

# RICHARD ALLEN

Director, Berkeley Seismology Lab

Class of 1954 Endowed Professor, Dept. of Earth & Planetary Science, UC Berkeley

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## Professional Appointments

*University of California, Berkeley, CA*

Professor, Dept. of Earth and Planetary Science 2012-present

Director, Berkeley Seismological Laboratory 2011-present

Chair, Dept. of Earth and Planetary Science 2015-2018

Associate Professor, Dept. of Earth and Planetary Science 2008-2012

Assistant Professor, Dept. of Earth and Planetary Science 2005-2008

*Google, Visiting Faculty* 2019-present

*Harvard University, Visiting Scholar* 2018-2019

*ETH Zürich, Institut für Geophysik, Switzerland, Visiting Professor* 2011

*Institut de Physique du Globe de Paris, France, Visiting Professor* 2010

*University of Wisconsin-Madison, Dept. of Geology and Geophysics*  
Assistant Professor of Geology and Geophysics 2002-2004

*California Institute of Technology, Seismological Laboratory*  
Texaco Prize Postdoctoral Research Fellow in Geophysics 2001

## Education

*Princeton University, Dept. of Geosciences* Ph.D. 2001

*University of Durham, UK, Dept. of Geological and Geophysical Sciences* M.Sc. 1995

*University of Cambridge, UK, Natural Sciences* B.A. 1994

## Research Interests

My research group studies large-scale tectonic processes, and short-timescale earthquakes.

Current projects include:

- **Subduction zone dynamics.** The biggest earthquakes and volcanoes are the products of large-scale mantle convection at convergent points known as subduction zones. We integrate seismological imaging techniques to constrain structure and infer dynamics in **Cascadia, Alaska** and **Japan**.
- **Real-time seismology.** New techniques allow rapid characterization of earthquakes using seismic and geodetic data. We now apply these methods to provide earthquake early warning algorithms being implemented as **"ShakeAlert"** in the U.S. and around the world.
- **Massive distributed sensing systems.** Data drives all of this work, and we are using private smartphones to detect and analyze earthquakes. **"MyShake"** is our global smartphone seismic network to which 1 million citizen scientists have already contributed.

## Teaching and Outreach

Engaging with students and the public increases awareness of science, develops the next generation of scientists, and provides new insights. Current activities include:

- “**Earthquakes in your backyard**” is an introductory-level class at UC Berkeley focusing on the science, engineering and societal aspects of earthquakes. Taught each year to 450 students, the class enrolls about 5% of all Berkeley undergrads.
- **Public talks and seminars** on topics of earthquakes, hazard, risk, mitigation and ongoing research efforts in the solid Earth science in the Bay Area, across the U.S., and internationally.
- **Media articles and documentaries** provide exposure to our research for millions of readers and viewers. Our work has been covered in hundreds of publications around the world including the *New York Times*, *London Times*, *Los Angeles Times*, *San Francisco Chronicle*, *Scientific American*, *National Geographic*, *Time*, *Newsweek*, *Der Spiegel*, CNN, BBC, NBC, CBS, ABC, FOX News, NPR, Al Jazeera, NOVA, and the Discovery Channel.

## Advisory Activities

Testimony and briefings for legislatures, legislators and senior government officials:

- **California Governor Gavin Newsom**: Public alerting across the state.
- **White House**: Earthquake Resiliency Summit; Office of Science and Technology Policy.
- **U.S. House of Representatives**: Committee on Transportation and Infrastructure, Subcommittee on Economic Development, Public Buildings, and Emergency Management; Committee on Natural Resources, Subcommittee on Energy and Mineral Resources.
- **California State Senate**: Government Organization and Natural Resources Committees.
- Michelle Bachelet, Former **President of Chile**.
- Floyd Kvamme, Co-Chair of **President Bush’s Council of Advisors on Science and Technology**.
- James Lee Witt, **Director of the Federal Emergency Management Agency**.
- Jack Gibbons, **Science Advisor to President Clinton**.

