Ceri Nunn

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| Institution:  | Jet Propulsion Laboratory - California Institute of Technology 4800 Oak Grove Drive M/S: 183-501Pasadena, CA 91109 | Telephone:  | +1 626 379-6521 |
|  | Female, British | Email: | ceri.nunn@jpl.nasa.gov  |

### Employment

**2022 - present:** Research Scientist, Jet Propulsion Laboratory, Pasadena,

 CA, U.S.A.

**2018 - 2022:** Postdoctoral Researcher, Jet Propulsion Laboratory, Pasadena,

 CA, U.S.A.

**2016 - 2018:** Marie Skłodowska-Curie fellow, LMU, Munich, Germany

**2015 - 2016:**  Postdoctoral Researcher, Durham University, U.K.

### Education

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| **2014** | **PhD** | **University of Cambridge**  |
|  |  | Thesis: Tomographic images of the crust and upper mantle beneath the Tibetan Plateau: using body waves, surface waves and a joint inversion.Keith Priestley (University of Cambridge), Steven Roecker (RPI), Frederik Tilmann (GFZ, Berlin) |
| **2009** | **MSci** | **University of Cambridge**  |
|  |  | Thesis: The Lower Martian Atmosphere: constraining the temperature, depth of the convective boundary layer and turbulence with a 1D and 3D model.Stephen Lewis (Open University), Alexander Piotrowski (University of Cambridge) |
| **2008** | **BA** | **University of Cambridge** |

### Mission Experience

**2021 - ongoing:** Farside Seismic Suite, Co-investigator. Selected June 2021 for 2025 launch.

**2020 - ongoing:** NASAInSight archivist of seismic data to the Planetary Data System

**2020 - ongoing:** Co-Investigator for NASA’s Lunar Geophysical Network (a candidate for a New Frontiers 5 mission) and co-author of mission concept study.

### Funding Record

**2021:** NASA Roses – Lunar Data Analysis Program (*LDAP*) (~$475,000)

**2020:** JPL A-team Funding - Penetrating Seismometers for the Moon ($30,000)

(led a JPL internal study on building a lunar seismic network with seismometers delivered by penetrators)

**2019:** NASA Roses - Planetary Data Archiving, Restoration, and Tools (*PDART*) (~$100,000)

**2018:** International Space Science Institute Workshop, Beijing - Supported Young Scientist (~€1,000)

**2017:** International Space Science Institute Workshop, Bern - Supported Young Scientist (~€1,000)

**2015:** Marie Skłodowska-Curie individual fellowship (~€160,000)

**2013:** Cambridge Philosophical Society Research Studentship (£3000)

**2011:** Schlumberger Travel Bursary (£1000)

Academic Service

**Planetary Science Summer School:** Contributor, 2022, 2023

**NASA Panel Reviewer:** 2019

**NASA External Reviewer:** 2022

**Co-supervisor:** JPL Intern ‘Measuring Scattering in the Lunar Crust’, 2019

Supervising Master’s Projects on ‘Modelling scatter on the Moon with Salvus’ and ‘Stacking Deep Moonquakes’, 2018, LMU, Munich

**Co-convener**: Interiors of Planets and Moons: Learning from Spacecraft Observations, Simulations, and in Situ Data, AGU 2020; **Planetary Seismology: Moon, Mars and Beyond, AOGS 2023, Singapore**

**Convener**: Seismic Modeling and Inversion: Exploring the Earth's Interior, AGU 2015

**Organizer and chair**: Discussion: Applying Best Practices in Seismic Tomography, with panelists Fiona Ann Darbyshire, Gary Pavlis, Nick Rawlinson, Kazunori Yoshizawa, AGU 2015

**Journal Reviews:** Nature Astronomy, Geophysical Journal International, Surveys in Geophysics, Nonlinear Processes in Geophysics, Geomatics, Natural Hazards and Risk, Earth and Space Science

