
Professor Sara Seager Massachusetts Institute of Technology

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Citizenship: US citizen since 20/07/2010

Birthdate: July 21, 1971

Professional History

1/2007–present: Massachusetts Institute of Technology, Cambridge, MA USA

- Class of 1941 Professor (1/2012–present)
- Professor of Planetary Science (7/2010–present)
- Professor of Physics (7/2010–present)
- Head of Planetary Group in the Dept. of Earth, Atmospheric, and Planetary Sciences (2007–present)

1/2007–12/2011: Massachusetts Institute of Technology, Cambridge, MA USA

- Ellen Swallow Richards Professorship (1/2007–12/2011)
- Associate Professor of Planetary Science (1/2007–6/2010)
- Associate Professor of Physics (7/2007–6/2010)

08/2002–12/2006: Carnegie Institution of Washington, Washington, DC, USA

- Senior Research Staff Member

09/1999–07/2002: Institute for Advanced Study, Princeton NJ

- Long Term Member (02/2001–07/2002)
- Short Term Member (09/1999–02/2001)
- Keck Fellow

Educational History

1994–1999 Ph.D. “*Extrasolar Planets Under Strong Stellar Irradiation*”
Department of Astronomy, Harvard University, MA, USA

1990–1994 B.Sc. in Mathematics and Physics
University of Toronto, Canada
NSERC Science and Technology Fellowship (1990–1994)

Awards and Distinctions

Academic Awards

2012 Raymond and Beverly Sackler Prize in the Physical Sciences
2007 Helen B. Warner Prize, American Astronomical Society
2004 Bok Prize in Astronomy, Harvard University

Other

2013 Royal Astronomical Society of Canada, Honorary Member
2012 AAAS Fellow

Media Recognition

2012 Time Magazine: 25 Most Influential in Space
2011 Nature: Named in 2011 Top Ten
2008 Discover Magazine: Named in Best 20 under 40
2006 Popular Science Magazine: Named in Fifth Annual Brilliant Ten

Prize Lectures and Visiting Positions

2011 •Page-Barbour Lecturer, University of Virginia, VA
•Salpeter Lecturer, Cornell University, NY
2010 •Biermann Lecturer, Max Planck Institute for Astrophysics, Garching, Germany
•Foster-Hewitt Lecturer, Lehigh University, PA
•Nova Lecturer, Netherlands
2009 •John Bahcall Lecturer, NASA: STScI and GSFC
2008 •Dr. H. Lyman Hooker Distinguished Visiting Professor, McMaster University, Canada
•*Spitzer* Distinguished Visiting Scientist, Spitzer Science Center, CA

Professional Societies

1999–present American Physical Society
1999–present American Astronomical Society
2007–2011 American Geophysical Union

Selected Space Science Mission Activities

Current

2010–present Co-I TESS (a NASA Explorer Mission, launch 2017)
2008–present PI ExoplanetSat (a prototype 3U CubeSat telescope)

Past

2011–2013 Co-I CommCube (a CubeSat to test novel communications methods)
2011–2012 CDIO lead for REXIS (a NASA New Horizons Mission, launch 2016)
2007–2011 Participating Scientist NASA/Kepler (launched 3/2009)
2008–2011 Co-I NASA/EPOXI Discovery Mission of Opportunity (formerly the NASA Deep Impact Spacecraft)
2008–2009 Deputy Mission Scientist for TESS, a NASA/SMEX proposal through Phase A

2008	Science Team Lead, NASA Concept Study (eXtrasolar Planet Characterizer, PI D. Spergel),
2003–2008	Support Scientist, CSA/MOST (Microvariability and Oscillations of Stars (MOST) microsatellite) (launched June 2003)
2005–2007	Co-I, NASA Institute for Advanced Concepts Phase II study of the “New Worlds Imager”
2005–2006	Co-I NASA Terrestrial Planet Finder (TPF) Instrument Concept Studies: Camera Team (CorECam), Spectrograph Team (CorSpec), Starlight Suppression System Team (ICS Nulling)
2004–2006	NASA TPF Scientific and Technology Definition Team
2002–2004	NASA TPF Scientific Working Group
2001–2002	MUSE microsatellite concept study for the Canadian Space Agency Co-I
2000–2001	TPF Biosignature Science Working Group
2000–2001	Ball Aerospace TPF Architecture Study Team

