

Planetary Science Institute
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EDUCATION

University of Arizona, Tucson, AZ

August 2000 – May 2006; Doctor of Philosophy (Planetary Sciences,
Molecular and Cell Biology minor)

Clarkson University, Potsdam, NY

August 1995 – May 1998; Bachelor of Science (Biology), with honors

PROFESSIONAL EXPERIENCE

Senior Scientist, August 2016 – present

Planetary Science Institute, Tucson, AZ

Current projects include (i) serving as a Co-Investigator on E-THEMIS infrared spectrometer for the upcoming NASA Europa Clipper mission, participating in development from formulating basic science goals through manufacture, testing, flight operations, and data analysis, (ii) performing computer simulations of asteroids & comets impacting planetary surfaces and resulting environmental effects, and (iii) analyzing data from planetary missions using analytical and statistical methods. Lead several project teams as Principal Investigator, and contribute to others as Co-Investigator and Collaborator.

Space Scientist, November 2011 – September 2015

USGS Astrogeology Science Center, Flagstaff, AZ

Supervised and managed several research projects as Principal Investigator, including (i) exploring thermal effects of impact bombardments on terrestrial planets, (ii) numerical modeling of hydrothermal activity on present-day Mars, and (iii) analysis and modeling of thermal anomalies on icy satellites. Served as Project Manager for image processing support for the OSIRIS-REx mission. Performed chemical and isotopic analyses of lunar and martian meteorites using an ion microprobe. Supervised an undergraduate student researcher and a USGS volunteer.

Urey Fellow, October 2010 – October 2011

Lunar and Planetary Institute, Houston, TX

Conducted research on the lunar bombardment history using Apollo sample analysis and numerical modeling techniques. Modeled thermal, physical, and geochemical effects of a broad range of impactors on the lunar crust, and tested model predictions using chemical, mineralogical and isotopic analyses of lunar samples at NASA Johnson Space Center. Organized proposal teams, prepared and submitted proposals to NASA. Supervised an undergraduate summer intern.

NASA Postdoctoral Program Fellow, August 2007 – September 2010

University of Colorado, Boulder, CO

Used computer modeling, laboratory analyses, and field work to study environmental conditions on early Earth. Carried out computer modeling at the University of Colorado, performed laboratory work (ion microprobe analyses of ancient zircons) at University of California -

Los Angeles, and conducted field work at Northwest Territories, Canada and Western Australia. Developed custom thermal analysis and fluid flow modeling software using C, FORTRAN, and Perl.

Postdoctoral Researcher, August 2006 – August 2007

Southwest Research Institute, Boulder, CO

Investigated surface processes on Europa, Enceladus, and Io using remote sensing data and geophysical modeling techniques. Performed computer modeling of endogenic hotspots on Europa based on imaging and thermal data from the Galileo spacecraft. Completed a thermal model of the south pole vents of Enceladus, constrained with data from the CIRS infrared spectrometer onboard the Cassini spacecraft. Calibrated and analyzed data from the New Horizons Jupiter encounter and determined temperatures of Io volcanoes.

Graduate Research and Teaching Assistant, May 2001 – June 2006

University of Arizona, Tucson, AZ

Used a numerical modeling approach to investigate dynamics, lifetimes, and microbial habitability of impact-induced hydrothermal systems in a range of craters on Earth and Mars. Constrained models with mineralogical, geochemical, and isotopic data analyses of samples from terrestrial craters. Evaluated methods for interpolation of data from the Mars Orbiter Laser Altimeter (MOLA) instrument, and used MOLA data to analyze Mars valley networks. Participated in Team X, a spacecraft design, analysis and evaluation study at Jet Propulsion Laboratory. As a Teaching Assistant, conducted lectures and class demonstrations, taught review sections, administered labs, graded homework and exams, assisted students during office hours, created and updated course websites.