**Proposal Reviews**: UK Space Agency’s Aurora Science

**Judge:** Outstanding Student Presentation Award, AGU (judge in 2013-2020 and session coordinator in 2015)

**Judge**: Outstanding Student Poster and PICO, EGU, 2017, 2018

### Invited Talks

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| **2022** | **Nunn, C.** Lunar Seismology - Past, Present, and Future, IRIS Webinar, September 29, 2022 |
| **2022** | **Nunn, C.** Lunar Seismology - Past, Present, and Future, PLENARY SESSION: New Horizons in Scope: Geophysics in Extreme and Unconventional Environments, SAGE/GAGE, June 2022 |
| **2020** | **Nunn, C.** Moonquakes: an introduction to what we know about the Moon from Lunar Seismology, Open Planetary Lunch Talks, <https://www.youtube.com/watch?v=sCT3lVvjaZk> |
| **2018** | **Nunn, C.**, Nakamura, Y., Igel, H., Apollo Passive Seismic Experiments: SEED format for lunar data, Institute of Geology and Geophysics, Chinese Academy of Sciences, 22 June 2018 |
| **2017** | **Nunn, C.**, Julian, B.R., Foulger, G.R., Mhana, N**.,** Seismic tomography of Mount Etna: No evidence for time-dependent changes during the 2002-3 flank eruption, TIDES (TIme-DEpendent Seismology) Training School: Seismic Tomography: Theory, Inversion, Uncertainties, University of Oxford, invited talk and attendance at training workshop  |