Selected Committee Membership

Current

2013–2015	Chair, Direct Imaging with an External Occulter STDT
2013–2015	Co-Chair, Beyond JWST Committee (AURA)
2009–2013	James Webb Space Telescope Advisory Committee (JSTAC)

Past

2008–2012	Spitzer Science Center Oversight Committee (Spitzer Space Telescope)
2007–2010	National Academy of Sciences NRC Committee on the Origin and Evolution of Life
2006–2008	Space Telescope Science Institute (HST) Visiting Committee
2007–2008	NASA/NSF Exoplanet Task Force
2005	James Webb Space Telescope Science Assessment Team
2004–2005	National Academy of Sciences Astronomy and Astrophysics Mid Course Review
2004–2005	NSF Optical and Infrared Long Range Planning Committee
2002–2005	Chair, NASA Astrobiology Astronomy Focus Group
2002	NASA Origins Roadmap Committee

Conference Scientific Organizing Committees

2013	•“Search for Life Beyond the Solar System”, Tucson, AZ
2012	•“Characterizing and Modeling Extrasolar Planetary Atmospheres: Theory and Observations”, Heidelberg, Germany
2011	•“Exploring Strange New Worlds: from Giant Planets to Super Earths”, Flagstaff, AZ
2010	•Third Workshop Stellar Observation Network Group (SONG), China
2009	•“Towards Other Earths”, Portugal
	•“Pathways Towards Habitable Planets”, Barcelona, Spain
2008	•“Characteristics and Habitability of Super Earths,” Aspen Center for Physics,
	•“Extrasolar Super-Earths,” Nantes, France
	•“Transiting Planets,” International Astronomical Union (IAU) Symposium 253, Boston
2006	•“The 4 th International TPF/Darwin Workshop,” Pasadena, CA,
2005	•“Direct Imaging of Exoplanets,” IAU Colloquium 200, France
2003	•14th Annual Maryland Astrophysics Conference: “The Search for Other Worlds,” MD

Current Research Group Members

(EAPS = MIT Dept. of Earth, Atmospheric, and Planetary Sciences; Physics = MIT Dept. of Physics; Aero-Astro = MIT Dept. of Aeronautical and Astronautical Engineering

*= co-supervised)

Exoplanet Characterization (Primarily Computer Modeling and Data Interpretation)

Name	Dept.	Position	Topic
William Bains	EAPS	Research Sci.	Biosignatures
Brice Demory	EAPS	Postdoc	Kepler Data, Transit Searches
Julien de Wit	EAPS	Grad Student	Exoplanet Atmosphere Modeling
Nikole Lewis	EAPS	Sagan Fellow	Atmospheric Circulation
Stephen Messenger	EAPS	Grad Student	Biosignatures
Vlada Stamenkovic	EAPS	Postdoc	Exoplanet Geophysics
Andras Zsom	EAPS	Postdoc	Exoplanet Atmosphere Modeling

Space Engineering Research (Hardware, Software, and Simulations)

Name	Dept.	Position	Topic
Ben Corbin	Aero-Astro	Grad Student	Space Satellite Constellations
Niraj Inamdar	Mech E.	Grad Student	REXIS and Asteroids
Mary Knapp	EAPS	Grad Student	Science, Camera, Systems
Akshata Krishnamurthy	EAPS	Res. Support	Systems, Structures
Zsuzsa Megyery	EAPS	Res. Support	Comm. Ground Station
*Chris Pong	Aero-Astro	Grad Student	Attitude Control Systems
*Matthew Smith	Aero-Astro	Grad Student	Optics and Systems

