Tom J. Wilson

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PROFESSIONAL WORK

Postdoctoral Research Fellow, University of Exeter, 2019-
Awarded STFC grant

- Creation of software pipeline for cross-matching external photometric catalogues to LSST datasets as part of LSST:UK consortium
- Efficient analysis of datasets of 10s of billions of objects, ensuring statistical robustness, correcting for systematic effects and correlations

Postdoctoral Researcher, Space Telescope Science Institute, 2018-2019

- Software development for `photutils`, an `astropy`-affiliated python package, focussing on analysis tools for PSF photometry
- Developed optimised observing strategy for *NASA*'s $3 billion flagship spacecraft, *RST*
- Involved solving maximisation problem of information content analysis, and robust statistical analysis of the fitting and modelling of supernovae lightcurves
- Differential analysis of wide-field *Hubble* datasets, improving search efficiency of transient events

EDUCATION

PhD in Physics, University of Exeter, 2013-2018 — Supervisor: Prof. Tim Naylor
Awarded STFC PhD Studentship

- Developed modern statistical methods for solving catalogue cross-matching problem in astronomy, optimised for datasets of billions of objects
- Complex characterisation of datasets in various correlated parameters, allowing for quantitative comparisons across independent datasets

Master's Dissertation, University of Exeter, 2012-2013 — Supervisor: Prof. Tim Naylor

- Analysis of datasets for previously unexplored parameterisations of data in colour-magnitude diagrams to enable new solutions for outstanding problems
- Exploration of parameter phase space and determination of key impacting factors in the initial mass function of stellar clusters
- Developed novel analysis tools to disentangle correlated parameters, resolving degeneracies within multi-dimensional datasets, breaking degeneracies with age in colour-colour diagrams

College Summer Internship, University of Exeter, 2012 — Supervisor: Dr Jennifer Hatchell
Awarded University College Studentship

- Work on the construction of temperature and dust β maps from JCMT 450μm and 850μm observations, supplementing existing datasets with new data and updated analysis methodology

MPhys in Physics with Astrophysics, First Class Honours, University of Exeter, 2009-2013

SOFTWARE ENGINEERING

Developer for the `astropy` `photutils` package

- 8th highest contribution (2nd highest 2018-2020) to the community-driven, open source software
- Code tests, feature improvements, package maintenance, and documentation development

Lead developer of the `macauff` python package

- Development of computationally efficient and precise codebase to ensure accurate photometry and astrometry can be obtained for a set of cross-matched photometric catalogues
- Writing entire project end-to-end, including creation of continuous integration suite, documentation, and class-based python and fortran code

Other project highlights:

- Optimisation and efficiency strategy for *RST*'s supernovae survey, impacting two years of flagship space telescope observations
- Improvements to data reduction for JCMT observations, and writing of key data analysis pipeline

Main programming strengths: python (`numpy`, `scipy`, `astropy`, `matplotlib`), fortran (`openmp`), statistical analysis and application

FIRST AUTHOR PUBLICATIONS

Wilson Tom J., Naylor T., 2018, MNRAS, 481, 2148; "A Contaminant-Free Catalogue of *Gaia* DR2-*WISE* Galactic Plane Matches: Including the Effects of Crowding in the Cross-Matching of Photometric Catalogues"

Wilson Tom J., Naylor T., 2018, MNRAS, 473, 5570; "Improving Catalogue Matching By Supplementing Astrometry with Additional Photometric Information"

Wilson Tom J., Naylor T., 2017, MNRAS, 469, 2517; "The Effect of Unresolved Contaminant Stars on the Cross-matching of Photometric Catalogues"

CO-AUTHOR PUBLICATIONS

Wakeford H. R., Sing D. K., Stevenson K. B., Lewis N. K., Pirzkal N., Wilson T. J., et al., 2020, AJ, 159, 204; "Into the UV: A Precise Transmission Spectrum of HAT-P-41b Using Hubble's WFC3/UVIS G280 Grism"

Steinhardt C., ..., Wilson T. J., et al., 2020, ApJS, 247, 64; "The Buffalo HST Survey"

