Oleg Abramov

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BACKGROUND AND EDUCATION

BORN: 31 January 1978, St. Petersburg, Russia

CITIZENSHIP: U.S. citizen

EDUCATION:

University of Arizona, Tucson, AZ
August 2000 – May 2006; Doctor of Philosophy (Planetary Sciences, Molecular and Cell Biology minor)
Dissertation Advisor: David A. Kring
GPA: 3.78/4.00

Clarkson University, Potsdam, NY
August 1995 – May 1998; Bachelor of Science (Biology), with honors
GPA: 3.62/4.00

RESEARCH EXPERIENCE

INTERESTS:

Thermal modeling, remote sensing, impact cratering, hydrothermal systems, origin and evolution of life, detection of biomarkers, analytical geochemistry.

POSITIONS:

Urey Fellow, October 2010 – present
Lunar and Planetary Institute, Houston, TX
Designed, planned, and coordinated own research projects. Developed a global numerical model for the thermal effects of impact bombardments on the Moon, and an analytical impact melt scaling model for terrestrial planets. Modeled thermal, physical, and geochemical effects of a broad range of impactors on the lunar crust, and tested model predictions using microprobe analyses of lunar minerals as well as photogeological observations. Presented results at conferences, published scientific papers, reviewed manuscripts and proposals. 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
Computer modeling, laboratory analyses, and field work were used to study conditions on Earth during the period of Late Heavy Bombardment, approx. 3.9 billion years ago. Computer modeling was carried out at the University of Colorado, laboratory work (ion microprobe analysis of ancient zircons) was carried out at University of California - Los Angeles, and field work was conducted 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. Completed 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. Assisted with setup of a biotechnology lab.

Graduate Research Assistant, May 2001 – June 2006
University of Arizona, Tucson, AZ
Used a numerical modeling approach to investigate the dynamics, lifetimes, and biological 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 the interpolation of data from Mars Orbiter Laser Altimeter (MOLA) instrument onboard the Mars Global Surveyor spacecraft, and used MOLA data to analyze Martian valley networks. Participated in Team X, a semester-long spacecraft design study for a future Europa orbiter at Jet Propulsion Laboratory.

Bioinformatics Assistant, February 2000 – August 2000
Metabolex, Inc., Hayward, CA
Analyzed, annotated, clustered, and archived DNA sequence data. Programmed in Perl, built custom software for DNA primer design, created and maintained internal website, completed all 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. Designed protocols and wrote software for several custom projects.

Research Assistant, May 1998 – August 1998
Cornell University Theory Center, Ithaca, NY
Assisted with computer modeling of the sun's convection zone. Used FORTRAN and IBM Data Explorer on an IBM SP2 supercomputer for programming and data rendering. Created visualizations on a Macintosh platform.

Research Intern, May 1997 – August 1997
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).

FUNDED RESEARCH PROPOSALS:

NASA Planetary Geology and Geophysics award (2011-2014), *Exploring Impact Bombardments on Rocky Worlds*, 0.5 FTE, **Principal Investigator**

NASA Exobiology Program award NNX11AD57G (2011-2014), *Investigating the Hadean Earth*, 0.125 FTE, **Co-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 Postdoctoral Program award (2007-2010), *Habitability of Early Earth: Thermal Modeling of the Lithosphere During the Late Heavy Bombardment*, 1.0 FTE, **Principal Investigator**.

NASA Exobiology Program award NNX07AV53G (2007-2010), *Exploring the Late Heavy Bombardment*, **Collaborator**.

PENDING RESEARCH PROPOSALS:

NASA Mars Science Laboratory Participating Scientist Program proposal (2011-2015), *Assessing the Extent of Hydrothermal Alteration at MSL Landing Sites with Numerical Modeling and Instrument Investigations*, 0.25 FTE, **Principal Investigator**

NASA Lunar Advanced Science and Exploration Research (LASER) Program proposal (2011-2014), *Exploring Lunar Bombardment History Using Shock-Metamorphosed Zircons*, 0.25 FTE, **Principal Investigator**

NASA Exobiology Program proposal (2011-2014), *Early Impact Bombardments on Extrasolar Terrestrial Planets: Implications for Habitability*, 0.25 FTE, **Principal Investigator**

FIELD GEOLOGY EXPERIENCE:

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.

Conducted geological fieldwork in Jack Hills, Western Australia, to collect and further characterize the oldest known terrestrial material (4.4 billion year-old zircons). Two-week expedition, Summer 2008.

