

## Paul James Wright

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CONTACT INFORMATION	Rm 614, Kelvin Building University of Glasgow Glasgow, G12 8QQ United Kingdom	Work: +44 (0)14133 08855 Web: <a href="http://www.pauljwright.co.uk">www.pauljwright.co.uk</a> Email: <a href="mailto:paul.wright@glasgow.ac.uk">paul.wright@glasgow.ac.uk</a> Publication List: <a href="#">SAO/NASA ADS</a>
RESEARCH SUMMARY	<p>My research interests are in solar and stellar physics, and my Ph.D. research has concentrated on one of the unsolved problems in Heliophysics—the coronal heating problem. During my Ph.D. I have gained expertise in numerous time-series analysis techniques and methods for recovering the differential emission measure (an ill-posed inverse problem) from a wide range of spectroscopic and narrowband data. I am a member of the <i>NuSTAR</i> Heliophysics working group and I led the analysis of the first solar flare observed by the <i>NuSTAR</i> hard X-ray <i>astrophysics</i> imaging spectrometer. I have also developed a stellar flare detection algorithm based on the observations obtained by the <i>Kepler</i> space telescope to determine the superflare rate of the Sun.</p>	
EDUCATION	<p><b>University of Glasgow</b>, Glasgow, UK 2014 – present</p> <p>Ph.D. Solar Physics Thesis Topic: <i>The Energetics of Small Flares and Brightenings</i> Advisers: Dr Iain G. Hannah, Dr Alexander MacKinnon</p> <p><b>University of Southampton</b>, Southampton, UK 2010 – 2014</p> <p>MPhys Astrophysics with a year abroad First-class honours (1:1) Adviser: Professor Malcolm Coe</p> <p><b>Smithsonian Astrophysical Observatory</b>, Cambridge, MA, USA 2013 – 2014</p> <p>MPhys Astrophysics with a year abroad Thesis Topic: <i>The Superflare Rates of Solar-Like Stars</i> Advisers: Dr Steven H. Saar, Dr Jeremy J. Drake</p>	
CURRENT ACADEMIC APPOINTMENT	<p><b>Affiliate Staff Member</b>, University of Glasgow 2017 – present</p> <p><b>SUPA School of Physics and Astronomy</b></p> <ul style="list-style-type: none"><li>Using the EBTEL hydrodynamics code to model light curves from coronal loops. The parameter space of these simulations will be constrained by observations obtained during the <i>NuSTAR</i> heliophysics campaign, and these simulations will be used to test a variety of analysis techniques.</li></ul>	
PREVIOUS ACADEMIC APPOINTMENTS	<p><b>Researcher</b>, NASA Frontier Development Lab (FDL) 2018</p> <p><b>SETI Institute/NASA Ames Research Center</b>, Mountain View, CA</p> <p>Project: <i>Predicting Solar Spectral Irradiance from SDO/AIA Observations</i></p> <ul style="list-style-type: none"><li>A selective (12% acceptance rate) 8-week applied Artificial Intelligence accelerator established to tackle knowledge gaps useful to NASA’s science and exploration goals, and humanity.</li><li>Implemented Deep Learning algorithms (Convolutional Neural Networks; CNNs) such as U-Net, AlexNet and ResNet to predict disk-integrated Solar Spectral Irradiance (SSI) observed by <i>SDO/EVE</i> (MEGS-A) from high-resolution <i>SDO/AIA</i> images which share a common latent space.</li><li>Predicted MEGS-A SSI with median absolute relative discrepancies of less than 1.6% using a CNN augmented with a Multi-Layer Perceptron (MLP).</li><li>Used a 1x1 CNN (equivalent to an MLP) to improve the computational speed for differential emission measure (DEM) inversion. Further improvement to the resulting DEMs were obtained by training a CNN to correct the DEMs to minimise the residual between observed and synthesized SSI.</li><li>Received the NASA Frontier Development Lab “Contribution to Science” award.</li></ul>	

