

SIMON J. LOCK

School of Earth Sciences
University of Bristol
Queens Road
Bristol, BS8 1RJ, UK

s.lock@bristol.ac.uk
+44 117 456 0517
+1 (617) 520-4813
orcid.org/0000-0001-5365-9616

Research interests | The formation, structure, and evolution of terrestrial and giant planets.
The history of Earth and how it became habitable.

EDUCATION

Ph.D. Department of Earth and Planetary Sciences, Harvard University, Cambridge, MA Thesis title: <i>The formation, structure and evolution of terrestrial planets.</i>	2018
M.A. Department of Earth and Planetary Sciences, Harvard University, Cambridge, MA	2014
MSci. (1st Class) Natural Sciences (Experimental and Theoretical Physics), University of Cambridge, Cambridge, UK	2012
B.A. (Hons, 1st Class) Natural Sciences (Experimental and Theoretical Physics), University of Cambridge, Cambridge, UK	2012

PROFESSIONAL EXPERIENCE

NERC Independent Research Fellow. School of Earth Sciences, University of Bristol, UK	2021–present
Planetary Science Option Postdoctoral Scholar. Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA	2018–2021
Graduate Student Fellow. Department of Earth and Planetary Sciences, Harvard University, Cambridge, MA	2012–2018
Masters and Undergraduate Student. Natural Sciences University of Cambridge, Cambridge, UK	2008–2012
SURF Fellow. Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA	2011

AWARDS AND HONORS

UK Natural Environment Research Council (NERC) Independent Research Fellowship	2021-2026
Pellas-Ryder Award, jointly awarded by the Meteoritical Society and the Planetary Division of the Geological Society of America	2019
Planetary Science Option Postdoctoral Fellowship, California Institute of Technology	2018–2021
NASA Earth and Space Science Fellowship	2013–2016
University Certificate of Distinction in Teaching, Harvard University	2013 & 2014
Dirac Prize, St. John's College, University of Cambridge	2012
Morton Prize, St. John's College, University of Cambridge	2012
United Steel Companies Scholarship, St. John's College, University of Cambridge	2011 & 2012

Elected a member of ‘The Foundation of the College of St. John the Evangelist
in the University of Cambridge’ in recognition of academic excellence

2011

RESEARCH FUNDING

UK NERC Independent Research Fellowship	2021–2026
Title: The consequences of the Moon-forming impact for the chemistry of Earth	
Role: PI, Fellow	
Amount: £758,114	
US NSF Geophysics/Petrology and Geochemistry	2020–2022
Title: The effect of rotational evolution on the surface and interior of the early Earth	
Role: Postdoc; science lead. (PI: P. D. Asimow; Co-I: M. Gurnis)	
Amount: \$300,000	
Planetary Science Option Postdoctoral Fellowship, California Institute of Technology	2018–2022
Title: The formation and deformation of Earth’s earliest crust	
Role: Postdoctoral Fellow	
Amount: \$58,000	
NASA Earth and Space Science Fellowship	2013–2016
Title: Atmospheric loss during high angular momentum giant impacts	
Role: Graduate student researcher	
Amount: \$90,000	

TEACHING EXPERIENCE

Leader, <i>The Physics of Planetary Impacts</i> , University of Bristol (unofficial course)	2022–present
Guest lecturer, <i>PHYS106: Stars & Planets</i> , University of Bristol	2022
Guest lecturer, <i>460-506: Structure & Formation of Terrestrial Planets</i> , Rutgers University	2020
Guest lecturer, <i>ASTR-330MN-01: Topics in Astrophysics: ‘Moon’</i> , Mount Holyoke College	2017
Guest lecturer, <i>GEL36: The solar system</i> , UC Davis	2017
Co-instructor & developer, <i>GEL251: Thermodynamics of the Earth and planets</i> , UC Davis	2015
Teaching fellow, <i>SPU30: Life as a planetary phenomenon</i> , Harvard University	2014
Teaching fellow, <i>SPU14: How to build a habitable planet</i> , Harvard University	2013

ADVISING EXPERIENCE

(post-)Graduate students:

Taylor, L., PhD, University of Bristol. Co-advised with Z. M. Leinhardt.	2022–present
Roche, M. J., PhD, University of Bristol. Co-advised with Z. M. Leinhardt.	2022–present
Hollyday, G. O., UC Davis. Co-advised with S. T. Stewart.	2016–2020
MS thesis: <i>Educational visualization tools for conveying research: Jupyter notebooks on synestias</i>	

