Jacob N. H. Abrahams

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Professional Overview

Operator keeping a healthcare system's interior running, recovering scientist, and occasional software developer – I like solving problems with a variety of tools and am more interested in what I'm solving than how I solve it. I began my career as a space scientist and now try to maximize my impact on the world in the private sector. Today I write and maintain software supporting healthcare practitioners, manage systems and the people in them, and improve those systems in order to bring the world's best healthcare to billions of people.

Education

PhD: Planetary Science
University of California Santa Cruz, Santa Cruz, CA

BS in Physics and Geophysics, Minor in English
California Institute of Technology, Pasadena, CA, class of 2017

- GPA 3.5
- Relevant Coursework: Analytical Mechanics, Planetary Physics, Geodynamics, Programming in Python and C, Waves, Statistical Mechanics, Quantum Mechanics, Physics Labs, Order of Magnitude Physics

Key Skills

Programming – Significant experience with Python (over 1000 hours of use), moderate experience programming in Mathematica (≈200 hours), R (≈50 hours), Matlab (≈50 hours).

Data Science – My work on the Europa Clipper mission was a data analysis project, both generating useful data and finding ways to analyze and combine multiple different data sets.

Putting out Fires – Things constantly break at startups and I excel at making sure they don't stay broken. Whether it's recovering from a crucial tool breaking, managing a suddenly-tighter budget, or managing a rapidly changing job description, I like being nimble and solving what needs to be solved.

Scientific Reasoning – My PhD training has equipped me to quickly process and understand scientific claims, and learn new quantitative subjects and fields quickly.

Interdisciplinary Communication – My experience explaining science, including scientific presentations, scientific writing, and teaching an undergraduate class, has equipped me to communicate complicated topics to a wide variety of audiences both verbally and in writing.

Quantitative Problem Solving – My research generally starts with analytical math, then blends into numerical modelling. Background in order-of-magnitude computation and math competitions add comfort with mathematical questions.

Work Experience

Operations Specialist — Jan 2023 - Ongoing
Forward — San Francisco, CA

- "Shadow-engineering", writing and maintaining ops-built tools in javascript, enabling practitioners to manage schedules, view performance, and ensure accurate timekeeping.
- Onboarding, scheduling, and managing remote healthcare associates.
- Inventory tracking and procurement; I built a new tool to streamline inventory tracking.
- Mentoring and informally managing junior operators.

Graduate Student Researcher — Fall 2017 - Ongoing
University of California, Santa Cruz, Santa Cruz, CA
Graduate student performing research on planetary interiors, using a combination of analytical math and computer modelling, with publications on a novel form of asteroid volcanism and Europa's global shape, and ongoing work on the lunar dynamo and Io's tidal evolution.

Instructor of Record — Winter 2022
University of California, Santa Cruz, Santa Cruz, CA
Planetary Interiors. Undergraduate and graduate level course, 14 students. Exploring gravity, the geophysics of planets, tides, heat flow, dynamos, elasticity, and basic fluid dynamics.

Lloyd V Berkner Space Policy Intern Fall 2021
National Academy of Sciences: Space Studies Board, Washington, DC
Worked with the space studies board on development and publication of reports relating to space science policy and priorities for space research.

Instructor Winter 2021
University of California, Santa Cruz, Santa Cruz, CA
UCSC GEOPATHS, teaching math skills to underserved geophysics students.

Teaching Assistant Spring 2020
University of California, Santa Cruz, Santa Cruz, CA
Fundamentals of geophysics. Involved redesigning and running labs for remote teaching.

Teaching Assistant Spring 2015 through Spring 2017
California Institute of Technology, Pasadena, CA
TA five times, for an introductory Geology class twice, an introductory geophysics class, an advanced physics lab, and a cooking class. Involves writing and grading problem sets, running lab sessions, helping run field trips and holding office hours.

Peer Tutor Fall 2015-Spring 2017
California Institute of Technology, Pasadena, CA
Tutoring Caltech students, ∼8 hrs/week, in subjects including Calculus, Classical Mechanics, E&M, Differential Equations, Complex Analysis, Linear Algebra, and Quantum Mechanics.

Teacher Summer 2013
Young Scholars Program, Chicago, IL
Taught group theory, geometry, and programming to talented middle school students.

Research Roles

Graduate Student Affiliate *Fall 2020 – Ongoing*
Europa Clipper, Jet Propulsion Lab, Pasadena, CA
Member of the UV Spectrograph team on the Europa Clipper mission, exploring how to use UVS data to constrain Europa's global shape.

Research Fellowships
MIT Dep. of Earth, Atmospheric and Planetary Sciences, Cambridge, MA Summer 2016
Computational thermal modelling of partially differentiated planetary bodies, focused on predicting the presence and timing of planetary dynamos. Simulated competing thermal evolution models to determine their agreement with recent paleomagnetic measurements of undifferentiated material which cooled in a magnetic field.

Caltech Department of Geological and Planetary Science, Pasadena, CA Summer 2015
Research on inner-core translation and True Polar Wander for Earth and Mercury. Performed a combination of computations by hand, theoretical physical considerations, and multi-day computations programmed in Python.

Caltech Department of Geological and Planetary Science, Pasadena, CA Summer 2014
Research on Human Magnetoreception. Developed electromagnetic shielding to protect experiments from interference.