PREVIOUS ACADEMIC APPOINTMENTS (CONT.)	<b>Post-Graduate Research Assistant, University of Glasgow</b> 2014 – 2017 <b>SUPA School of Physics and Astronomy</b> Project: <i>The Energetics of Small Flares and Brightenings</i> <ul style="list-style-type: none"> <li>Analysed observations of the Sun with <i>NuSTAR</i>, a telescope not designed for helio-physics. These observations are the most sensitive of their kind and have resulted in numerous, wide-ranging, highly-collaborative peer-reviewed publications.</li> <li>Analysed non-flaring coronal time-series in pursuit of signatures of the coronal heating mechanism. Techniques included time-lag analysis (cross-correlation), Fourier analysis, wavelet analysis, and local intermittency measure (LIM).</li> <li>Studied the temperature distribution of the solar atmosphere through the recovery of an ill-posed inverse problem (the differential emission measure, DEM) using techniques such as Tikhonov regularisation, Markov-chain Monte Carlo, Spline fitting, and Sparse Inversion (by Basis Pursuit).</li> <li>The press-release image produced from the <i>NuSTAR</i> observations obtained for <a href="#">Wright et al. 2017</a> was published by numerous news outlets and is one of the five iconic images from <i>NuSTAR</i>'s first five years in space.</li> </ul> Primary Collaborators: <i>Dr Iain Hannah, Dr Alexander MacKinnon, Dr Hugh Hudson, Dr Paulo Simões</i>
	<b>Visiting Researcher, NASA Goddard Space Flight Center (GSFC)</b> 2016 <b>Heliophysics Science Division</b> <ul style="list-style-type: none"> <li>Explored the possibility of implementing DEM maps in the <a href="#">Helioviewer</a> project, and their usefulness as an input for various established time-series analysis techniques.</li> </ul> Collaborators: <i>Dr Nicholeen Viall, Dr Jack Ireland</i>
	<b>Research Scholar, Center for Astrophysics   Harvard &amp; Smithsonian</b> 2013 – 2014 <b>Solar and Stellar X-ray Group</b> Project: <i>The Superflare Rates of Solar-Like Stars</i> <ul style="list-style-type: none"> <li>Designed and implemented a sophisticated stellar flare detection routine for long-cadence (30 mins) <i>Kepler</i> data obtained from a proprietary set of spectroscopically verified solar-type stars in three open clusters.</li> <li>A preliminary report on this work had coverage by <a href="#">Science</a> and the <a href="#">Smithsonian Magazine</a>.</li> </ul> Collaborators: <i>Dr Steven Saar, Dr Søren Meibom, Dr Jeremy Drake, Dr José D. do Nascimento Jr, Dr Vinay Kashyap</i>
	<b>Summer Research Intern, University of Southampton</b> 2013 <b>Astronomy Group</b> <ul style="list-style-type: none"> <li>Investigated the presence of double blue straggler sequences in globular clusters using Hubble Space Telescope (ACS, WFPC2) data.</li> </ul> Collaborators: <i>Dr Andrea Dieball</i>
	<b>REFEREED JOURNAL PUBLICATIONS</b> <ul style="list-style-type: none"> <li>[1] Marsh, A. J., Smith, D. M., Glesener, L. <i>et al</i> 2017. <i>First NuSTAR Limits on Quiet Sun Hard X-Ray Transient Events</i>, <a href="#">ApJ</a>, 849, 131</li> <li>[2] Wang, J., Simões, P. J. A., Jeffrey, N. L. S. <i>et al</i> 2017. <i>Observations of Reconnection Flows in a Flare on The Solar Disk</i>, <a href="#">ApJL</a>, 847, L1</li> <li>[3] <b>Wright, P. J.</b>, Hannah, I. G., Grefenstette, B. W., <i>et al</i> 2017. <i>Microflare Heating of a Solar Active Region Observed with NuSTAR, Hinode/XRT, and SDO/AIA</i>, <a href="#">ApJ</a>, 844, 132</li> <li>[4] Kuhar, M., Krucker, S., Hannah, I. G., <i>et al</i> 2017. <i>Evidence of Significant Energy Input in the Late Phase of a Solar Flare from NuSTAR X-ray Observations</i>, <a href="#">ApJ</a>, 835, 6</li> </ul>