Participated in six Planetary Geology Field Practicums (3-7 day geology field trips) at Lunar and Planetary Laboratory, University of Arizona.

MISSION INVOLVEMENT:

Mars Science Laboratory (MSL): Submitted a Participating Scientist proposal to NASA, March 2011.

Cassini: analyzed data from the Composite Infrared Spectrometer (CIRS) instrument. Participating Scientist proposal in preparation for submission in July 2011.

New Horizons: calibrated and analyzed data from Long Range Reconnaissance Imager (LORRI), Linear Etalon Imaging Spectral Array (LEISA), and Multispectral Visible Imaging Camera (MVIC) instruments.

Jupiter Europa Orbiter: Participated in Team X, a spacecraft design, analysis and evaluation study at Jet Propulsion Laboratory, 2005.

Mars Global Surveyor: interpolated and analyzed data from Mars Orbiter Laser Altimeter (MOLA) instrument.

Mars Exploration Rovers (MER): Contributed to landing site selection by assessing surface roughness using MOLA data.

OTHER PROFESSIONAL ACTIVITIES AND SKILLS

TEACHING EXPERIENCE:

NATS 101, Planet Earth: Evolution of a Habitable World, Spring 2006 (Prof. Renu Malhotra)
Teaching Assistant: *Graded homeworks and exams, administered labs, held office hours, maintained grade database.*

NATS 102, The Universe And Humanity: Origin And Destiny, Spring 2004 (Prof. John S. Lewis)
Teaching Assistant: *Gave several lectures, graded homeworks and exams, administered labs, held office hours, taught review sessions, created and maintained class website, maintained grade database.*

ADVISING EXPERIENCE:

Designed a project for and supervised a Lunar and Planetary Institute Undergraduate Intern, Spring 2011.

SERVICE ACTIVITIES:

Served as scientific manuscript reviewer for journals *Icarus*, *Journal of Geophysical Research*, *Planetary and Space Science*, *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*, and *Outer Planets Research Program*.

Served on review panels for the following NASA grant programs: *Outer Planets Research Program.*

Served on the Lunar and Planetary Science Conference (LPSC) Program Committee at Lunar and Planetary Institute, 2011.

PUBLIC OUTREACH ACTIVITIES:

Presented at Lunar and Planetary Laboratory Public Outreach events:
January 22, 2005 – New Discoveries on Titan;
July 10, 2004 – Titan: World of Mystery;
June 19, 2004 – Saturn: The Real Lord of the Rings;
January 24, 2004 – Space Mania II: Spirit and Opportunity.

Presented at the 2005 Phoenix Student Showcase.

Presented at the 2004 University of Arizona Student Showcase (winner).

Served as science fair judge – San Xavier Mission School (2003).

WEBSITE (includes downloadable copies of all papers):

http://www.lpi.usra.edu/lpi/abramov/

PROFESSIONAL ORGANIZATIONS:

American Geophysical Union (AGU)
Geochemical Society

COMPUTING SKILLS:

Operating Systems:	UNIX, MS Windows, MacOS
Analytical Software:	Maple, Mathematica, OpenDX, IDL, ISIS, Excel, HYDROTHERM, Tecplot, HEATING, GNU Plot, Origin, Generic Mapping Tools
Programming Languages:	C, C++, FORTRAN, Perl, CGI Scripting
Word Processing & Presentation:	MS Word, LaTeX, HTML, Adobe Photoshop, Adobe Illustrator, MS PowerPoint

FELLOWSHIPS AND HONORS

Fall 2010	Urey Fellowship, Lunar and Planetary Institute
Winter 2010	Featured in Discover magazine's top 100 stories of 2009
Fall 2007	NASA Postdoctoral Program Fellowship, funded by NASA Astrobiology Institute
Fall 2005	Imaging Fellowship, University of Arizona
Fall 2005	Registration Scholarship, University of Arizona
Summer 2005	NASA Mars Exploration Program conference travel award
Spring 2005	LPSC/GSA Stephen E. Dwornik Award Student Paper Honorable Mention
Fall 2004	University of Arizona Student Showcase winner in the Graduate science category
Fall 2004	NASA Mars Exploration Program conference travel award
Spring 2004	Galileo Circle Scholarship, University of Arizona
Spring 2004	Graduate and Professional Student Council conference travel award
Spring 2002	Registration Scholarship, University of Arizona
Fall 2001	Graduate College Fellowship, University of Arizona
Spring 1998	Presidential Scholar, Clarkson University

PUBLICATIONS

SUMMARY:
12 peer-reviewed papers (9 first-authored) in 7 years of publishing (2004-2011)
Average number of citations per first-authored paper = 11.29
Hirsch citation metric: h = 7

JOURNAL ARTICLES:

Abramov, O., S.M. Wong, and D.A. Kring, Differential Melt Scaling for Oblique Impacts on the Earth, Moon, and Mars, *Meteor. Planet. Sci.*, submitted, 2011.

