

Jack Broderick Muir

Personal Data

Name	Jack Broderick Muir
Nationality	Australian
Work Address	364 South Mudd Laboratory, California Institute of Technology 1200 East California Boulevard, Pasadena CA, 91125, USA
Home Address	1/22 Elamang Avenue, Kirribilli NSW, 2061, Australia
Email	jmuir@caltech.edu
Phone	(+61) 0492-938-309
Website	http://web.gps.caltech.edu/~jmuir/
ORCID	0000-0003-2617-3420

Education

Expected 2021	PhD (Geophysics) California Institute of Technology, Pasadena CA
06/2019	MSc (Geophysics) California Institute of Technology, Pasadena CA GPA 4.2/4.3
12/2014	PhB (Science, Honours in Physics) Australian National University, Canberra ACT 1 st class honours with the University Medal, GPA 7.0/7.0

Professional Positions

From 03/2022	Marie Skłodowska-Curie Individual Fellow Oxford University, Oxford UK
01/2021–Present	Visiting Researcher Australian National University, Canberra ACT
06/2015–Present	Graduate Student Researcher California Institute of Technology, Pasadena CA
01/2012–01/2013	Intern Researcher Australian Nuclear Science and Technology Organization, Lucas Heights NSW

Publications

In prep.	<i>Inversion of the local basin depth and internal structure of the Los Angeles basin using intermediate period ground motions of the Ridgecrest Mw 7.1 Earthquake recorded at the Community Seismic Network,</i> J.B. Muir et al.
In prep.	<i>Reconstructing the Seismic Wavefield using a Preconditioned Wavelet-Curvelet Compressive Sensing Approach II: Performance Assessment and Design of Mixed Distributed-Acoustic-Sensing and Point Sensor Deployments,</i> J.B. Muir & Z. Zhan

In review.	<i>Reconstructing the Seismic Wavefield using a Preconditioned Wavelet-Curvelet Compressive Sensing Approach,</i> J.B. Muir & Z. Zhan
In review	<i>Convection of the Earth's Inner Core,</i> H. Tkalčić et al.
In review	<i>HypoSVI - Hypocentral Earthquake Location Analysis using Machine Learning based Stein Variational Gradient Descent,</i> J. Smith et al.
In review	<i>Seismological Monitoring of Groundwater Resources in the Los Angeles Region,</i> E. Syracuse et al.
12/2020	<i>Probabilistic lowermost mantle P-Wave tomography from hierarchical Hamiltonian Monte Carlo and model parametrisation cross-validation,</i> J.B. Muir & H. Tkalčić, GJI, (2020) 223 (3): 1630–1643 https://doi.org/10.1093/gji/ggaa397
02/2020	<i>Geometric and level set tomography using ensemble Kalman inversion</i> J.B. Muir & V.C. Tsai, GJI (2020) 220 (2): 967–980 https://doi.org/10.1093/gji/ggz472
01/2020	<i>Did Oldham Discover the Core After All? Handling Imprecise Historical Data with Hierarchical Bayesian Model Selection Methods,</i> J.B. Muir & V.C. Tsai, SRL (2020) 91 (3): 1377–1383 https://doi.org/10.1785/0220190266
09/2017	<i>Rayleigh Wave H/V via Noise Cross-Correlation in Southern California,</i> J.B. Muir & V.C. Tsai, BSSA (2017) 107 (5): 2021–2027 https://doi.org/10.1785/0120170051
12/2015	<i>Strong, Multi-Scale Heterogeneity in Earth's Lowermost Mantle,</i> H. Tkalčić et al. Sci. Rep. (2016) 5: 18416 https://doi.org/10.1038/srep18416
11/2015	<i>Spherical Harmonic Analysis in the Geosciences via Bayesian Inference,</i> J.B. Muir & H. Tkalčić, GJI (2015) 203 (2): 1164–1171 https://doi.org/10.1093/gji/ggv361
07/2012	<i>A single-probe-beam double-heterodyne polarimeter-interferometer for plasma Faraday rotation measurements,</i> J. Howard et al. JINST (2012) 7 P07009 https://doi.org/10.1088/1748-0221/7/07/p07009

Funding Awarded

10/2021–10/2023	<i>TerraPINN: Toward fully physics based probabilistic seismic hazard assessment using physics informed neural networks</i> Marie Skłodowska-Curie Actions Individual Fellowship Co-I Tarje Nissen-Meyer 224,933.76 Euro
08/2020–07/2023	<i>Improving the Interpretability of Tomographic Images Using Geologically Motivated Parametrizations</i> National Science Foundation Award 2011079

PI Victor C. Tsai, JBM wrote scientific justification of proposal
255,859.00 USD

02/2020–03/2021 *Combining High-Resolution Local Models with the SCEC CVMS*
Southern California Earthquake Center Award 20024
PI Robert W. Clayton, JBM wrote scientific justification of proposal
23,460.00 USD