BOOK CHAPTERS	[5] <b>Wright, P. J.</b> , Cheung, M. C. M., Thomas, R., <i>et al</i> 2018 <i>DeepEM: A Deep Learning Approach to DEM Inversion</i> . In M. Bobra & J. Mason, eds., <i>Machine Learning, Statistics, and Data Mining for Heliophysics</i> , <b>Chapter 4</b>	
FIRST AUTHOR	[6] <b>Wright, P. J.</b> , MacKinnon, A., Hannah, I. G., and Simões, P. J. A. 2019. <i>Local Intermittency Measure: The Application to Active Region Light Curves</i>	
PUBLICATIONS IN PREPARATION (WORKING TITLES)	[7] <b>Wright, P. J.</b> , Hannah, I. G., Viall, N. M., <i>et al</i> 2019. <i>The Thermal Time Evolution of Active Regions Determined by SDO/AIA</i>	
	[8] <b>Wright, P. J.</b> , Saar, S. H., Meibom, S., <i>et al</i> 2019. <i>The Age-Dependent Superflare Rates of G-Type Dwarfs In Three Kepler Clusters</i>	
	[9] <b>Wright, P. J.</b> , Saar, S. H., Meibom, S., <i>et al</i> 2019. <i>An Extension of The Age-Dependent Superflare Rates to F- and K-Type Dwarfs</i>	
CONFERENCES, WORKSHOPS, & SCHOOLS	<b>Invited Oral Presentations</b>	
	<i>ISSI Team Meeting: Coronal Nanoflares</i> , Bern, CH	2018
	<i>ISSI Team Meeting: Coronal Nanoflares</i> , Bern, CH	2016
	<i>Center for Astrophysics   Harvard &amp; Smithsonian</i> , Cambridge, MA, USA	2014
	<b>Oral/e-Poster Presentations</b>	
	<i>Living with a Star (SDO/LWS) Workshop</i> , Ghent, Belgium	2018
	<i>Solar Physics Division Meeting (SPD/AAS)</i> , Portland, OR, USA	2017
	<i>Coronal Loops Workshop VIII</i> , Palermo, Sicily, IT	2017
	<i>Living with a Star (SDO/LWS) Workshop</i> , Burlington, VT, USA	2016
	<i>Hinode 10</i> , Nagoya, JP	2016
	<i>National Astronomy Meeting 2016</i> , Nottingham, UK	2016
	<i>Hinode 9</i> , Belfast, UK	2015
	<i>Glasgow-Cambridge Flare Workshop</i> , Glasgow, UK	2015
	<b>Poster Presentations</b>	
	<i>European Solar Physics Meeting (ESPM)</i> , Budapest, HU	2017
	<i>Solar Physics Division Meeting (SPD/AAS)</i> , Portland, OR, USA	2017
	<i>Living with a Star (SDO/LWS) Workshop</i> , Burlington, VT, USA	2016
	<i>Coronal Loops Workshop VII</i> , Cambridge, UK	2015
	<i>National Astronomy Meeting (NAM) 2015</i> , Llandudno, UK	2015
	<i>223rd AAS Meeting</i> , National Harbor, MD, USA	2014
	<b>Schools Attended</b>	
	<i>CESRA Radio Summer School 2015</i> , Glasgow, UK	2015
	<i>STFC Advanced Summer School in Solar Physics</i> , Dundee, UK	2014
	<b>Additional Conferences/Workshops Attended</b>	
	<i>NuSTAR Heliophysics Workshop (remote participation)</i> , Berkeley, CA, USA	2017
	<i>SUPA Cormack Astronomy Meeting</i> , Edinburgh, UK	2015
	<i>Royal Astronomical Society Discussion Meeting: Results from IRIS</i> , London, UK	2015
	<i>SUPA Cormack Astronomy Meeting</i> , Edinburgh, UK	2014
	<i>1st Space Glasgow Research Conference</i> , Glasgow, UK	2014

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AWARDS AND GRANTS TOTAL: £7000	<b>University of Glasgow</b>	
	NASA Frontier Development Lab, Contribution to Science Award	2018
	Solar Physics Division Meeting (AAS/SPD) Student Poster Award	2017
	Solar Physics Division Meeting (AAS/SPD) Studentship Award	2017
	Coronal Loops Workshop VIII Travel Award	2017
	National Astronomical Observatory of Japan Travel Award	2016
	Hinode 9 Travel Award	2015
	European Space Agency/Cambridge Philosophical Society Travel Award	2015
AWARDS AND GRANTS (CONT.)	<b>University of Southampton</b>	
	Research Scholarship	2013
	Summer Studentship Grant	2013
TEACHING	<b>Coursera Inc.</b>	
	<b>“Data Scientists Toolbox” Community Mentor</b>	2017 – present
	An invited mentor of a course in the Data Science specialisation offered by Johns Hopkins University.	
