JamesMcCormac

Curriculum Vitae

Contact

Department of Physics
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Links

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Languages

English (Native)
Spanish (Fluent)

Computing

Operating systems:
Linux, macOS, Windows

Programming Languages:
Python, C, Bash, HTML, CSS, Javascript

Web Frameworks:
Flask, JQuery

Databases:
MySQL

Grid Computing:
SGE

Version Control:
Git

Word Processing:
LaTeX, Microsoft Office

Education

Queen's University Belfast, BT7 1NN, U.K.

2008 – 2012 **Doctor of Philosophy** in Astronomy
2004 – 2008 **Master of Science** in Physics with Astrophysics with First Class Honours

Experience

2014 – 2019 **Department of Physics, University of Warwick** Gibbet Hill Road, Coventry, CV4 7AL
Postdoctoral Research Fellow: NGTS project, Cerro Paranal, Chile

- Construction & commissioning of a robotic observatory.
- Routine operation & opto-mechanical maintenance of 12 telescopes.
- Development of operational software and environment monitoring.
- Development of observatory web interface in Python, Flask and MySQL.
- Development of web-based survey strategy tool (Javascript, HTML, CSS).
- Write & maintain TWiki-based documentation.
- Exploitation of scientific results through exoplanet discoveries from *NGTS*.

2011 – 2018 **Department of Physics, University of Warwick** Gibbet Hill Road, Coventry, CV4 7AL
NITES telescope manager, ORM, La Palma, Canary Islands, Spain

- Construction & commissioning of the semi-robotic observatory.
- Routine operation & opto-mechanical maintenance of 0.4m telescope.
- Development of operational software and environment monitoring.
- High-precision photometric follow-up of *SuperWASP* exoplanets.
- Provide training and support to postgraduate student users.
- Co-supervise masters projects – characterising galactic stellar clusters.
- Data analysis of large survey for exoplanets in the globular cluster M71.

2015 – 2018 **Department of Physics, University of Warwick** Gibbet Hill Road, Coventry, CV4 7AL
Python Programming Lab Demonstrator

- Supervise practical lab sessions for 1^{st} year Python programming course.
- Demonstrate basic operations and how to think programmatically.
- Demonstration of pseudo-code for sounding out initial ideas.
- Provide one-on-one support for students having difficulties.

2016 – 2018 **Department of Physics, University of Warwick** Gibbet Hill Road, Coventry, CV4 7AL
Public Outreach: Warwick Astro Planetarium

- Visit local primary schools with the department's inflatable IMAX-style planetarium and present a series of immersive videos on astronomy.
- Interact with young children and answer questions about the universe.
- Aim to engage with children and promote STEM subjects.

2012 – 2014 **Isaac Newton Group of Telescopes** Santa Cruz de La Palma, Canary Islands, Spain
Telescope Operator & Support Astronomer, 4.2m William Herschel Telescope

- Was responsible for both ING telescopes for up to 100 nights per year.
- Provided expert training and support to visiting international astronomers.
- Was responsible for minimising technical downtime at the observatory.
- Routinely configured and calibrated the *ACAM*, *IDS*, *LIRIS* & *WYFFOS* spectrographs, plus the *ACAM*, *PFIP* & *WFC* CCD cameras.
- Developed Python scripts for efficient observing and data calibration.
- Developed a Raspberry Pi driven auxiliary camera for the RoboDIMM astronomical seeing monitor.

- Supervised summer student project in 2013. The project was 50% python programming: developing an automated calibration process for the ACAM imager; and 50% science: measuring accurate colours for stars in the M71 globular cluster.
- Completed multiple first-responder medical courses, driving safety, fire safety and general health & safety courses, required for remote site work.

2008 – 2010 **Queen's University Belfast** University Road, Belfast BT7 1NN
PhD Research Project: The Next Generation Transit Survey Prototype

- Designed and built the prototype telescope for newly proposed transiting exoplanet survey *NGTS*.
- Commissioned the prototype at the ORM, La Palma, Canary Islands, Spain and operated it remotely from my home at sea level on La Palma between 2009 and 2010.
- Developed a telescope, camera, focuser and dome control system in C.
- Analysed photometric data using Python and demonstrated the prototype's ability to detect super-Earth and Neptune-sized exoplanets. The commencement of the full £3M NGTS project was based in part on the results of this prototype.

2009 – 2010 **Isaac Newton Group of Telescopes** Santa Cruz de La Palma, Canary Islands, Spain
Student Support Astronomer, 2.5m Isaac Newton Telescope

- Provided expert training and support to visiting international astronomers.
- Configured the *IDS* spectrograph and *WFC* CCD camera as per the visiting astronomer's requirements.
- Developed various Python scripts to automate observing and calibration tasks and increase the overall efficiency of the limited telescope time.
- Provided technical feedback to visiting astronomers based on their telescope time application.

