

**SSA**   
**Seismological  
Society of America**



**2021**  
**A Year of Connection**

## SSA Board

### Officers

John Townend, *President*

Peggy Hellweg, *President-Elect*

Bill Walter, *Past President*

Kris Pankow, *Secretary*

Mitch Withers, *Treasurer*

### Board of Directors

Annemarie Baltay (2023)

Susan Bilek (2023)

Xyoli Pérez-Campos (2024)

Heather DeShon (2022)

Karen Fischer (2024)

Hiroshi Kawase (2023)

Kuo-Fong Ma (2022)

Meghan S. Miller (2022)

Zhigang Peng (2024)

Kate Scharer (2023)

Carl Tape (2024)

*Right: Jose Cancel of Puerto Rico Seismic Network (PRSN), Alena Leeds of USGS and Javier Santiago of PRSN install a temporary seismometer at Sabana Yeguas.*

@Thomas Pratt/USGS



## Message from the President

### Our connected community

➔ **Throughout 2021, the members of our Society stayed connected to each other and to the important mission that we share.**

The recipients of SSA's 2021 honors, highlighted on the next page, remind us how much we can accomplish when we work together. Consider William Ellsworth's collaboration with a colleague to develop the widely used double-difference earthquake location method; the open-source software component of Seyed Mostafa Mousavi's deep-learning model for simultaneous earthquake detection and phase picking; Timothy Ahern's IRIS workshops that have shared best practices in hazards education across the globe; and David Wald's ShakeMap, which provides us with near-real-time maps of ground motion and shaking intensity following significant quakes.

As a Society, we've continued to bring new support to efforts like these, each of which represent another step toward a better-understood and safer world. In 2021, we made more time to connect with one another, at SSA's virtual Annual Meeting and its ongoing sessions on seismic tomography. These meetings allowed researchers near and far to share their science and receive critically important feedback. They also gave our community more time for important conversations.

One of these discussions that I was especially honored to participate in was the Annual Meeting panel on "Decolonizing Science," Kendall Moore's new documentary. The film focuses on the need for a more inclusive and equitable culture in the global scientific community. It's a need that SSA is working to address in many ways, from our ongoing ally skills training courses and land acknowledgment workshops to our newly formed Diversity, Equity and Inclusion Committee.

The generosity of the SSA community makes all of our progress possible. In these pages we thank the donors who gave gifts to SSA in 2021, including the largest in our Society's history. (If you'd care to break that record, please do.)

On behalf of SSA, I'd also like to thank our many volunteers who gave their time and talents to our community and helped us advance our mission throughout 2021. We are grateful for the editors and reviewers who helped launch *The Seismic Record*, SSA's new open-access journal; the volunteers who advocated for seismology on Capitol Hill, and the SSA Connects mentors who continued to answer our members' important professional development questions.

As I write this message we're counting down the days until we reconnect with friends and colleagues at SSA's first Annual Meeting since 2019. How exciting to look forward to a meeting without the risk of screens freezing or speakers forgetting to unmute!

It's been a tremendous honor to serve as your president. I have been awed and inspired by the work of SSA's connected community. Here's to an even better and brighter year ahead.

  
**John Townend**  
SSA President, 2021

# 2021: A Year of Outstanding Science

→ SSA's Honors Program recognizes our peers who have distinguished themselves through their innovative and often paradigm-shifting research, their early-career contributions to the field of seismology and their exemplary commitment to public service.

We honor the recipients of the Reid, Richter and Press awards and our Joyner Lecturer for their outstanding contributions and for the inspiration that they provide to the SSA community.

Their achievements remind us to keep supporting one another and keep pushing forward the boundaries of knowledge.



## 2021 Honors



**William Ellsworth**  
Professor of Geophysics,  
Stanford University

**HARRY FIELDING REID  
MEDAL**

*This medal, SSA's highest honor, recognizes outstanding contributions to seismology or earthquake engineering.*

William Ellsworth is recognized for his critical contributions to earthquake location, earthquake nucleation, earthquake recurrence and induced seismicity research.

With Felix Waldhauser, Ellsworth developed the double-difference (DD) earthquake location method, which has had a tremendous influence on the field of seismology since the publication of their seminal study in the *Bulletin of the Seismological Society of America* in 2000. The DD method has been used in thousands of investigations to precisely locate earthquakes, revealing the intricacies of fault geometry deep below ground.