Undergraduate students:

Tanna, P., University of Cambridge.	2022–present
MSci thesis: <i>Can we detect moon forming impacts in other star systems?</i>	
Klein, I. A., University of Bristol.	2022–present
Project: <i>Identification of post-impact bodies beyond the corotation limit</i>	
Pepper, A. C., UC Davis. Co-advised with S. T. Stewart.	2017–2021
Project: <i>Giant impacts between rotating bodies in an Eulerian code</i>	

PUBLIC ENGAGEMENT AND OUTREACH

Advisor on BBC Studios documentary series on the Moon	2023
Led activities as part of the Access to Bristol scheme	2022 & 2023
Participant in Skype A Scientist, a program which matches schools to scientists who lead class discussions about science and what it is like to be a scientist	2020–present
Helped develop tools for cinematic visualisation (Aleo, Lock et al., 2020)	2020
Interviewee on Blue Dot, North State Public Radio	2019
Invited speaker at ‘Astronomy on Tap’, Pasadena	2019
Advisor for new show ‘Imagine the Moon’ at Adler Planetarium, Chicago, IL	2018
Advisor for ‘Strip the Cosmos’ documentary on the Discovery Channel	2018
Talk to Stockton Astronomical Society	2018
Author of popular science articles (see Other Publications)	2017–present
Lead role in organizing activities for UC Davis Picnic Day, a university-wide open day	2016–2018
Press interviews and consultations (e.g., New Scientist, National Geographic, Quanta)	2016–present

SERVICE

Academic service	
Co-convenor of Union session, American Geophysical Union fall meeting <i>U016. The formation and early evolution of the Earth and the Moon</i>	2022
Co-convenor, American Geophysical Union fall meeting <i>DI001. Accretion, differentiation and their longterm consequences for planetary evolution</i>	2018
Journal reviewer: e.g., Sci. Adv., JGR: Planets, Nature Geo., EPSL, Icarus, PSJ	2017–present
NASA review panel panelist	
NASA review panel non-panelist reviewer	
External grant reviewer for the Swiss National Science Foundation	
NSF ad hoc reviewer	
Departmental/University service	
School Research Concordat Champion representative, University of Bristol	2023–present
Co-organized ‘Publishing your first paper’ workshop, School of Earth Sciences, University of Bristol	2023
Member of Advanced Computing Research Centre (ACRC) High Performance Computing (HPC) User Group, University of Bristol	2023–present
Member of the Staff Disability Forum, University of Bristol	2023–present
Co-led discussion on review writing for PhD Students, University of Bristol	2022
Restarted and organised early career researchers (ERC) coffee School of Earth Sciences, University of Bristol	2022–present
Founder and organizer of the Planets Discussion Group, University of Bristol	2022–present
Member of the Caltech GPS Local Scholars Committee on Diversity	2020–2021
Caltech Center for Comparative Planetary Evolution (³ CPE) postdoc retreat committee	2020
Department colloquium events coordinator, UC Davis	2014–2016
EPS Day coordinator, Harvard University	2013–2014
Graduate student visit organizer, Harvard University	2012–2013

PROFESSIONAL MEMBERSHIPS

American Geophysical Union	2014–present
Association of Women Geoscientists	2018–present
European Association of Geochemistry	2019–present
Institute of Physics, UK	2007–present

OTHER SKILLS

Fluent or highly competent in several programming and scripting languages including: C; C++; Fortran; Python, MATLAB; Julia; Bash and C Shell.