Bioinformatics Associate, February 2000 – August 2000

Metabolex, Inc., Hayward, CA

Analyzed, annotated, clustered, and archived DNA sequence data. Programmed in Perl, wrote software for a primer walking project, created and maintained internal website, completed projects with minimal supervision.

Research Associate, September 1998 – February 2000

Metabolex, Inc., Hayward, CA

Carried out inoculations, DNA minipreps, sequencing reactions, gel loading, and data extraction as part of a high-throughput sequencing group. Performed troubleshooting and contributed to laboratory protocols.

Research Assistant, May 1998 – August 1998

Cornell University Theory Center, Ithaca, NY

Assisted with computer modeling of the sun's convection zone. Programmed in FORTRAN on an IBM SP2 supercomputer and used IBM Data Explorer for rendering results. Created interactive visualizations on a Macintosh platform.

Research Intern, May 1997 – August 1997, United States

Adirondack Biomedical Research Institute, Lake Placid, NY

Worked on molecular characterization of Cellular – Retinaldehyde Binding Protein (CRALBP) using mutagenesis, mass spectroscopy, isotopic labeling, protein purification, SDS-PAGE, and Nuclear Magnetic Resonance (NMR).

OTHER PROFESSIONAL ACTIVITIES AND SKILLS**SERVICE ACTIVITIES:**

- Serve on NASA Europa Clipper Geology, Composition, and Habitability working groups (2015-present).
- Serve on Planetary Science Institute “Red Team” internal review panel to improve outgoing proposals (2017-present).
- Served as judge for the Dworkin Award at Lunar and Planetary Science Conference (multiple years).
- Chaired scientific and technical sessions at the Lunar and Planetary Science Conference and American Geophysical Union Fall Meeting.
- Served as scientific manuscript reviewer for journals *Icarus*, *Journal of Geophysical Research*, *Planetary and Space Science*, *Earth and Planetary Science Letters*, *Meteoritics and Planetary Science*, and *Geophysical Research Letters*.
- Served as external reviewer for the following NASA grant programs: *Mars Fundamental Research Program*, *Mars Data Analysis Program*, *Solar System Workings*, and *Outer Planets Research Program*.
- Served on review panels for the following NASA grant programs: *Mars Fundamental Research Program*, *Mars Data Analysis Program*, *Cassini Data Analysis Program*, *Astrobiology Institute*, and *Outer Planets Research Program*.
- Served on the Lunar and Planetary Science Conference (LPSC) Program Committee at Lunar and Planetary Institute, 2011.

FIELD EXPERIENCE:

- HI-SEAS (Hawai'i Space Exploration Analog & Simulation) Mission 1 crew member: Participated in a NASA-funded Mars simulation as crew geologist and health & safety officer, April-August 2013.
- Participated in two two-week simulated Mars missions at the Mars Desert Research Station (MDRS), operated by the Mars Society, in the Canyonlands region of Utah. Performed duties of crew geologist and produced scientific reports from the field. Participated in field-testing of an autonomous roving vehicle. February 2013 & January 2003.
- Conducted geological field work in the Assean Lake Complex, northern Manitoba, Canada, to map and sample ancient detrital zircons (approx. 3.9 billion years old). Two-week expedition, Summer 2011, led by Dr. Stephen Mojzsis, University of Colorado.
- Participated in a field trip to study impact cratering and volcanic processes in lunar analogue terrains at Meteor Crater and San Francisco Volcanic Field, Arizona. Performed exercises and experiments in geologic mapping, structural geology, geophysics, sample collection and characterization. One-week trip, Spring 2011, led Dr. David Kring (Lunar and Planetary Institute).
- Conducted geological fieldwork in Acasta Gneiss Complex, Northwest Territories, Canada, to map and sample the oldest known terrestrial rocks (up to 4.03 billion years old). Two-week expedition, Summer 2009, led by Dr. Stephen Mojzsis, University of Colorado.
- Conducted geological fieldwork in Jack Hills, Western Australia, to collect and characterize the oldest known terrestrial material (4.4 billion year-old zircons). Two-week expedition, Summer 2008, led by Dr. Mark Harrison, University of California - Los Angeles.
- Participated in six Planetary Geology Field Practicums (3-7 day geology field trips) at Lunar and Planetary Laboratory, University of Arizona, September 2001-May 2006.

