

Research Interests

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

Contact Information

Johns Hopkins University
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Academic Positions

51 Pegasi b Postdoctoral Fellow, Advisor: Sarah Hörst Sep 2023 –
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

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 Pregenetic Earth: The Study of Nucleobase Synthesis Within Meteorite Parent Bodies*

B.Sc. in Software Engineering (with internship), University of Calgary 2005 – 2010

Publications

First author: 9 publications / 361 citations / 1 award
Total: 13 publications / 398 citations / 1 award
h-index: 8 / *i*10-index: 8

Manuscripts under review (1)

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.

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.
- 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 CO₂-, N₂-, H₂O-, CH₄-, and H₂-Dominated Atmospheres.
- 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. **(Cazzarelli 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 Pangenetic 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 Cazzarelli 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

Total: 51 / Keynote: 1 / Invited: 4 / Conference: 7 / Poster: 2 / Seminars: 17 / 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
Pacifichem 2021, Virtual Dec 2021
Astrobiology Science Conference (AbSciCon 2019), Seattle, WA, USA Jun 2019

Oral Conference Presentations (7)

Astrobiology Science Conference (AbSciCon 2022), Virtual May 2022
Canadian Astronomical Society (CASCA) Annual Meeting, Virtual (Best Student Talk Award) May 2021
5th 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 (17)

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 (PCE₃) 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

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, 2 times)	2022
• BIOPHYS 3D03: Origins of Life (40 undergrads, 4 times)	2018 – 2020
• ASTR 2E03: Planetary Astronomy (80 undergrads, 2 times)	2018 – 2019
Research Mentor (3 students) , Max Planck Institute for Astronomy, McMaster University	
• Klaus Paschek, Masters research projects (2 papers)	2019 – 2022
• Kaitlin Cerrillo, Masters thesis	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

Journal Referee	2020 – 2023
Nature Geoscience, Nature Astronomy, Scientific Reports, Frontiers in Microbiology, Astrobiology, Earth and Planetary Science Letters, ACS Earth and Space Chemistry (3x), Origins of Life and Evolution of Biospheres, Life	
Committee Member , Land Acknowledgment Committee Earth & Planetary Sci. Dept., JHU	2022 - present
Scientific Organizing Committee , Johns Hopkins U. and STScI Joint Astrobiology Seminar	2022 – present
Theme Lead , Interdisciplinary Consortia for Astrobiology Research Proposal	2022 – present
Organizer , Monthly Research and Technical Staff Peer Mentoring Lunches	2022 – present
Organizer , Trip to Baltimore American Indian Center for Earth and Planetary Science Department	2023
Space Exploration Topical Team in Astrobiology Member , Canada Space Agency (CSA)	2015 – 2022
Selection Committee Member (2)	2017 – 2020
Associate Dean of Graduate Studies (Science), Director of the Origins Institute, McMaster University	
Co-Founder , McMaster Astronomy and Physics Student Association (MAPSA)	2019 – 2020

Department Graduate Student Representative , Physics & Astronomy Dep., McMaster U.	2016 – 2020
Graduate Student Ambassador , Astrobio. and Phys. & Astro. Grad. Programs, McMaster U.	2019 – 2021
Seminar Organizer , Astrobiology Journal Club, McMaster University	2017 – 2021
President , Astronomy Club, University of British Columbia	2014 – 2015
Summer Radio Telescope Volunteer , Physics & Astronomy Dep., University of British Columbia	2013
Lead Audio/Visual Volunteer , Canadian Astronomical Society Annual Meeting, University of BC	2013

Outreach

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

Professional Development

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