INVITED TALKS AND SEMINARS

- University of Manchester, Department of Earth and Environmental Sciences Seminar, 2022. *Earth in the Emergency Room: Recovery of Earth after the Moon-forming giant impact.*
- Rocky Worlds Discussions Series talk, 2022. *Impact-driven atmospheric loss from terrestrial planets.*
- University of Cambridge, Department of Earth Sciences Seminar, 2022. *Crust formation and deformation on the rapidly rotating early Earth.*
- Geological Society ‘Earth and the Early Moon’ meeting, 2021. *A tectonically active early Earth driven by the tidal recession of the Moon.*
- University of Oslo, The Center for Earth Evolution and Dynamics (CEED) seminar, 2021. *Recovery of Earth after the Moon-forming giant impact.*
- Taiwan Space Union, Mini-Moon seminar series, 2021. *The synestia story.*
- Washington University in St. Louis, Department Colloquium, 2020. *The formation of the Earth and Moon.*
- University of California, Santa Cruz, Center for the Origin, Dynamics and Evolution of Planets Seminar, 2020. *The origin of the Moon within a terrestrial synestia.*
- Cal Poly Pnomia, Physics and Astronomy Department Seminar, 2019. *The origin of the Moon within a terrestrial synestia.*
- Moon Workshop, American University of Beirut, 2019. *A review lecture on the formation of the Moon and The origin of the Moon within a terrestrial synestia.*
- University of Arizona, Lunar and Planetary Laboratory Colloquium, 2019. *The origin of the Moon within a terrestrial synestia.*
- University of California, Los Angeles, Geochemistry Seminar, 2019. *Giant impacts stochastically change the internal pressures of terrestrial planets.*
- Carnegie Institute, Geophysical Laboratory, 2019. *The origin of the Moon within a terrestrial synestia.*
- Weizmann Institute of Science, Department of Earth and Planetary Sciences, 2019. *The origin of the Moon within a terrestrial synestia.*
- Lunar and Planetary Institute, 2018. *The origin of the Moon within a terrestrial synestia.*
- ISSI workshop ‘Reading Terrestrial Planet Evolution in Isotopes and Element Measurements’, 2018. *Origin of the Moon, including isotopic constraints on its origin.*
- The University of Chicago, Geophysical Sciences Department, 2018. *Recovery of the Earth after the Moon-forming giant impact.*
- University of Cambridge, Bullard Laboratories Seminar, 2017. *The last stage of Earth’s formation: Increasing the pressure.*
- University of Cambridge, Institute of Astronomy, 2017. *A new exhibit in the planetary zoo: Hot, rotating rocky planets.*
- ACCRETE International Interdisciplinary Workshop, 2017. *A new model for lunar origin: Equilibration with Earth beyond the corotation limit.*
- American Geophysical Union Fall Meeting, 2016. *Preservation of primordial mantle in the aftermath of a giant impact.*
- University of California, Berkeley, CIPS Seminar, 2016. *A new exhibit in the planetary zoo: Hot, rotating rocky planets.*
- University of Bristol, Astrophysics Seminar, 2016. *A new model for lunar origin: Equilibration with Earth beyond the hot spin stability limit.*
- American Geophysical Union Fall Meeting, 2015. *Condensing the Moon from a MAD Earth.*
- The University of Chicago, Geophysical Sciences Department Colloquium, 2015. *Condensing the Moon from a MAD Earth.*

