Richard Anslow

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Research interests

Planetary System Dynamics: numerical and analytical modelling of the orbital dynamics of small bodies in planetary systems and their interactions with rocky (exo-)planets. Solar System late veneer: combining geodynamical and astrophysical modelling to constrain plausible sources of highly-siderophile elements in planetary mantles. Origins of life: using dynamical modelling and exoplanet demographics to propose tests for origins scenarios, and constrain potential environments for prebiotic chemistry. White dwarf planetary systems: modelling debris in post-main sequence planetary systems to understand white dwarf pollutants.

Education

2022 – pres. PhD in Astronomy, University of Cambridge (UK). Supervisors: Dr A. Bonsor & Dr P. B. Rimmer
Investigating the connection between the dynamics of small bodies in (exo-)planetary systems and their impacts, focusing on Earth's late veneer and the cometary delivery of prebiotic feedstock molecules.

- re-assessed the ability of comets to deliver prebiotic feedstock molecules to the early Earth, challenging the potential role of comets in the origins of life.
- established a fundamental dynamical constraint on the cometary delivery of prebiotic molecules to exoplanets around low-mass stars. This publication was ranked 7th in the Royal Society's Top 10 papers of 2023.
- highlighted a contradiction between the geodynamics of metal entrainment, observed concentration of highly-siderophile elements, and estimates of total mass accretion during the late veneer.

2017 – 2021 MPhys in Physics, University of Oxford (UK). Final grade: 1st Class (Rank: 10th in cohort)
Numerical investigation into the dynamics, and associated gravitational wave signal, of binary stellar-mass black holes in SMBH accretion discs. Supervisor: Prof. S. Balbus FRS.

- Part C courses: Astrophysics (87%), Atmospheric and Oceanic Physics (88%, Rank 1/33).

Work experience

2020 & 2021 – 2022 Technology Associate, Morgan Stanley (UK).
Business and Data Analyst in the Technology large programmes change group, developing novel Python and SQL tooling, and coordinating company-wide software testing.

- Developed and packaged a novel, automated, Python tool which identified cross-dependencies between large software systems across the institutional securities division.
- Completed 4 month intensive technology qualification, focussing on object-oriented programming, and developing large codebases.
- Led a team of 15 analysts on a volunteering initiative in which we mapped over 600 buildings across different communities in Northern India for the charity Educate Girls.

Publications

4 first author publications (3 refereed and 1 under review), 2 co-author publications (2 refereed)

- Anslow, Landeau, Bonsor, Itcovitz, Shorttle (subm.) *The efficient delivery of highly-siderophile elements to the core creates a mass accretion catastrophe for the Earth.* JGR: Planets

5) McDonald, Bonsor, Rae, Rimmer, Anslow, Todd 2025 *Constraining the survival of HCN during cometary impacts*. Icarus

4) Anslow, Bonsor, Todd, Wordsworth, Rae, McDonald, Rimmer 2025 *The atmospheric entry of cometary impactors*. MNRAS

3) Anslow, Bonsor, Rimmer, Rae, McDonald, Walton 2025 *The plausibility of origins scenarios requiring two impactors*. Proc. R. Soc. A

2) Rogers, Debes, Anslow, et al. 2024 *WD0141-675: A case study on how to follow-up astrometric planet candidates around white dwarfs*. MNRAS

1) Anslow, Bonsor & Rimmer 2023 *Can comets deliver prebiotic molecules to rocky exoplanets?*. Proc. R. Soc. A.

Awards, scholarships and funding

- 2025 Wolfson College Travel & Research Award (Wolfson College, University of Cambridge, £1200)
- 2024 Funding for Widening Participation Summer Intern (Leverhulme Centre for Life in the Universe, £3200)
- 2024 Graduate student stipend for 2024 MIAPbP Habitability workshop (Excellence Cluster ORIGINS, €1600)
- 2024 Funding for invited seminar and research visit (IPGP, Université Paris Cité, ∼€500)
- 2023 7th in the Royal Society's Top 10 papers, 2023 (Can comets deliver prebiotic molecules to rocky exoplanets?)
- 2023 Travel funds for Life in the Universe II (Northeastern University, $700)
- 2022–2026 STFC Studentship for study towards a PhD in Cambridge (£85K)
- 2020 Karastergiou General Relativity Prize, performance in Part B General Relativity (University of Oxford)
- 2019–2021 Open Scholarship for academic performance (St Edmund Hall, University of Oxford, 3× £250)

