Curriculum Vitae

RICHARD JOHN O'CONNELL

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Academic Degrees:

B. S. (Physics) California Institute of Technology, 1963
M. S. (Geology) California Institute of Technology, 1966
Ph.D. (Geophysics) California Institute of Technology, 1969

Positions Held:

Research Fellow, Geophysics, California Institute of Technology, 1969–1970

Research Geophysicist, Institute of Geophysics and Planetary Physics, University of California, Los Angeles, 1970–1971

Assistant Professor, Department of Geological Sciences, Harvard University, 1971–1974

Associate Professor, Department of Geological Sciences, Harvard University, 1974–1977

Visiting Researcher, Institut de Physique du Globe, Université Paris VI, 1976

Visiting Researcher, Department of Geophysics, Cambridge University, 1976

Member, Center for Earth and Planetary Physics, Harvard University, 1971–1986

Director, Center for Earth and Planetary Physics, Harvard University, 1983–1986

Professeur Invité, Institut de Physique du Globe de Paris, 2004

Visiting Miller Professor, University of California, Berkeley, Jan–May 2013

Professor of Geophysics, Harvard University, 1977–

Professional Societies:

American Geophysical Union, Fellow
American Association for the Advancement of Science, Fellow
Geological Society of America

Honors and Awards:

Fellow, American Geophysical Union, 1987
Inge Lehmann Medal, American Geophysical Union, 2000
Arthur L. Day Medal, Geological Society of America, 2001
Fellow, American Association for the Advancement of Science, 2003
Fellow, American Academy of Arts and Sciences, 2007
Augustus Love Medal, European Geosciences Union, 2008

Service:

Working Group 5 (Physical Properties of the Earth's Interior), IUGG Commission on Geodynamics 1971–1974

Advisory Editorial Board, Earth and Planetary Science Letters, 1974–1978

NASA Lunar and Planetary Review Panel, 1977–1978

Advisory Editorial Board, Tectonophysics, 1981–1987

Geophysics Panel, NASA Earth System Science Committee, 1985–1986

Committee on Earth Sciences, Space Science Board, 1985–1987

Geophysics Study Committee, National Research Council, 1985–1988

Visiting Science Committee, NASA, Goddard Space Flight Center, 1986–1987

Board of Directors, Universities Space Research Association, 1984–90; Chairman, 1988-1990

Convener, Lunar and Planetary Science Council (USRA), 1984–1988

Earth Sciences Review Panel, National Science Foundation, 1985-1989

NASA Solid Earth Science Coolfont Report Panel, 1989

Institute of Geophysics and Planetary Physics Advisory Committee, Los Alamos National Lab, 1983–1993

Steering Committee, University Navstar Consortium, 1983–1994; Chairman, 1989–1994

Consultant, Los Alamos National Laboratory, 1980–

Consultant, AMOCO Tulsa Research Center, 1984–1999

Consultant, Rockwell International, 1984–1987

Visiting Committee, SUNY Stony Brook, Earth Sciences Dept, 1986

Visiting Committee, University of Washington Geophysics Program, 1990

CSEDI Coordinating Committee, Chairman, 1992–1996

UCAR Universities Relations Committee, 1994–1997

Earth Sciences Instrumentation and Facilities Program Review Panel, National Science Foundation, 1995–1998

Editor, Earth and Planetary Science Letters, 1996–1999

NSF Center for High Pressure Research Advisory Committee, 1997–2001

Editor, Geochemistry, Geophysics, Geosystems, 1999–2003

Advisory Committee, Consortium for Materials Properties Research in Earth Sciences, 2002–2008

Advisory Committee, Meetings for Young Researchers in Earth Sciences (MYRES), 2003–2005

AGU Tectonophysics Section, President–elect, 2004–2006; President, 2006–2008

American Geophysical Union, Council, 2004–2008

AGU Whitten Medal Committee, 2004–2006

EGU Love Medal Committee 2008–2011

American Academy of Arts and Sciences, Membership Committee, Class I, Section 4, 2010–

AGU Lehmann Medal Committee, 2011–

Students

Ph.D.: Alex Woronow (1975), J. Peter Watt (1978), Bradford Hager (1978), Carl Gable (1989), Shimon Wdowinski (1990), Bruce Buffett (1990), Winston Tao (1991), Michael Manga (1994), Bernhard Steinberger (1996), Thorsten Becker (2002), James Kellogg (2004), Diana Valencia (2008), Wade Henning (2011), John Crowley (2012), Athena Eyster (current).