Advising on the use of current real-time earthquake information:

- **Private organizations**, including: Google, Apple, Boeing, Chevron, Genentech, Hewlett Packard, Lam Research, Life Technologies, Intel, Microsoft, PG&E, Red Cross, So. Cal Edison.
- **Government agencies**, including: Bay Area Rapid Transit (BART), California Dept. of Water Resources, CalEMA, CalTrans, California Seismic Safety Commission, City of San Francisco.

## Professional Service

Chair, National Academies, Committee on Seismology and Geodynamics, 2015–2019.  
Chair, U.S. Earthquake Early Warning Science R&D Committee, 2006–2016.  
Chair, Ocean-Bottom Seismometer Instrumentation Pool, IRIS Oversight Committee, 2015.  
Principal Organizer, 3<sup>rd</sup> International Conference on Earthquake Early Warning: Implementing Earthquake Alerts. Berkeley, California, Sep 3-5, 2014.  
Member, Cascadia Initiative Expedition Team deploying seafloor instruments, 2011-2015.  
Chair, International Earthquake Early Warning Advisory Committee, Geological Institute of Israel. 2012-2013.  
Chair, National Science Foundation, Amphibious Array Steering Committee, 2009-2012.  
Chair, IRIS PASSCAL Standing Committee. 2009-2011. Member 2008-2011.

## Honors and Awards

- Class of 1954 Endowed Professor, UC Berkeley 2017
- National Science Foundation, GeoPRISMS Distinguished Lecturer 2015
- Tel Aviv University, Yuval Ne'eman Distinguished Lecturer 2014
- Noyce Prize for Excellence in Undergraduate Teaching, UC Berkeley 2008
- Hellman Faculty Research Award, UC Berkeley 2006

## Patents

Smartphone-based earthquake early warning systems. Licensed to Google 2019.

## Selected Publications

[Google Scholar](#) page. Complete list and reprints available: <http://rallen.berkeley.edu/pub>.

Allen, R.M., Q. Kong, R. Martin-Short (2020). The MyShake Platform: A Global Vision for Earthquake Early Warning. *Pure Appl. Geophys.* **177**, 1699–1712 <http://doi.org/10.1007/s00024-019-02337-7>.

Pritchard, M. E., R. M. Allen, T. W. Becker, M. D. Behn, E. E. Brodsky, R. Bürgmann, C. Ebinger, J. T. Freymueller, M. Gerstenberger, B. Haines, et al. (2020). New Opportunities to Study Earthquake Precursors, *Seismol. Res. Lett.* 91, 2444–2447 <http://doi.org/10.1785/0220200089>

Kong, Q., R. Martin-Short, R.M. Allen (2020). Towards Global Earthquake Early Warning with the MyShake Smartphone Seismic Network. *Seismo. Res. Lett.* **Part 1** - Simulation platform and detection algorithm. <http://doi.org/10.1785/0220190177>. **Part 2** - Understanding MyShake performance around the world. <https://doi.org/10.1785/0220190178>

Strauss, J.A., Q. Kong, S. Pothan, S. Thompson, A. Mejia, S. Allen, S. Patel, R.M. Allen (2020). MyShake Citizen Seismologists help launch dual-use seismic network in California. *Front. Commun.* **5**:32. <https://doi.org/10.3389/fcomm.2020.00032>.

Hawley, W. B., & Allen, R. M. (2019). The fragmented death of the Farallon plate. *Geophysical Research Letters*, **46**, 7386–7394. <https://doi.org/10.1029/2019GL083437>.