Past Research Group Members

(EAPS = MIT Dept. of Earth, Atmospheric, and Planetary Sciences; Physics = MIT Dept. of Physics; Aero-Astro = MIT Dept. of Aeronautical and Astronautical Engineering)

Past Postdoctoral Fellows

Name	Dept.	Current Position
Alessandra Babuscia	MIT Aero-Astro	JPL Staff
Diana Valencia	MIT EAPS Sagan Fellow	Faculty at U. of Toronto
Margaret Turnbull	Carnegie NRC Fellow (2004–2006)	GSI
L. Jeremy Richardson	GSFC NRC Fellow (2004–2006)	Unknown
Kaspar von Braun	Carnegie Fellow (2002–2005)	MPIA

Past MIT PhD Students

Name	Dept.	Current Position
Bjoern Benneke	Aero-Astro (2010–2013)	Postdoc at Caltech
Renyu Hu	EAPS (2009–2013)	Hubble Fellow at JPL
Leslie Rogers	Physics (2007–2012)	Hubble Fellow at Caltech
Nikku Madhusudhan	Physics (2008–2009)	Lecturer at Cambridge, UK

Past Masters or Other PhD Students

Name	Dept.	Current Position
*Jameson Nash	Aero-Astro Masters	MIT/Aero Astro
Rachel Bowens-Rubin	EAPS Masters	MIT/EAPS researcher
Luyao Li	EAPS Masters	Unknown
Thomas Beatty	Physics Masters (2008–2009)	Ohio State U. grad student
Ben Hood	PhD (11/2005–1/2007)	Industry

Selected Past Undergraduate Research Students (* = Senior Thesis)

Name	Dept. (year of position)	Current Position
Becky Jensen-Clem	Physics (2010-2012)	Caltech graduate student
Sukrit Ranjan	Physics (2009)	Harvard graduate student
Ana-Maria Piso	Physics/EAPS (2011)	Harvard graduate student
*Sarah Gelman	EAPS (2009)	U. of Washington graduate student
*Li Zeng	Physics (2007–2009)	Harvard graduate student
Sonali Shukla	Carnegie Summer Intern (2005)	New York University grad student

Invited Talks at International Conferences

2014	•The Search for Life Beyond the Solar System, Tucson, AZ
2013	•Dreams of Earth and Sky, a Celebration for Freeman Dyson Princeton, NJ
2012	•ExoMol, UK
2010	•Characterizing/Modeling Exoplanet Atmospheres, Germany •The Astrophysics of Planetary Systems, IAU Symp. 276, Italy •SPIE Plenary Talk, CA
2009	•Vatican Astrobiology Workshop, Italy •Towards Other Earths, Portugal
2008	•The Search for Life in the Universe, STScI, Baltimore, MD •New Vision 400, Beijing, China •COSPAR Plenary Talk, Montreal, PQ •Astrobiology Science Conference Plenary Talk, CA •American Physical Society Plenary Talk, St. Louis, MO •Harvard Origins Symposium, Cambridge, MA •American Astronomical Society Warner Prize Lecture
2007	•NASA Planetary Atmospheres Workshop, Baltimore, MD •Gordon Research Conference: Origins of Solar Systems, MA •Michelson Summer Workshop, Pasadena, CA
2006	•The 4 th International TPF/Darwin Workshop, Pasadena, CA •Pale Blue Dot III, Chicago •German/American Frontiers of Science, National Academy of Sciences, Germany •Astrophysics Enabled by the Return to the Moon, STScI, MD •SPIE Astronomical Telescopes and Instrumentation: Probing the Universe from the Ground and Space, Plenary Talk
2005	•Protoplanets and Stars V (PPV), NASA evening, Hawaii •A Decade of Extrasolar Planets Around Normal Stars, STScI, Baltimore, MD •AAAS Annual Meeting Special session on the Transit of Venus, Washington, D.C., February
2004	•Bioastronomy 2004: Habitable Worlds, Iceland, July •Theoretical Astrophysics: Planetary Systems, Cambridge, MA
2003	•The 14 th Annual Maryland Astrophysics Conference: The Search of Other Worlds, University of Maryland, October •AAS Meeting Plenary Talk, Seattle, WA January
2002	•SPIE Conference: Future Research Direction and Visions for Astronomy, Hawaii, August •Scientific Frontiers in Research on Extrasolar Planets, Washington DC, June •Astrophysics of Life Conference, STScI Institute, Baltimore, May

