William J. Oldroyd

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ASTRONOMY POSITIONS

Postdoctoral Research Scholar Aug 2022 – Present
Northern Arizona University (NAU) Flagstaff, AZ (Remote)

EDUCATION

Northern Arizona University (NAU) Aug 2018 – Aug 2022
Astronomy and Planetary Science, MS, PhD Flagstaff, AZ

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

SELECT PUBLICATIONS

Refereed (12)

- ***Recurring Activity Discovered on Quasi-Hilda 2009 DQ118*** - Oldroyd, W., et al., ApJL, 957, L1, Oct 2023
- ***The DECam Ecliptic Exploration Project (DEEP) VI: first multi-year observations of trans-Neptunian objects*** - Smotherman, H., et al. including Oldroyd, W., Accepted to AJ, arXiv:2310.03678, Oct 2023
- ***The DECam Ecliptic Exploration Project (DEEP): V. The Absolute Magnitude Distribution of the Cold Classical Kuiper Belt*** - Napier, K., et al. including Oldroyd, W., Accepted to PSJ, arXiv:2309.09478, Sep 2023
- ***The DECam Ecliptic Exploration Project (DEEP) IV: Constraints on the shape distribution of bright TNOs*** - Strauss, R., et al. including Oldroyd, W., Accepted to AJ, arXiv:2309.04034, Sep 2023
- ***The DECam Ecliptic Exploration Project (DEEP) III: Survey characterization and simulation methods*** - Bernardinelli, P., et al. including Oldroyd, W., Accepted to AJ, arXiv:2310.03671, Oct 2023
- ***The DECam Ecliptic Exploration Project (DEEP) II. Observational Strategy and Design*** - Trujillo, C., et al. including Oldroyd, W., Accepted to AJ, Oct 2023
- ***The DECam Ecliptic Exploration Project (DEEP): I. Survey description, science questions, and technical demonstration*** - Trilling, D., et al. including Oldroyd, W., Accepted to AJ, arXiv:2309.03417, Sep 2023
- ***Tuning the Legacy Survey of Space and Time (LSST) Observing Strategy for Solar System Science*** - Schwamb, M., et al. including Oldroyd, W., ApJSS, 266, 22, Jun 2023
- ***Migratory Outbursting Quasi-Hilda Object 282P/(323137) 2003 BM80*** - Chandler, C., Oldroyd, W., & Trujillo, C., ApJL, 937, L2, Sep 2022
- ***Photometric observations of the binary near-Earth asteroid (65803) Didymos in 2015-2021 in support of the DART space mission*** - Pravec, P., et al. including Oldroyd, W., PSJ, 3, 175, Jul 2022
- ***Outer Solar System Perihelion Gap Formation Through Interactions with a Hypothetical Distant Giant Planet*** - Oldroyd, W., & Trujillo, C., AJ, 162, 39, Aug 2021
- ***Cometary Activity Discovered on a Distant Centaur: A Non-Aqueous Sublimation Mechanism*** - Chandler, C., Kueny, J., Trujillo, C., Trilling, D., & Oldroyd, W., ApJL, 892, L38, Apr 2020

Research Notes and White Papers (9)

- ***A Jupiter-family Comet Discovery via Citizen Science: 2005 XR132*** - Chandler, C., Oldroyd, W., et al., RNAAS, 7,170, Aug 2023
- ***Cometary Activity on Quasi-Hilda Object 2018 CZ16*** - Trujillo, C., Chandler, C., Oldroyd, W., et al., RNAAS, 7,106, May 2023
- ***New Active Asteroid (588045) 2007 FZ18*** - Chandler, C., Oldroyd, W., et al., RNAAS, 7, 102, May 2023
- ***New Recurrently Active Main-belt Comet 2010 LH15*** - Chandler, C., Oldroyd, W., et al., RNAAS, 7, 60,

Mar 2023
- ***Comet-like Activity Discovered on Quasi-Hilda Asteroid 2009 DQ118*** - Oldroyd, W., et al., RNAAS, 7, 42, Mar 2023
- ***New Active Asteroid 2015 VA108: A Citizen Science Discovery*** - Chandler, C., Oldroyd, W., et al., RNAAS, 7, 27, Feb 2023
- ***Discovery of Dust Emission Activity Emanating from Main-belt Asteroid 2015 FW412*** - Chandler, C., Trujillo, C., Oldroyd, W., et al., RNAAS, 7, 22, Feb 2023
- ***Community Challenges in the Era of Petabyte-Scale Sky Surveys*** - Kelley, M., et al. including Oldroyd, W., BAAS, 53, 495, May 2021
- ***The Scientific Impact of the Vera C. Rubin Observatory's Legacy Survey of Space and Time (LSST) for Solar System Science*** - Vera C. Rubin Observatory LSST Solar System Science Collaboration et al. including Oldroyd, W., BAAS, 53, 236, May 2021