FUNDED RESEARCH PROPOSALS:

- NASA Solar System Workings Program award 80NSSC19K0032 (2018-2021), Constraining Lunar Bombardment History by Modeling Impact Age Distributions, 0.25 FTE, Principal Investigator
- NASA Solar System Workings Program award 80NSSC17K0732 (2017-2020), Integrated Modeling of Early Impact Bombardments, 0.25 FTE, Principal Investigator
- NASA Habitable Worlds Program award 80NSSC17K0740 (2017-2020), Impact Bombardments on Extrasolar Terrestrial Planets: Implications for Habitability, 0.25 FTE, Principal Investigator
- NASA Europa Instrument Investigation award (2015-2025), Europa Thermal Emission Imaging System (E-THEMIS), 0.1 FTE, Co-Investigator
- NASA Exobiology Program award (2015-2018), Environmental Effects of Asteroidal Bombardment on the Hadean Earth, 0.1 FTE, Co-Investigator
- NASA Mars Fundamental Research Program award NNH14AX55I (2014-2017), Quantifying Water Released Into the Atmosphere of Mars by Early Impact Bombardments, 0.25 FTE, Principal Investigator
- NASA Planetary Geology and Geophysics award (2014-2017), Combining Sample Analysis and Numerical Modeling to Reconstruct the Origin and Evolution of Flynn Creek Crater, Tennessee, 0.1 FTE, Co-Investigator
- NASA Cassini Data Analysis Program award NNH13AV61I (2013-2016), Endogenic Heat from Enceladus' South Polar Fractures: Improved Models and New Observations, 0.25 FTE, Principal Investigator
- NASA Mars Fundamental Research Program award (2013-2016), Testing Models of the Heat Transfer from Silicate Melts into Wet Sediments, 0.1 FTE, Co-Investigator
- NASA Planetary Geology and Geophysics award NNH12AU58I (2012-2015), Exploring Impact Bombardments on Rocky Worlds, 0.5 FTE, Principal Investigator
- Lunar and Planetary Institute Urey Fellowship award (2010-2013), Exploring the Lunar Bombardment History: A Window to the Early Solar System, 1.0 FTE, Principal Investigator
- NASA Exobiology Program award NNX11AD57G (2011-2014), Investigating the Hadean Earth, 0.125 FTE, Co-Investigator
- NASA Postdoctoral Program award (2007-2010), Habitability of Early Earth: Thermal Modeling of the Lithosphere During the Late Heavy Bombardment, 1.0 FTE, Principal Investigator

ADVISING EXPERIENCE:

- Supervised a USGS volunteer, February 2015 - September 2015.
- Designed a project for and supervised a Northern Arizona University undergraduate student, August 2014-May 2015.
- Designed a project for and supervised a Lunar and Planetary Institute undergraduate intern, Spring 2011.

PUBLIC OUTREACH ACTIVITIES:

- Participated in in-person, telephone, and e-mail press interviews.
- Presented at public outreach events: New Zealand International Science Festival, Kang Chiao International School, University of Otago, Flagstaff Festival of Science, Lowell

Observatory, Arizona State University SpaceVision, Lunar and Planetary Laboratory public outreach events.

Volunteered at USGS Open House (multiple years).

Created science-based illustrations for EPO materials at Lunar and Planetary Institute, 2011.

