Curriculum Vitae

Li ZENG

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Work Appointment

Simons Foundation Postdoctoral Fellow *June 2015-present*
Department of Earth and Planetary Sciences, Harvard University, Cambridge, MA

- Mentor: Stein B. Jacobsen
- Program: Simons Collaboration on the Origins of Life (SCOL award #337090)
- Project: "Uncovering the Chemistry of Earth-like Planets"
  http://www.simonsfoundation.org/life-sciences/simons-collaboration-on-the-origins-of-life/postdoctoral-fellows/

Education

Ph.D. in Astronomy & Astrophysics *2009-2015*
Harvard University, Cambridge, MA

- Advisor: Dimitar D. Sasselov
- Thesis: "Interior Structure and Chemistry of Solid Exoplanets"

Master of Arts in Astronomy & Astrophysics *2009-2011*
Harvard University, Cambridge, MA

- Advisor: Dimitar D. Sasselov
- Project: "New High-Pressure Equation of State of Water and Its Implication for GJ 1214b and Other Water Planets"

Bachelor of Science in Physics *2006-2009*
Massachusetts Institute of Technology, Cambridge, MA

- Advisor: Sara Seager
- Project: "A Computational Tool to Interpret the Bulk Composition of Solid Exoplanets based on Mass and Radius Measurements"
- Mathematics and Physics GPA: 5.0/5.0, Cumulative GPA: 5.0/5.0

Peking University, Beijing, China (transferred to MIT in 2006) *2005-2006*

- Mathematics and Physics GPA: 4.0/4.0, Cumulative GPA: 3.9/4.0

Selected courses at Harvard: Radiative Processes in Astrophysics (Astronomy 150), Galaxies and Dynamics (Astronomy 202a), Cosmology (Astronomy 202b), Mechanics in Earth and Environmental Science (E-PSCI 202), Stellar and Planetary Astrophysics (Astronomy 201a), Quantum Mechanics for Astrophysics (Astronomy 251), Evolution of the Vertebrates (OEB 139), Interstellar Medium and Star Formation (Astronomy 201b)

Selected courses at MIT: General Relativity (8.962), Modern Astrophysics (8.284), Electromagnetism II (8.07), Classical Mechanics III (8.09), Quantum Physics I, II, & III (8.04, 8.05, 8.06), Experimental Physics I & II (8.13, 8.14), Differential Equations (18.03)

Research Experience

Department of Earth and Planetary Sciences, Harvard University *2015-present*

- Project: "**Uncovering the Chemistry of Earth-like Planets**"
- Advisor: Stein B. Jacobsen, Professor of Geochemistry
- Description: Using the evidence from our solar system to understand Earth-like exoplanets, and in particular, to (1) predict their surface chemistry and thereby the possibility of life, (2) infer their internal structures and chemical compositions from their mass-radius relations combined with their host stars' elemental abundances, and (3) understand the origins of volatile contents (especially water) on their surfaces.

Department of Astronomy, Harvard University *2009-2015*

- Project: "**Model the interior structure of solid exoplanets**"
- Advisor: Dimitar D. Sasselov, Phillips Professor of Astronomy/Director of Origins of Life Initiative, Harvard University

- Description: Developing computer models to understand the mass-radius relations, interior structures, and thermal evolutions of solid exoplanets. Computer models made publicly available as online interactive tools on www.astrozeng.com in the format of Mathematica Computable Document Format (CDF, http://www.wolfram.com/cdf/), to facilitate other researchers to directly apply these tools to characterize exoplanets in research and teaching.

Department of Astronomy, Harvard University *2008*
- Projects: (1) "**Mass-Radius Relation of Exoplanets**", (2) "**Simulation of the output of Astrocomb**"
- Advisors: (1) Dimitar D. Sasselov, (2) Ronald Walsworth, Senior Physicist, Smithsonian Astrophysical Observatory
- Description: (1) Computer models developed for the mass-radius relations of exoplanets (2) Computer models developed for the output of Astrocomb: a laser frequency comb expected to increase resolution of the existing spectrographs by nearly a hundredfold, with applications to exoplanet science in detecting small Earth-like planets orbiting around Sun-like stars.

