

# Ben K. D. Pearce, PhD

benkdpearce.com

## Research Interests

-Astrobiology  
-Origins of Life  
-Early Earth/Titan  
-Atmospheric Chemistry  
-Abiotic Biomolecule Synthesis

## Contact Information

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## Academic Positions

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- Assistant Professor** 2024 –  
Department of Earth, Atmospheric, and Planetary Sciences, Purdue University
- 51 Pegasi b Postdoctoral Fellow**, Advisor: Sarah Hörst 2023 – 2024  
Department of Earth and Planetary Sciences, Johns Hopkins University
- Banting Postdoctoral Fellow**, Advisor: Sarah Hörst 2021 – 2023  
Department of Earth and Planetary Sciences, Johns Hopkins University

## Education

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- Ph.D. in Physics and Astronomy – Astrobiology**, McMaster University 2017 – 2021  
Thesis: *The Origin of RNA on Biogenic World*, Advisor: Ralph Pudritz
- M.Sc. in Physics and Astronomy – Astrobiology**, McMaster University 2015 – 2017  
Thesis: *The Emergence of the RNA World on the Early Earth*, Advisor: Ralph Pudritz
- B.Sc. in Astronomy (with distinction)**, University of British Columbia 2012 – 2015  
Thesis: *Seeding the Precognetic Earth: The Study of Nucleobase Synthesis Within Meteorite Parent Bodies*
- B.Sc. in Software Engineering (with internship)**, University of Calgary 2005 – 2010

## Publications

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First author: 9 publications / 389 citations / 1 award  
Total: 13 publications / 428 citations / 1 award  
*h*-index: 9 / *i10*-index: 9

Manuscripts under review (3)

- Pearce, B. K. D.**, Hörst, S. M., Seebree, J. A. & He, C. Organic hazes as a source of life's building blocks to warm little ponds on the Hadean Earth. *Nature Geoscience*, sent out to reviewers Feb. 24, 2023.
- Cerrillo, K. E., Mollière, P., Pudritz, R. E., & **Pearce, B. K. D.** On The Habitability And Biomolecular Potential Of An Impacted, Young Earth. *Planetary Science Journal*, submitted May 17, 2023.
- Stolar, T., **Pearce, B. K. D.**, Etter, M., Truong, K.-N., Krajnc, A., Mali, G., Rossi, B., Molčanov, K., Lončarić, I., Meštrović, E., Užarević, K., & Grisanti, L. Prebiotic base-pairing of uracil and 2,6-diaminopurine. *Chem*, submitted July 20, 2023.

First author refereed journal publications (9)

- Pearce, B. K. D.**, He, C. & Hörst, S. M. [ACS Earth Space Chem 2022, 6, 2385–2399](#)  
An experimental and theoretical investigation of HCN production in the Hadean Earth atmosphere.
- Pearce, B. K. D.**, Molaverdikhani, K., Pudritz, R. E., Henning, Th., et al. [Astrophys J 2022, 932, 1](#)  
Towards RNA life on Early Earth: From atmospheric HCN to biomolecule production in warm little ponds.