COMPUTING SKILLS:

Operating Systems: UNIX/Linux, MS Windows, MacOS

Analytical Software: MATLAB, Maple, Mathematica, MS Excel, ArcGIS, ENVI, Photoscan, IDL, HYDROTHERM, MODFLOW, Tensorflow, Tecplot, Paraview, GNU Plot, Origin, Generic Mapping Tools

Programming Languages: C, C++, FORTRAN, Perl, Python, CGI scripting

Word Processing & Presentation: MS Word, MS PowerPoint, LaTeX, HTML, Adobe Photoshop, Adobe Illustrator

PUBLICATIONS

SUMMARY:

27 peer-reviewed papers (13 first-authored) in 20 years of publishing (2004-2024)

Average number of citations per first-authored paper = 91

Hirsch citation metric: $h = 18$

JOURNAL ARTICLES:

Rodriguez, J. A. P., D. Domingue, B. Travis, J. S. Kargel, **O. Abramov**, M. Zarroca, M. E. Banks, J. Weirich, A. Lopez, N. Castle, Y. Jianguo, and F. Chuang, Mercury's Hidden Past: Revealing a Volatile-dominated Layer through Glacier-like Features and Chaotic Terrains, *Planet. Sci. J.*, 4(11), 2023.

Abramov, O., K.L. Bebell, and S.J. Mojzsis, Emergent bioanalogous properties of blockchain-based distributed systems, *Orig. Life Evol. Biosph.*, 51 (2), 131-165, 2021.

Brasser, R., S.J. Mojzsis, S.C. Werner, and **O. Abramov**, A new estimate for the age of highly siderophile element retention in the lunar mantle from late accretion, *Icarus*, 361, 2021.

Richardson, J.E., and **O. Abramov**, Modeling the formation of the lunar upper megaregolith layer, *Planet. Sci. J.*, 1(1), 2020.

Mojzsis, S.J., R. Brasser, N.M. Kelly, **O. Abramov**, and S.C. Werner, Onset of giant planet migration before 4480 million years ago, *Astrophys. Jour.*, 881:44, 2019.

Mojzsis, S.J., **O. Abramov**, E.A. Frank, and R. Brasser, Thermal effects of late accretion to the crust and mantle of Mercury, *Earth Planet. Sci. Lett.*, 482, 536-544, 2018.

Frank, E.A., R.W. Potter, **O. Abramov**, P.B. James, R.L. Klima, S.J. Mojzsis, and L.R. Nitter, Evaluating an impact origin for Mercury's high-magnesium region, *J. Geophys. Res., Planets*, 122(3), 614-632, 2017.

Abramov, O., and S.J. Mojzsis, Thermal effects of impact bombardments on Noachian Mars, *Earth Planet. Sci. Lett.*, 442, 108-120, 2016.

Baker, L.L., A. Bernard, W.C. Rember, M. Milazzo, C. Dundas, **O. Abramov**, and L. Keszthelyi, Temperature profile around a basaltic sill intruded into wet sediments, *J. Vol. Geotherm. Res.* 302, 81-86, 2015.