Among Ellsworth's other notable research is his work on earthquake foreshock sequences and earthquake nucleation processes, and more recently, an influential body of work on the causes and consequences of induced seismicity. He is a co-director of the Stanford Center for Induced and Triggered Seismicity.

His work on understanding the causes of and solutions to induced seismicity attests to his scientific creativity, productivity and outstanding mentorship, according to Stanford geophysicist Mark Zoback, who nominated Ellsworth for the award.

"We are delighted that our students can learn seismology with theoretical rigor from someone with vast practical experience and a long and distinguished career as an academic and public servant," Zoback said in his nomination. "He has been extremely generous with students and colleagues and contributes with a level of energy and enthusiasm one would expect from someone just starting their career."

Ellsworth began his career at the U.S. Geological Survey (USGS) in 1971. He was chief of the Branch of Seismology of the USGS from 1982 to 1988 and chief scientist of the USGS Earthquake Hazards Team from 2002 to 2005. During his career at USGS and Stanford, Ellsworth has served on numerous review and advisory panels, including his current position as chair of the USGS's Earthquake Early Warning External Working Group.

Among his many honors, Ellsworth is a past president of SSA, a Fellow of the American Geophysical Union and recipient of the Distinguished Service Award of the Department of the Interior.

## 2021 Honors



### Seyed Mostafa Mousavi

Adjunct Professor of Geophysics,  
Stanford University; Research  
Scientist, Google

#### CHARLES F. RICHTER EARLY-CAREER AWARD

*This award honors outstanding contributions to the goals of the Society by a member early in her or his career.*

Seyed Mostafa Mousavi has conducted pioneering works in the emerging field of machine learning applications in seismology. He has developed algorithms to solve multiple challenging seismological research problems, including earthquake source depth classification, earthquake signal detection, location determination, magnitude estimation, event discrimination and seismic wave arrival time picking.

His 2020 publication of Earthquake Transformer, an advanced deep-learning model for simultaneous earthquake detection and phase picking, including its open-source software package, has been downloaded by researchers in more than 50 countries.

Mousavi is also known for developing multiple approaches to “denoising,” or separating earthquake signals from “noise” in a seismogram. His techniques have been used on seismic data from seafloor cables, for improving nuclear test-ban treaty monitoring and for monitoring earthquakes in dense urban environments, among other applications.

Richter, the award’s namesake “would smile and be amazed, if he were here, at the level at which Mousavi has taken raw network data and turned it into detailed maps of thousands

of earthquake locations that delimit starkly obvious fault planes,” said Charles Langston, who nominated Mousavi for the award.

“Clearly this is the future of empirical network seismology, and Dr. Mousavi is at its leading edge,” Langston added.

Mousavi has published 20 peer-reviewed papers as the first or single author in various journals and on a wide range of topics that include seismic hazard and risk assessment, crustal and upper mantle attenuation estimation, and statistical analyses of spatio-temporal patterns of seismicity, in addition to the works mentioned above.

*The Joyner Fund provides the financial support for the Richter honorarium.*



### Timothy Ahern

Longtime Director of  
IRIS Data Services

#### FRANK PRESS PUBLIC SERVICE AWARD

*This award honors outstanding contributions to the advancement of public safety or public information relating to seismology.*

Timothy Ahern became the program manager for the IRIS Data Management Center shortly after IRIS was formed and later became director of data services for IRIS, serving in that position for nearly three decades. He ushered in a new collaborative, open-data approach to observational seismology worldwide that has improved hazard assessment and increased public safety in at-risk communities. In their support of his nomination, his colleagues said he was consistently ahead of the curve in terms of understanding the technology necessary for seismic data storage and management.

To encourage global sharing, Ahern organized yearly international workshops on managing data from seismic networks in Latin America, Africa, the Middle East and Southeast Asia. The workshops share best practices in data handling and communication, software tutorials and hazards education, among other features, and have been credited with building human capacity in seismology.

Under Ahern’s leadership at IRIS, the Data Management Center moved beyond raw waveforms to producing and distributing products such as ground motion visualization and aftershock animations that have been widely useful to both seismologists and the general public.