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, A. Wittmann, A Case Study of Gale Crater: Developing an Exploration Strategy for Targeting Noachian Impact Craters to Study Impact Processes and Potential Habitats for Life, *Icarus*, in revisions, 2011.

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.

DISSERTATION:

Abramov, O., Impact-Induced Hydrothermal Activity on Earth and Mars, Ph.D. Thesis, Department of Planetary Sciences, University of Arizona, 2006.

CONFERENCE PRESENTATION ABSTRACTS:

Abramov, O., D. A. Kring, and S. J. Mojzsis, Modeling of impact-induced age resetting and partial Pb-loss in zircon grains, *Lunar Planet. Sci. XXXXII*, abstract 2674, 2011.

Schwenzer, S.P., and **O. Abramov**, Impact-generated hydrothermal systems on Noachian Mars: Clays, carbonates and more, *2010 AGU Fall Meeting*, Abstract P44B-03, San Francisco, CA., 13-17 Dec, 2010.

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, A. Wittmann, Exploring Martian Impact Craters: Why They are Important for the Search for Life, *AbSciCon 2010*, abstract 5527, 2010.

Abramov, O., and S.J Mojzsis, Thermal, Physical, and Biological Effects of Impact Bombardments on Noachian Mars, *Lunar Planet. Sci. XXXXI*, abstract 2402, 2010.

Fairen, A. G., V. Chevrier, **O. Abramov**, G. A. Marzo, P. Gavin, A. F. Davila, C. Gross, T. Kneissl, T. L. Roush, J. L. Bishop, L. L. Tornabene, J. M. Dohm, J. A. P. Rodriguez, D. Schulze-Makuch, C. P. McKay, Toro Crater: First Evidence for Hesperian Phyllosilicates on Mars, *Lunar Planet. Sci. XXXXI*, abstract 2683, 2010.

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, A. Wittmann, Exploring Martian Impact Craters: What They Can Reveal About the Subsurface and Why They are Important in the Search for Life, *Lunar Planet. Sci. XXXXI*, abstract 1589, 2010.

Abramov, O. and S.J. Mojzsis, Simulations of Diffusive Pb-, Ti- and REE-loss in Terrestrial and Lunar Zircon and Apatite as a Function of Impact Heating During Impact Bombardments, *Eos Trans. AGU, 90*(52), Fall Meet. Suppl., Abstract V13C-2040, 2009.

Abramov, O., and S.J Mojzsis, Thermal effects of impacts on the Hadean Earth, *Goldschmidt Conference Abstracts,* A5, 2009.

Abramov, O., Modeling hydrothermal activity associated with martian impact craters: an overview, *Workshop on Modeling Martian Hydrous Environments*, abstract 4029, 2009.

Abramov, O., and S.J Mojzsis, Microbial habitability of the Hadean Earth during the Late Heavy Bombardment , *Lunar Planet. Sci. XXXX*, abstract 2379, 2009.

Abramov, O., and S.J. Mojzsis, Thermal State of the Lithosphere During Late Heavy Bombardment: Implications for Early Life, *Eos Trans. AGU*, *89*(53), Fall Meet. Suppl., Abstract V11E-08, 2008.

Mojzsis, S.J., **O. Abramov**, T.M. Harrison, D.A. Kring, H.F. Levison, D. Trail, and E.B. Watson, Exploring for early bombardments on Earth from pre-3.85 Fa thermal effects recorded in

Hadean zircons - a status report, *Eos Trans. AGU*, *89*(53), Fall Meet. Suppl., Abstract V11E-07, 2008.

Abramov, O., and S.J Mojzsis, Thermal State of the Terrestrial Lithosphere During the Late Heavy Bombardment: Implications for Habitability, *Early Solar System Impact Bombardment*, abstract 3019, 2008.