Publications

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| **2022** | **Nunn, C.,** Nakamura, Y., Kedar, S., Panning, M.P., 2022. A New Archive of Apollo’s Lunar Seismic Data. Planet. Sci. J. 3, 219. <https://doi.org/10.3847/PSJ/ac87af> |
| **2022** | **Nunn, C.,** 2022. Moon: Seismicity, in: Cudnik, B. (Ed.), Encyclopedia of Lunar Science. Springer International Publishing, Cham, pp. 1–11. <https://doi.org/10.1007/978-3-319-05546-6_157-1> |
| **2022** | Marusiak, A.G., Panning, M.P., Vance, S.D., **Nunn, C**., Stähler, S.C., Tharimena, S., 2022. Seismic Detection of Euroquakes Originating From Europa’s Silicate Interior. Earth and Space Science 9. https://doi.org/10.1029/2021EA002041 |
| **2022** | Knapmeyer, M., Marusiak, A.G., Horleston, A., **Nunn, C.,** Knapmeyer-Endrun, B., 2022. Seismology across the Solar System. Deutsche Geophysikalische Gesellschaft, Geophysik im Wandel, <https://dgg-online.de/WordPress_01/wp-content/uploads/2022/03/DGG100_Geophysik_im_Wandel_3_EN.pdf> |
| **2022** | **Nunn, C**., 2022. Legacy of the Apollo Seismic Experiments, in: Cudnik, B. (Ed.), Encyclopedia of Lunar Science. Springer International Publishing, Cham, pp. 1–11. <https://doi.org/10.1007/978-3-319-05546-6_165-1> |
| **2021** | Karakostas, F., Schmerr, N., Maguire, R., Huang, Q., Kim, D., Lekic, V., Margerin, L., **Nunn, C.,** Menina, S., Kawamura, T., Lognonné, P., Giardini, D., Banerdt, B., 2021. Scattering Attenuation of the Martian Interior through Coda-Wave Analysis. Bulletin of the Seismological Society of America. <https://doi.org/10.1785/0120210253> |
| **2021** | **Nunn, C.**, Pike, W.T., Standley, I.M., Calcutt, S.B., Kedar, S., Panning, M.P., 2021. Standing on Apollo’s Shoulders: A Microseismometer for the Moon. Planet. Sci. J. 2, 36.<https://doi.org/10.3847/PSJ/abd63b> |
| **2020** | **Nunn, C.**, Garcia, R.F., Nakamura, Y., Marusiak, A.G., Kawamura, T., Sun, D., Margerin, L., Weber, R., Drilleau, M., Wieczorek, M.A., Khan, A., Rivoldini, A., Lognonné, P., Zhu, P., 2020. Lunar Seismology: A Data and Instrumentation Review. Space Sci Rev 216, 89.<https://doi.org/10.1007/s11214-020-00709-3> |
| **2020** | Panning, M.P., Pike, W.T., Lognonné, P., Banerdt, W.B., Murdoch, N., Banfield, D., Charalambous, C., Kedar, S., Lorenz, R.D., Marusiak, A.G., McClean, J.B., **Nunn, C.**, Stähler, S.C., Stott, A.E., Warren, T., 2020. On‐Deck Seismology: Lessons from InSight for Future Planetary Seismology. J. Geophys. Res. Planets 125.<https://doi.org/10.1029/2019JE006353> |
| **2019** | Garcia, Raphael F., Khan, A., Drilleau, M., Margerin, L., Kawamura, T., Sun, D., Wieczorek, M.A., **Nunn, C.**, Weber, R.C., Marusiak, A.G., Lognonné, P., Nakamura, Y., Peimin, Z., Lunar Seismology: An Update on Interior Structure Models. Space Science Reviews 215, no. 8., doi: 10.1007/s11214-019-0613-y |
| **2018** | Krischer, L., Aiman, Y.A., Bartholomaus, T., Donner, S., Driel, M. van, Duru, K., Garina, K., Gessele, K., Gunawan, T., Hable, S., Hadziioannou, C., Koymans, M., Leeman, J., Lindner, F., Ling, A., Megies, T., **Nunn, C**., Rijal, A., Salvermoser, J., Soza, S.T., Tape, C., Taufiqurrahman, T., Vargas, D., Wassermann, J., Wölfl, F., Williams, M., Wollherr, S., Igel, H., 2018. seismo‐live: An Educational Online Library of Jupyter Notebooks for Seismology. Seismological Research Letters 89, 2413–2419. <https://doi.org/10.1785/0220180167> |
| **2014** | **Nunn, C**., Roecker, S. W., Priestley, K. F., Liang, X., Gilligan, A. Joint Inversion of Surface Waves and Teleseismic Body Waves Across the Tibetan Collision Zone: the Fate of Subducted Indian Lithosphere, *Geophys. J. Int*, 198, 1526–1542 (2014), doi: 10.1093/gji/ggu193 |
| **2014** | **Nunn, C.**, Roecker, S. W., Tilmann, F. J., Priestley, K. F., Heyburn, R., Sandvol, E. A., Ni, J. F., Chen, Y. J., Zhao, W. and the INDEPTH IV and ASCENT Team, Imaging the lithosphere beneath NE Tibet: teleseismic P and S body wave tomography incorporating surface wave starting models, *Geophys. J. Int,* 196, 1724–1741 (2014), doi:10.1093/gji/ggt476 |
| **2014** | Gilligan, A., Roecker, S. W., Priestley, K. F., **Nunn, C**., Shear velocity model for the Kyrgyz Tien Shan from joint inversion of receiver function and surface wave data, *Geophys. J. Int,* 199, 480–498 (2014), doi: 10.1093/gji/ggu225 |