“Tim’s vision of freely available high-quality data has impacted every seismologist across the globe,” said Brian Stump, the Albritton Chair of Geological Sciences at Southern Methodist University, who nominated Ahern for the award. “Access to data, quantification of data quality and a range of analysis tools not only supports institutions funding the acquisition of the data but provides professionals and students alike the ability to explore these datasets.”

# 2022 Honor



**David J. Wald**  
Seismologist, USGS National Earthquake Information Center, Golden, Colorado

**WILLIAM B. JOYNER  
MEMORIAL LECTURE**

David. J. Wald is responsible for developing and managing ShakeMap, which provides near-real-time maps of ground motion and shaking intensity following significant earthquakes, as well as the Did You Feel it? citizen-science earthquake reporting system. He leads development and operations of other systems for post-earthquake response and pre-earthquake mitigation, including ShakeCast, Ground Failure and PAGER.

Editor-in-chief of EERI's premier journal *Earthquake Spectra* and an adjunct professor in the Geophysics Department at the Colorado School of Mines, Wald was an IRIS/SSA Distinguished Lecturer in 2004 and received EERI's Distinguished Lecturer award in 2014. He also served on the Board of Directors for SSA and EERI and was the 2009 SSA Frank Press Public Service Award recipient. In 2021, Wald received the USGS Shoemaker Lifetime Achievement Award in Communications.

His Joyner Lecture offers a combined seismological/earthquake engineering view of future earthquake response and recovery, where the initial impact and secondary hazard models are rapidly supplemented with crowd-sourced and remotely sensed observations that are integrated in a holistic fashion for more a more accurate view of the consequences. He will deliver the lecture at both the 2022 SSA Annual Meeting and the EERI 2021 Annual Meeting and 12th National Conference on Earthquake Engineering.

*Awarded by the Earthquake Engineering Research Institute and SSA, the lectureship honors William B. Joyner's career at the USGS and his commitment to continuing communication and education at the interface between research findings of earthquake science and the practical realities of earthquake engineering.*



© USGS/H. Dieterich

**→ Who Should SSA Honor Next?**

When our peers make a positive difference in our community, we need to recognize their contributions.

Learn how to nominate a deserving colleague for an SSA honor and be sure to note the **new nomination package deadline of 30 September.**

[seismosoc.org/awards](https://seismosoc.org/awards)

# 2021: A Year of Connection

→ Throughout the past year, SSA members stayed connected to one another and to the cause that unites our community. They shared their time, talents, papers, presentations and financial gifts with the Society—even when it wasn't convenient or easy to do so.

The strength of this community is the reason that SSA has continued to thrive—not simply survive—during a global pandemic. Together in 2021 we welcomed a new peer-reviewed journal to our family of publications and offered more professional support to members than ever before. Thanks to an extraordinary gift, we also established our most ambitious plans yet to continue developing the seismologists of tomorrow.

**WE ARE ONE COMMUNITY. TOGETHER WE ADVANCE EARTHQUAKE SCIENCE.**



## Sharing Research with the World

### The SSA Annual Meeting

**At SSA headquarters in Albany, California, we've always measured time in relation to our flagship event, the Annual Meeting. Outstanding co-chairs and a small but mighty team of staff work behind the scenes for many months to ensure that our annual gathering continues its longstanding tradition of scientific excellence.**

In 2021, as health and safety concerns surrounding COVID-19 forced us to move our meeting online, the SSA community stood ready, as always, to help with the planning. In spite of the pandemic-related challenges and disruptions in their daily lives, our members provided the Society with an exciting array of abstracts.

In the end, 1,033 scientists and engineers found a quiet place and made time in their busy schedules to join one another online for the five-day 2021 virtual Annual Meeting. Many had taken advantage of the free training from an internationally renowned speech coach that SSA offered to every member before the gathering. During the dynamic week of daily technical oral and poster presentations (more than 750 in total), plenary sessions and networking opportunities, together we advanced earthquake science.

#### DID YOU KNOW?

In addition to the opportunity to apply for an Annual Meeting travel grant, all student and early-career members enjoy deep discounts to attend SSA's flagship meeting.