3. **Pearce, B. K. D.**, Ayers, P. W., & Pudritz, R. E. [J Phys Chem A 2020, 124, 8594](#)  
CRAHCN-O: A Consistent Reduced Atmospheric Hybrid Chemical Network Oxygen Extension for Hydrogen Cyanide and Formaldehyde Chemistry in CO<sub>2</sub>-, N<sub>2</sub>-, H<sub>2</sub>O-, CH<sub>4</sub>-, and H<sub>2</sub>-Dominated Atmospheres.
4. **Pearce, B. K. D.**, Molaverdikhani, K., Pudritz, R. E., Henning, Th., et al. [Astrophys J 2020, 901, 110](#)  
HCN production in Titan's Atmosphere: Coupling Quantum Chemistry and Disequilibrium Atmospheric Modeling.
5. **Pearce, B. K. D.**, Ayers, P. W., & Pudritz, R. E. [J Phys Chem A 2019, 123, 1861–1873](#)  
A Consistent Reduced Network for HCN Chemistry in Early Earth and Titan Atmospheres: Quantum Calculations of Reaction Rate Coefficients.
6. **Pearce, B. K. D.**, Tupper, A. S., Pudritz, R. E., & Higgs, P. G. [Astrobiology 2018, 18, 343–364](#)  
Constraining the Time Interval for the Origin of Life on Earth.
7. **Pearce, B. K. D.**, Pudritz, R. E., Semenov, D. A., et al. [Proc Natl Acad Sci USA 2017, 114, 11327–11332](#)  
Origin of the RNA World: The Fate of Nucleobases in Warm Little Ponds. **(Cozzarelli Prize Winner)**
8. **Pearce, B. K. D.**, & Pudritz, R. E. [Astrobiology 2016, 16, 853–872](#)  
Meteorites and the RNA World: A Thermodynamic Model of Nucleobase Synthesis within Planetesimals.
9. **Pearce, B. K. D.**, & Pudritz, R. E. [Astrophys J 2015, 807, 85](#)  
Seeding the Precognetic Earth: Meteoritic Abundances of Nucleobases and Potential Reaction Pathways.

#### Second/third author refereed journal publications (4)

1. Paschek, K., Semenov, D. A., **Pearce, B. K. D.**, Lange, K., et al. [Astrophys J, 2022, 942, 50](#)  
Meteorites and the RNA World: Synthesis of Nucleobases in Carbonaceous Planetesimals and the Role of Initial Volatile Content.
2. Paschek, K., Kohler, K., **Pearce, B. K. D.**, Lange, K., Henning, Th., Trapp, O. et al. [Life 2022, 12, 404](#)  
Possible Ribose Synthesis in Carbonaceous Planetesimals.
3. Lai, J. C.-Y., **Pearce, B. K. D.**, Pudritz, R. E., & Lee, D. [Icarus 2019, 319, 685–700](#)  
Meteoritic Abundances of Fatty Acids and Potential Reaction Pathways in Planetesimals.
4. Cobb, A. K., Pudritz, R. E., & **Pearce, B. K. D.** [Astrophys J 2015, 809, 6](#)  
Nature's Starships II: Simulating the Synthesis of Amino Acids in Meteorite Parent Bodies.

#### Academic Awards, Grants, and Honors

- [51 Pegasi b Postdoctoral Fellowship](#) (3yr) Sep 2023 – Aug 2026. **\$415,000.**
- [Banting Postdoctoral Fellowship](#) (2yr), Sep 2021 – Aug 2023. **\$140,000.**
- U21 Researcher Resilience Fund. **\$5000.**
- Best Student Talk at Canadian Astronomical Society (CASCA) Annual Meeting, May 2021. **\$210.**
- Joseph and Joanne Lee Ontario Graduate Scholarship (1yr) (OGS), Sep 2020 – Aug 2021. **\$15,000.**
- NSERC Alexander Graham Bell Canada Grad. Scholarship-Doc. (2yr), Sep 2018 – Aug 2020. **\$70,000.**
- **PASS WITH DISTINCTION** on PhD Comprehensive Examination, Feb 2019.
- [PNAS Cozzarelli prize](#), Division of Physical and Mathematical Sciences, 2017. For papers exhibiting outstanding scientific excellence and originality, Awarded April 2018.
- NSERC Postgraduate Scholarship-Doctoral (1yr) (PGS-D), Sep 2017 – Aug 2018. **\$21,000.**
- Best Talk at McMaster Physics & Astronomy Graduate Student Symposium Day, Oct 2016. **\$20.**
- Joseph and Joanne Lee Ontario Graduate Scholarship (1yr) (OGS), Sep 2016 – Aug 2017. **\$15,000.**
- NSERC Canada Graduate Scholarship-Michael Smith Foreign Study Supp., May – Jul 2016. **\$5,300.**
- NSERC Alexander Graham Bell Canada Grad. Scholarship-Master (1yr), Sep 2015 – Aug 2016. **\$17,500.**
- NSERC Undergraduate Student Research Award (USRA), May – Aug 2015. **\$8,800.**
- Paul Sykes Scholarship in Astronomy, Sep 2014. **\$100.**
- NSERC CREATE undergraduate student research fellowship in the Canadian Astrobiology Training Program (CATP), May 2014. **\$1,000.**
- NSERC Undergraduate Student Research Award (USRA), May – Aug 2014. **\$8,400.**