Lowell Observatory, Flagstaff, Arizona *January 2008*
- Project: "**Implementing the Time-Delay-Integration Mode on the Perkins Re-imaging System at Lowell Observatory**"
- Advisor: Brian W. Taylor, Senior Research Scientist, Lowell Observatory
- MIT Astronomy Field Camp
- Description: Implementation of the stripe-scan mode onto the telescope

Department of Earth, Atmospheric and Planetary Sciences (EAPS), Massachusetts Institute of Technology *2007*
- Project: "**A Computational Tool to Interpret the Bulk Composition of Solid Exoplanets based on Mass and Radius Measurements**"
- Advisor: Sara Seager, Professor of Planetary Science/Professor of Physics/Class of 1941 Professor, Massachusetts Institute of Technology
- Description: Matlab programs developed to calculate the interior structure of extra-solar planets based on the mass and radius measurements. Results were published in the Publications of the Astronomical Society of the Pacific (PASP).

Teaching & Public Outreach

Astronomy Night on solar system planets and scales followed by outdoor observation activities at the Center School, Stow, MA — Nov.23, 2015

Docent and operator of telescopes, Harvard-Smithsonian Center for Astrophysics Monthly Public Observatory Nights www.cfa.harvard.edu/publicevents — April, 2015 - present

Public outreach talks on Exoplanets at Rockport High School, Rockport, MA — *May 1 & 15, 2015*

Talk on *"Uncovering the Chemistry of Earth-like Planets"* at the Amateur Telescope Makers of Boston Club (http://www.atmob.org) Monthly Meeting, Phillips Auditorium, Harvard-Smithsonian Center for Astrophysics — *April 09, 2015*

Head Teaching Fellow (administrating all other teaching fellows in this class), Harvard Undergraduate General Education Course: "*Science of the Physical Universe 30: Life as a Planetary Phenomenon*". — *Spring 2012*

Talk on *"Buddhism and Astronomy"* at the **Dinner with Dharma Talk** at the Greater Boston Buddhist Cultural Center (http://gbbcc.net/) — *Nov. 11, 2011*

Teaching Fellow, Harvard Undergraduate General Education Course: "*Science of the Physical Universe 30: Life as a Planetary Phenomenon*". — *Spring 2011*

Research Publication

Li Zeng and Stein B. Jacobsen. "*A Simple Analytical Model for Rocky Planet Interior*". The Astrophysical Journal, 2017. *2017*
[DOI: 10.3847/1538-4357/aa6218] [ApJ, 837, 164] [arXiv:1606.03522]

Li Zeng and Stein B. Jacobsen. "*Variational Principle for Planetary Interiors*". The Astrophysical Journal, 2016. *2016*
[DOI: 10.3847/0004-637X/829/1/18] [ApJ, 829, 18] [arXiv:1606.03523]

Mercedes López-Morales, Raphaëlle D. Haywood, Jeffrey L. Coughlin, **Li Zeng**, et al. "*Kepler-21b: A Rocky Planet around a V=8 Magnitude Star*". The Astronomical Journal, 2016. *2016*
[DOI: 10.3847/0004-6256/152/6/204] [AJ, 152, 204] [arXiv:1609.07617]

Li Zeng, Dimitar D. Sasselov, and Stein B. Jacobsen. "*Mass-Radius Relation for Rocky Planets based on PREM*". The Astrophysical Journal, 2016. *2016*
[DOI: 10.3847/0004-637X/819/2/127] [ApJ, 819, 127] [arXiv:1512.08827]

Andrew Vanderburg, Bejamin Montet, John Johnson, Lars Buchhave, **Li Zeng**, et al. "*Characterizing K2 Planet Discoveries: A super-Earth Transiting the Bright K Dwarf HIP 116454*". The Astrophysical Journal, 2015. *2015*
[DOI: 10.1088/0004-637X/800/1/59] [ApJ, 800, 59] [arXiv:1412.5674]

Sarah Ballard, William Chaplin, David Charbonneau, Jean-Michel Desert, Francois Fressin, **Li Zeng**, et al. "*Kepler-93b: A Terrestrial World Measured to within 120 km, and a Test Case for a New Spitzer Observing Mode*". The Astrophysical Journal, 2014. *2014*
[DOI: 10.1088/0004-637X/790/1/12] [ApJ, 790, 12] [arXiv:1405.3659]