→ View these 2021 Annual Meeting presentations and more at [seismosoc.org/meetings/ssa-2021-recordings](https://seismosoc.org/meetings/ssa-2021-recordings)



**What Have We Learned About the Earth's Interior from Seismology in the Last 40 Years?** — *Barbara Romanowicz, University of California, Berkeley*



**Rules and Outliers in Seismology—Implications for Hazard Mitigation Strategy** — *Hiroo Kanamori, California Institute of Technology*

### Missed a Session?

SSA members can log in to their accounts to view past virtual seismic tomography sessions, including:

- » Cutting Edge Methods for Seismic Imaging I – Abstracts
- » Cutting Edge Methods for Seismic Imaging II – Abstracts
- » Cutting Edge Methods and Applications in Seismic Tomography – Abstracts
- » Cutting Edge Methods and Applications in Seismic Tomography II – Abstracts
- » Full-Waveform Methods and Applications

→ [seismosoc.org/tomography/past-tomography](https://seismosoc.org/tomography/past-tomography)

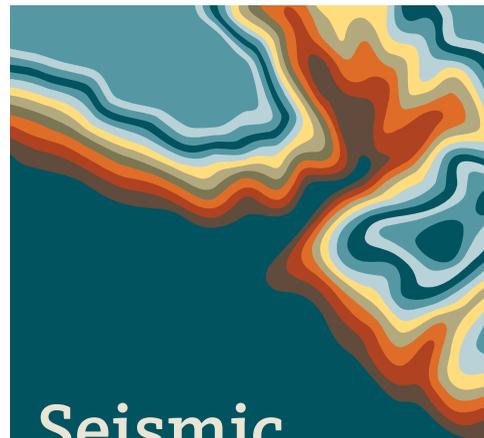


## Exploring New Ideas in Seismic Tomography

The Annual Meeting was not the only opportunity for our community to connect, present research and receive critically important feedback from one another in 2021.

SSA also continued its series of virtual sessions exploring the exciting topic of seismic tomography. The idea for these new sessions emerged when the Society's first in-person topical meeting (originally scheduled for 2020) was postponed due to the pandemic.

While the scientific conversation continued online, plans for the in-person gathering continued. We can't wait to welcome attendees to "Seismic Tomography: What Comes Next?"—at long last—in Toronto this October.



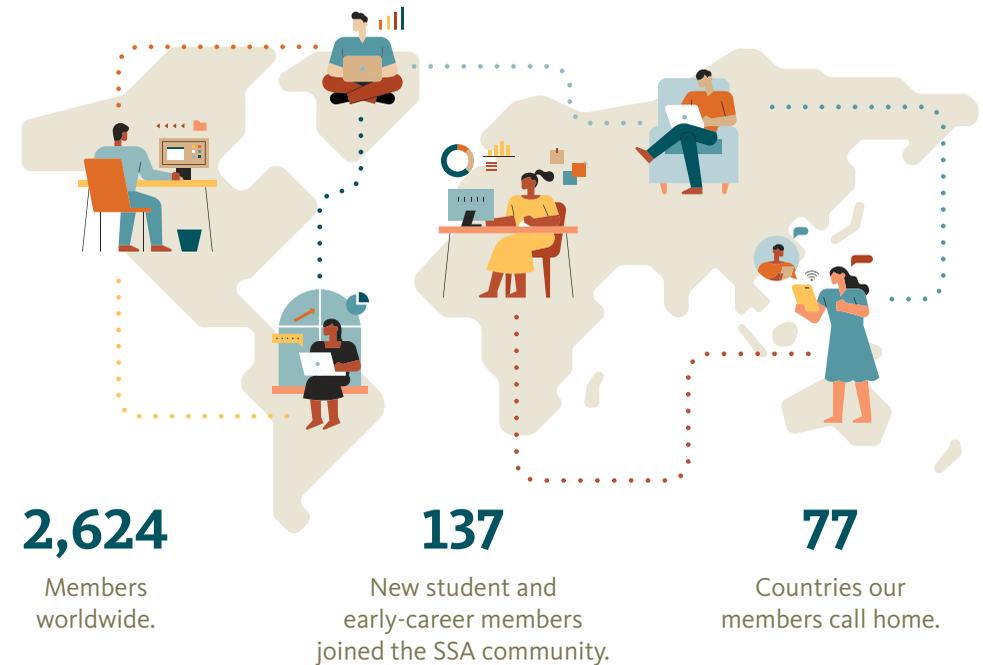
## Seismic Tomography

WHAT COMES NEXT?