- 2001 •Rubin Symposium, Washington DC, January
- 2001 •The Challenge of High Resolution X-Ray to IR Spectroscopy, University of Kentucky, Lexington, November
- 1999 •From Giant Planets to Cool Stars, Flagstaff, May

Astronomy, Planetary Science, Geophysics (g), or Physics (p) Colloquia and Seminars(*)

- 2013 Boston University.
- 2010 Harvard/CfA ITC
- 2009 Berkeley, McMaster University (Canada), Princeton University^g, Queens University^p (Canada), McGill University (Canada)
- 2008 American Museum of Natural History, Aspen Center for Physics^p, Boston University, JPL^{*}, MIT^p, Princeton, Spitzer Science Center
- 2007 Caltech^g, Max Planck (Munich), U Mass(Amherst), University of Waterloo (Canada)
- 2006 Harvard University^g, MIT (EAPS), Penn State University
- 2005 Columbia University, NASA/GSFC^{*}, NIST^{*}, STScI
- 2004 Fermilab^{*}, Harvard University, Johns Hopkins University, MIT, Ohio State University
- 2003 Carnegie/DTM, NASA/GSFC^{*}, NASA/Ames^{*}, NRAO, University of Pennsylvania^p, UCLA
- 2002 Caltech^{*}, Cornell, ESO^{*} (Chile), Harvard University^{*}, IfA Hawaii, University of Maryland
- 2001 American Museum of Natural History^{*}, Berkeley, Carnegie DTM, Carnegie Observatories, Institute for Advanced Study, Princeton, University of Arizona, University of Delaware, University of Toronto
- 2000 Institute for Advanced Study, Penn State, Rutgers^{*}, University of British Columbia, University of Pennsylvania^{*}, University of Washington

Selected Public Talks

2013	TEDx Mid Atlantic	Washington	DC
2013	TEDx	Cambridge	MA
2013	RASC GA	Lakehead University	Canada
2011	Public Lecture Series	SETI Institute	CA
	Public Lecture Series	Perimeter Institute	Canada
2010	“Are We Alone” Lecture Series	Linda Hall Library	MO
2009	John Bahcall Public Lecture	National Air and Space Museum	DC
	International Year of Astronomy	McGill	PQ
	Isaac Asimov Debate	Hayden Planetarium	NY
	Exploring Space Series	National Air and Space Museum	DC
	Frontiers of Science Lecture Series	Penn State, University	PA
	International Year of Astronomy	Royal Military College	ON
2008	IDEAS Boston		MA
	Summer Lecture Series	The Aspen Institute	CO
	MIT Club of New York	Hayden Planetarium	NY
2004	Exploring Space Series	National Air and Space Museum	DC
2003	NSF Symposium "The Universe from the Ground Up"		DC
2002	Royal Canadian Institute and Royal Astronomical Society of Canada		ON

Scientific Publications (*=Student or Postdoc in Seager's Research Group)

For a full publication list see <http://seagerexoplanets.mit.edu/ftp/SeagerPublications.pdf>

h-index = 46. Citation count = 8060. Number of publications > 250. Number of refereed publications > 138.

Selected highlights:

Seager, S., Bains, W., & Hu, R. 2013 "Biosignature Gases in H₂-Dominated Atmospheres on Rocky Exoplanets", ApJ, in press.

Seager, S., Bains, W., & Hu, R. 2013, "A Biomass-Based Model to Estimate the Plausibility of Exoplanet Biosignature Gases", ApJ, 775, 104-127.

Seager, S. 2013, "Exoplanet Habitability", Science, 340, 577-581.

Seager, S., Schrenk, M., & Bains, W. 2012, "An Astrophysical View of Earth-Based Metabolic Biosignature Gases", Astrobiology, 12, 61-82.