Li Zeng and Dimitar D. Sasselov. "*The Effect of Temperature Evolution on the Interior Structure of H_2O-rich Planets*". The Astrophysical Journal, 2014. *2014*
[DOI: 10.1088/0004-637X/784/2/96] [ApJ, 784, 96] [arXiv:1402.7299]

Li Zeng and Dimitar D. Sasselov. "*A Detailed Model Grid for Solid Planets from 0.1 through 100 Earth Masses*". Publications of the Astronomical Society of the Pacific, 2013. *2013*
[DOI: 10.1086/669163] [PASP, 125, 227] [arXiv:1301.0818]

Li Zeng and Sara Seager. "*A Computational Tool to Interpret the Bulk Composition of Solid Exoplanets based on Mass and Radius Measurements*". Publications of the Astronomical Society of the Pacific, 2008. *2008*
[DOI: 10.1086/591807] [PASP, 120, 983] [arXiv:0808.1916]

Publication in Preparation

Li Zeng, Stein B. Jacobsen, and Dimitar D. Sasselov. "*Elemental Abundance Model of Rocky Planets*".

Li Zeng, Stein B. Jacobsen, and Dimitar D. Sasselov. "*Platinum as Tracer for Late Veneer Mixing into Early Mantle*".

Conferences Attended/Planned

48th Lunar and Planetary Science Conference (LPSC, http://www.hou.usra.edu/meetings/lpsc2017/), the Woodlands, Texas — *March 20-24, 2017*
- Talk: "*Water Worlds NOT Gas Dwarfs*".

2016 AGU (American Geophysical Union) Fall Meeting (http://fallmeeting.agu.org), San Francisco, CA — *Dec. 12-16, 2016*
- Poster: "*On the Origin of High Shear Wave Velocities in the Deep Roots of Cratons*".

Simons Collaboration of the Origins of Life Quarterly Investigator and Fellows Meeting, New York City, and subsequent visits and talks at Columbia University (Oct.26) and Yale University (Oct.27) — *Oct.25-27, 2016*
- Talk: "*Rocky Exoplanet Interiors*".

2016 CIDER Summer Program "*Flow in the Deep Earth*" (www.deep-earth.org/summer16.shtml), UC Santa Barbara, CA — *June 26-July 23, 2016*
- Group Research Collaboration on the Lithosphere of the Earth

Emerging Researchers in Exoplanet Science Symposium (http://carlsaganinstitute.org/eres2016/), Carl Sagan Institute, Cornell University, NY — *June 13-14, 2016*
- Talk: "*Rocky Exoplanet Interiors*".

2015 AGU Fall Meeting, San Francisco, CA — *Dec. 14-18, 2015*
- Talk: "*Uncovering the Chemistry of Earth-like Planets*".

29th International Astronomical Union (IAU) General Assembly (astronomy2015.org), Honolulu, Hawaii — *August 3-14, 2015*
- Talk: "*Uncovering the Interior Structure and Chemistry of Solid Exoplanets*".

GRC (Gordon Research Conference): Origins of Solar Systems (www.grc.org/programs.aspx?id=12345), Mount Holyoke College, South Hadley, MA — *June 28-July 03, 2015*
- Poster: "*Uncovering the Chemistry of Earth-like Planets*".

GRC: Interior of the Earth (www.grc.org/programs.aspx?id=12544), Mount Holyoke College, South Hadley, MA — *June 07-12, 2015*
- Poster: "*Uncovering the Chemistry of Earth-like Planets*".

225th American Astronomical Society (AAS) Meeting (aas.org), Seattle, WA — *Jan. 04-09, 2015*
- **Thesis Talk**: "*Uncovering the Chemistry of Earth-like Planets*".

2014 AGU Fall Meeting, San Francisco, CA — *Dec. 15-19, 2014*
- Poster: "*Platinum Concentrations and Tungsten Isotope Ratios of Earth's Mantle as Tracers for Late Veneer Mixing into the Early Mantle*".

224th AAS Meeting, Boston, MA — *June 1-5, 2014*

223rd AAS Meeting, Washington, DC — *Jan. 05-09, 2014*
- Talk: "*Interior structure of solid super-Earths: temperature-dependent H_2O structure and new online tools*".