PEER-REVIEWED PUBLICATIONS

13. Canup, R. M., K. Righter, N. Dauphas, K. Pahlevan, M. Čuk, **S. J. Lock**, S. T. Stewart, J. Salmon, R. Rufu, M. Nakajima and T. Magna. Origin of the Earth and Moon. *New views of the Moon II*. Accepted.
12. Chidester*, B. A., **S. J. Lock***, K. E. Swadba, Z. Rahman, K. Righter and A. J. Campbell. The lithophile element budget of Earth's core. *Geochemistry, Geophysics, Geosystems* 23, e2021GC009986, doi: 10.1029/2021GC009986, 2022. *B. A. Chidester and S. J. Lock are co-first authors.
11. Daher H., B. K. Arbic, J. G. Williams, J. K. Ansong, D. H. Boggs, M. Müller, M. Schindelegger, J. Austermann, B. D. Cornuelle, E. B. Crawford, O. B. Fringer, H. C. P. Lau, **S. J. Lock**, A. C. Maloof, D. Menemenlis, J. X. Mitrovica, J. A. M. Green and M. Huber. Long-term Earth-Moon evolution with high-level orbit and ocean tide models. *JGR: Planets* 126, e2021JE006875, doi: 10.1029/2021je006875, 2021.
10. Čuk, M., **S. J. Lock**, S. T. Stewart and D. Hamilton. Tidal evolution of the Earth-Moon system with a high initial obliquity. *Planetary Science Journal. The Planetary Science Journal* 2, 147, doi: 10.3847/PSJ/ac12d1, 2021.
9. Stewart, S. T., E. J. Davies, M. S. Duncan, **S. J. Lock**, S. Root, J. P. Townsend, R. G. Kraus, R. Caracas and S. B. Jacobsen. The shock physics of giant impacts: Key requirements for the equations of state. *AIP Conference Proceedings* 2272, 080003, doi: 10.1063/12.0000946, 2020.
8. Aleo, P. D., **S. J. Lock**, D. J. Cox, S. A. Levy, J. P. Naiman, A. J. Christensen, K. Borkiewicz, and R. Patterson. Clustering-informed cinematic astrophysical data visualization with application to the Moon-forming terrestrial synestia. *Astronomy and Computing* 33, 100424, doi: 10.1016/j.ascom.2020.100424, 2020.
7. **Lock, S. J.**, K. R. Bermingham, R. Parai and M. Boyet. Geochemical constraints on the origin of the Moon and preservation of ancient terrestrial heterogeneities. *Space Science Reviews* 216, 109, doi: 10.1007/s11214-020-00729-z, 2020.
6. Carter, P. J., **S. J. Lock** and S. T. Stewart. The energy budgets of giant impacts. *JGR: Planets* 125, e2019JE006042, doi: 10.1029/2019JE006042, 2020.
5. **Lock, S. J.**, S. T. Stewart and M. Čuk. The energy budget and figure of Earth during recovery from the Moon-forming giant impact. *EPSL* 530, pp 115885, doi: 10.1016/J.EPSL.2019.115885, 2020.
4. **Lock, S. J.** and S. T. Stewart. Giant impacts stochastically change the internal pressures of terrestrial planets. *Science Advances* 5, eaav3746, doi: 10.1126/sciadv.aav3746, 2019.
3. **Lock, S. J.**, S. T. Stewart, M. I. Petaev, Z. M. Leinhardt, M. T. Mace, S. B. Jacobsen and M. Čuk. The origin of the Moon within a terrestrial synestia. *JGR: Planets* 123, pp 910-951, doi: 10.1002/2017JE005333, 2018.
2. **Lock, S. J.** and S. T. Stewart. The structure of terrestrial bodies: Impact heating, corotation limits and synestias. *JGR: Planets* 122, pp 950-982, doi:10.1002/2016JE005239, 2017.
1. Čuk, M., D. Hamilton, **S. J. Lock**, and S. T. Stewart. Tidal evolution of the Moon from a high-obliquity, high-angular-momentum Earth. *Nature* 539, pp 402-406, doi:10.1038/nature19846, 2016.

IN PROGRESS

Student advisees underlined.

1. **Lock, S. J.** A tectonically active early Earth driven by the tidal recession of the Moon. In review.
2. Kenworthy, M., **S. J. Lock**, G. Kennedy, R. van Capelleveen, E. Mamajek, L. Carone, F.-J. Hambsch, J. Masiero, A. Mainzer, J. D. Kirkpatrick, E. Gomez, Z. M. Leinhardt, J. Dou, P. Tanna, A. Sainio, H. Barker, S. Charbonnel, O. Garde, P. Le Dû, L. Mulato, T. Petit, and M. R. Smith. The afterglow

of a planetary collision and transit of the resultant debris cloud. *Nature*. In review. Preprint will shortly be available on Research Square.

3. **Lock, S. J.**, and S. T. Stewart. The effect of pre-impact surface conditions on the efficiency of atmospheric loss in giant impacts. In submission.
4. Stewart, S. T., P. J. Carter, E. J. Davies, **S. J. Lock**, R. G. Kraus, S. Root, M. I. Petaev and S. B. Jacobsen. The formation of chondrites by vaporizing collisions between planetesimals. In prep.

OTHER PUBLICATIONS

5. **Lock, S. J.** HERCULESv1_user: HERCULES planetary structure code (Version v1.0.0). *Zenodo*, <http://doi.org/10.5281/zenodo.3509365>, 2019.
4. Stewart, S. T., E. J. Davies, M. S. Duncan, **S. J. Lock**, S. Root, J. P. Townsend, and S. B. Jacobsen. Equation of State Model Forsterite-ANEOS-SLVTv1.0G1: Documentation and Comparisons (Version v1.0.0). *Zenodo*, <http://doi.org/10.5281/zenodo.3478631>, 2019
3. **Lock, S. J.** and S. T. Stewart. Origin Story. *Scientific American*, CCCXX, 7, 2019.
2. **Lock, S. J.** Making the Moon: The legacy of Apollo. *The Geographer*, Summer issue, 2019.
1. **Lock, S. J.** A new theory of how the Moon formed. *Scientific American*, 2017.