*Demory, B.-O., & **Seager, S.** 2011, "Lack of Inflated Radii for Kepler Giant Planet Candidates Receiving Modest Stellar Irradiation", ApJS, 197, 12-16.

*Demory, B.-O., Gillon, M., Deming, D., Valencia, D., **Seager, S.**, Benneke, B., Lovis, C., Cubillos, P., Harrington, J., Stevenson, K. B., and 4 coauthors 2011, "Detection of a Transit of the Super-Earth 55 Cancri e with Warm Spitzer", A&A, 533, 114.

Seager, S., & Deming, D. 2010, "Exoplanet Atmospheres", Ann. Rev. Astron. and Astrophys., 48, 631-672.

*Rogers, L. A., & **Seager, S.** 2010, "Three Possible Origins for the Gas Layer on GJ 1214b", ApJ, 716, 1208-1216.

*Rogers, L. A., & **Seager, S.** 2010, "A Framework for Quantifying the Degeneracies of Exoplanet Interior Compositions", ApJ, 712, 974-991.

*Madhusudhan, N., & **Seager, S.** 2009, "A Temperature and Abundance Retrieval Method for Exoplanet Atmospheres", ApJ, 707, 24-39.

Seager, S., & Deming, D. "On the Method to Infer an Atmosphere on a Tidally-Locked Super Earth Exoplanet and Upper limits to GJ 876d", ApJ, 703, 1884-1889.

*Miller-Ricci, E., **Seager, S.**, & Sasselov, D. 2009, "The Atmospheric Signatures of Super-Earths: How to Distinguish Between Hydrogen-Rich and Hydrogen-Poor Atmospheres", ApJ, 690, 1056-1067.

Seager, S., Kuchner, M., Hier-Majumder, C. A., & Militzer, 2007, "Mass-Radius Relationships for Solid Exoplanets", ApJ, 669, 1279-1297.

Seager, S., Richardson, L. J., Hansen, B. M. S., Menou, K, Cho, J., & Deming, D. 2005, "On the Day Side Thermal Emission of Hot Jupiters", ApJ, 632, 1122-1131.

Deming, D., **Seager, S.**, Richardson, L. J., & Harrington, J. 2005, "Detection of Infrared Radiation from an Extrasolar Planet", Nature, 434, 740-743.

Seager, S., & Mallen-Ornelas, G. 2003, "On the Unique Solution of Planet and Star Parameters from an Extrasolar Planet Transit Light Curve", ApJ, 585, 1038-1055.

*Ford, E. B., **Seager, S.**, & Turner, E. L. 2001, "Characterization of Extrasolar Terrestrial Planets from Diurnal Photometric Variability", Nature, 412, 885-887.

Seager, S., Whitney, B. A., & Sasselov, D. D. 2000, "Light Curves and Polarization of the Close-in Extrasolar Giant Planets", ApJ, 540, 504-520.

Seager, S., & Sasselov, D. D. 2000, "Theoretical Transmission Spectra During an Extrasolar Giant Planet Transit", ApJ, 537, 916-921.

Seager, S., Sasselov, D. D., & Scott, D. 2000, "How Exactly Did the Universe Become Neutral?", ApJS, 128, 407-430.

Seager, S., Sasselov, D. D., & Scott, D. 1999, "A New Calculation of the Recombination Epoch", 1999, ApJ, 523, L1-5.

Seager, S., & Sasselov, D. D. 1998, "Extrasolar Giant Planets Under Strong Stellar Irradiation", ApJ, 502, L157-161.

Books

Seager, S. 2010, "Exoplanet Atmospheres: Physical Processes", Princeton University Press, ISBN: 978-1-4008-3530-0

Seager, S. (editor) 2010, "Exoplanets", University of Arizona Press, ISBN: 978-0816529452

Invited Autobiographical Essay, "Astrobiology Pioneers"

Seager, S. 2012, "Written in the Stars", Astrobiology, 12, 83-88.