Recent Conference Presentations (7 of 37)
- ***Multiple Epochs of Activity Discovered on Quasi-Hilda 2009 DQ118*** - Oldroyd, W., et al., DPS55/EPSC, 102.03, San Antonio, TX, Oct 2023
- ***Dynamical Migration of Active Quasi-Hilda Asteroid 2009 DQ118*** - Oldroyd, W., et al., ACM14, 2537, Flagstaff, AZ, Jun 2023
- ***Active Quasi-Hilda 2009 DQ118 and the Asteroid-Comet Boundary*** - Oldroyd, W., Trujillo, C., & Chandler, C., DDA54, 202.01, East Lansing, MI, May 2023
- ***Didymos as an Active Asteroid*** - Oldroyd, W., et al., LPSC54, 2947, The Woodlands, TX, Mar 2023
- ***Orbital Evolution of an Active Quasi-Hilda Object with a Short Dynamical Lifetime*** - Oldroyd, W., Chandler, C., & Trujillo, C., DPS54, 202.08, London, Ontario, Oct 2022
- ***A Statistical Approach to Optimizing Orbit Constraints for Directly Imaged Exoplanets*** - Oldroyd, W., & Robinson, T., DDA53, 401.03, New York City, NY, Apr 2022
- ***Using the Outer Solar System Perihelion Gap as a Constraint for Planet X*** - Oldroyd, W., & Trujillo, C., DPS53/EPSC, 310.05, Geneva, Switzerland, Oct 2021

Minor Planet Discoveries (47)
- *2021 LO43* - MPEC 2023-C118
- *2021 FQ54* - MPEC 2023-C116
- *2021 LM43* - MPEC 2023-C114
- *2021 DM19* - MPEC 2023-C113
- *2021 RV209* - MPEC 2023-C112
- *2021 DK18* - MPEC 2022-S119
- *2021 RR205* - MPEC 2022-S118
- *2021 DH17* - MPEC 2022-K183
- *2021 CP40* - MPEC 2022-K182
- *2020 BF102* - MPEC 2022-K181
- *2021 DG17* - MPEC 2022-K180
- *2020 FR40* - MPEC 2022-K179
- *2020 FQ40* - MPEC 2022-K178
- *2020 FP40* - MPEC 2022-K174
- *2021 LL37* - MPEC 2022-K173
- *2020 BE102* - MPEC 2022-K172
- *2021 DF17* - MPEC 2022-J106
- *2020 BY101* - MPEC 2022-G191
- *2015 AH281* - MPEC 2021-Y32
- *2021 DS15* - MPEC 2021-Y30
- *2020 BC95* - MPEC 2021-Y29
- *2021 DR15* - MPEC 2021-Y28
- *2021 DO15* - MPEC 2021-Y25
- *2019 GZ129* - MPEC 2021-Y24
- *2019 EV5* - MPEC 2021-Y23
- *2020 VL26* - MPEC 2021-Y21
- *2020 BA95* - MPEC 2021-Y20
- *2019 EU5* - MPEC 2021-Y19
- *2019 ET5* - MPEC 2021-Y18
- *2021 DN15* - MPEC 2021-Y17
- *2019 SH187* - MPEC 2021-Y16
- *2021 DM15* - MPEC 2021-Y09
- *2020 FQ38* - MPEC 2021-Y08
- *2020 BZ94* - MPEC 2021-Y06

- *2019 SS149* - MPEC 2021-D88
- *2020 BR60* - MPEC 2021-D85
- *2019 SW148* - MPEC 2021-C298
- *2020 FB31* - MPEC 2021-C297
- *2020 FA31* - MPEC 2021-C289
- *2020 FY30* - MPEC 2021-C282
- *2015 VX184* - MPEC 2020-L18
- *2017 VO34* - MPEC 2019-F101
- *2018 AX18* - MPEC 2019-C98
- *2017 WH30* - MPEC 2019-C97
- *2017 SN132* - MPEC 2019-C96
- *2017 OG69* - MPEC 2019-C95
- *2018 VG18* - MPEC 2018-Y14