	<b>University of Glasgow</b>	
	<b>Astronomy 1 Tutorial Demonstrator</b>	2016 - 2017
	Supervised students, and marked first-year astronomy problem sets.	
	<b>Astronomy 3/4 (Honours) Laboratory Demonstrator</b>	2015 - 2016
	Demonstrated, supervised, and marked a number of final-year research projects covering topics such as asteroid light curves, and solar limb darkening.	
	<b>Physics Pre-University Summer School</b>	2015
	Taught at a pre-university school for students entering the first year of undergraduate education.	
MEMBERSHIPS	<b>NuSTAR Heliophysics Working Group</b> , Member	2015 – present
	<b>International Space Science Institute (ISSI)</b> , Young Scientist Member	2015 – present
	Member of Paola Testa’s ISSI Team: <i>New Diagnostics of Particle Acceleration in Solar Coronal Nanoflares from Chromospheric Observations and Modelling</i>	
	<b>Royal Astronomical Society</b> , RAS Fellow	2014 – present
COMMUNITY INVOLVEMENT	<b>Nature Communications</b> , Reviewer	2017 – present
	<b>Glasgow Astronomy &amp; Astrophysics Group Meeting</b> , Organiser	2017
	<b>CESRA Radio Summer School</b> , Volunteer Organiser	2015
SCIENTIFIC OUTREACH	<b>Glasgow Science Centre</b> , Demonstrator	2016
	<b>British Science Week</b> , Demonstrator	2016
	<b>Institute of Physics: Women and Girls in Science</b> , Demonstrator	2016
	<b>Scottish Television (STV)</b> , Guest Presenter	2015
	<b>World Wide Telescope</b> , Ambassador	2013 – 2014
	<b>BBC Stargazing Live</b> , Demonstrator	2013
	<b>So’ton Astrodome</b> , Demonstrator	2012
	<b>BBC Bang Goes The Theory Roadshow</b> , Demonstrator	2012
	<b>UK Solar Physics (UKSP) Nuggets</b> , concise, easy-to-read science articles	
	84. The first <i>NuSTAR</i> microflare	2017
	<b>Hinode/XRT Picture of the Week (XPOW)</b>	
	The First Microflare Observations with <i>Hinode</i> /XRT & <i>NuSTAR</i>	2017

PERSONAL PROJECTS	<b>ColourBlind</b> , A repository for colour-blind-friendly colour tables.
PROFESSIONAL DEVELOPMENT	<b>Coursera, Inc. (MOOC Platform)</b> Using Coursera.org, a massive open online course (MOOC) platform, to take specialisations (a series of related courses plus a final capstone project) offered by accredited universities to further develop skills and understanding in a wide range of topics.  <b>Data Science</b> , Johns Hopkins University 2017 – present Nine-course (plus capstone) introduction to data science. <b>Mastering Software Development in R</b> , Johns Hopkins University 2018 – present Four-course (plus capstone) specialisation providing rigorous training in R.
TECHNICAL SKILLS:	<i>Computing</i> : IDL (5+ years), Python (2+ years), PyTorch, R, Bash, $\LaTeX$ , PyCharm, IRAF, git (GitHub, Gitlab), Microsoft Office, Adobe Creative Cloud, Linux/Unix, Mac OSX, Microsoft Windows  <i>General</i> : Data Analysis, Data Visualisation, Interdisciplinary Collaboration, Public Speaking, Teaching, Writing (Technical & Lay)