### Conferences and Training Schools

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| **2023** | Nunn, C., Fernando, B.A., Kedar, S., Panning, M.P., Tracing Seismic Phases Across the Moon. 54th Lunar Planet. Sci. Conf., The Woodlands, TX, poster |
| **2022** | Nunn, C., Nakamura, Y., Kedar, S., Panning, M.P., The Lunar Geophysical Package (LGP): A New Archive of Apollo Seismic Data. 53rd Lunar Planet. Sci. Conf., The Woodlands, TX, virtual poster |
| **2021** | Improving the Accessibility of the Apollo Passive Seismic Data: Archiving at the PDS and IRIS, AGU Fall Meeting, virtual poster |
| **2021** | The Lunar Geophysical Package and Farside Seismic Suite: A “suitcase science” approach to building a long-lived, human-deployed, lunar network, 52nd Lunar Planet. Sci. Conf., The Woodlands, TX, poster |
| **2020** | MoonShake: a Future Lunar Seismic Network delivered by Penetrators, AGU Fall Meeting, virtual, e-lightning talk |
| **2020** | Improving the Accessibility of the Apollo Seismic Data: Archiving at IRIS and the PDS, 51st Lunar Planet. Sci. Conf., The Woodlands, TX, <https://www.hou.usra.edu/meetings/lpsc2020/pdf/2269.pdf>, proceedings only |
| **2019** | Standing on Apollo’s Shoulders: MEMS seismometers for the Lunar Geophysical Network, AGU Fall Meeting, San Francisco, eLightning talk |
| **2019** | Scoping MEMS seismometers for the Moon, EGU, Vienna, talk |
| **2019**  | Scoping MEMS seismometers for the Moon, 50th Lunar Planet. Sci. Conf., <https://www.hou.usra.edu/meetings/lpsc2019/pdf/2223.pdf>, The Woodlands, TX, poster |
| **2018** | Artificial Impacts and Meteoroid Strikes on the Moon: Observations from seismic data with insights from synthetic models, AGU Fall Meeting, Washington DC, poster |
| **2018** | Workshop: An International Reference for Seismological Data Sets and Internal Structure Models of the Moon, International Space Science Institute, Beijing, China, 18-22 June 2018, working group to prepare papers and reference data for the Moon |
| **2017**  | **Nunn, C**., Nakamura, Y. and Igel, H. Apollo​ ​Passive​ ​Seismic​ ​Experiments:​ ​lunar​ ​data​ ​in​ ​SEED Format, AGU Fall Meeting, New Orleans, poster |
| **2017**  | Workshop: An International Reference for Seismological Data Sets and Internal Structure Models of the Moon, International Space Science Institute, Bern, Switzerland, 23-27 October 2017, working group to prepare papers and reference data for the Moon |
| **2017**  | **Nunn, C**., Nakamura, Y. and Igel, H. Apollo​ ​Passive​ ​Seismic​ ​Experiments:​ ​lunar​ ​data​ ​in​ ​SEED Format, AG Seismologie, Bad Breisig, poster |
| **2017** | **Nunn, C.** and Igel, H., Lunar Structure from Coda Wave Interferometry, EGU, PICO (interactive presentation)  |
| **2016** | **Nunn, C.** and Igel, H., Lunar Structure from Coda Wave Interferometry, AGU Fall Meeting, poster |
| **2016** | **Nunn, C**. and Igel, H. Lunar Structure from Coda Wave Interferometry, AG Seismologie, Bad Salzschlirf, poster |
| **2015** | **Nunn, C.**, Julian, B.R, Foulger, G.R. Patanè, D., Ibáñez, J.M., Briole, P., Mhana, N. and the MED-SUV Team, Mount Etna: 3-D and 4-D structure using seismic tomography, AGU Fall Meeting, San Francisco, abstract #S23D-2779, poster |
| **2013** | **Nunn, C**., Roecker, S. W., Priestley, K. F., Liang, X., Heyburn, R., A joint inversion of surface waves and teleseismic body waves across the Tibetan collision zone, AGU Fall Meeting, San Francisco, abstract #S33A-2394, poster |
| **2012** | **Nunn, C**., Roecker, S. W., Tilmann, F. J., Priestley, K. F., Heyburn, R., Mechie, J., Sandvol, E. A., Ni, J. F., Chen, Y. J., Zhao, W., Velocity structure of the NE Tibetan Plateau: P and S body wave tomographic model of the northeastern Tibetan Plateau and its margins with additional constraints from surface wave tomography, AGU Fall Meeting, San Francisco, abstract #T54B-05, talk |
| **2011** | **Nunn, C**., Tilmann, F. J., Roecker, S. W., Priestley, K. F, Heyburn, R, Mechie, J., Sandvol, E. A., Ni, J. F., Chen, Y. J., Zhao, W., and the INDEPTH IV and ASCENT Team, P- and S-wave tomographic structure of NE Tibet, AGU Fall Meeting, San Francisco, abstract #T43A-2302, poster |
| **2011** | **Nunn, C.** ,Tilmann, F. J., Roecker, S. W., Priestley, K. F, Heyburn, R, Mechie, J., Sandvol, E. A., Ni, J. F., Chen, Y. J., Zhao, W., and the INDEPTH IV and ASCENT Team, P- and S-wave tomographic structure of NE Tibet, UKSEDI: Study of the Earth's Deep Interior meeting, Royal Astronomical Society, London, November, poster |
| **2011** | **Nunn, C**, Tilmann, F. J., Roecker, S. W., Priestley, K. F, Heyburn, R. and the INDEPTH IV and ASCENT Team, P-wave tomographic structure of NE Tibet, EGU, Vienna, poster |