CONFERENCE PROCEEDINGS

Student advisees underlined.

62. **Lock, S. J.**, S. T. Stewart, and M. J. Roche. Atmospheric loss in giant impacts depends on pre-impact surface conditions. *Goldschmidt Conf.*, Abs. 19972, 2023.
61. Roche, M. J., **S. J. Lock**, J. Dou, and Z. M. Leinhardt. The effect of atmospheric properties on atmospheric loss during giant impacts. *Gordon Research Conference: Origins of Solar Systems*, 2023.
60. Taylor, L., **S. J. Lock**, D. Grant, J. Dou, Z. M. Leinhardt, and H. R. Wakeford. Using transit observations to detect and characterise planetary bodies in the aftermath of giant impacts. *Gordon Research Conference: Origins of Solar Systems*, 2023.
59. **Lock, S. J.** and S. T. Stewart. The effect of pre-impact surface conditions on the efficiency of atmospheric loss in giant impacts. *Lunar & Planet. Sci. Conf.* 54, Abs. 2290, 2023.
58. **Lock, S. J.** and S. T. Stewart. The effect of pre-impact surface conditions on the efficiency of atmospheric loss in giant impacts. *American Geophysical Union Fall Meeting*, 2022.
57. **Lock, S. J.** and S. T. Stewart. The effect of pre-impact surface conditions on the efficiency of atmospheric loss in giant impacts. *UK Exoplanet Meeting*, 2022.
56. **Lock, S. J.** and S. T. Stewart. The effect of pre-impact surface conditions on the efficiency of giant impact atmospheric loss. *British Planetary Science Conference*, 2022.
55. **Lock, S. J.** and P. D. Asimow. A tectonically active early Earth driven by the tidal recession of the Moon. *Geological Society ‘Earth and the Early Moon’ meeting*, 2021.
54. **Lock, S. J.** and P. D. Asimow. A tectonically active early Earth driven by the tidal recession of the Moon. *AGU Fall Meeting*, Abs. DI022-01, 2020.
53. Chidester B. A., **S. J. Lock** and S. T. Stewart. Planetary differentiation in the aftermath of giant impacts. *AGU Fall Meeting*, Abs. DI021-06, 2020.
52. Chidester B. A., **S. J. Lock**, M. Millot and S. T. Stewart. Metal–silicate equilibration in the aftermath of giant impacts. *Goldschmidt Conf.*, Abs. 416, 2020.