Viscosity of the Earth, D. L. Anderson and R. J. O'Connell, *Geophys. J. R. astr. Soc.* **14**, 287–295, 1967.

Dynamics of the motion of a phase change boundary to changes in pressure, R. J. O'Connell and G. J. Wasserburg, *Rev. Geophys.* **5**, 329–410, 1967.

Critique of the paper by W. J. Van de Lindt, 'Movement of the Mohoĥovoçic discontinuity under isostatic conditions,' R. J. O'Connell, *J. Geophys. Res.* **73**, 6604–6607, 1968.

Dynamic response of phase boundaries in the Earth to surface loading, I; Viscosity of the lower mantle, II, R. J. O'Connell, PhD Thesis, California Institute of Technology, 1969.

Rheology of the mantle, R. J. O'Connell, *EOS, Trans. Am. Geophys. Un.* **52**, 140–142, 1971.

Pleistocene glaciation and viscosity of the lower mantle, R. J. O'Connell, *Geophys. J. R. astr. Soc.* **23**, 299–327, 1971.

Dynamics of submergence and uplift of a sedimentary basin underlain by a phase-change boundary, R. J. O'Connell and G. J. Wasserburg, *Rev. Geophys. Space Phys.* **10**, 335–368, 1972.

Equation of state of NaCl: Ultrasonic measurements to 8 kbar and 800^oC and static lattice theory, H. Spetzler, C. G. Sammis and R. J. O'Connell, *J. Phys. Chem. Solids* **33**, 1727–1750, 1972.

Effect of stress induced anisotropy and porosity on elastic properties of polycrystals, H. Spetzler, E. Schreiber and R. J. O'Connell, *J. Geophys. Res.* **77**, 4938–4944, 1972.

Seismic velocities in dry and saturated cracked solids, R. J. O'Connell and B. Budiansky, *J. Geophys. Res.* **79**, 5412–5426, 1974.

Elastic moduli of a cracked solid, B. Budiansky and R. J. O'Connell, *Int. J. Solids Structures* **12**, 81–97, 1976.

The effects of mantle phase changes on postglacial rebound, R. J. O'Connell, *J. Geophys. Res.* **81**, 971–974, 1976.

Reply (to comment by W. Bruner on 'Seismic velocities in dry and saturated cracked solids'), R. J. O'Connell and B. Budiansky, *J. Geophys. Res.* **81**, 2577—2578, 1976.

Application of normal-mode theory to calculation of changes in the Earth's moment of inertia due to earthquakes, A. M. Dziewonski and R. J. O'Connell, in: *Semiannual Technical Summary, Seismic Discrimination* (MIT, Lincoln Laboratory, March 1976).

Excitation of the Chandler wobble by large earthquakes, R. J. O'Connell and A. M. Dziewonski, *Nature* **262**, 259-262, 1976.

The elastic properties of composite materials, J. P. Watt, G. F. Davies and R. J. O'Connell, *Rev. Geophys. Space Phys.* **14**, 541–563, 1976.

On the scale of mantle convection, R. J. O'Connell, *Tectonophysics* **38**, 119–136, 1977.

Large-scale heterogeneities in the lower mantle, A. M. Dziewonski, B. H. Hager and R. J. O'Connell, *J. Geophys. Res.* **82**, 239–255, 1977.

Transducer and bond phase shifts in ultrasonics and their effects on measured pressure derivatives of elastic moduli, G. F. Davies and R. J. O'Connell, in: *High-Pressure Research: Applications in Geophysics* (M. H. Manghnani and S. Akimoto, eds.) Academic Press, New York, 533–562, 1977.

Physical properties of the Earth's interior, R. J. O'Connell, T. J. Shankland and R. C. Liebermann, in: *Geodynamics: Progress and Prospects* (C. L. Drake, ed.) American Geophysical Union, Washington, DC, 1976.

Viscoelastic properties of fluid-saturated cracked solids, R. J. O'Connell and B. Budiansky, *J. Geophys. Res.* **82**, 5719–5739, 1977.

Measures of dissipation in viscoelastic media, R. J. O'Connell and B. Budiansky, *Geophys. Res. Lett.* **5**, 5–8, 1978.

Subduction zone dip angles and flow driven by plate motion, B. H. Hager and R. J. O'Connell, *Tectonophysics* **50**, 111–133, 1978.