- Allen, R.M., D. Melgar (2019). Earthquake Early Warning: Advances, Scientific Challenges, and Societal Needs. *Ann. Rev. Earth & Planet Sci.*, **47**, <https://doi.org/10.1146/annurev-earth-053018-060457>.
- Kong, Q., S. Patel, A. Inbal, R.M. Allen (2019). MyShake: Detecting and characterizing earthquakes with a global smartphone seismic network. *Seismo. Res. Lett.*, **90**, 1937-1949, [doi: 10.1785/0220190097](https://doi.org/10.1785/0220190097).
- Kong, Q., A. Inbal, R.M. Allen, Q. Lv, A. Puder (2018). Machine Learning Aspects of the MyShake Global Smartphone Seismic Network. *Seismo. Res. Lett.*, <https://doi.org/10.1785/0220180309>.
- Martin-Short, R., Allen, R., Bastow, I. D., Porritt, R. W., & Miller, M. S. (2018). Seismic imaging of the Alaska subduction zone: Implications for slab geometry and volcanism. *Geochemistry, Geophysics, Geosystems*, **19**. <https://doi.org/10.1029/2018GC007962>.
- Allen, R.M., E.S. Cochran, T. Huggins, S. Miles, D. Otegui (2017), Quake warnings, seismic culture, *Science*, **358**, 1111, <https://doi.org/10.1126/science.aar4640>.
- Ruhl, C.J., D. Melgar, R. Grapenthin, and R.M. Allen (2017), The value of real-time GNSS to earthquake early warning, *Geophys. Res. Lett.*, **44**, 8311-8319, <https://doi.org/10.1002/2017GL074502>.
- Hawley, W.B., R.M. Allen, M.A. Richards, (2016), Tomography reveals buoyant asthenosphere accumulating beneath the Juan de Fuca plate, *Science*, **353**, 1406-1408, <https://doi.org/10.1126/science.aad8104>.
- Kong, Q., R.M. Allen, L. Schreier, Y.-W. Kwon, (2016), MyShake: A smartphone seismic network for earthquake early warning and beyond, *Sci. Adv.*, **2**, e1501055, <https://doi.org/10.1126/sciadv.1501055>.
- Martin-Short, R., R.M. Allen, I.D. Bastow, E. Totten and M.A. Richards, (2015), Mantle flow geometry from ridge to trench beneath the Gorda–Juan de Fuca plate system, *Nature Geoscience*, **8**, 965-968, <https://doi.org/10.1038/NGEO2569>.
- Allen, R.M. (2013). Seconds count. *Nature* **502**, 29-31, <https://doi.org/10.1038/502029a>.
- Obrebski, M., R.M. Allen, F. Pollitz, S.-H. Hung, (2011). Lithosphere-asthenosphere interaction beneath the western United States from the joint inversion of body-wave traveltimes and surface-wave phase velocities, *Geophys. J. Int.* **185**, 1003-1021, <https://doi.org/10.1111/j.1365-246X.2011.04990.x>.
- Allen, R.M. and A. Ziv, (2011). Application of real-time GPS to earthquake early warning, *Geophys. Res. Lett.*, **38**, L16310, <https://doi.org/10.1029/2011GL047947>.
- Allen, R.M., P. Gasparini, O. Kamigaiichi, M. Bose (2009) The Status of Earthquake Early Warning around the World: An Introductory Overview, *Seismo. Res. Lett.*, **80**, (5) p682-693, <https://doi.org/10.1785/gssrl.80.5.682>.
- Brudzinski, M. and R.M. Allen, (2007). Segmentation in Episodic Tremor and Slip All Along Cascadia, *Geology*, **35** (10) 907-910, <https://doi.org/10.1130/G23740A.1>.
- Olson, E.L., and R.M. Allen, (2005). The deterministic nature of earthquake rupture. *Nature*, **438**, 212-215, <https://doi.org/10.1038/nature04214>.
- Allen, R.M., H. Kanamori, (2003). The potential for earthquake early warning in southern California. *Science*, **300** (5620) 786-798, <https://doi.org/10.1126/science.1080912>.
- Ritsema, J., R.M. Allen, (2003). The elusive mantle plume, *Earth Planet. Sci. Lett.*, **207**, 1-12, 2003.