51. **Lock, S. J.** and P. D. Asimow. A tectonically active early Earth driven by the tidal recession of the Moon. *Lunar & Planet. Sci. Conf.* 51, Abs. 1848, 2020.
50. Arbic B. K., H. Daher, J. G. Williams, J. K. Ansong, D. H. Boggs, M. Müller, M. Schindelegger, A. Adcroft, J. Austermann, B. D. Cornuelle, E. Crawford, O. B. Fringer, H. C-P. Lau, **S. J. Lock**, A. C. Maloof, D. Menemenlis, J. X. Mitrovica, M. Green and M. Huber. 4.5 billion years of Earth-Moon evolution from high-level ocean tide and orbital dynamics models: First results. *AGU Ocean Science Meeting*, PL51A-02, 2020.
49. Stewart, S. T., E. J. Davies, M. Duncan **S. J. Lock**, S. Root, J. Townsend, R. G. Kraus, R. Caracas, S. B. Jacobsen and Z. Li. Integrative approaches to building planet Earth: New wide-ranging equations of state. *AGU Fall Meeting*, Abs. P43D-3500, 2019.
48. **Lock, S. J.**, S. T. Stewart, B. A. Chidester and P. D. Asimow. Giant impacts stochastically change the internal pressures of terrestrial planets. *Goldschmidt Conf.*, Abs. 2041, 2019.
47. Chidester, B. A., **S. J. Lock** and S. T. Stewart. Exploring the conditions of metal-silicate equilibration during and after giant impacts. *Goldschmidt Conf.*, Abs. 597, 2019.
46. Stewart, S. T., E. J. Davies, M. Duncan **S. J. Lock**, S. Root, J. Townsend, R. Caracas, R. G. Kraus and S. B. Jacobsen. Shock physics of giant impacts: Transforming rocky planets into supercritical synestias. *APS: SCCM* 21, Abs S6.00004, 2019.
45. Pepper, A. C., **S. J. Lock**, E. J. Davies and S. T. Stewart. Giant impacts between rotating bodies in an Eulerian code. *Lunar & Planet. Sci. Conf.* 50, Abs. 3228, 2019.
44. Carter, P. J., E. J. Davies, **S. J. Lock** and S. T. Stewart. Collapsing impact vapor plumes: A new planetesimal formation environment. *Lunar & Planet. Sci. Conf.* 50, Abs. 1247, 2019.
43. Carter, P. J., E. J. Davies, **S. J. Lock** and S. T. Stewart. High collision velocities between planetesimals during planet growth and migration. *Lunar & Planet. Sci. Conf.* 50, Abs. 1246, 2019.
42. Stewart, S. T., P. J. Carter, E. J. Davies, **S. J. Lock**, R. G. Kraus, S. Root, M. I. Petaev and S. B. Jacobsen. Collapsing impact vapor plume model for chondrule and chondrite formation. *Lunar & Planet. Sci. Conf.* 50, Abs. 1251, 2019.
41. **Lock, S. J.**, S. T. Stewart, P. J. Carter, E. J. Davies, M. I. Petaev and S. B. Jacobsen. Size distribution of chondrules set by droplet breakup and coupling during vaporizing collisions in the nebula. *Lunar & Planet. Sci. Conf.* 50, Abs. 1783, 2019.
40. Stewart, S. T., P. J. Carter, E. J. Davies, **S. J. Lock**, R. G. Kraus, S. Root, M. I. Petaev and S. B. Jacobsen. Impact vapor plume expansion and hydrodynamic collapse in the solar nebula. *Lunar & Planet. Sci. Conf.* 50, Abs. 1250, 2019.
39. **Lock, S. J.**, S. T. Stewart, M. I. Petaev and S. B. Jacobsen. A terrestrial synestia: A new environment for formation of the Moon. *Lunar & Planet. Sci. Conf.* 50, Abs. 1784, 2019.
38. Chidester, B. A., A. J. Campbell, **S. J. Lock** and S. T. Stewart. Constraining the conditions of the Moon-forming giant impact with metal-silicate partitioning of lithophile elements. *AGU Fall Meeting*, Abs. DI11B-0023, 2018.
37. **Lock, S. J.**, S. T. Stewart and M. Čuk. Earth after the Moon forming giant impact: Accounting for all the energy *Lunar & Planet. Sci. Conf.* 49, Abs. 1616, 2018.
36. Carter, P. J., **S. J. Lock** and S. T. Stewart. The energy budgets of giant impacts. *Lunar & Planet. Sci. Conf.* 49, Abs. 2713, 2018.
35. Stewart, S. T., **S. J. Lock** and R. Caracas. Raining a magma ocean: Thermodynamics of rocky planets after giant impacts. *Lunar & Planet. Sci. Conf.* 49, Abs. 1708, 2018.

