Collaboration Oct 2019 – Present
 - Co-authored two white papers for the Planetary Science and Astrobiology Decadal Survey
 - Collaborated on cadence recommendations for Vera C. Rubin Observatory
- Searching for Surface Features on Large Trans-Neptunian Objects Apr 2020 – Present
 - Observed large TNOs using the LBT (PI)

BYU Undergraduate Research

- Modeling the Thermal Interactions of Meteorites Below the Antarctic Ice Dec 2014 – Apr 2018
 - Analyzed solar flux and temperature field data and modeled meteorite migration through the ice
- Using Modeling to Improve Methods for Teaching Basic Electrostatics Dec 2014 – Apr 2018
 - Developed and tested physical models for visually representing electrostatics principles
- Modeling the Orbital Parameters of the Haumea System Jul 2017 – Aug 2018
 - Utilized statistical fitting to find precise fits for orbital parameters with Hubble Space Telescope data

TELESCOPE OBSERVING EXPERIENCE

- Large Binocular Cameras (Red and Blue), 2 x 8.4m Large Binocular Telescope, Large Binocular Telescope (LBT) Observatory, Arizona, USA, remote queue
- Inamori Magellan Areal Camera and Spectrograph, 6.5m Walter Baade Magellan Telescope, Las Campanas Observatory, Chile, on site and remote
- Large Monolithic Imager, 4.3m Lowell Discovery Telescope (LDT), Lowell Observatory, Arizona, USA, on site and remote
- Dark Energy Camera (DECam), 4m Víctor Blanco Telescope, Cerro Tololo Inter-American Observatory, Chile, remote
- 0.5m Barry Lutz Telescope, Atmospheric Research Observatory, Northern Arizona University, Arizona, USA, on site
- 0.4m David Derrick Telescope, Orson Pratt Observatory, Brigham Young University, Utah, USA, on site

HIGH PERFORMANCE COMPUTING AND PROGRAMMING EXPERIENCE

- Utilized over 1.3 million compute hours on the NAU High Performance Computing Cluster, *Monsoon*, for orbital dynamics simulations, space weathering models, exoplanet lightcurve extraction, and parallel computing metric testing
- Programming languages used in research: python, C/C++, bash, IDL, MATLAB, VBA, Mathematica

TEACHING EXPERIENCE

NAU Mentoring

- Interns to Scholars Mentor Jul 2020 – Present
 - Co-mentored a beginning undergraduate in a hands on computational research project focused on searching for exoplanets in data from NASA's Transiting Exoplanet Survey Satellite mission
- Summer Research Experience for Undergraduates Mentor Jun 2020 – Aug 2020
 - Co-mentored an upper level undergraduate on Constraining the Space Weathering Rate with Asteroid Family Spectral Slope Modeling using NAU's HPC cluster

TRiO Upward Bound Teaching

- Summer Residential Program Instructor Jul 2020 & Jul 2021
 - Developed curriculum and taught courses on “Solar System Exploration” and “Planet Detection Techniques” to high school students from diverse backgrounds, cultures and academic levels
- South Mountain Community College Saturday Academy Instructor Jan 2021 – May 2021
 - Developed curriculum and taught an Applied Physics course to a class of high school students from diverse backgrounds cultures and academic levels who are potential first generation college students

BYU Teaching

- Teaching Assistant Dec 2014 – Dec 2017
 - Assisted students in walk-in laboratory with 100-500 level physics labs
 - Repaired, improved and installed equipment for all physics labs in the department
 - Taught Physics 107, a non-physics major lab course
 - Support TA over data reduction and analysis using IRAF and AstroImageJ for Physics 329, an upper level observational astronomy course

Other

- Private High School Physics Tutor Sep 2016 – Dec 2016
 - Assisted a student with conceptual understanding and homework

OUTREACH PRESENTATIONS

- Efigie Educação E Cultrua (Brazil) Mock Class Program, May 10, 2021, “How to Discover a Planet”
- Phoenix Astronomical Society, Mar 4, 2021, “The Search for Planet X”
- West Valley Astronomy Club, Feb 2, 2021, “The Search for Planet X”
- Flagstaff Festival of Science In-School Speaker Program, Oct 22, 2020, “A Hidden Planet in our Solar System”
- Saguaro Astronomy Club & East Valley Astronomy Club, Sep 4, 2020, “The Search for Planet X”
- Prescott Astronomy Club, Oct 17, 2019, “Exploring the Gap Beyond the Kuiper Belt: Implications for Planet X”

ASTRONOMY SERVICE

- American Astronomical Society Chambliss Astronomy Achievement Student Awards Poster Competition Judge at the AAS Winter 2021 meeting
- NAU Astronomy and Planetary Science Fellowship Mock Review Panel Panelist Jan 2019, 2020, and 2021
- Local Host for Legacy Survey of Space and Time Solar System Science Collaboration Virtual Solar System Readiness Sprint Conference Jun 2020

EXTRACURRICULAR, AND VOLUNTEER EXPERIENCE

- NAU Department of Astronomy and Planetary Science Grad Student Club Oct 2020 – Present
 - Vice President
 - Coordinated events, awards, organization, and club founding
- Volunteer Boy Scout Leader Dec 2004 – Dec 2018
 - Eagle Scout
 - Merit Badge Counselor for Astronomy and Chess

- BYU Astronomy Research Group Leader Sep 2016 – Dec 2016
 - Planned and oversaw weekly department wide meetings and invited guest speakers
- BYU Marching Band and Basketball Pep Band 1st Trombone Jul 2010-Dec 2011 & Jul 2014 – Mar 2015
 - Performed at an elite level in front of tens of thousands of people at televised sporting events
 - Co-organized the largest marching band competition in Utah
- Volunteer Representative for the Church of Jesus Christ of Latter-day Saints Mar 2012 – Mar 2014
 - Spanish speaking Missionary in Wisconsin
 - Taught English classes for Hispanic minority groups
 - Taught workshops on leadership, goal setting, and teaching
 - Volunteered at hospitals and food pantries
- BYU Student Association Chess Club President Jan 2011 – Dec 2011
 - Planned and participated in intercollegiate chess tournaments and community outreach