

CRAIG WALTON

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POSITIONS

NOMIS fellow <i>ETH Zurich</i>	September 2023 — Present <i>Centre for Origin and Prevalence of Life</i>
Junior Research Fellow <i>Trinity College</i> <i>University of Cambridge</i>	April 2023 — Present <i>Institute of Astronomy</i> <i>Department of Earth Sciences</i>
University of Trieste <i>Visiting researcher — MAECI scholarship</i>	March — September 2023 <i>Department of Mathematics and Geosciences</i>
University of Cambridge <i>Leverhulme Centre for Life in the Universe</i>	September 2022 — March 2023 <i>Institute of Astronomy</i>

ACADEMIC RECORD

University of Cambridge <i>PhD — Phosphorus pathways in deep time (Supervisor: Oliver Shorttle)</i>	October 2018 — September 2022 <i>Earth Sciences</i>
University of St Andrews <i>MGeol, 1st Class</i>	September 2013 - May 2018 <i>Earth and Environmental Sciences</i>

RESEARCH INTERESTS

Primary area of research: Earth and Solar System evolution

Sub-fields: Cosmochemistry and meteoritics. Origin of Life. Geochemistry and geoinformatics. Biogeochemistry.

RESEARCH SKILL-SET

- Modelling, coding, software - Python, Inkscape, LaTeX (advanced), R, Matlab (intermediate)
- Microscopy (Optical microscope, Scanning Electron Microscope, Electron-Back-Scatter Diffraction analyses)
- Handling, preparation, and analysis (ion probe, electron microprobe) of meteorite samples
- Geo-spatial, -chemical, and -chronological data handling and analysis (Macrostrat, Isoplot, COPSE)
- Experience of two synchrotron beam-time sessions at the Oxford Diamond Light Source (one in-person and one remote)

FUNDING AND FUNDING IN-KIND

- Named post-doc: Cosmic dust as a feedstock for prebiotic chemistry on Mars and exoplanets - Leverhulme Centre for Life in the Universe Scheme 2022-23 - Value £109,639 (2 year post-doctoral salary; beginning March 2023)
- Co-Investigator: Unravelling the conditions of aqueous alteration on C-type asteroids: implications for the delivery of water and volatiles to the terrestrial planets - - Leverhulme Centre for Life in the Universe Scheme 2022-23 - Value: £109,639 (2 year post-doctoral salary; beginning March 2023 - named post-doc: Dr Ross Findlay)
- MAECI Scholarship, University of Trieste - Value: £5,400 (6 month post-doctoral salary from March 2023)

- Did cosmic dust fertilise prebiotic chemistry? - Cambridge Planetary Science and Life in the Universe Research Grants Scheme 2021-22 - Value: £22,000 (6 month post-doctoral salary; beginning September 2022)
- Supported by and contributed to writing of Isaac Newton Trust grant “The meteorite record of early Earth bombardment and solar system dynamics.” Named grant holder: Dr Oliver Shorttle. Value: £30,000
- 3 x 1 day session on the Beijing IGG CAS Ion-probe facility (2022). Value estimated: £5000
- 2 x 1 day session on the Beijing IGG CAS Ion-probe facility (2021). Value estimated: £3500
- 2 x 1 day session on the Edinburgh NERC Ion-probe facility (June 2018, July 2019). Value estimated: £3500
- 3.5 year NERC funded PhD studentship (NE/L002507/1)

PUBLIC SCIENCE COMMUNICATION AND OUTREACH

Sept 2022 BBC Sky at Night magazine	Chelyabinsk 10th Anniversary special podcast
Aug 2022 Interviewed for TV documentary	“The Great Filter” (Oceanic Preservation Society)
Mar 2021 The Cosmic Cast talk presenter	Phosphorus and the early solar system
Nov 2020 Astronomy on Tap talk presenter	Meteorites: messengers from the early solar system
July 2019 Royal Society Summer Science Festival	University of Cambridge, origin of life stand
April 2019 Edinburgh Science festival	Open University meteorite stand
Dec 2018-2019 Open University	Public science engagement during Moon Night

TEACHING

Jul-Aug 2023	Created/taught geology course to prospective university students (Immerse Education)
Feb-Apr 2023	Designed/delivered tailored mineralogy supervisions to colour-blind 1A geologists
2022-2023	Conceived/supervised Part III student project on meteorite shock features
Oct-Nov 2022	Demonstrated 6-part Pt II Scientific Computing course
Sept 2022	Deliver planetary geology lectures for Sutton Trust summer students
2020-21	Conceived/co-supervised prebiotic chemistry Master’s project, University of Alberta

PROFESSIONAL MEMBERSHIPS

Astrobiology Society of Britain and Cambridge Philosophical, Geochemical, Europlanet, Mineralogical, and Royal Astronomical Societies.