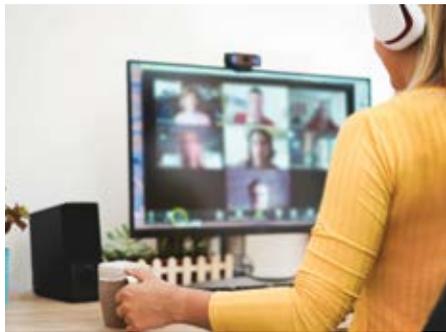
28–30 Oct 2022  
Toronto, Canada

## A Growing Global Community

In 2021 the Society's network of scientists and engineers grew. Our members continued to bring their research across geographic borders and make new connections worldwide.



# Granting Travel Wishes



**Career-changing connections happen at scientific conferences. SSA travel grants give more members the opportunity to enjoy them.**

In 2021, 19 student and international scientists participated in the Society's virtual Annual Meeting with the assistance of an SSA Annual Meeting Travel Grant. Our Global Travel Grant program helped four more members participate in seismology-related conferences hosted by other organizations worldwide.

The Global Travel Grant program continues to help student and early-career members make a name for themselves in the wider scientific community. This critically important support has been available throughout the pandemic whether recipients travel to the meeting or make their presentations virtually.

Our grant recipients continue to report back that they received invitations to submit papers, met new collaborators and received critically important feedback from senior scientists. Travel grants remain one of the most important ways that we help develop a skilled workforce of seismologists who will continue to advance earthquake science.

## DID YOU KNOW?

SSA Annual Meeting Travel Grants now include stipends for childcare to help ensure that the parents in our community are available to join the scientific conversation.



→ **Where will an SSA Global Travel Grant take you? Student and early-career members can apply for the next round of grants this July at: [seismosoc.org/awards/global-travel-grant/](https://seismosoc.org/awards/global-travel-grant/)**

## A \$100 Seismometer the Size of a Rubik's Cube

At the 2021 Annual Meeting we were delighted to introduce Vivien He, a Southern California high school student, to our community. Her SSA Travel Grant enabled her to attend the conference free of charge.

At the meeting He told attendees about her invention, a low-cost seismometer device akin to a smart smoke detector. The device had already detected all earthquakes over magnitude 3.0 around Los Angeles since the prior September.

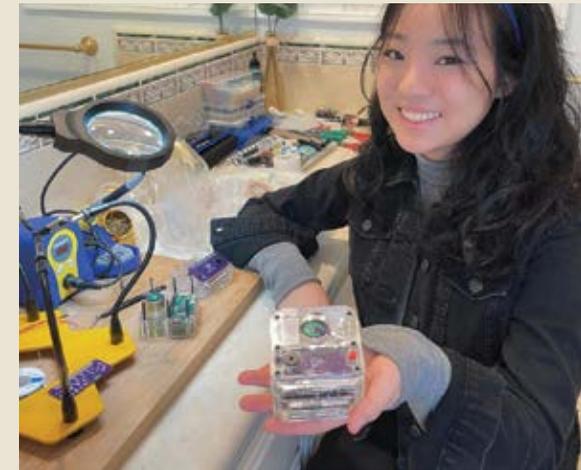
Now wrapping up her senior year at Palos Verdes Peninsula High School in Rolling Hills Estates, He researched, designed, built and tested the entire device over a summer and fall spent at home under COVID-19 restrictions. Her home lab occupied a corner of a bedroom with "bedside drawers full of little wires and extra geophones and components," she said.

There was also the bathroom she borrowed where the bright light was good for soldering. For acrylic laser cutting, her dad helped her drag a table out of the garage into the yard as a safety precaution.

**“Don't tell my mom—but I did one time have a little bit of a fire,” she admitted.**

The seismometer device fills a gap in current earthquake early warning systems, He said, by providing a consumer-friendly, low-cost but built-for-purpose alternative to more expensive, scientific-grade systems like the West Coast's ShakeAlert system. Her device offers a way for people in earthquake zones to gain a few to tens of seconds of warning to take action and automatically shut down utilities and machinery at work.

Since attending the Annual Meeting, He has set up a nonprofit, Melior Earth, to help her get the device to those who need an inexpensive earthquake early warning system. "I do have hopes that I would be able to provide this to lower-income families and neighborhoods with less earthquake-proof infrastructure," she said.