06/2015–06/2018 Origin Energy Foundation / General Sir John Monash Scholarship
180,000.00 AUD

Honours and Awards

02/2021 Marie Skłodowska-Curie Individual Fellowship
02/2015 General Sir John Monash Scholarship
12/2014 ANU University Medal in Physics
12/2014 Director of Science Education Commendation (ANU)
12/2014 Australian Society of Exploration Geophysicists ACT Branch Student Award
01/2014 ANU Dunbar Scholarship for Physics Honours
12/2013 Australian Meteorological and Oceanographic Society ACT Branch Student Award
12/2011,13 Dean's Science Commendation (ANU)
12/2010,11,13 ANU National Merit Scholarship

Invited Talks

09/2020 Parsimoniously introducing high-resolution local updates into the SCEC CVMs using a level-set approach,
Southern California Earthquake Center workshop on “Multi-scale seismic velocity models—Imaging and validation studies”
06/2020 Imaging the Los Angeles Basin using the July 5 2019 Mw 7.1 Ridgecrest Earthquake,
Oxford University
01/2019 Geometric and Level Set Tomography using Ensemble Kalman Inversion,
Australian National University
11/2017 Rayleigh Wave H/V via Noise Cross-Correlation in Southern California,
Los Alamos National Laboratory

Conference Presentations

03/2021 Level-set Imaging of the Los Angeles Basin using the Hierarchical Ensemble Kalman Sampling
SSA virtual tomography meeting
12/2020 Level-set imaging of the Los Angeles Basin using the Community Seismic Network,
AGU fall meeting talk
09/2020 A Level-Set Approach to Parsimoniously Updating the SCEC CVMs,
SCEC annual meeting poster

12/2019	Wavefield Reconstruction and Surface Wave Tomography from LassoCV, AGU fall meeting talk
09/2019	Visualising the Ridgcrest Earthquakes using Wavefield Reconstruction, SCEC annual meeting poster
12/2018	Taming the tomographic null space using geometric and level set parameteri- zations of the Earth, AGU fall meeting talk
09/2018	Geometric and Level Set Tomography for Interface Detection in the Near Sur- face, SCEC annual meeting poster
12/2017	Wavefield Reconstruction using Compressive Sensing and Distributed Acous- tic Sensing, AGU fall meeting poster
12/2016	Rayleigh Wave H/V via Noise Cross-Correlation in Southern California, AGU fall meeting talk
12/2015	Joint Bayesian Tomography of the Core-Mantle Boundary Topography and Low- ermost Mantle Velocity, AGU fall meeting talk
12/2014	Spherical Harmonic Analysis via Bayesian Inference, AGU fall meeting poster
09/2013	Bayesian inference applied to the differential rotation of Earth's inner core, Australian Conference of Undergraduate Research poster
09/2012	A single-probe-beam double-heterodyne polarimeter-interferometer for plasma Faraday rotation measurements, Australian Conference of Undergraduate Research poster

General Audience Publications

05/2019	<i>Listening to the Heartbeat of our Planet</i> , Caltech Letters https://caltechletters.org/science/historical-seismology
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Teaching Assistantships

04–06/2020	Caltech Ge264 <i>Machine Learning in Geophysics</i>
04–06/2019	Caltech Ge111B <i>Field Geophysics B</i>
01–03/2018	Caltech Ge162 <i>Seismology</i>
01–03/2017	Caltech Ge111A <i>Field Geophysics A</i>

Internships & Intensives

07/2019	Dr. Lucy Jones Center for Science and Society Science Activation Workshop
06/2018	Gene Golub SIAM Summer School: Inverse Problems
11/2014–01/2015	Student Internship in Geophysics Australian National University

11/2013–01/2014	Student Fellowship in Astrophysics Australian Astronomical Observatory (AAO)
01/2012–01/2013	Year in Industry Internship in Condensed Matter Physics Australian Nuclear Science and Technology Organisation (ANSTO)
11/2011–01/2012	Summer Internship in Optics Australian National University
07/2011	Winter School in Astronomy Australian National University

Volunteer Activities & Roles

Reviewing	GRL, JGR: Solid Earth, GJI, BSSA, PAAG
07/2016–07/2019	Caltech Graduate Student Council Academics Chair 07/2017–07/2018 Treasurer 07/2018–07/2019 Steering Committee 07/2017–07/2019
07/2015–Present	Caltech Graduate Honor Council
02–09/2014	Australasian Conference for Undergraduate Research — Planning Committee

Professional Memberships & Roles

12/2016–Present	Seismological Society of America
08/2014–Present	American Geophysical Union
08/2014–Present	Australian Society of Exploration Geophysicists

Sydney, Australia, March 15, 2021