Awards

2017 **Performance Merit Award** University of Warwick
Award for excellent performance during previous 1.5 years

2013 & 2014 **Exceptional Performance Award** Isaac Newton Group of Telescopes
Award for exceptional performance in my position as Telescope Operator & Support Astronomer at the ING.

2008 – 2011 **Department of Employment & Learning PhD scholarship** Queen's University Belfast
Funding for tuition fees and a stipend during a 3 year PhD degree.

2008 **Raymond Greer Award** Queen's University Belfast
Awarded each year for the best overall MSci in Physics.

2008 **Certificate of Entrepreneurial Studies** Queen's University Belfast
Awarded to the winners of an Entrepreneurial Studies competition.

Publications

First-author publications:

2017 **The Next Generation Transit Survey - Prototyping Phase**
McCormac, J., et al. 2017, PASP, 129, 972

2014 **A Search for Photometric Variability towards M71 with the Near-Infrared Transiting ExoplanetS Telescope**
McCormac, J., et al. 2014, MNRAS, 438, 3383

2013 **DONUTS: A Science Frame Autoguiding Algorithm with Sub-Pixel Precision, Capable of Guiding on Defocused Stars**
McCormac, J., et al. 2013, PASP, 125, 548

Co-authored publications:

2018 **Unmasking the hidden NGTS-3Ab: a hot Jupiter in an unresolved binary system**
Günther, M. N., et al. 2018, MNRAS, 478, 4720

2018 **Automatic vetting of planet candidates from ground-based surveys: machine learning with NGTS**
Armstrong, D. J., et al. 2018, MNRAS, 478, 4225

2018 **Ground-based detection of G star superflares with NGTS**
Jackman, J. A. G., et al. 2018, MNRAS, 477, 4655

2018 **SPECULOOS: a network of robotic telescopes to hunt for terrestrial planets around the nearest ultracool dwarfs**
Delrez, L., et al. 2018, SPIE submitted

2018 **An Earth-sized exoplanet with a Mercury-like composition**
Santerne, A., et al. 2018, Nature Astronomy, 2, 393

2018 **NGTS-2b: An inflated hot-Jupiter transiting a bright F-dwarf**
Raynard, L., et al. 2018, MNRAS submitted

2018 **The Next Generation Transit Survey (NGTS)**
Wheatley, P. J., et al. 2018, MNRAS, 475, 4, 4476

2018 **NGTS-1b: A hot Jupiter transiting an M-dwarf**
Bayliss, D., et al. 2018, MNRAS, 475, 4, 4467

2018 **MASCARA-2 b. A hot Jupiter transiting the mV = 7.6 A-star HD 185603**
Talens, G. J. J., et al. 2018, A&A, 612, A57

2018 **The discovery of WASP-151b, WASP-153b, WASP-156b: Insights on giant planet migration and the upper boundary of the Neptunian desert**
Demangeon, O. D. S., et al. 2018, A&A, 610, A63

2018 **LRG-BEASTS III: ground-based transmission spectrum of the gas giant orbiting the cool dwarf WASP-80**
Kirk, J., et al. 2018, MNRAS, 474, 876

2018 **Qatar Exoplanet Survey: Qatar-6b?A Grazing Transiting Hot Jupiter**
Alsubai, K., et al. 2018, AJ, 155, 52

2018 **The First Post-Kepler Brightness Dips of KIC 8462852**
Boyajian, T. S., et al. 2018, ApJ, 853, L8

2017 **Centroid vetting of transiting planet candidates from the Next Generation Transit Survey**
Gunther, M., et al. 2017, MNRAS, 472, 295

2017 **MASCARA-1 b. A hot Jupiter transiting a bright m_V = 8.3 A-star in a misaligned orbit**
Talens, G. J. J., et al. 2017, A&A, 606, A73

2017 **A population of faint low surface brightness galaxies in the Perseus cluster core**
Wittmann, C., et al. 2017, MNRAS, 470, 1512

2017 **The EURONEAR Lightcurve Survey of Near Earth Asteroids**
Vaduvescu, O., et al. 2017, Earth Moon and Planets, 120, 41

2017 **Rayleigh scattering in the transmission spectrum of HAT-P-18b**
Kirk, J., et al. 2016, MNRAS, 468, 3907

2017 **K2-110 b: a massive mini-Neptune exoplanet**
Osborn, H. P., et al. 2017, A&A, 604, A19

2017 **From Dense Hot Jupiter to Low Density Neptune: The Discovery of WASP-127b, WASP-136b and WASP-138b**
Lam, K. W. F., et al. 2017, A&A, 599, A3

2017 **GRB 171205A: GOTO detection of the optical counterpart.**
Steeghs, D., et al. 2017, GRB Coordinates Network, Circular Service, No. 22190, #1