34. **Lock, S. J.**, S. T. Stewart and S. Mukhopadhyay. The last stage of Earth's formation: Increasing the pressure. *AGU Fall Meeting*, Abs. P53F-07, 2017.
33. Stewart, S. T., **S. J. Lock** and R. Caracas. Raining a magma ocean: Thermodynamics of rocky planets after a giant impact. *AGU Fall Meeting*, Abs. MR34B-01, 2017.
32. Hollyday, G. O., S. T. Stewart, Z. M. Leinhardt, P. J. Carter and **S. J. Lock**. Lunar accretion after a high-energy, high-angular momentum giant impact. *ACCRETE International Interdisciplinary Workshop*, 2017.
31. **Lock, S. J.**, S. T. Stewart, M. I. Petaev, Z. M. Leinhardt, M. T. Mace, S. B. Jacobsen and M. Čuk. A new model for lunar origin: Equilibration with Earth beyond the corotation limit. *ACCRETE International Interdisciplinary Workshop*, 2017.
30. **Lock, S. J.**, S. T. Stewart and S. Mukhopadhyay. Preservation of primordial chemical signatures in Earth's mantle by pressure induced freezing after a giant impact. *Lunar & Planet. Sci. Conf.* 48, Abs. 2390, 2017.
29. Hollyday, G. O., S. T. Stewart, Z. M. Leinhardt, P. J. Carter and **S. J. Lock**. Lunar accretion after a high-energy, high-angular momentum giant impact. *Lunar & Planet. Sci. Conf.* 48, Abs. 2606, 2017.
28. **Lock, S. J.**, S. T. Stewart and S. Mukhopadhyay. Preservation of primordial mantle in the aftermath of a giant impact. *AGU Fall Meeting*, Abs. DI33A-01, 2016.
27. Stewart, S. T., **S. J. Lock**, M. I. Petaev, Z. M. Leinhardt, M. T. Mace, S. B. Jacobsen and M. Čuk. Accretion of the Moon after a high-energy, high-angular momentum giant impact. *AGU Fall Meeting*, Abs. V41D-01, 2016.
26. Bremner, P. M., H. Fuqua, A. Mallik, M. R. Diamond, **S. J. Lock**, S. Panovska, Y. Nishikawa, H. Jimenez-Perez, A. Shahar, W. R. Panero, P. H. Lognonne and U. Faul. Constraints on lunar structure from combined geochemical, mineralogical, and geophysical modeling. *AGU Fall Meeting*, Abs. DI34A-07, 2016.
25. **Lock, S. J.**, S. T. Stewart, M. I. Petaev, Z. M. Leinhardt, M. T. Mace, S. B. Jacobsen and M. Čuk. A new model for lunar origin: Equilibration with Earth beyond the hot spin stability limit. *Lunar & Planet. Sci. Conf.* 47, Abs. 2881, 2016.
24. **Lock, S. J.** and S. T. Stewart. A hot spin stability limit for terrestrial planets. *Lunar & Planet. Sci. Conf.* 47, Abs. 2856, 2016.
23. Huang, S., M. I. Petaev, W. Wang, **S. J. Lock**, Z. Wu, S. T. Stewart and S. B. Jacobsen. Lunar origin beyond the hot spin stability limit: Stable isotopic fractionation. *Lunar & Planet. Sci. Conf.* 47, Abs. 2261, 2016.
22. Petaev, M. I., S. B. Jacobsen, S. Huang, **S. J. Lock** and S. T. Stewart. Testing models of the Moon's origin, III: Phase diagram of a proto-Lunar disk and condensation of trace elements. *Lunar & Planet. Sci. Conf.* 47, Abs. 2468, 2016.
21. Stewart, S. T., **S. J. Lock**, M. I. Petaev, S. B. Jacobsen, G. Sarid, Z. M. Leinhardt, S. Mukhopadhyay and M. Humayun. Mercury impact origin hypothesis survives the volatile crisis: Implications for terrestrial planet formation. *Lunar & Planet. Sci. Conf.* 47, Abs. 2954, 2016.
20. Čuk, M., D. Hamilton, **S. J. Lock** and S. T. Stewart. Tidal evolution of the Moon from a fast-spinning, high-obliquity Earth. *Lunar & Planet. Sci. Conf.* 47, Abs. 2489, 2016.
19. Jacobsen, S. B., M. I. Petaev, B. Boatwright, **S. J. Lock** and S. T. Stewart. A new model for lunar origin: Elemental and isotopic constraints. *Lunar & Planet. Sci. Conf.* 47, Abs. 2489, 2016.