ACADEMIC SERVICE

Program organiser for European Lunar Symposium (June 2023)

Program organiser (Earth Science) for LCLU Science Day (Mar 2023)

Member of the Institute of Astronomy PostDoc committee (2022)

Represented Institute of Astronomy PostDoc committee at staff meetings.

NASA Planetary proposal peer reviewer and week-long panel member (July 2022); Member of the Sedimentary Geochemistry and Paleoenvironments project (Stanford)

6 journal article reviews completed in 2021-2023 (*Earth, Moon, and Planets*, *Journal of Geophysical Research - Solid Earth*; *American Mineralogist*; *Earth Science Reviews*; *Science Bulletin*; *Minerals*)

Organised and invited speakers to present weekly seminars at the Planetary Chemistry group (led by Dr Oliver Shorttle)

Led discussion seminar (‘Phosphorus availability on Earth-like worlds’) at weekly meeting of the Initiative for Life and Planets in the Universe, University of Cambridge

Academic officer representing Trinity Hall graduate students (2021-2022)

AWARDS AND PRIZES

Postgraduate

2022 Leverhulme Centre for Life in the Universe travel grant - Latsis Symposium, Zurich

2022 Astrobiology Society of Great Britain travel grant - BPSC, Milton Keynes

2020 NASA travel grant - Gordon Research Conference on Origins of Life, Galveston

2018 NASA travel grant - Gordon Research Conference on Origins of Life, Galveston

Undergraduate

2015-2018 Dean's List, University of St Andrews (awarded for first class marks across all subjects)

2017 Laidlaw foundation research internship - University of St Andrews

2016 Petroleum Exploration Society of Great Britain Award

2016 Irving Fieldwork Prize

2016 Paneth Trust research internship at Open University Department of Physical Sciences

2016 Participation in Undergraduate Research Assistantship Programme

2015 First Prize for Field Work (Rio Tinto Environmental Earth Sciences Excursion)

INVITED TALKS

Oct 2022 University of Cambridge

Cosmic dust as a planetary fertiliser

Oct 2022 University of Leeds

Crustal sediment accumulation and global nutrient supply

May 2021 University of St Andrews

Phosphorus availability to life on Earth-like exoplanets

Nov 2021 NASA Planetary Chemistry and Early Earth Environments seminar series (PCE3)

Phosphorus on prebiotic Earth: from minerals to microbes

Dec 2021 University of Cambridge

Interference chemistry: a geological roadmap of prebiotic Earth

Nov 2020 University of Bristol

Phosphorus at the dawn of life

PUBLICATIONS

Journal articles

Walton, C. R. et al., 2024a Micro-faults: evidence for pervasive frictional melting in chondritic impactites, *In preparation*.

Walton, C. R. et al., 2023d Cosmic dust fertilization of prebiotic chemistry on early Earth, *In preparation*.

Walton, C. R. et al., 2023c In-situ phosphate U-Pb ages of the L chondrites, *Under Review*.

Alcott, L., Mills, B., **Walton, C. R.** et al., 2023 Crustal carbonate build-up drives long-term oxygenation of the Earth, *Under Review*.

Walton, C. R. et al., 2023b Evolution of the crustal phosphorus reservoir, *Under Review*.

Walton, C. R. et al., 2023a Phosphorus availability on the Early Earth, *Nature Geoscience*.

Walton, C. R. et al., 2022b Interference chemistry: can prebiotic systems survive in the wild? *Frontiers in Earth Science*. doi.org/10.3389/feart.2022.1011717

Müller, U., Elsila, J., Trail, D., DasGupta, S., Giese, C., **Walton, C. R.** et al., 2022 *Frontiers in Prebiotic Chemistry and Early Earth Environments*, *Origin of Life and Evolution of Biospheres*.

Walton, C. R. et al., 2022a Ancient and recent collisions revealed by phosphate minerals in the Chelyabinsk meteorite, *Communications Earth and Environment*. <https://www.nature.com/articles/s43247-022-00373-1>

Walton, C. R. et al., 2021c Scum of the Earth: could life have emerged from near-surface multi-compartmentalised environments? *Life*. <https://www.mdpi.com/2075-1729/11/9/976>

Walton, C. R. et al., 2021b Phosphorus mineral evolution and prebiotic chemistry: from minerals to microbes, *Earth Science Reviews*. <https://doi.org/10.1016/j.earscirev.2021.103806>

Peters, S., **Walton, C. R.**, et al. 2021 Igneous rock area and age in continental crust, *Geology*.
<https://doi.org/10.1130/G49037.1>

Walton, C. R. et al., 2021a Formation and deformation of Phosphorus-Olivine-Assemblages in the Chelyabinsk chondrite, *Meteoritics and Planetary Science*. <https://doi.org/10.1111/maps.13648>

Conference abstracts

Walton, C. R. et al. 2023 The origin of life on Earth: from cosmochemistry to biology, International Conference of Deep Space Sciences, Hefei, China.