Mojzsis S.J., **O. Abramov**, T.M. Harrison, D.A. Kring, H.F. Levison, D. Trail, and E.B. Watson, Exploring for Early Bombardments on Earth from Pre-3.83 Ga Thermal Effects Recorded in Hadean Zircons — A Status Report, *Early Solar System Impact Bombardment*, abstract 3025, 2008.

Abramov, O., and S.J Mojzsis, Thermal state of the lithosphere during Late Heavy Bombardment , *Geochim. Cosmochim. Acta, 72*(12), A2, 2008.

Abramov, O., and S.J Mojzsis, Thermal Modeling of the Terrestrial Lithosphere During the Late Heavy Bombardment , *Lunar Planet. Sci. XXXIX*, abstract 1036, 2008.

Spencer, J.R., S.A. Stern, K. Retherford, **O. Abramov**, D. Reuter, A. Cheng, H.A. Weaver, A. Lunsford, J. Moore, J. Perry, R.M. Lopes, L. Kamp, and New Horizons Science Team, New Horizons Observes Io's Volcanic Activity, DPS meeting #39, *Bull. Am. Astron. Soc.*, *39*, p. 437, 2007.

Spencer, J.R., S.A. Stern, J. Moore, R.M.C. Lopes, K. Retherford, **O. Abramov**, M. Showalter, A.F. Cheng, H.A. Weaver, D.C. Reuter, A. Lunsford, C. Olkin, H. Throop, and K.L. Jessup, New Horizons Observations of Io's Volcanism, *Workshop on Ices, Oceans, and Fire: Satellites of the Outer Solar System*, abstact 6030, LPI Contribution No. 1357, p.134-135, 2007.

Abramov, O., and J.R. Spencer, South Polar Thermal Anomaly on Enceladus: Modeling and Observations, *Lunar Planet. Sci. XXXVIII*, abstract 2343, 2007.

Abramov, O., and J.R. Spencer, Numerical Modeling of Endogenic Thermal Anomalies on Europa, *Eos Trans. AGU*, *87*(52), Fall Meet. Suppl., Abstract P23E-0101, 2006.

Spencer, J.R., J.C. Pearl, M. Segura, **O. Abramov**, and C.C. Team, Heat Flow From the South Pole of Enceladus: Spatial Distribution and Power Supply, *Eos Trans. AGU*, *87*(52), Fall Meet. Suppl., Abstract P22B-05, 2006.

Abramov, O., and D.A. Kring, Numerical modeling of impact-induced hydrothermal activity at the Chicxulub crater, *Lunar Planet. Sci. XXXVII*, abstract 2102, 2006.

Abramov, O., and D. A. Kring, Impact-induced hydrothermal activity at central-peak and peak-ring craters on early Mars, *Workshop on the Role of Volatiles and Atmospheres on Martian Impact Craters*, Laurel, Maryland, abstract 3028, 2005.

Abramov, O., and D.A. Kring, Impact-induced hydrothermal activity on early Mars, *Lunar Planet. Sci. XXXVI*, abstract 1048, 2005.

Abramov, O., and D.A. Kring, Numerical modeling of impact-induced hydrothermal activity on early Mars, *2nd Conf Early Mars*, abstract 8062, 2004.

Abramov, O., and D.A. Kring, Impact-generated hydrothermal activity at Gusev Crater: Implications for the Spirit mission, *Lunar Planet. Sci. XXXV*, abstract 1976, 2004.

Abramov, O., and D.A. Kring, Impact-induced hydrothermal system at the Sudbury crater: Duration, temperatures, mechanics, and biological implications, *Lunar Planet. Sci. XXXV*, abstract 1697, 2004.

Abramov, O., and D.A. Kring, Numerical modeling of the impact-induced hydrothermal system at Sudbury crater, *Eos Trans. AGU*, *84*(46), Fall Meet. Suppl., Abstract P52A-0477, 2003.

Abramov, O., and D.A. Kring, Finite-difference modeling of impact-induced hydrothermal systems, *Lunar Planet. Sci. XXXIV*, abstract 1846, 2003.

Abramov, O., Richardson, J., and A.S. McEwen, Altimetry-based analysis of valley systems on Mars, *Eos Trans. AGU*, *83*(47), Fall Meet. Suppl., Abstract P51B-0361, 2002.

Abramov, O., and A.S. McEwen, An evaluation of interpolation methods for MOLA data, *Eos Trans. AGU*, *82*(47), Fall Meet. Suppl., Abstract P42A-0567, 2001.