*Vivien He with her earthquake early warning device in her makeshift soldering room.*

### → **How To Get A Head Start In Science Like Vivien He**

**STEP ONE:**  
Obtain an SSA Annual Meeting Travel Grant early in your research (even if you're still in high school).

**STEP TWO:**  
Participate in this meeting and present your research to the world.

**STEP THREE:**  
Respond to invitations to join researchers at Caltech and publish your first paper in an SSA journal.

# Inviting More Voices to Seismology

**Together we advance earthquake science. That simple tagline captures the heart and soul of SSA.**

We are one community made up of members from many places exploring many disciplines at many points in our professional journeys, and we want that diversity to continue to grow. In 2021 we remained committed to fostering a Society that is welcoming and supportive to all who wish to join.

**“Diversity, equity and inclusion are critical issues for our community and our science.”**

—JOHN TOWNEND,  
SSA President, 2021

In November, following the first report of our Diversity, Equity and Inclusion (DEI) Task Force, the SSA Board of Directors established a new, permanent DEI Committee. Its charge:

- » Recommend to the Board actions and initiatives that will improve DEI throughout SSA;
- » Support the implementation of the principles and initiatives that foster DEI in all SSA activities;
- » Document and report to the Board on an annual basis the DEI initiatives implemented within SSA and their outcomes; and
- » Liaise with DEI groups in other geoscience societies to develop and share resources that improve the participation of under-represented groups in SSA and in geoscience more generally.

“SSA’s mission—advancing earthquake science worldwide—requires a thriving, interconnected community representing a wide array of perspectives, experiences, ideas and questions,” said SSA President John Townend. “Likewise, our success depends on members standing up for the rights of one another, recognizing and removing workplace obstacles, and welcoming all who wish to join and thrive in our Society. Diversity, equity and inclusion are critical issues for our community and our science.”



In November, SSA members Xyoli Pérez-Campos, Carlos Alberto Vargas, Ericka Alinne Solano and Mario Ruiz taught members how to write land acknowledgment statements. Conducted in Spanish, the workshop explored these statements as a way to both reflect on the history of the land where we conduct our research and honor Indigenous communities.



In April, SSA members were among the first to view an early screening of Kendall Moore’s “Decolonizing Science.” The documentary examines the need to address past injustices in order to create a more inclusive future for the global scientific community.

→ Your ideas help SSA create a more diverse, equitable and inclusive global community. Share them at: [DEI@seismosoc.org](mailto:DEI@seismosoc.org)

## DIVERSITY, EQUITY AND INCLUSION COMMITTEE

- » **Kate Scharer**, USGS chair
- » **Richard Alfaro**, Los Alamos National Laboratory industry representative
- » **Jeff Bayless**, AECOM Membership Committee representative (ex officio)
- » **Sue Bilek**, New Mexico Institute of Mining and Technology 2022 Nominations (BOD) Committee chair (ex officio)
- » **Esteban Chaves**, Observatorio Vulcanológico y Sismológico de Costa Rica representative based outside the U.S.
- » **Heather DeShon**, Southern Methodist University Publications Committee representative (ex officio)
- » **Lisa Grant Ludwig**, University of California Irvine Government Relations Committee representative
- » **Monique Holt**, University of Illinois Chicago early-career representative
- » **Mariah Jenkins**, USGS SSA’s science research community representative
- » **Meghan Miller**, Australian National University Honors Committee representative (ex officio)
- » **Leah Salditch**, USGS Meetings Committee representative (ex officio)
- » **Aaron Velasco**, The University of Texas at El Paso minority-serving institutions representative

# Providing Professional Support

## TRAINING

In 2021 our members joined us online for these complimentary trainings:

- » Tips for Preparing Your Abstract
- » Active Bystander Intervention to End Harassment
- » Include is a Verb: How Allies Make Inclusion a Reality
- » Speech Coaching for Poster Presenters



©University of Oklahoma

*Xiaowei Chen, an SSA Connects mentor, in the field at the first seismic site to study foreshock activities leading up to the Pawnee earthquake.*