### NRC Planetary Science and Astrobiology Decadal Survey

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| **2020** | **Nunn, C.**, Calcutt, S., Clark, P.E., Eubanks, T.M., Kedar, S., Panning, M.P., Pike, W.T., Radley, C.F., Standley, I.M., Sutin, B.M., Zimmerman, W.F., 2020. MoonShake: a future Lunar Seismic Network Delivered by Penetrators (A White Paper for the National Research Council’s Planetary Science and Astrobiology Decadal Survey). <https://baas.aas.org/pub/2021n4i219/release/1> |
| **2020** | Neal, C., Weber, R.C., Amato, M., J., Seas, A., Science Team [including **Nunn, C**], Engineering Team, 2020. The Lunar Geophysical Network (Planetary Missions Concept Studies Report), Submitted in response to: NNH18ZDA001N-PMCS. |
| **2020** | Gulick, S.P., Kawamura, T., **Nunn, C.**, Neal, C.R., Christeson, G.L., Tsuji, T., Schmerr, N., Garcia, R.F., Logonné, P., 2020, Active Seismic Subsurface Exploration on Artemis III: Exploration and Science Goals (A White Paper for the National Research Council’s Planetary Science and Astrobiology Decadal Survey)  |
| **2020** | Neal, C.R., Dell’Agnello, S., Grimm, R., Gulick, S.P.S., James, P., Lognonné, P., **Nunn, C.,** Panning, M.P., Petro, N., Schmerr, N., Watters, T., Zacny, K., 2020, Enabling Elements for Artemis Surface Science (A White Paper for the National Research Council’s Planetary Science and Astrobiology Decadal Survey)  |
| **2020**  | Panning, M.P., Weber, R.C., Kedar, S., Bugby, D.C., Calcutt, S., Currie, D., Dell’Agnello, S., Elliott J., GrimmR., Gulick7,  S.P.S., Fuqua Haviland, H. He, Y., Johnson, C.L., Kawamura, T., Lognonné, P., Nagihara, S., Neal, C.R., **Nunn, C.**, Pike, W.T., Standley, I.M., Walsh, W., Wieczorek, M., 2020, Building a lunar network using a long-lived, human-deployed Lunar Geophysical Package (LGP) (A White Paper for the National Research Council’s Planetary Science and Astrobiology Decadal Survey) |
| **2020**  | Daubar, I. J., R. A. Beyer, V. Hamilton, A. McEwen, N. Bardabelias, S. M. Brooks, P. K. Byrne, S. Byrne, F. Calef III, J. Castillo-Rogez, S. Diniega, V. C. Gulick, C. W. Hamilton, D. Jha, A. Keresztur, **C. Nunn,** P. Schenk, S. S. Sutton. (2020) Extended Missions in Planetary Science: Impacts to Science and the Workforce. (A White Paper for the National Research Council’s Planetary Science and Astrobiology Decadal Survey) <http://dx.doi.org/10.3847/25c2cfeb.1d8e902b> |

