William J. Oldroyd

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EDUCATION

Northern Arizona University (NAU) Aug 2018 – Present
Astronomy and Planetary Science, PhD Flagstaff, AZ

Brigham Young University (BYU) Aug 2010 – Dec 2011 & Apr 2014 – Apr 2018
Physics-Astronomy, BS; Minors: Mathematics, Spanish, Geology 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 (4)

- **Oldroyd, W.**; Robinson, T., "Orbit Determination Optimization for Directly Imaged Exoplanets," in prep
- Trujillo, C.; Trilling, D.; Gerdes, D.; Fuentes, C.; Jurić, M.; Lin, E.; Markwardt, L.; McNeill, A.; Sheppard, S.; Holman, M.; Mommert, M.; **Oldroyd, W.**; Payne, M.; Ragozzine, D.; Rivkiin, A.; Schlichting, H.; Smotherman, H.; Strauss, R.; Napier, K.; Beach, C.; Gowman, G.; Pan, J.; Simpson, A.; Stetzler, S., "Observing Strategy for the DECam Ecliptic Exploration Project: DEEP," in prep
- **Oldroyd, William J.**; Trujillo, Chadwick A., "Outer Solar System Perihelion Gap Formation Through Interactions with a Hypothetical Distant Giant Planet," AJ, 162, 39, Aug 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 (25)

- **Oldroyd, W. J.**; Trujillo, C. A., "Using the Outer Solar System Perihelion Gap as a Constraint for Planet X," AAS DPS #53, 310.05, Oct 2021
- Chandler, C. O.; Trujillo, C. A.; Kueny, J. K.; **Oldroyd, W. J.**; Hsieh, H. H., "Active Asteroids Citizen Science," AAS DPS #53, 507.04, Oct 2021
- Trilling, D.; Gerdes, D.; Fuentes, C.; Jurić, M.; Lin, E.; Markwardt, L.; McNeill, A.; Sheppard, S.; Trujillo, C.; Holman, M.; Mommert, M.; **Oldroyd, W.**; Payne, M.; Ragozzine, D.; Rivkiin, A.; Schlichting, H.; Smotherman, H.; Strauss, R.; Napier, K.; Beach, C.; Gowman, G.; Pan, J.; Simpson, A.; Stetzler, S., "Year 3 of the DECam Ecliptic Exploration Project (DEEP)," AAS DPS #53, 202.04, Oct 2021
- **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 Solontoi; 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
- Large Scale Survey for Extreme Trans-Neptunian Objects — Aug 2018 – Present
  - Recovered newly discovered outer solar system objects using the LDT and Magellan telescopes
  - Observed survey fields using DECam
- DECam 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 per observation
- Asteroid Family Spectral Slope Modeling to Constraining Space Weathering Rates — Dec 2018 – Present
  - Developed space weathering 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)
- Detailed Photometry of Didymos for the DART Mission — Jul 2021 – Aug 2021
  - Reduced Gemini data using IRAF and produced high precision photometry with AstroImageJ

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 1.8 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

COLLOQUIA AND OUTREACH PRESENTATIONS

- Carnegie Institution of Washington Earth and Planets Laboratory Astronomy Seminar, Oct 22, 2021, "Placing Constraints on Planet X"
- 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

- NAU Astronomy and Planetary Science Graduate Student Faculty Representative Jul 2021 - Present
- AAS DDA Equity, Diversity, and Inclusion Year-round Mentoring Program Committee Member and Mentor Jul 2021-Present
- AAS DPS Meeting Science Chat Moderator, Oct 2020 and 2021
- AAS Chambliss Astronomy Achievement Student Awards Poster Competition Judge Jan 2021
- NAU Astronomy and Planetary Science Fellowship Mock Review Panel Panelist Jan 2019, 2020, and 2021
- Local Host for the LSST 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