GRC: Origins of Solar Systems, Mount Holyoke College, South Hadley, MA — *June 23-28, 2013*
- Poster: "*The effect of temperature evolution on the interior structure of solid planets*".

221th AAS Meeting, Long Beach, CA — *Jan. 05-11, 2013*
- Poster: "*The effect of temperature evolution on the interior structure of solid planets*".

GRC: Origins of Solar Systems, Mount Holyoke College, South Hadley, MA — *July 17-22, 2011*

218th AAS Meeting, Boston, MA — *May 22-26, 2011*
- Poster: "*The Value of K2 in Determining Interior Composition of Terrestrial Planets*".

Planetary Decadal Survey Town Hall and New England Regional Planetary Science Meeting, Boston University, Boston, MA — *March 26, 2011*

Talks presented

"Rocky Exoplanet Interiors", Department of Earth & Planetary Sciences, Harvard University	*Sept. 15, 2016*
"Rocky Planet Interiors", The Kavli Institute for Astronomy and Astrophysics, Peking University	*July 25, 2016*
"Rocky Exoplanet Interiors", Kavli Institute for Astrophysic and Space Research, MIT	*June 15, 2016*
"Rocky Exoplanet Interiors", Carl Sagan Institute, Cornell University	*June 13, 2016*
"Uncovering the Chemistry of Earth-like Planets", AGU Fall Meeting, San Francisco, CA	*Dec. 18, 2015*
"Uncovering the Chemistry of Earth-like Planets", Department of Astronomy, Columbia University	*Oct. 19, 2015*
"Uncovering the Chemistry of Earth-like Planets", Simons Collaboration on the Origins of Life (SCOL) Quarterly Investigator and Fellow's Meeting, Simons Foundation Headquarter, NY	*Oct.16, 2015*
Visits and Talks at (1) Yunnan Observatory, (2) Department of Astronomy of Yunnan University, and (3) Lunar and Planetary Science Research Center (LPSRC) at Institute of Geochemistry, Chinese Academy of Sciences in Guiyang, China	*August-Sept., 2015*
"Uncovering the Interior Structure and Chemistry of Solid Exoplanets", 29th International Astronomical Union (IAU) General Assembly, Honolulu, Hawaii	*August 5, 2015*
"Uncovering the Chemistry of Earth-like Planets", Public talks at Rockport High School, Rockport, MA	*May 1 & 15, 2015*
"Uncovering the Chemistry of Earth-like Planets", Amateur Telescope Makers of Boston (ATMOB) Monthly Meeting, Phillips Auditorium, Harvard-Smithsonian Center for Astrophysics	*April 09, 2015*
"New Mass-Radius Relation for Earth-like Planets", Harvard-Smithsonian Center for Astrophysics (Cfa)	*March 24, 2015*
"Uncovering the Chemistry of Earth-like Planets", Thesis Talk, 225th American Astronomical Society (AAS) Meeting, Seattle, WA	*Jan. 08, 2015*
"Uncovering the Chemistry of Earth-like Planets", MIT Exoplanet Meeting, MIT Kavli Institute	*Sept. 17, 2014*
"Interior structure of solid super-Earths: temperature-dependent H2O structure and new online tools", 223rd AAS Meeting, Washington, DC	*Jan. 08, 2014*
"How to relieve stress and stay healthy for graduate students: oriental wisdom on exercise and natural healing", with Master Anlin Wang, Department of Astronomy, Harvard University	*August 20, 2013*
"Earth's heat", Department of Astronomy, Harvard University	*July 30, 2013*
"Planet Interiors Come Alive", a series of 4 talks delivered during visits at (1) the Purple Mountain Observatory in Nanjing, (2) Beijing Exoplanet Focus Group Meeting in Tsinghua University, (3) National Astronomical Observatories of Chinese Academy of Sciences, and (4) the Department of Astronomy, Peking University	*May 06-19, 2013*
"An Online Interactive Tool to Characterize Exoplanet Interiors", Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology	*March 04, 2013*
"An Online Interactive Tool to Characterize Exoplanet Interiors", Department of Astronomy, Harvard University	*Jan. 22, 2013*
"Solid Planet Model Grid", Department of Astronomy, Harvard University	*Jan. 16, 2013*
"Planet Interiors Come Alive", Department of Astronomy, Harvard University	*Nov. 06, 2012*
"Buddhism and Astronomy", Dinner with Dharma Public Outreach Talk at the Greater Boston Buddhist Cultural Center	*Nov. 11, 2011*
"Understanding the Interior Structure of Solid Exoplanets", Origins of Life Initiative, Harvard University	*Oct. 06, 2011*
"Searching for Life in the Outer Solar System", Department of Chemistry, Harvard Univer*sity*	*July 24, 2011*
"Earth Encounters as the Origin of Fresh Surfaces on Near-Earth Asteroids", Department of Astronomy, Harvard University	*Nov. 9, 2010*

