



Dr. Tim D. Pearce

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Research: Debris discs • Exoplanets • Planet-disc interactions • Hot dust • Dynamics & simulations

Employment

- 2019–present **Postdoctoral researcher**, Friedrich-Schiller-Universität, Jena, Germany
Full-time research, supervision and teaching in the Theory Group.
- 2018–2019 **Lead Mathematical Developer**, JCT Consultancy Ltd., Lincoln, UK
Responsible for all maths and research in an industry-leading traffic-modelling company.
- 2016–2018 **Weapon Engineer Officer (Submariner)**, Royal Navy
Underwent extensive management, leadership and engineering training before joining a *Vanguard*-class submarine as an engineering officer.
- 2011 **Visiting Researcher**, Institute of Astronomy, University of Cambridge, UK
Summer job in the X-ray astrophysics group, characterising gas structures in galaxies.

Education

- 2012–2016 **PhD in Theoretical Astrophysics**, Institute of Astronomy, University of Cambridge, UK
Title: *Planetary Orbits and Interactions with Debris*
Supervisors: Mark Wyatt & Grant Kennedy
Awarded with no corrections.
- 2008–2012 **MPhys in Physics and Astronomy (1st class, Hons.)**, Durham University, UK
Masters thesis: *Modelling Hypervelocity Stars*

Formal Collaborations

- 2022-present **ExoPAG SAG 23** Science-Team member (impact of exozodis on exoplanet imaging)
- 2020-present **NaCo-ISPY** Science-Team member (direct-imaging survey for planets)
- 2019-present **FOR 2285** Research-Unit member (DFG-funded, multi-institution collaboration)

Student Supervision

Masters projects

- 2022 (ongoing) **Marcel Herrmann**, co-supervisor
Title: *Debris-disc stirring by embedded large bodies*
- 2021 (ongoing) **Tyson Costa**, primary supervisor
Title: *Projectile stirring of a debris disc by planetesimals scattered by a planet*
- 2020–2021 **Robert Ostermann**, primary supervisor
Title: *Constraints on unseen planets in ISPY debris-disk systems*
Publication: Pearce, Launhardt, Ostermann et al. (2022)

Bachelors projects

- 2022 (ongoing) **Laura Schulze**, primary supervisor
Title: *Constraining the orbit of Fomalhaut b through mean-motion resonances*
- 2021 **Marc Friebe**, primary supervisor
Title: *Gaps in debris discs - the importance of planet migration*
Publication: Friebe, Pearce & Löhne (2022)

Masters mini-projects

- 2022 (ongoing) **Marc Friebe & Richard Bernecker**, primary supervisor
Title: *Constraining planets around ϵ Eri from clumps in the debris disc*

Undergraduate Teaching

Friedrich-Schiller-Universität, Jena

2020-2021 **Example classes**, 4th-year *Celestial Mechanics* course
Group of 10 students. Official student feedback very positive, placing my teaching quality and engagement above Physics-department averages in all assessment criteria.

Institute of Astronomy, University of Cambridge

2014-2016 **Example classes**, 4th-year *Planetary System Dynamics* course
Groups of 6-12 students. Taught for 2 years.

2014-2016 **Tutorials**, 3rd-year *Problems in Astrophysics* course
Supervised 3 pairs of students.

Conference Organisation

Session chair & Organising Committee member

2018-2019 *JCT Traffic Signal Symposium and Exhibition*, Nottingham, UK
The primary UK conference on traffic modelling and junction design (2 instances).

Local Organising Committee member

2022 (upcoming) *Debris discs: At Home and Abroad*, Jena, Germany
2014 *Characterizing Planetary Systems Across the HR Diagram*, Cambridge, UK

Observations (as Co-I)

JWST

Cycle 1 *Using JWST to search for Planetary Sculptors in an ALMA-Selected Sample of Debris Disks*
(24hrs, PI: Hinkley)
Cycle 1 *Searching for low mass planets in debris disk gaps* (11hrs, PI: Marino)

VLTI/MATISSE

Period 110 *Disc or spherical shell? The architecture of hot exozodiacal dust systems observed with MATISSE* (9hrs, PI: Kirchschrager)
Period 109 *Mid-infrared emission of six hot exozodis* (9hrs, PI: Kirchschrager)

ALMA

2016 *Double-ring debris disks at 10s of au: probing how far out planets can form*
(10 hrs, PI: Marino)
2016 *What lies beyond Exo-Jupiter planets?* (2 hrs, PI: Wyatt)

Publicly-Available Science Codes

- [SculptingPlanet](#) - Constrain the mass and orbit of an unseen planet sculpting a debris disc.
- [MinSelfStirringDiscMass](#) - Calculate the absolute minimum mass a debris disc requires to self-stir.
- [PlanetMassToCarveDebrisGap](#) - Calculate the gap carved by a planet embedded in a massive debris disc.
- [Orbital Element Plotter](#) - Plot all possible orbits of an imaged companion.

Other Skills and Experience

Reviews: Referee for ApJ.