18. **Lock, S. J.**, S. T. Stewart, M. I. Petaev, Z. M. Leinhardt, M. T. Mace, S. B. Jacobsen and M. Čuk. Condensing the Moon from a MAD Earth. *AGU Fall Meeting*, Abs. V23D-07, 2015.
17. Stewart, S. T. and **S. J. Lock**. The thermal states of accreting planets: From Mars-like embryos to a MAD Earth. *AGU Fall Meeting*, Abs. MR21D-02, 2015.
16. Mallik, A., H. Fuqua, P. M. Bremner, S. Panovska, M. R. Diamond, **S. J. Lock**, Y. Nishikawa, H. Jimenez-Perez, A. Shahar, W. R. Panero, P. H. Lognonne and U. Faul. Origin and constraints on ilmenite-rich partial melt in the lunar lower mantle. *AGU Fall Meeting*, Abs. DI43A-2610, 2015.
15. Čuk, M., D. Hamilton, **S. J. Lock** and S. T. Stewart. Tidal evolution of the Moon from a high-obliquity, high-angular-momentum Earth. *AAS, DPS Meeting*, 47, Abs. 309.01, 2015.
14. Stewart, S. T., **S. J. Lock**, Z. M. Leinhardt, M. Mace and M. Čuk. The role of vaporization in high angular momentum Moon-forming giant impacts. *APS Shock Compression of Condensed Matter Meeting*, Abs. O3.003, 2015.
13. Stewart, S. T., **S. J. Lock** and S. Mukhopadhyay. How much of the mantle melts in a giant impact? *Lunar & Planet. Sci. Conf.* 46, Abs. 2263, 2015.
12. **Lock, S. J.**, S. T. Stewart, Z. M. Leinhardt, M. T. Mace and M. Čuk. The post-impact state of the Moon-forming giant impact: Favorable aspects of high-angular momentum models. *Lunar & Planet. Sci. Conf.* 46, Abs. 2193, 2015.
11. **Lock, S. J.**, S. T. Stewart, Z. M. Leinhardt, M. T. Mace and M. Čuk. The Earth-lunar disk connection: Favorable aspects of a high-angular momentum giant impact. *AGU Fall Meeting*, Abs. P51A-3900, 2014.
10. Mukhopadhyay, S., S. T. Stewart, **S. J. Lock**, R. Parai and J. M. Tucker. Late impacts and the origins of the atmospheres on the terrestrial planets. *AGU Fall Meeting*, Abs. DI53C-03, 2014.
9. Fuqua, H., P. M. Bremner, M. R. Diamond, G. Garapic, **S. J. Lock**, A. Mallik, Y. Nishikawa, S. Panovska, A. Shahar, P. H. Lognonne, W. R. Panero, U. Faul, M. P. Panning, H. Jimenez-Perez, N. C. Schmerr and Q. C. Williams. Consequences and resolution of lunar lower mantle partial melt. *AGU Fall Meeting*, Abs. P13D-3860, 2014.
8. Stewart, S. T., **S. J. Lock** and S. Mukhopadhyay. Partial atmospheric loss and partial mantle melting during the giant impact stage of planet formation. *AGU Fall Meeting*, Abs. P44A-06, 2014.
7. **Lock, S. J.**, S. T. Stewart and S. Mukhopadhyay. Was the atmosphere lost during the Moon-forming event? *ACCRETE International Interdisciplinary Workshop*, 2014.
6. Jacobson, S. A., A. Morbidelli, D. C. Rubie, D. P. O'Brien, S. N. Raymond, S. T. Stewart and **S. J. Lock**. Planet formation within the grand tack model. *Lunar & Planet. Sci. Conf.* 45, Abs. 2274, 2014.
5. **Lock, S. J.**, S. T. Stewart and S. Mukhopadhyay. Was the atmosphere lost during the Moon-forming giant impact? *Lunar & Planet. Sci. Conf.* 45, Abs. 2843, 2014.
4. Stewart, S. T., **S. J. Lock** and S. Mukhopadhyay. Atmospheric loss and volatile fractionation during giant impacts. *Lunar & Planet. Sci. Conf.* 45, Abs. 2869, 2014.
3. Mukhopadhyay, S., S. T. Stewart, **S. J. Lock**, R. Parai, M. K. Peto and J. M. Tucker. Sculpting the volatile content of the Earth through giant impact-induced atmospheric loss and magma oceans. *AGU Fall Meeting*, Abs. V24B-07, 2013.
2. **Lock, S. J.**, S. T. Stewart, S. Mukhopadhyay and J. M. Tucker. Constraints on the Earth's impact history from the requirement for atmospheric loss. *The Royal Society satellite meeting: Origin of the moon - Challenges and prospects*, 2013.

1. **Lock, S. J.** and S. T. Stewart. Atmospheric loss during high angular momentum giant impacts
Lunar & Planet. Sci. Conf. 44, Abs. 2608, 2013.

REFERENCES

Sarah T. Stewart

Professor

Department of Earth and Planetary Sciences

University of California, Davis

One Shields Avenue, Davis, CA 95616

(530) 754-6021

sts@ucdavis.edu

David J. Stevenson

Marvin L. Goldberger Professor of Planetary Science

Division of Geological and Planetary Sciences

California Institute of Technology

1200 East California Boulevard, Pasadena, CA 91125

(626) 395-6534

djs@gps.caltech.edu

Francis Nimmo

Professor

Department of Earth and Planetary Sciences

University of California, Santa Cruz

Santa Cruz, CA 95064

(831) 459-1783

fnimmo@ucsc.edu

Jerry X. Mitrovica

Frank B. Baird, Jr. Professor of Science

Department of Earth and Planetary Sciences

Harvard University

20 Oxford Street, Cambridge, MA 02138

(617) 496-2732

jxm@eps.harvard.edu