Honors/Awards/ Memberships

Simons Postdoctoral Fellow *June 2015-present*
SCOL (Simons Collaboration on the Origins of Life) [award #337090]

- Project: "Uncovering the Chemistry of Earth-like Planets"
- Mentoring PI: Professor Stein B. Jacobsen
- Department of Earth and Planetary Sciences, Harvard University

http://www.simonsfoundation.org/life-sciences/simons-collaboration-on-the-origins-of-life/postdoctoral-fellows/

President, Harvard GSAS Anlin Taichi Wudao Association, Harvard University *2014-2015*
哈佛大學安林太極武道協會
(Oriental Traditional Culture, Science, and Research Association)
(東方傳統文化科學研究協會)
http://projects.iq.harvard.edu/anlintaichiwudao

- Officially registered student organization of the Graduate School of Arts and Sciences at Harvard University, aiming at promoting stress relief, health, and wellness among students, staff, and faculty at Harvard University, through the practice of Taichi, acupressure, and meditation, as well as group discussions, and exploring the connections between the modern science and the ancient traditions of internal cultivation in the Orient

Philip Putnam Chase Memorial Fellowship, Harvard University *2010 and 2011*

- Merit fellowship awarded to top international PhD students in the natural sciences

James Mills Peirce Fellowship, Harvard University *2009*

- Merit fellowship awarded to top PhD applicants in the natural sciences, mathematics, and engineering

Member of Phi Beta Kappa (ΦBK), Massachusetts Institute of Technology *2009-present*

- In recognition of high attainments in liberal scholarship

Member of Sigma Pi Sigma (ΣΠΣ), Massachusetts Institute of Technology *2009-present*

- In recognition of high scholarship in Physics

Lifetime member of the National Society of Collegiate Scholars (NSCS) in the U.S. *2007-present*

Jack C. Tang Scholarship, Massachusetts Institute of Technology *2006-2009*

- Merit and need-based fellowship awarded to undergraduate students from China

VIII-th International Astronomy Olympiad (Stockholm, Sweden) *Oct. 2003*

- **1st Prize (Gold Medal)**
- **Best Result** of the theoretical, observational and practical rounds in total among all competitors.
- Details: member of the national team of China. The competition was held in Stockholm, Sweden, and organized by the European Association for Astronomy Education, Stockholm Observatory, as well as the Swedish National Space Board with coordination of the Olympic Coordination Council of the Euro-Asian Astronomical Society (EAAS).

VII-th International Astronomy Olympiad (Special Astrophysical Observatory, Russia) *Oct. 2002*

- **2nd Prize (Silver Medal)**
- **Best Result** in the observational round
- Details: member of the national team of China. The competition was held at the Special Astrophysical Observatory of Russian Academy of Sciences (SAO RAS) in North Caucasus.

Skills/Abilities

Languages

- Mandarin-Chinese (native)
- English (fluent)
- Pāli (Canonical Theravāda Buddhism Language)

Computer skills

- Mathematica
- Matlab
- Adobe Illustrator
- C
- Excel

Math and Physics skills

- Tensor Analysis (General Relativity, Electromagnetism)
- Calculus of Variations (Hamiltonian Mechanics)
- Advanced Calculus
- Linear Algebra
- Quantum Mechanics

Arts

- Pencil Sketch
- Traditional Chinese Painting
- Traditional Chinese Calligraphy

Music

- Singing
- Piano

Sports

- Taiji (太極, Tai-chi or Taijiquan)
- Traditional Chinese Martial Arts (功夫, Kungfu)
- Swimming
- Badminton
- Soccer