Walton, C. R. et al. 2023 Size matters: apatite shock-induced textural discrepancies between lunar and asteroidal meteorites, European Lunar Symposium, Padua, Italy.

Walton, C. R. et al. 2023 Prebiotic fertilisation and bombardment of early Earth by extraterrestrial materials, AbGradEPEC, La Palma.

Walton, C. R. et al. 2022 Life under fire: collisional evolution of the prebiotic Earth, Latsis Symposium: The Origin and Prevalence of Life, Zurich.

Walton, C. R. et al. 2022 Did sediment accumulation reshape crustal nutrient reservoirs? Goldschmidt, Hawaii.

Walton, C. R. et al. 2022 The cosmic desert: exogenous sediments on Early Earth. BPSC, Open University.

Walton, C. R. et al. 2022 Interference chemistry and overcoming the prebiotic concentration problem. Molecular Origins of Life, Munich.

Walton, C. R. et al. 2022 Which planets best liberate phosphate for prebiotic chemistry? European Geochemical Union, Vienna.

Walton, C. R. et al. 2022 Towards phosphate U-Pb texture-age records of Solar System dynamical evolution. Lunar and Planetary Science Congress, Houston.

Walton, C. R. et al. 2022 Is Moon-formation really recorded by shocked meteorites? European Lunar Symposium, Glasgow.

Walton, C. R. et al. 2022 The shocked meteorite record: a Rosetta stone for Solar System dynamical history? Meeting of the Cambridge Initiative for Planetary Science and Life in the Universe.

Walton, C. R. et al. 2021 Shocked primitive meteorites record collisional reheating from 4.48 to 4.44 Ga. The Moon and Early Earth: Geological Society special meeting.

Walton, C. R. et al. 2021 Interference chemistry: a geochemical roadmap of early Earth, Astrobiology Graduate Conference, ELSI.

Walton, C. R. et al. 2021 Phosphorus-Olivine-Assemblages (POAs): a paragenetic model for P-bearing phases in primitive meteorites, 84th Meeting of the Meteoritical Society, Boston.

Walton, C. R. et al. 2021 Interference chemistry: can prebiotic chemistry survive in the wild?, Molecular Origins of Life, Munich.

Walton, C. R., Mills, B. J. W., Williams, H. M., and Shorttle, O. 2021 Evolution of the phosphorus cycle: sources, sinks, and recycling pathways, Goldschmidt.

Walton, C. R., Williams, H., and Shorttle, O. 2020 The secret life of impact breccias: chondritic phosphate shock textures, Goldschmidt.

Walton, C. R., et al 2020 Phosphorus mineralogy on the early Earth, Molecular Origins of Life, Munich.

Walton, C. R., Shorttle, O., Jenner, F. E., Williams, H., Golden, J., Morrison, S. M., Downs, R. T., Hazen, R. M., Pasek, M. 2020 The Prebiotic Phosphorous Cycle: from Minerals to Microbes, Origins of Life GRS/GRC, Galveston, Texas.

- Walton, C. R.**, Zerkle, A. L., Golden, J., Hazen, R. and Shorttle, O. 2019 Quantifying the phosphorous inventory of the North American crust, Geological Society of London Janet Watson meeting, London.
- Walton, C. R.**, Potts, N., Mare E., Buisman, I., Bromiley, G. and Mikhail, S. 2019 Pyroxene-melt element partitioning as a function of chlorine content, VMSG, University of St Andrews.
- Walton, C. R.**, Cernok, A., and Anand, M. 2018 The formation and shock-history of phosphate minerals in Chelyabinsk (LL5), MAPS Special Edition: Abstracts from the 81st Meeting of the Meteoritical Society, Moscow.
- Walton, C. R.**, Zerkle, A. L., Hazen, R. and Golden, J. 2018 Phosphorous fluxes over supercontinent cycles: perspectives from the Phosphorous Mineral Evolution Database (P-MED), Royal Society Earth Dynamics Meeting, London.
- Walton, C. R.**, Golden, J., Pasek, M., Hazen, R. 2018 Phosphorous mineralogy during the origin of life. Origins of Life GRS/C, Galveston, Texas.
- Walton, C. R.** and Anand, M. 2017 Microfault textures in chondritic meteorites: does rarity imply insignificance? 1st BPSC, Glasgow. DOI: 10.13140/RG.2.2.28993.66409.
- Walton, C. R.** and Anand, M. 2017 Textural evidence for shock-related metasomatic replacement of olivine by phosphates in the Chelyabinsk chondrite, 48th LPSC, DOI: 10.13140/RG.2.2.19428.37769.