Bradley L., Sipőcz B., Robitaille T., Tollerud E., Vinícius Z., Deil C., Barbary K., Wilson T. J., et al, 2019, 10.5281/zenodo.3568287; "astropy/photutils: v0.7, v0.7,1, v0.7.2"

Wakeford H. R., Wilson T. J., et al., 2019, RNAAS, 3, 7; "Exoplanet Atmosphere Forecast: Observers Should Expect Spectroscopic Transmission Features to be Muted to 33%"

Wakeford H. R., Lewis N. K., Fowler J., Bruno G., Wilson T. J., et al., 2019, AJ, 157, 11; "Disentangling the Planet from the Star in Late-Type M Dwarfs: A Case Study of TRAPPIST-1g"

Wakeford H. R., Sing D. K., Deming D., Lewis N. K., Goyal J., Wilson T. J., et al., 2018, AJ, 155, 29; "The Complete Transmission Spectrum of WASP-39b with a Precise Water Constraint"

Rumble D., Hatchell J., Pattle K., Kirk H., Wilson T., et al., 2016, MNRAS, 460, 4150; "The JCMT Gould Belt Survey: Evidence for Radiative Heating and Contamination in the W40 Complex"

Rees J., Wilson T., et al., 2016, IAUS, 314, 205; "The Age of Taurus: Environmental Effects on Disc Lifetimes"

Hatchell J., Wilson T., et al., 2013, MNRAS, 429, 10; "The JCMT Gould Belt Survey: SCUBA-2 Observations of Radiative Feedback in NGC 1333"

SCIENTIFIC TALKS & CONFERENCES

August 2020, Rubin Observatory Project and Community Workshop, Contributed Talk
July 2020, University of Exeter, Contributed Talk
July 2019, Python in Astronomy 19, Contributed Talk
June 2019, STScI, HotSci@STScI Colloquia, Contributed Seminar Talk
March 2019, STScI, Friday Science Coffee, Contributed Seminar Talk
February 2019, STScI, TESS Data Workshop, Contributed Talk
February 2019, UNLV BUFFALO 2019 Meeting, Contributed Talk
May 2018, Exeter, First Year PhD Development Day, Invited Talk
March 2018, Science with Precision Astrometry, Contributed Poster
September 2017, Cardiff Star Formation Workshop, Contributed Talk
July 2016, NASA Goddard Space Flight Center, Invited Seminar Talk
June 2016, Cool Stars 19, Contributed Poster
April 2015, BECSS Bristol, Contributed Talk
March 2015, Milky Way Astrophysics from Wide-Field Surveys, Contributed Talk

TEACHING & OUTREACH EXPERIENCE

Undergraduate Astrophysics Lab Demonstrator, 2013-2017

- Assist in teaching of 20-30 second year undergraduates in the astrophysics portion of the lab
- Demonstrated use of UNIX commands, IRAF, data reduction and analysis, & report writing
- Duties included report assessment and feedback
- Experiments included analysis of Cepheid variability periods, colour-magnitude diagrams, and optical spectroscopy

Undergraduate Astrophysics Teaching Telescope Operator, 2013-2017

- Lead undergraduate students in usage of the university's teaching telescope
- Teaching of telescope operation, as well as remote/automated capacities of ACP Scheduler
- Involved teaching an understanding of observation planning

Undergraduate Physics Problem Tutor, 2013-2017

- Assist in running first year undergraduate physics problems classes
- Involved organising homework sessions, managing approximately 140 students
- Provided guidance on a wide variety of problems, ranging from solid state physics to electromagnetism to astrophysics

"Pint of Science" Event Organiser, 2013-2018

- Co-organised the "Pint of Science" outreach events held in Exeter each year
- Events involve three nights of outreach talks from a selection of researchers, aimed at public engagement
- Included a host of responsibilities including deciding the themes for each nights' talks, inviting speakers, and organising event location
- Involved engaging with the community and answering questions from members of the public

Observing At the James Clerk Maxwell Telescope, Hawaii, 2014

- Experience at the JCMT as part of the JPS survey
- Involved telescope operation, data processing, and observation scheduling