- **Dean's Honour List**, Sep 2012 – May 2014.

## Presentations

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Total: 55 / Keynote: 1 / Invited: 4 / Conference: 8 / Poster: 2 / Seminars: 20 / Journal Club: 20

### Invited Keynote Presentations (1)

**Towards Molecular Complexity: At the crossroads between astrophysics and biochemistry**,  
Max Planck Institute for Astronomy, Heidelberg, Germany May 2022

### Invited Conference Presentations (4)

**Life in the Universe**, Sofia, Bulgaria Oct 2022  
**European Geosciences Union General Assembly**, Virtual May 2022  
**Pacificchem 2021**, Virtual Dec 2021  
**Astrobiology Science Conference (AbSciCon 2019)**, Seattle, WA, USA Jun 2019

### Oral Conference Presentations (8)

**51 Pegasi b Science Summit**, San Francisco, USA Aug 2023  
**Astrobiology Science Conference (AbSciCon 2022)**, Virtual May 2022  
**Canadian Astronomical Society (CASCA) Annual Meeting**, Virtual (Best Student Talk Award) May 2021  
**5<sup>th</sup> International Congress on Astrobiology**, Virtual Nov 2020  
**Science of Early Life 2019**, Seeon-Seebruck, Germany Nov 2019  
**Science of Early Life 2018**, Hamilton, ON, Canada Jun 2018  
**Astrobiology Science Conference (AbSciCon 2017)**, Mesa, AZ, USA Apr 2017  
**Astrobiology Science Conference (AbSciCon 2015)**, Chicago, IL, USA Jun 2015

### Poster Conference Presentations (2)

**Canadian Astronomical Society (CASCA) Annual Meeting**, Montréal, QC, Canada Jun 2019  
**Origins of Life Gordon Research Conference and Seminar**, Gavelston, TX, USA Jan 2018

### Invited Seminars (20)

**EPS Research Day**, Johns Hopkins University May 2023  
**Department of Mineral Sciences, National Museum of Natural History**, Washington, DC Apr 2023  
**Purdue University EAPS Seminar**, West Lafayette, IN Apr 2023  
**University of Texas at San Antonio EPS Seminar**, San Antonio, TX Jan 2023  
**University of Washington Astrobiology Colloquium**, Seattle, WA Nov 2022  
**University of Northern Iowa Chemistry & Biochemistry Seminar**, Cedar Falls, IA Oct 2022  
**EPS Research Day**, Johns Hopkins University May 2022  
**European Astrobiology Institute (EAI) Seminar**, Virtual Feb 2022  
**Queens University Physics & Astronomy Department Seminar**, Virtual Nov 2021  
**Prebiotic Chemistry and Early Earth Environments (PCE<sub>3</sub>) Seminar**, Virtual Aug 2021  
**Dominion Radio Astrophysical Observatory Seminar – Herzberg Astrophysics**, Virtual Jul 2021  
**University of British Columbia Astronomy Colloquium**, Virtual Jun 2021  
**Postdoctoral Fellowship Workshop**, Virtual (Speaker and Panelist) May 2021  
**Heidelberg Initiative for the Origins of Life (HIFOL) Seminar**, Virtual May 2020  
**Origins Institute Retreat**, Hamilton, ON, Canada Apr 2019  
**Max Planck Institute for Astronomy (MPIA) ExoCoffee**, Heidelberg, Germany Oct 2018  
**Physics & Astronomy Graduate Student Symposium Day**, McMaster University Oct 2018  
**Origins Institute Retreat**, Mono, ON, Canada Oct 2016  
**University of Heidelberg Chemistry Seminar**, Heidelberg, Germany Jun 2016  
**MPIA Planet and Star Formation Department Seminar**, Heidelberg, Germany May 2016