Computing: C#, Python, C++, LaTeX, Linux. Highly experienced with n-body integrator *Rebound*.

Management: Level 5 Diploma in Management and Leadership, Chartered Management Institute, 2016.

German language: Intermediate 1 (CEFR level B1), Jena Sprachenzentrum, 2020 (awarded grade 1.7).

English language: Fluent (native speaker).

Academic Conferences and Talks

Invited review talks

2022 (upcoming) *(Exo)Planet Diversity, Formation and Evolution*, Berlin, Germany
Title: *Debris Discs as Probes of Planetary Systems*

Discussion session chair

2022 (upcoming) *Debris Discs at Home and Abroad*, Jena, Germany
Session: *Hot exozodis*

Contributed talks

2022 (upcoming) *Debris Discs at Home and Abroad*, Jena, Germany
2022 *In the Spirit of Lyot*, Leiden, Netherlands
2022 *PERC International Symposium on Dust & Parent Bodies*, Japan (Virtual)
2021 *European Astronomical Society Annual Meeting*, Leiden, Netherlands (Virtual)
2020 *Five years after HL Tau: a new era in planet formation*, Chile (Virtual)
(Outside academia April 2016 - December 2019)
2015 *Exoplanet Community Meeting*, Warwick, UK

Posters

2022 (upcoming) *Debris Discs at Home and Abroad*, Jena, Germany
2021 *Distorted Astrophysical Discs*, Cambridge, UK (Virtual)
2021 *Sagan Summer Workshop - Circumstellar Disks and Young Planets*, USA (Virtual)
2021 *Towards the Comprehensive Characterization of Exoplanets*, STScI, USA (Virtual)
(Outside academia April 2016 - December 2019)
2015 *In the Spirit of Lyot*, Montreal, Canada
2014 *Characterizing Planetary Systems Across the HR Diagram*, Cambridge, UK
2013 *Protostars and Planets VI*, Heidelberg, Germany

Seminars

2022 (upcoming) *Astronomy Group Seminar Series*, Warwick, UK
2021 *TLS Institute's Colloquium*, Tautenburg, Germany (Virtual)
2021 *Mark Wyatt's Group Seminar Series*, Cambridge, UK (Virtual)
2020 - present *FOR 2285 Research Unit Seminar Series*, various locations, Germany (7 talks so far)
2020 - present *AIU Seminar Series*, Jena, Germany (3 talks so far)
(Outside academia April 2016 - December 2019)
2016 *Astrophysics Seminar Series*, Exeter, UK
2014 *Institute of Astronomy Seminar Series*, Cambridge, UK

Publications (Including Submitted Works)

First author

- Hot exozodis: cometary supply without trapping is unlikely to be the mechanism
Pearce, Kirchschrager, Rouillé et al., submitted to MNRAS
- Planet populations inferred from debris discs: insights from 178 debris systems in the ISPY, LEECH and LStEN planet-hunting surveys
Pearce, Launhardt, Ostermann et al., 2022, A&A, 659, A135
- Fomalhaut b could be massive and sculpting the narrow, eccentric debris disc, if in mean-motion resonance with it
Pearce, Beust, Faramaz et al., 2021, MNRAS, 503, 4767
- Gas trapping of hot dust around main-sequence stars
Pearce, Krivov & Booth, 2020, MNRAS, 498, 2798

(Outside academia April 2016 - December 2019)

- Double-ringed debris discs could be the work of eccentric planets: explaining the strange morphology of HD 107146
Pearce & Wyatt, 2015, MNRAS, 453, 3329
- Constraining the orbits of sub-stellar companions imaged over short orbital arcs
Pearce, Wyatt & Kennedy, 2015, MNRAS, 448, 3679
- Dynamical evolution of an eccentric planet and a less massive debris disc
Pearce & Wyatt, 2014, MNRAS, 443, 2541
- Imaged substellar companions: not as eccentric as they appear? The effect of an unseen inner mass on derived orbits
Pearce, Wyatt & Kennedy, 2014, MNRAS, 437, 2686

Second author

- ALMA detection of ϵ Eridani's resonant clumps
Booth, Pearce, Krivov et al., submitted to MNRAS
- Gap carving by a migrating planet embedded in a massive debris disc
Friebe, Pearce & Löhne, 2022, MNRAS, 512, 4441

Other co-author

- High resolution ALMA and HST images of q1 Eri: an asymmetric debris disc with an eccentric Jupiter
Lovell, Marino, Wyatt et al., 2021, MNRAS, 506, 1978
- LStEN: L' band Imaging Survey for Exoplanets in the North
Musso Barucci, Launhardt, Müller et al., 2021, A&A, 645, A88
- Resolving the outer ring of HD 38206 using ALMA and constraining limits on planets in the system
Booth, Schulz, Krivov et al., 2021, MNRAS, 500, 1604

(Outside academia April 2016 - December 2019)

- An M-dwarf star in the transition disk of Herbig HD 142527
Lacour, Biller, Cheetham et al., 2016, A&A, 590, A90