RESEARCH EXPERIENCE

Current Research

- The Active Asteroids Citizen Science Project — Dec 2019 – Present
  - Performing orbital dynamical analyses on active objects detected through the project
  - Carrying out follow-up observations of small bodies searching for activity using the 1.8m VATT (PI), 3.5m APO, 4.3m LDT (PI), 6.5m Magellan, 8.1m Gemini South, and 2x8.4m LBT (PI)
  - Working with Citizen Science volunteers to make activity discoveries and publish findings
- The NASA Double Asteroid Redirection Test (DART) Mission — Jul 2021 – Present
  - Performing comparative analysis of activity on Didymos and other active asteroids
  - Prepared JWST observations of the DART impact for optimal time series photometric measurements
  - Measured high precision Gemini lightcurve photometry of the Didymos system prior to impact
- The DECam Ecliptic Exploration Project (DEEP) — Sep 2018 – Present
  - Developed DEEP's characteristic fan-shaped on-sky observing pattern
  - Carried out survey observations using DECam on the 4m Blanco telescope
- Searching for Surface Features on Large Trans-Neptunian Objects — Apr 2020 – Present
  - Observing large TNOs using the 1.8 VATT (PI) and the 2x8.4m LBT (PI)
- Legacy Survey of Space and Time Solar System Science Collaboration — Oct 2019 – Present
  - Collaborating on Solar System preparations for the upcoming Vera C. Rubin observatory including cadence recommendations, software requirements, and follow-up coordination

NAU Graduate Research

- Large Scale Survey for Extreme Trans-Neptunian Objects — Aug 2018 – Aug 2022
  - Recovered newly discovered outer solar system objects using the 4.3m LDT and 6.5m Magellan telescopes and observed survey fields using the 4m Blanco telescope
- Orbital Solutions for Revisit Optimization of Directly Imaged Exoplanets — Dec 2018 – Aug 2022
  - Developed a model for maximizing orbit determination efficiency per observation
- The Outer Solar System Perihelion Gap — Aug 2018 – Aug 2021
  - 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
- Asteroid Family Spectral Slope Modeling to Constraining Space Weathering Rates — Dec 2018 – Aug 2020
  - Developed space weathering models using Markov Chain Monte Carlo statistical techniques

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), 2x8.4m Large Binocular Telescope, Large Binocular Telescope (LBT) Observatory, Arizona, USA, remote queue
- Gemini Multi-Object Spectrograph Imager, 8.1m Gemini South Telescope, Gemini Observatory, Chile, 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
- Astrophysical Research Consortium Telescope Imaging Camera (ARCTIC), 3.5m Apache Point Observatory (APO), New Mexico, USA, remote
- Vatt4k, 1.8m Vatican Advanced Technology Telescope (VATT), Mount Graham International Observatory, Arizona, USA, on site observer and trained telescope operator
- 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 2 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, LaTeX, C, C++, bash, IRAF, IDL, MATLAB, awk, VBA, Mathematica

TEACHING EXPERIENCE

Metavisionaries Teaching

- Faculty Member and Instructor Jul 2023 – Present
    - Taught Astrobiology courses through Virtual Reality to college students from a worldwide audience

NAU Mentoring

- Interns to Scholars Mentor Jul 2020 – May 2022
    - 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 (REU) 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, 2021, & 2022
    - 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 – May 2021 & 2022
    - Developed curriculum and taught courses in Applied Physics and The Science of Natural Disasters to 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

Tutoring

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

SCHOLARSHIPS, GRANTS, AND AWARDS (6 of 23)

- 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

COLLOQUIA AND OUTREACH PRESENTATIONS (11)

- Eastern Arizona College Astronomy 103 Guest Lecture, 27 Mar 2023, “DART: The Double Asteroid Redirection Test”
- Discovery Park Public Lecture Series, 25 Mar 2023, “DART: The Double Asteroid Redirection Test”
- National Space Society, Phoenix Chapter, 17 Sep 2022, “Planet X and the Perihelion Gap”
- Scientist Skype Day, Hillside Avenue School, Feb 25, 2022
- 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

- AAS DDA Equity, Diversity, and Inclusion Year-round Mentoring Program Committee Member and Mentor

Jul 2021-Present

- NAU Department of Astronomy and Planetary Science Representative to meet with the US VP Oct 2023
- AAS DPS/EPSC Meeting Student Mentor Oct 2023
- Referee for Monthly Notices of the Royal Astronomical Society Sep 2023
- Local Host for the LSST Solar System Science Collaboration Readiness Conference Jun 2020 & 2023
- LPSC Dwornik Student Presentation Award Judge Mar 2023
- AAS DDA meeting Session Chair Apr 2022 and DPS meeting Session Chair Oct 2022
- NAU Astronomy and Planetary Science Graduate Student Faculty Representative Jul 2021 - Aug 2022
- 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

EXTRACURRICULAR, AND VOLUNTEER EXPERIENCE

- Pima Youth Soccer League Coach — Oct 2023 – Present
  - Head Coach at the Junior level
- Eastern Arizona College Community Patriotic and Jazz Bands — Jul 2023 – Present
  - Trombone/Bass Trombone Player
- NAU Department of Astronomy and Planetary Science Grad Student Club — Oct 2020 – Dec 2021
  - Vice President - coordinated events, 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 for 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
  - Organized and competed in intercollegiate chess tournaments
  - Planned and oversaw weekly activities and community outreach