- Hopkins, M.D., S.J. Mojzsis, W.F. Bottke, and **O. Abramov**, Micrometer-scale U–Pb age domains in eucrite zircons, impact re-setting, and the thermal history of the HED parent body, *Icarus*, 245, 367-378, 2015.
- Tsang, C.C.C., J.A. Rathbun, J.R. Spencer, B.E. Hesman, and **O. Abramov**, Io's hot spots in the near-infrared detected by LEISA during the New Horizons flyby, *J. Geophys. Res.: Planets*, 119, 10 2222-2238, 2014.
- Mojzsis, S.J., N. L. Cates, G. Caro, D. Trail, **O. Abramov**, M. Guitreau, J. Blichert-Toft, M.D.Hopkins, and W. Bleeker, Component geochronology in the ca. 3920 Ma Acasta Gneiss, *Geochim. et Cosmochim. Acta*, 133, 68-96, 2014.
- Abramov, O.**, J.A. Rathbun, B.E. Schmidt, and J.R. Spencer, Detectability of thermal signatures associated with active formation of 'chaos terrain' on Europa, *Earth Planet. Sci. Lett.*, 384, 37-41, 2013.
- Abramov, O.**, D.A. Kring, and S.J. Mojzsis, The impact environment of the Hadean Earth, *Chemie Der Erde*, 73, 227-248, 2013.
- Abramov O.**, S.M. Wong, and D.A. Kring, Differential melt scaling for oblique impacts on terrestrial planets. *Icarus*, 218, 906-916, 2012.
- Schwenzer, S.P., **O. Abramov**, C.C. Allen, S. Clifford, J. Filiberto, D.A. Kring, J. Lasue, P.J. McGovern, H.E. Newsom, A.H. Treiman, D.T. Vaniman, R.C. Wiens, and A. Wittmann, Gale Crater: Formation and Post-Impact Hydrous Environments, *Planet. Space Sci.*, 70, 84-95, 2012.
- Schwenzer, S.P., **O. Abramov**, C.C. Allen, S.M. Clifford, C.S. Cockell, J. Filiberto, D.A. Kring, J. Lasue, P.J. McGovern, H.E. Newsom, A.H. Treiman, D.T. Vaniman, and R.C. Wiens, Puncturing Mars: How impact craters interact with the Martian cryosphere, *Earth Planet. Sci. Lett.*, 335, 9-17, 2012.
- Abramov, O.**, and S.J. Mojzsis, Abodes for life in carbonaceous asteroids?, *Icarus*, 213, 273-279, 2011.
- Fairen, A.G., V. Chevrier, **O. Abramov**, G.A. Marzo, P. Gavin, A.F. Davila, L.L. Tornabene, J.L. Bishop, T.L. Roush, C. Gross, T. Kneissl, E.R. Uceda, J.M. Dohm, D. Schulze-Makuch, J.A.P. Rodriguez, R. Amils, and C.P. McKay, Noachian and more recent phyllosilicates in impact craters on Mars, *Proc. Nat. Acad. Sci.*, 107, 12095-12100, 2010.
- Abramov, O.**, and S.J. Mojzsis, Microbial habitability of the Hadean Earth during the late heavy bombardment, *Nature*, 459, 419 -422, 2009.
- Abramov, O.**, and J.R. Spencer, Endogenic heat from Enceladus' south polar fractures: New observations, and models of conductive surface heating, *Icarus*, 199, 189-196, 2009.
- Abramov, O.**, and J.R. Spencer, Numerical modeling of endogenic thermal anomalies on Europa, *Icarus*, 195, 378-385, 2008.
- Spencer, J.R., S.A. Stern, A.F. Cheng, H.A. Weaver, D.C. Reuter, K. Retherford, A. Lunsford, J.M. Moore, **O. Abramov**, R.M.C. Lopes, J.E. Perry, L. Kamp, M. Showalter, K.L. Jessup, F. Marchis, P.M. Schenk, and C. Dumas, Io Volcanism Seen by New Horizons: A Major Eruption of the Tvashtar Volcano, *Science*, 318, 240-243, 2007.
- Abramov, O.**, and D.A. Kring, Numerical modeling of impact-induced hydrothermal activity at the Chicxulub crater, *Meteor. Planet. Sci.*, 42, 93-112, 2007.
- Abramov, O.**, and D.A. Kring, Impact-induced hydrothermal activity on early Mars, *J. Geophys. Res.*, 110, E12S09, doi:10.1029/2005JE002453, 2005.
- Abramov, O.**, and D.A. Kring, Numerical modeling of an impact-induced hydrothermal system at the Sudbury crater, *J. Geophys. Res.*, 109, E10007, doi:10.1029/2003JE002213, 2004.

Abramov, O., and A.S. McEwen, An evaluation of interpolation methods for MOLA data, *Int. J. Rem. Sens.*, 25(3), 669-676, 2004.