Conference talks and seminars

1. *Smashing It: How impacts forge formation, dynamics and climates of (exo)planets* (Leeds, 2025), contributed talk
   "The cometary delivery of prebiotic feedstock molecules to the early Earth and rocky exoplanets"
2. *EGU25* (Vienna, 2025), contributed PICO
   "The efficient delivery of highly-siderophile elements to the core creates a mass accretion catastrophe for the Earth"
3. *LCLU Coffee Meetings* (Cambridge, April 2025), invited seminar
   "Prebiotic chemistry on icy moons" (Joint seminar with Tereza Constantinou, IoA).
4. *Origins Federation Conference* (Cambridge, 2024), invited poster
   "The plausiblity of origins scenarios requiring two impactors"
5. *EPOE 2024* (Paris, May 2024), contributed talk
   "The significance of small impactors on late accretion to the early-Earth and rocky exoplanets"
6. *IoA Wednesday Seminar* (Cambridge, May 2024), contributed seminar
   "The cometary delivery of prebiotic feedstock molecules to the early-Earth and rocky exoplanets"
7. *IPGP Origins Seminar Series* (Paris, May 2024), invited seminar
   "The accretion of small impactors to the early-Earth and rocky exoplanets"
8. *LCLU Annual Science Day* (King's College, Cambridge, March 2024), contributed poster
   "Can comets deliver prebiotic molecules to rocky exoplanets?"
9. *LCLU Coffee Meetings* (Cambridge, February 2024), invited seminar
   "The accretion of small impactors to the early-Earth and rocky exoplanets"
10. *Life in the Universe II* (Boston, September 2023), invited poster
    "Can comets deliver prebiotic molecules to rocky exoplanets?"
11. *UK Exoplanet Meeting 2023* (UCL, August 2023), contributed talk
    "Can comets deliver prebiotic molecules to rocky exoplanets?"
12. *Molecular Origins of Life* (online, June 2023), contributed poster
    "Can comets deliver prebiotic molecules to rocky exoplanets?"

Academic service and outreach

- 2025 – : Reviewer for Icarus.
- 2025 – : Member COST Action CA22133 (Working Group 4: Emerging habitable environments)
- September 2024: Local Organising Committee (Origins Federation Conference, Cambridge)
  – Co-ran breakout session "What are the prerequisites for an origin of life?".

- August 2024: Co-ran half-day exoplanet detection workshop for Sutton Trust Computer Science summer school.
  – Interactive workshop delivered to ∼30 high-achieving students from disadvantaged backgrounds.
- August 2024: Seminar: *"Introduction to Life in the Universe Sciences and PhDs"* (Leverhulme Centre for Life in the Universe, Cambridge)
- 2024 – pres.: Work-life balance Focus Group, EDI Committee (Institute of Astronomy, Cambridge)
- 2023 – 2024: International Women's Day Organising Committee (Institute of Astronomy, Cambridge)
  – Co-ran exoplanet detection coding workshop for 120 Year 8 students from local state schools (6 groups of 20).
- 2023 – 2024: Organiser of weekly *Meet the colloquium speaker* sessions (Institute of Astronomy, Cambridge)
- March 2023: Outreach for IOA+KICC Public Open Day, (Institute of Astronomy, Cambridge).
  – Organised, and ran a cloud chamber demonstration (> 1000 Open Day attendees).
- 2018 – 2019: Access Officer for underrepresented groups (St. Edmund Hall, Oxford)
  - Recipient of award for contribution to Outreach work by the VP for Access & Academic affairs (2019)
  – Organised, and ran 2 week-long 'Access Roadshows' visiting (approx. 15) state schools in Hampshire and Leicestershire. (approx. 1000 students overall)

Media coverage

- January 2025: Comment for the New Scientist "Habitable planets could have formed at the dawn of the universe"
- February 2025: Astrobite describing 2023 paper, 'Can comets deliver prebiotic molecules to rocky exoplanets?'.
- November 2023: Over 400 news articles worldwide about Can comets deliver prebiotic molecules to rocky exoplanets?, including the New Scientist, Independent, Forbes, BBC Science Focus, Newsweek, Daily Mail, Interesting Engineering and the Evening Standard, amongst others.
- November 2023: Podcast interview about cometary delivery with BBC Cambridge's The Naked Scientists. Listen to the podcast here!
- December 2023: Youtube interview (∼ 30 min) with Fraser Cain (publisher of www.universetoday.com) on recent paper Can comets deliver prebiotic molecules to rocky exoplanets?. Audience: approx. 395,000 subscribers.

Teaching

- 2023 – 2025: *Part III Planetary System Dynamics*. Example Class instructor for ∼45 masters students, Department of Applied Mathematics and Theoretical Physics (DAMTP), University of Cambridge. (26 hrs)
- Michaelmas 2024: Demonstrator (Astrophysics Practicals), *Planetary Science and Life in the Universe MPhil*, Institute of Astronomy, University of Cambridge. (4 hrs)
  – Co-wrote and ran practicals on planetary dynamics (stability of multi-planet systems), and debris disc SED-fitting
- Michaelmas – Lent 2024: Demonstrator (Reading Group), *Planetary Science and Life in the Universe MPhil*, Institute of Astronomy, University of Cambridge. (10 hrs)
  – Delivered bi-weekly examples classes (2 hrs), revision supervisions (1 hr), and mock exam marking.
- 2017 – pres.: *Advanced Mathematics and Physics* tutor for pre-University students (> 300 hrs)
  – Agencies worked with include: The Profs, U2Tuition, and Polaris & Dawn Consulting.

Student supervision

- 2025: Part III (Masters) project, co-supervised with Amy Bonsor and Paul Rimmer
- 2024: Jerric Chong: LCLU Summer Internship, co-supervised with Catriona McDonald (IoA, Cambridge).

Technical skills

Computing: Python and SQL (advanced), `C/C++` (intermediate). Have a look here for my public codes. LaTeX, GitHub and UNIX (advanced).
Languages: English (native speaker), French (beginner), German (beginner), Italian (beginner)