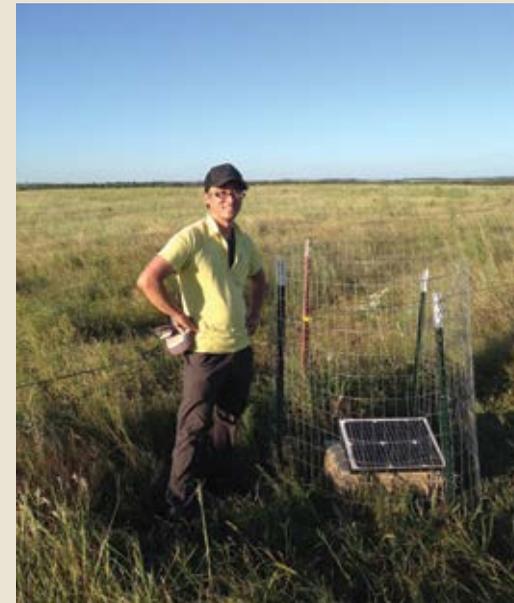
## The Ripple Effect

At SSA, we want to make sure that our members know how to write a land acknowledgement as well as a scientific abstract. We believe that understanding the latest developments in machine learning is as important as knowing how to create a supportive workplace and a fulfilling career.

In 2021, we continued to expand our virtual professional development opportunities to explore these subjects and more. As a Society we want to help every member reach their potential. We also want to contribute to building a culture of support across the wider scientific community.

Our SSA Connects mentoring program is one way our members are joining us in creating this ripple effect. Throughout 2021 our early-career and veteran scientists stepped forward to connect with our students in these monthly meetups and answer their most pressing career-related questions.

One mentee described the sessions as career therapy. Others told us: “That was brilliant,” “please do more,” and “best webinar I’ve ever been in thanks to the awesome mentors.” But we really know the program is working when our mentees come back later to pay it forward and serve as mentors themselves.



*Nori Nakata, an SSA Connects mentor, deploying seismometers in Pawnee, Oklahoma.*

## Thank You, Mentors

These volunteers shared their insight and advice in our mentoring sessions, including:

- » Early-Stage Career Advice
- » Work-Life Balance in Science
- » Proposal and Grant Writing
- » Earthquake Early Warning
- » Range of Jobs Available in Seismology
- » Ground Motion
- » Advice for Student and Early-Career Members
- » Programming Languages: What You Need to Know

→ Looking for career advice or ready to share it? Get connected with our mentoring program at:  
[seismosoc.org/jobs/ssa-connect](https://seismosoc.org/jobs/ssa-connect)

## 2021 SSA CONNECTS MENTORS

- » **Rachel Abercrombie**, Boston University
- » **Luciana Astiz**, National Science Foundation
- » **Julian J. Bommer**, Imperial College London
- » **Rich Briggs**, USGS
- » **Esteban Chaves**, Volcanological and Seismological Observatory of Costa Rica, Universidad Nacional
- » **Xiaowei Chen**, The University of Oklahoma
- » **Angela Chung**, University of California, Berkeley
- » **Wenyuan Fan**, University of California, San Diego
- » **Megan Flanagan**, EditSprings
- » **Dara Goldberg**, USGS
- » **Jeanne Hardebeck**, USGS
- » **Emily Kleber**, Utah Geological Survey
- » **Fan-Chi Lin**, University of Utah
- » **Maureen Long**, Yale University
- » **Stephen R. McNutt**, University of San Francisco
- » **Andrew Michael**, USGS
- » **Sarah E. Minson**, USGS
- » **Morgan Moschetti**, USGS
- » **Nori Nakata**, Massachusetts Institute of Technology
- » **Marleen Nyst**, RMS
- » **Sunyoung Park**, University of Chicago
- » **Adam Pascale**, Seismology Research Centre
- » **Rebecca O. Salvage**, University of Calgary
- » **Seth Stein**, Northwestern University
- » **Brian Terbush**, Washington State Emergency Management Division
- » **Suzan Van der Lee**, Northwestern University
- » **John Vidale**, University of Southern California
- » **Christa von Hillebrandt-Andrade**, NOAA
- » **Shawn Wei**, Michigan State University
- » **Ivan Wong**, Lettis Consultants International, Inc.
- » **Gilead Wurman**, ENGEO Incorporated
- » **Michael Wyssession**, Washington University in St. Louis
- » **Max Wyss**, International Centre for Earth Simulation
- » **Lingling Ye**, Sun Yat-Sen University
- » **Cleat Zeiler**, Nevada National Security Site
- » **Katerina Ziotopoulou**, University of California, Davis