## Journal Club Presentations (20)

**Astrobiology Journal Club**, Johns Hopkins University (1)

Mar 2022

**Astrophysics Journal Club**, McMaster University (8)

2015 – 2021

**Astrobiology Journal Club**, McMaster University (11)

2015 – 2021

## Teaching and Mentorship

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**Instructor (1 course)**, Johns Hopkins University

- AS 270.114: Guided Tour: The Planets (100 undergrads) 2023

**Teaching Assistant (23 courses)**, McMaster University, University of British Columbia

- BIOPHYS 3D03: Origins of Life (40 undergrads, 5 times) 2016 – 2021
- ASTR 2E03: Planetary Astronomy (80 undergrads, 5 times) 2016 – 2021
- ASTR 2B03: Big Questions (40 undergrads, 5 times) 2015 – 2020
- ASTR 1F03: Introduction to Astronomy & Astrophysics (400 undergrads, 3 times) 2017 – 2020
- PHYS 1E03: Waves, Electricity and Magnetic Fields (40 undergrads, 2 times) 2016
- PHYS 1A03: Introductory Physics (40 undergrads, 1 time) 2015
- MATH 110: Differential Calculus (100 undergrads, 1 time) 2014
- MATH 101: Integral Calculus with Applications to Phys. Sci. (100 undergrads, 1 time) 2014

**Guest Lecturer (9 classes)**, Johns Hopkins University, McMaster University

- AS.270.303: Earth History (22 undergrads, 1 time) 2023
- AS.360.339: Planets, Life and the Universe (22 undergrads, 4 times) 2022 – 2023
- BIOPHYS 3D03: Origins of Life (40 undergrads, 4 times) 2018 – 2020
- ASTR 2E03: Planetary Astronomy (80 undergrads, 2 times) 2018 – 2019

**Research Mentor (4 students)**, Johns Hopkins, Max Planck Institute for Astronomy, McMaster University

- David Tovia Woods, Undergraduate research project 2023 – present
- Klaus Paschek, Masters research projects (2 papers) 2019 – 2022
- Kaitlin Cerrillo, Masters thesis (1 paper) 2020 – 2021
- James Lai, Undergraduate research project (1 paper) 2016 – 2019

**Academic Mentor (5 students)**, McMaster University & University of British Columbia mentorship programs

- Hannah Krivic (MSc student) 2020 – 2021
- Liam Farrell (MSc student) 2019 – 2020
- Joshua Myers (MSc student) 2018 – 2019
- Lucas Le Nagard (MSc student) 2016 – 2017
- Timothy Tan (Undergraduate student) 2014 – 2015

**Consultant for Students (4 courses)**, McMaster University, Saltfleet District High School

- ISCI 3A12: Life, the Universe and Everything (7 undergrads, 3 times) 2019 – 2020
- Grade 12 astronomy class (5 students) 2018 – 2019

**Tutor**, University of British Columbia and McMaster University Physics Drop-in Centres

2014, 2016

## Service

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**Journal Referee**

2020 – 2023

Nature Geoscience, Nature Astronomy, Scientific Reports, Frontiers in Microbiology, Astrobiology, Planetary Science Journal, Earth and Planetary Science Letters, ACS Earth and Space Chemistry (3x), Origins of Life and Evolution of Biospheres, Life