IT Skills

ObsPy, SAC

Programming in Python, Fortran, Java, VB; scripting in Bash and AWK

Environments: Mac, Linux, UNIX and Windows

Cluster computing

High quality figures and animations in Python (matplotlib, cartopy, basemap), GMT, IDL, Inkscape

SQL databases (Oracle, MySQL, SQL Server)

Sun Certified Java Programmer (2002)

Oracle Certified Professional, Oracle Forms Developer (1999)

### Software Products

<https://github.com/cerinunn/pdart>

Planetary Data Archiving, Restoration, and Tools (PDART) for the Apollo missions

<https://github.com/cerinunn/apollo-shoulders>

Standing on Apollo's Shoulders: a Microseismometer for the Moon - Electronic Supplement

Outreach Activities:

**Nov 2022:** [Episode 266: Moonquakes](https://soundcloud.com/nasa/houston-we-have-a-podcast-moonquakes), by Houston We Have a Podcast

**Aug 2020:**  [Moonquakes and marsquakes: How we peer inside other worlds](https://horizon.scienceblog.com/1389/moonquakes-and-marsquakes-how-we-peer-inside-other-worlds/), by [Horizon Magazine](https://horizon.scienceblog.com/author/horizonmagazine/)

**Nov 2018:**  [Old Lunar Data Gets New Life, With Help From Seismologists](https://spectrum.ieee.org/tech-talk/aerospace/space-flight/old-lunar-data-gets-new-life-with-help-from-seismologists), by Michael Durmiak, Spectrum

**June 2016:** How to make a mountain (for pupils aged 10-11 years)

The Moon (for pupils aged 9-10 years)

Talks at Cherry Hinton Primary School, Cambridge, UK

**8 June 2015:** Darwin: the great geologist behind the Origin of Species

*The Conversation*

<http://theconversation.com/revealed-the-great-geologist-behind-the-origin-of-species-42783>

**October 2015:** The structure of Mount Etna

Talk for the North Eastern Geological Society

<http://www.northern-england-geology.co.uk/negs-newsletter-dec-2015.pdf>

Fieldwork:

**2007:** Mapping of the Loch Ba Ring Dyke, Isle of Mull, Scotland (35 days fieldwork).

Career Breaks

**Jul 2014 - Jan 2015:** Career break with my youngest daughter.

**Jan 2012 - Jul 2012:** Maternity Leave, 3 months full-time, 3 months part-time.

Teaching:

**LMU, Munich**

**Spring 2016, Spring 2017:** Geophysical Data Acquisition (for MSc course - lectures, practicals, developing practicals, writing exam material)

**Nov 2016:**  Contributor to SeismoLive (<https://krischer.github.io/seismo_live_build/>)

**July 2016:** Oral Examiner - Seismology (for MSc in Geophysics)

**University of Cambridge**

**2010 – 2011:**  Teaching Assistant - Continental Tectonics and Mountains (3rd year Geology BA or 4th year Geology MSci)

**2009 – 2010** Teaching Assistant - Physics of the Earth as a Planet (4th year Physics MSci)

**2010** Teaching Assistant in revision classes for Geology (1st year Natural Sciences BA)

Early Career (highlights)

**2003 - 2005:** CoreLogic, London (now Servelec CoreLogic)

Project Team Leader

Ran a team of 18 people (included software architects, Java developers, test engineers and help desk staff), developing software for social services in the UK. Developed the initial system architecture, and was responsible for recruiting and developing the team that implemented the software. The software was successfully installed at seven different customer sites. Played a major role in working with customers and users to design the software to meet their requirements, and a client-facing role in resolving problems.

**1997 - 2003:** Iteba, London

Team Leader and Software Developer

Joined Iteba initially as a Software Tester. Transferred to the software development team soon after joining, and developed with a number of products including FoxPro and Oracle Forms, later specializing in Java. Ran several successful projects.

**1992 - 1995:**  University of Sussex

Social Psychology (B.A. Hons)