2016 **WASP-92b, WASP-93b and WASP-118b: three new transiting close-in giant planets**
Hay, K. L., et al. 2016, MNRAS, 463, 3276

2016 **The Astropy Problem**
Muna, D., et al. 2016, arXiv, 1610.03159

2016 **K2-30 b and K2-34 b: Two inflated hot Jupiters around solar-type stars**
Lillo-Box, J., et al. 2016, A&A, 594, A50

2016 **WASP-113b and WASP-114b, two inflated hot Jupiters with contrasting densities**
Barros, S. C. C., et al. 2016, A&A, 593, A113

2016 **The Next Generation Transit Survey Becomes Operational at Paranal**
West, R. G., et al. 2016, ESO Messenger, 165, 10

2016 **Supernova 2014J at M82 - II. Direct analysis of a middle-class Type Ia supernova**
Vallely, P., et al. 2016, MNRAS, 460, 1614

2016 **K2-29 b/WASP-152 b: An Aligned and Inflated Hot Jupiter in a Young Visual Binary**
Santerne, A., et al. 2016, ApJ, 824, 55

2016 **Single transit candidates from K2: detection and period estimation**
Osborn, H. P., et al. 2016, MNRAS, 427, 2273

2016 **SN 2014J at M82 - I. A middle-class Type Ia supernova by all spectroscopic metrics**
Galbany, L., et al. 2016, MNRAS, 457, 525

2016 **WASP-135b: A Highly Irradiated, Inflated Hot Jupiter Orbiting a G5V Star**
Spake, J. J., et al. 2016, PASP, 128, 2

2016 **K2 variable catalogue - II. Machine learning classification of variable stars and eclipsing binaries in K2 fields 0-4**
Armstrong, D. J., et al. 2016, MNRAS, 456, 2260

2015 **Photodynamical mass determination of the multiplanetary system K2-19**
Barros, S. C. C., et al. 2015, MNRAS, 454, 4267

2015 **Characterization of the K2-19 Multiple-transiting Planetary System via High-dispersion Spectroscopy, AO Imaging, and Transit Timing Variations**
Narita, N., et al. 2015, ApJ, 815, 47

2015 **One of the closest exoplanet pairs to the 3:2 mean motion resonance: K2-19b and c**
Armstrong, D. J., et al. 2015, A&A, 582, A33

2015 **K2 Variable Catalogue: Variable stars and eclipsing binaries in K2 campaigns 1 and 0**
Armstrong, D. J., et al. 2015, A&A, 579, A19

2015 **Subaru and Swift observations of V652 Herculis: resolving the photospheric pulsation**
Jeffery, C. S., et al. 2015, MNRAS, 447, 2836

2014 **The EBLM project. II. A very hot, low-mass M dwarf in an eccentric and long-period, eclipsing binary system from the SuperWASP Survey**
Gómez Maqueo Chew, Y., et al. 2014, A&A, 572, A50

2014 **A window on exoplanet dynamical histories: Rossiter-McLaughlin observations of WASP-13b and WASP-32b**
Brothwell, R. D., et al. 2014, MNRAS, 440, 3392

2013 **Discovery of WASP-65b and WASP-75b: Two hot Jupiters without highly inflated radii**
Gomez Maqueo Chew, Y., et al. 2013, A&A, 559, 36

2013 **WASP-54b, WASP-56b, and WASP-57b: Three new sub-Jupiter mass planets from SuperWASP**
Faedi, F., et al. 2013, A&A, 551, A73

2013 **WASP-52b, WASP-58b, WASP-59b, and WASP-60b: Four new transiting close-in giant planets**
Hébrard, G., et al. 2013, A&A, 549, A134

2012 **A hot Uranus transiting the nearby M dwarf GJ 3470. Detected with HARPS velocimetry. Captured in transit with TRAPPIST photometry**
Bonfils, X., et al. 2012, A&A, 546, A27

2012 **NGTS: a robotic transit survey to detect Neptune and super-Earth mass planets**
Chazelas, B., et al. 2012, SPIE, 8444, 84440E

2012 **A transiting companion to the eclipsing binary KIC002856960**
Armstrong, D. J., et al. 2012, A&A, 545, L4

2011 **WASP-35b, WASP-48b, and HAT-P-30b/WASP-51b: Two New Planets and an Independent Discovery of a Hat Planet**
Enoch, B., et al. 2011, AJ, 142, 86

2011 **WASP-40b: Independent Discovery of the 0.6 MJup Transiting Exoplanet HAT-P-27b**
Anderson, D. R., et al. 2011, PASP, 123, 555

2011 **Independent Discovery of the Transiting Exoplanet HAT-P-14b**
Simpson, E. K., et al. 2011, AJ, 141, 161