Mixed-oxide and perovskite-structure model mantles from 700-1200 km, J. P. Watt and R. J. O'Connell, *Geophys. J. R. astr. Soc.* **54**, 601–630, 1978.

Kinematic models of large-scale flow in the Earth's mantle, B. H. Hager and R. J. O'Connell, *J. Geophys. Res.* **84**, 1031–1048, 1979.

Comment (on 'Elastic moduli of two-component systems' by A. K. Chatterjee, A. K. Mal and L. Knopoff), B. Budiansky and R. J. O'Connell, *J. Geophys. Res.* **84**, 5687–5688, 1979.

Creep and fracture in the moon, R. A. Verrall and R. J. O'Connell, *Lunar and Planet. Sci. X*, 1265–1267, 1979.

An experimental investigation of the Hashin-Shtrikman bounds on two-phase aggregate elastic properties, J. P. Watt and R. J. O'Connell, *Phys. Earth Planet. Int.* **21**, 359–370, 1980.

Lithospheric thickening and subduction, plate motions and mantle convection, B. H. Hager and R. J. O'Connell, in: *Physics of the Earth's Interior* (Proceedings of the International School of Physics 'Enrico Fermi'; course 78), A. M. Dziewonski and E. Boschi, eds., North Holland, 464–492, 1980.

On the thermal state of the Earth, R. J. O'Connell and B. H. Hager, in: *Physics of the Earth's Interior* (Proceedings of the International School of Physics 'Enrico Fermi'; course 78), A. M. Dziewonski and E. Boschi, eds., North Holland, 270–317, 1980.

Rheology, plate motions and mantle convection, B. H. Hager and R. J. O'Connell, in: *Mechanics of Plate Tectonics and Continental Drift* (P. A. Davies and S. K. Runcorn, eds.), Academic Press, 199–223, 1980.

Bulk dissipation in heterogeneous media, B. Budiansky and R. J. O'Connell, in: *Solid Earth Geophysics and Geotechnology* **AMD-42**, (S. Nemat Nasser, ed.), American Society of Mechanical Engineers, New York, 1–10, 1980.

A simple global model of plate dynamics and mantle convection, B. H. Hager and R. J. O'Connell, *J. Geophys. Res.* **86**, 4843–4867, 1981.

Geophysical constraints on partial melt in the upper mantle, T. J. Shankland, R. J. O'Connell and H. S. Waff, *Rev. Geophys. Space Sci.* **19**, 394–406, 1981.

Bulk attenuation in a polycrystalline Earth, D. Heinz, R. Jeanloz and R. J. O'Connell, *J. Geophys. Res.* **87**, 7772–7778, 1982.

Subduction, back-arc spreading and global mantle flow, B. H. Hager, R. J. O'Connell and A. Raefsky, *Tectonophysics* **99**, 165–189, 1983.

Bulk thermoelastic attenuation of composite materials, B. Budiansky, E. E. Sumner, Jr. and R. J. O'Connell, *J. Geophys. Res.* **88**, 10343–10348, 1983.

A viscoelastic model of anelasticity of fluid saturated porous rocks, R. J. O'Connell (Proceedings of the Physics and Chemistry of Porous Media Symposium, October 1983), American Institute of Physics Spec. Publ., 166–175, 1984.

Non linear generation of acoustic beams in crystalline rock, P. A. Johnson, T. J. Shankland, R. J. O'Connell and J. N. Albright, *J. Geophys. Res.*, **92**, 3597–3602, 1987.

A continuum model of continental deformation above subduction zones: Application to the Andes and the Aegean, S. Wdowinski, R. J. O'Connell and P. C. England, *J. Geophys. Res.*, **94**, 10331–10346, 1989.

On the choice of boundary conditions in continuum models of Continental Deformation, S. Wdowinski and R. J. O'Connell, *Geophys. Res. Lett.*, **17**, 2413–2416, 1990.

A benchmark comparison of numerical methods for infinite Prandtl number thermal convection in two-dimensional cartesian geometry, B. J. Travis,C. Anderson, J. Baumgardner, C. W. Gable, B. H. Hager, R. J. O'Connell, P. Olson, A. Raefsky and G. Schubert, *Geophys. Astrophys. Fluid Dynam.*, **55**, 137–160, 1990.

Toroidal–poloidal partitioning of lithospheric plate motions, R. J. O'Connell, C. W. Gable and B. H. Hager, in *Glacial Isostasy, Sea Level and Mantle Rheology*, edited by R. Sabadini and K. Lambeck, Kluwer Academic Publishers, Dordrecht, 535–551, 1991.