Honors

Waters Award for outstanding PhD research proposal	2020
NASA JPL Planetary Science Summer School	2020
Qualifying Exam honors, UCSC	2020
Chancellor's Fellowship, UCSC	2017-2018
Finalist - Gee Family Poster Competition	2016

Leadership and Service

Library and Scholarly Communication Committee, UCSC	2020 - Ongoing
Graduate Leadership Council, UCSC PBSci Division	2020 - Ongoing
Graduate Student Representative, UCSC EPS department	2020 - Ongoing
Organized department seminar series, UCSC EPS department	Spring 2020

Publications

1. **Abrahams, J. N. H.**; Nimmo, F.; Becker, T. M.; Gladstone, G. R.; Retherford, K. D.; Steinbrügge, G. Mazarico, E. (2021). Improved Determination of Europa's Long-Wavelength Topography using Stellar Occulatations. *Earth and Space Sciences*. https://doi.org/10.1029/2020EA001586.
2. **Abrahams, J. N. H.** & Nimmo, F. (2019). Ferrovolcanism: Iron volcanism on metallic asteroids. *Geophysical Research Letters*. https://doi.org/10.1029/2019GL082542.

3. Arredondo, A.; Hodges, A.; **Abrahams, J. N. H.**; et al. (2022). VALENTInE: A Concept for a New Frontiers Class Long Duration *In situ* Balloon-based Aerobot Mission to Venus. *Planetary Science Journal*. Accepted.
4. Bryson, J. F. J.; Weiss, B. P.; Getzin, B.; **Abrahams, J. N. H.**; Nimmo, F.; Scholl, A. (2019) Paleomagnetic Evidence for a Partially Differentiated H Chondrite Parent Planetesimal. *JGR: Planets*. https://doi.org/10.1029/2019JE005951
5. Wang, C. X.; Hillburn, I. A.; Wu, D.; Mizuhara, Y.; Couste, C. P.; **Abrahams, J. N. H.**; Bernstein, S. E.; Matani, A.; Shimojo, S.; Kirschvink, J. L. (2019). Transduction of the Geomagnetic Field as Evidenced from alpha-Band Activity in the Human Brain. *eNeuro*. https://doi.org/10.1523/ENEURO.0483-18.2019

Presentations

1. **Abrahams, J. N. H.**; Nimmo, F; Garrick-Bethell, I.; Bills, G. B.; Bierson, C. J. (2021). Long Period Non-Synchronous Rotation of Io. *AGU Fall Meeting*. #P45C-2442 (abstract).
2. **Abrahams, J. N. H.**; Nimmo, F.; Garrick-Bethell, I.; Bill, B. G.; Bierson, C. J. (2021) Long Period Non-Synchronous Rotation of Io. *AGU Fall Meeting*. #P45C-2442 (abstract).
3. **Abrahams, J. N. H.**; Nimmo, F.; Garrick-Bethell, I.; Bill, B. G.; Bierson, C. J. (2021) Long Period Non-Synchronous Rotation of Io. *Lunar and Planetary Science Conference*. #2548 (abstract).
4. **Abrahams, J. N. H.**; Nimmo, F.; Retherford, K. D.; Becker, T. M.; Gladstone, G. R.; Steinbrügge, G. (2020). Constraining Europa's Global Shape with Stellar Occultations Collected by Europa CLipper's UV Spectrograph. *AGU Fall Meeting*. #P081-0008 (abstract).
5. **Abrahams, J. N. H.**, Nimmo, F., Retherford, K. D., Gladstone G. R. (2020). Europa's Global Shape and Tidal Deformation: Stellar Occultation Astrometry as a Complement to Radar Altimetry on Europa Clipper. *Lunar and Planetary Science Conference*. #1650 (abstract).
6. **Abrahams, J. N. H.**, Brummell, N., Wade, J. B. N, Garrick-Bethell, I., Korre, L. (2019). The Role of a Moderately Conductive Basal Magma Ocean in the Ancient Lunar Dynamo. *AGU Fall Meeting*. #GP43B-0801 (abstract).
7. **Abrahams, J. N. H.** & Garrick-Bethell, I. (2019). The role of electromagnetic coupling in lunar core-mantle differential precession. *The Core of the Moon workshop*.
8. **Abrahams, J. N. H.** & Nimmo, F. (2019). Ferrovolcanism: Iron Volcanism on Metallic Asteroids. *Lunar and Planetary Science Conference L*. #1598 (abstract).
9. **Abrahams, J. N. H.**, Nimmo, F., Kleine, T. (2018). Mechanism and Timing of Volatile Loss on the IVB Parent Body. *AGU Fall Meeting*. #GP21C-0774 (abstract).
10. **Abrahams, J. N. H.**, Nimmo, F., Kleine, T. (2018). Thermal Models of Iron Meteorite Evolution and Comparison with Pd-Ag Volatile-Loss Constraints. *Lunar and Planetary Science Conference IL*. #1711 (abstract).
11. **Abrahams, J. N. H.**; Bryson, J. F. J.; Weiss, B. P.; Nimmo, F. (2016). Thermal Evolution of a Partially Differentiated H Chondrite Parent Body. *AGU Fall Meeting*, #P51A-2124 (abstract).

12. Bryson, J. F. J.; Weiss, B. P.; Scholl, A.; Getzin, B.; **Abrahams, J. N. H.**; Nimmo, F. (2016). Paleomagnetic Evidence for a Partially Differentiated H Chondrite Parent Planetesimal. *AGU Fall Meeting*, #P53D-02 (abstract).
13. **Abrahams, J. N. H.**; Cao, H.; Stevenson, D. J. (2016). Inner Core Translation, True Polar Wander, and Mercury's North-South Asymmetric Magnetic Field. *Lunar and Planetary Science Conference XLVII*, #2502 (abstract).
14. Mitchell, R. N.; Thissen, C.; Kirschvink, J. L.; Schrag, D. P.; Montanari, A.; Coccioni, R.; Slotznick, S. P.; Yamazaki, T.; Penserini, B. D.; **Abrahams, J. N. H.**; Cruz-Heredia, M.; Evans, D. A. (2015). Milankovitch Wobble? *AGU Fall Meeting*, # GP23B-1313 (abstract).