2011 **WASP-37b: A 1.8 M J Exoplanet Transiting a Metal-poor Star**
Simpson, E. K., et al. 2011, AJ, 141, 8

2011 **WASP-38b: a transiting exoplanet in an eccentric, 6.87d period orbit**
Barros, S. C. C., et al. 2011, A&A, 525, A54

Journal Referee

2015 **Monthly Notices of the Royal Astronomical Society**
Technical publication on a new high-speed scientific camera, CHIMERA

Conferences & Meetings

2018 **Oral Presentation** SPECULOOS Team Meeting, University of Liege, Belgium
Presented summary of ongoing autoguiding upgrade project

2018 **Oral Presentation** NGTS Team Meeting, DLR, Berlin
Presented summary of NGTS operations and facility performance

2018 **Oral Presentation** UK Exoplanet Meeting, Oxford University, UK
Presented project summary and latest exoplanet discoveries from NGTS

2017 **Oral Presentation** SPECULOOS Team Meeting, University of Cambridge, UK
Presented operations overview of NGTS and summary of autoguiding system.

2017 **Oral Presentation** NGTS Team Meeting, University of Warwick, UK
Presented summary of NGTS operations and facility performance

2016 **Oral Presentation** European Southern Observatory, Paranal, Chile
Presented an NGTS project overview to ESO staff at Paranal.

2016 **Oral Presentation** NGTS Team Meeting, Geneva Observatory, Switzerland
Presented summary of NGTS operations and facility performance

2016 **Oral Presentation** National Astronomy Meeting, Nottingham, UK
Presented the current status of the NGTS project and our first planet candidates to the professional community.

2016 **Poster** UK Exoplanet Meeting, Exeter, UK
Presented the current status of the NGTS project.

2015 **Oral Presentation** European Week of Astronomy and Space Science (EWASS), Tenerife
Presented a technical overview of the NGTS facility.

2015 **Oral Presentation** NGTS Team Meeting, University of Warwick, UK
Presented summary of NGTS operations and facility performance

2015 **Poster** UK Exoplanet Meeting, Warwick, UK
Presented an NGTS project overview poster.

2014 **Oral Presentation** NGTS Team Meeting, University of Leicester, UK
Presented summary of NGTS operations and facility performance

2013 **Oral Presentation** Third Workshop on Robotic Autonomous Observatories, Malaga
Presented the results from the NGTS prototyping phase to the amateur and professional community.

2013 **Oral Presentation** Isaac Newton Group of Telescopes, La Palma
Presented my PhD research to staff from the ING, NOT and Mercator telescopes.

Software Projects

DONUTS Image Alignment Algorithm github.com/jmccormac01/Donuts
A simple yet powerful image alignment algorithm used in precise telescope tracking and in extracting precise photometry from astronomical data. The algorithm employs a cross-correlation technique to register translational shifts between astronomical images, allowing the offsets to be corrected. The algorithm is currently in use at the NGTS, NITES, SPECULOOS and Warwick 1m telescopes. Members of the astronomical community are currently deploying DONUTS at telescopes in Mexico and Chile.

Core Skills:

- Image handling and manipulation in Python (Numpy, SciPy, Scikit Image).
- Data analysis using Fast Fourier Transforms.
- Continuous integration and testing with Travis CI, Landscape and Coveralls.
- Maintaining documentation along with examples.
- Supporting feedback from users, fixing faults and improving stability.

NGTS Operations Web Interface github.com:private
A Python/Flask web interface that displays the current status of the NGTS observatory in the Atacama Desert, Chile. The web interface displays information such as the current weather, the status of each of the 12 telescopes, views from 8 webcams and all-sky camera, and various diagnostics. It also hosts a custom tool written in Javascript for efficiently selecting which stars to survey. Forms are used to log changes to the observatory hardware and the routine maintenance carried out on site.

Core Skills:

- Backend: Python & MySQL (Numpy, Scipy, Astropy, Matplotlib, PyMySQL, Flask, Flask-WTForms, Jinja & YouTube API).
- Frontend: HTML, Bootstrap, Javascript & CSS.
- Analysis of large datasets with distributed computing (Sun Grid Engine).
- Integration of software with complex hardware.
- Designing fault tolerant systems.

Eclipsing Binary Data Analysis Pipeline github.com/jmccormac01/Spectroscopy
A data analysis pipeline for analysing and modelling large sets of spectroscopic data from low-mass eclipsing binary (EBLM) stars. EBLMs are pairs of stars where the secondary star has a mass between that of Jupiter and a very low-mass star. The goal of my pipeline is to measure precise masses and radii for new EBLMs.

Core Skills:

- Calibration and extraction of data from thousands of images and spectra (Python, Numpy, Scipy, Matplotlib).
- Managing database of data products (MySQL).
- Monte Carlo modelling of data from multiple instruments.
- Displaying results via a custom Flask web interface.

References

Available on request