Convection in three dimensions with surface plates: Generation of toroidal flow, C. W. Gable, R. J. O'Connell and B. J. Travis, *J. Geophys. Res.*, **96**, 8391–8405, 1991.

Deformation of the central Andes (15° –27° S) derived from a flow model of subduction zones, S. Wdowinski and R. J. O'Connell, *J. Geophys. Res.*, **96**, 12245–12255, 1991.

Tomography, the geoid and plate motion, C. W. Gable and R. J. O'Connell, *Reviews of Geophysics*, **supplement**, 776–782, April, 1991.

Ablative subduction: A two-sided alternative to the conventional subduction model, W. C. Tao and R. J. O'Connell, *J. Geophys. Res.*, **97**, 8877–8904, 1992.

Toroidal-poloidal partitioning of plate motions since 120 Ma, C. Lithgow-Bertelloni, M. A. Richards, Y. Ricard, R. J. O'Connell and D. C. Engebretson, *Geophys. Res. Lett.* , **20**, 375–378, 1993.

Deformation of a weak subducted slab and variation of seismicity with depth, W. C. Tao and R. J. O'Connell, *Nature*, **361**, 626–628, 1993.

The interaction of plume heads with compositional discontinuities in the Earth's Mantle, M. Manga, H. A. Stone and R. J. O'Connell, *J. Geophys. Res.*, **98**, 19979–19990, 1993.

Marginal Stability of a Layered Fluid with Mobile Surface Plates, Buffett, B., C. W. Gable and R. J. O'Connell, *J. Geophys. Res., 99*, 19,885–19,900, 1994.

Continent–ocean chemical heterogeneity in the mantle based on seismic tomography, A.M. Forte, A.M. Dziewonski and R. J. O'Connell, *Science*, **268**, 386–388, 1995.

The tectosphere and postglacial rebound, M. Manga and R. J. O'Connell, *Geophys. Res. Lett.*, **22**, 1949–1952, 1995.

Thermal and Chemical Heterogeneity in the Mantle: A Seismic and Geodynamic Study of Continental Roots, A. M. Forte, A. M. Dziewonski, and R. J. O'Connell, *Phys Earth Planet. Int.*, **92**, 45–55, 1995.

Change of the Earth's rotation axis inferred from advection of mantle density heterogeneities, B. Steinberger and R.J. O'Connell, *Nature*, **387**, 169–173, 1997.

Advection of plumes in mantle flow; implications for hotspot motion, mantle viscosity and plume distribution, B. Steinberger and R. J. O'Connell, *Geophys. J. Int.,* **132**, 412–434, 1998.

Thermal structure, thickness and composition of continental lithosphere, R. L. Rudnick, W. F. McDonough and R. J. O'Connell, *Chemical Geology*, **145**, 395–411, 1998.

On Maxwell singularities in postglacial rebound, L. Boschi, J. Tromp and R. J. O'Connell, *Geophys. J. Int.*, **136**, 492–498, 1999.

Thermal constraints on the survival of primitive blobs in the lower mantle, Th. W. Becker, J. B. Kellogg and R. J. O'Connell, *Earth Planet. Sci. Lett.*, **171**, 351–365, 1999.

The development of subduction in the upper mantle: insights from experimental and laboratory experiments, Th. W. Becker, C. Faccenna, R. J. O'Connell, and D. Giardini, *J. Geophys. Res.*, **104**, 15207–15226, 1999.

Effects of mantle flow on hotspot motion, Bernhard Steinberger and R. J. O'Connell, in *The History and Dynamics of Global Plate Motions* ed. by Mark A. Richards, Richard G. Gordon, and Rob D. van der Hilst, Geophysical Monograph Series, **121**, 377–398, American Geophysical Union, 2000.

Predicting plate velocities with mantle circulation models, T. W. Becker and R. J. O'Connell, *Geochemistry, Geophysics, Geosystems*, **2**, 2001GC000171, 2001.

The convective mantle flow signal in rates of true polar wander, B. Steinberger and R. J. O'Connell, in *Ice Sheets, Sea Level and the Dynamic Earth*, edited by J. X. Mitrovica, and L. L. A. Vermeersen, Geodynamics Series, **29**, 233–256, AGU, Washington, D. C., 2002.