**Proposal Reviewer**, NASA NSPIRES

2023

**Committee Member**, Land Acknowledgment Committee Earth & Planetary Sci. Dept., JHU 2022 - present

<b>Scientific Organizing Committee</b> , Johns Hopkins U. and STScl Joint Astrobiology Seminar	2022 – present
<b>Theme Lead</b> , Interdisciplinary Consortia for Astrobiology Research Proposal	2022 – present
<b>Organizer</b> , Monthly Research and Technical Staff Peer Mentoring Lunches	2022 – present
<b>Organizer</b> , Trip to Baltimore American Indian Center for Earth and Planetary Science Department	2023
<b>Space Exploration Topical Team in Astrobiology Member</b> , Canada Space Agency (CSA)	2015 – 2022
<b>Selection Committee Member (2)</b> Associate Dean of Graduate Studies (Science), Director of the Origins Institute, McMaster University	2017 – 2020
<b>Co-Founder</b> , McMaster Astronomy and Physics Student Association (MAPSA)	2019 – 2020
<b>Department Graduate Student Representative</b> , Physics & Astronomy Dep., McMaster U.	2016 – 2020
<b>Graduate Student Ambassador</b> , Astrobio. and Phys. & Astro. Grad. Programs, McMaster U.	2019 – 2021
<b>Seminar Organizer</b> , Astrobiology Journal Club, McMaster University	2017 – 2021
<b>President</b> , Astronomy Club, University of British Columbia	2014 – 2015
<b>Summer Radio Telescope Volunteer</b> , Physics & Astronomy Dep., University of British Columbia	2013
<b>Lead Audio/Visual Volunteer</b> , Canadian Astronomical Society Annual Meeting, University of BC	2013

## Outreach

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<b>Public and Private Lecture Presenter (13)</b> Shawn and Ed Brewing Company, Origins Institute Public Lecture, McMaster Alumni Association (2x), Pint of Science, Pender Harbour Elementary/Secondary School, St. James Elementary School, Lake City Secondary School (2x), Simon Fraser University Summer Camps (2x), McMaster Astronomy Club (2x)	2017 – 2023
<b>YouTube Show Host (8 episodes)</b> , <a href="#">A Pint of Astrobiology</a>	2022
<b>Roller Coaster Contest Judge</b> , Baltimore High School STEM Outreach Event	May 2022
<b>Online Workshop Developer</b> , Praxical U21 <a href="#">Exploring Life's Origins Workshop</a>	2020 – 2021
<b>Radio Interviews (4)</b> CBC Quirks and Quarks, The AlmaMac 93.3 CFMU (2x), Radio Sputnik World Service	2018 – 2021
<b>Podcast Interviews (5)</b> PNAS Science Sessions, Cosmic Controversy, Planet B612 (2x), Nate's Podcast	2018 – 2021
<b>Planetarium Show Developer/Presenter (6 shows, ~80 presentations)</b> <a href="#">William J. McCallion Planetarium</a>	2015 – 2020
<b>Public Lecture Organizer (3)</b> , Ask a Scientist, Science on Tap, Astronomy Education Night	2014 – 2020
<b>Discussion Panelist (2)</b> , UofT Astrotours, UofT Astronomy & Space Exploration Society	2018 – 2019
<b>3D Theater Presenter (2 shows, 6 presentations)</b> , Mars, Einstein's Universe	2015 – 2016
<b>Origins Institute Twitter Account Moderator</b> , Astrobiology Grads (@McMAstroBio)	2016 – 2021

## Professional Development

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<b>Bystander Intervention Training</b> , Johns Hopkins University	Jun 2022
<b>Child Safety Training</b> , Johns Hopkins University	Jun 2022
<b>Harassment Prevention Training</b> , Johns Hopkins University	Oct 2021
<b>Lab Safety Training</b> , Johns Hopkins University	Sep 2021
<b>Mental Health First Aid Certification</b> , Mental Health Commission of Canada	Dec 2019
<b>Teaching Assistant Training Programs (2)</b> , McMaster University	2015, 2019
<b>Summer Astronomical Instrumentation School</b> , Dunlap Institute of Astron. & Astrophys.	Aug 2013