Modeling the distribution of isotopic ratios in geochemical reservoirs, J. B. Kellogg, R. J. O'Connell and S. B. Jacobsen, *Earth Planet. Sci. Lett.*, **204**, 183–202, 2002.

Comparison of azimuthal seismic anisotropy from surface waves and finite–strain from global mantle-circulation models, T.W. Becker, J.B. Kellogg, G. Ekström, and R.J. O'Connell, *Geophys. Journ. Int.*, **155**, 696–714, 2003.

Prediction of Emperor-Hawaii seamount locations from a revised model of plate motion and mantle flow, B. Steinberger, R. Sutherland and R. O'Connell, *Nature*, **430**, 167 – 173, 2004.

Internal structure of massive terrestrial planets, D. Valencia, R. J.O'Connell and D. Sasselov, *Icarus*, **181**, 545–554, 2006 (doi:10.1016/j.icarus.2005.11.021).

Mantle flow under the western United States from shear wave splitting, T. W. Becker, V. Schulte-Pelkum, D. K. Blackman, J. B. Kellogg, and R. J. O'Connell, *Earth Planet. Sci. Lett.*, **247**, 235-251, 2006.

Modeling Lead Isotopic Heterogeneity in Mid-Ocean Ridge Basalts, James B. Kellogg, Stein B. Jacobsen, and Richard J. O'Connell, *Earth Planet. Sci. Lett.*, **262**, 328 342, 2007.

Radius and Structure Models of the First Super-Earth Planet, Diana Valencia, Dimitar D. Sasselov, and Richard J. O'Connell, *The Astrophysical Journal*, **656**, 545–551, 2007.

Detailed Models of super-Earths: How well can we infer bulk properties? Diana Valencia, Dimitar D. Sasselov, and Richard J. O'Connell, *The Astrophysical Journal*, **665**, 1413-1420, 2007.

Inevitability of Plate Tectonics on super-Earths, D. R. Valencia, R. J. O'Connell and D. D. Sasselov. *The Astrophysical Journal*, **670**, L45–L48, 2007.

Isotopes as clues to the origin and earliest differentiation history of the Earth. S.B. Jacobsen, M.C. Ranen, M.I. Petaev, J.L. Remo, R.J. O'Connell, and D.D. Sasselov, *Phil. Trans. R. Soc. A*, **366**, 4129-4162; doi:10.1098/rsta.2008.0174, 2008.

Massive terrestrial planets (super–Earths): detailed physics of their interiors, D.Sasselov, D.Valencia, and R.J. O'Connell, *Physica Scripta*, **130**, 014035, 2008.

Convection scaling and subduction on Earth and super–Earths, D. R. Valencia and R. J. O'Connell, *Earth Planet. Sci. Lett.*, **286**, 492-502, 2009, doi:10.1016/j.epsl.2009.07.015

Geodynamics of the Yellowstone Hotspot and Mantle Plume: Seismic and GPS Imaging, Kinematics, Mantle Flow, Robert B. Smith, Michael Jordan, Bernhard Steinberger, Christine M. Puskas, Jamie Farrell, Gregory P. Waite, Stephan Husen, WuLung Chang, and Richard O'Connell, *Journal of Volcanology and Geothermal Research*, **188**, 26-56, 2009, doi:10.1016/j.jvolgeores.2009.08.020

The role of high-pressure experiments on determining super-Earth properties. D.R. Valencia, R. J. O'Connell and D. D. Sasselov, *Astrophysics & Space Science*, **322**,135-139, 2009

Tidally heated terrestrial exoplanets: Viscoelastic response models, Wade G. Henning, Richard J. O'Connell and Dimitar D. Sasselov, *The Astrophysical Journal*, **707**, 1000-1005, 2009, doi: 10.1088/0004-637X/707/2/1000

The Interior Dynamics of Water Planets, Roger Fu, Richard J. O'Connell, Dimitar D. Sasselov, *The Astrophysical Journal*, **708**, 1326, 2010, doi: 10.1088/0004-637X/708/2/1326

On the Relative Influence of the Heat and Water Transport on Planetary Dynamics, John W. Crowley, Mélanie Gérault and Richard J. O'Connell, *Earth Planet. Sci. Lett.*, **310**, 380388, 2011, doi:10.1016/j.epsl.2011.08.035

An analytic model of convection in a system with layered viscosity and plates, J. W. Crowley and R. J. O'Connell, Geophys. J. Int., **188**, 61-88, 2012. doi:10.1111/j.1365-246X.2011.05254.x