3

Outstanding peer-reviewed journals

4

Outstanding editors-in-chief

Allison Bent, Keith Koper; Thomas Pratt and his successor, P. Martin Mai

1,070

Volunteer reviewers

60

Volunteer associate editors

## Expanding Our Publications Program



### The Seismic Record

Open-access, rapid publication, short-form papers on the latest seismological developments and events that demand immediate attention. That's the fastest way to describe our fast-moving publication, *The Seismic Record*. Published for the first time in April 2021, the journal is the latest addition to SSA's family of widely read and cited peer-reviewed publications.

Led by Editor-in-Chief Keith Koper and featuring scientific insights from authors around the globe—*TSR* is sharing research that can't wait. Research like Lawrence Livermore National Laboratory researchers Sean Ford and Bill Walter's comparison of coda waves, the scattered waves that arrive after the direct waves of a seismic event. In *TSR*'s debut issue they told us the comparison could be used to determine the relative locations of two underground explosions. The technique, called coda wave interferometry, was tested on explosions conducted as part of the Source Physics Experiment. Ford and Walter reported that coda wave interferometry can also put a limit on the extent of damage caused by an explosion. Their findings suggest the technique could be used to improve the estimates of the relative locations of larger explosions, such as the series of announced nuclear tests conducted by the Democratic People's Republic of Korea over the past two decades.



### Seismological Research Letters

In 2021, Allison Bent, *Seismological Research Letters*' outstanding editor-in-chief since 2018, continued to share her superb insight, innovative ideas and leadership with our publications program. Bent, a research seismologist with Natural Resources Canada, led the creation of six outstanding *SRL* issues in 2021, including two focus sections. The May 2021 *SRL* issue offered a special exploration of European Seismic Networks and Associated Services and Products. September 2021 focused on Arctic and Antarctic Seismology.



### Bulletin of the Seismological Society of America

Thomas Pratt, *BSSA* editor-in-chief since 2016, concluded his distinguished five-year term of service in September 2021. The research geophysicist at the USGS cultivated several special issues, including issues on the 2016 Kaikoura earthquake, 1967 Koyuna earthquake, the 2019 Ridgecrest earthquake sequence, and observations, mechanisms and hazards of induced seismicity. Special 2021 sections developed under Pratt's tenure included advances in site response estimation, fault displacement and near-source ground models, and a special issue on Martian seismology and the InSight mission to Mars. Pratt also spearheaded the recent redesign of *BSSA* and created its new Key Points overviews that help readers locate specific information more quickly. The Society is grateful for his many editorial contributions.



Workers lower a package containing chemical explosives into a borehole for a Source Physics Experiment detonation. The resulting data was studied by Lawrence Livermore National Laboratory researchers Sean Ford and Bill Walter and published in *TSR*'s first issue.

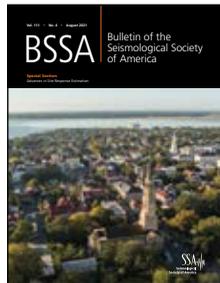
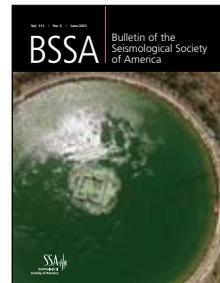
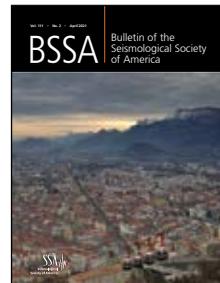
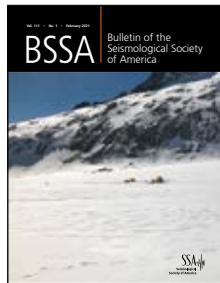


P. Martin Mai, a professor of geophysics in the Earth Science and Engineering program of the Physical Sciences and Engineering Division at KAUST, is *BSSA*'s new editor-in-chief. Mai, who stepped into the role in September, has published more than 100 peer-reviewed papers, and since 2003 has supervised more than 35 graduate students and more than 15 postdoctoral researchers. He served as president of the Seismology Division of the European Geosciences Union from 2015 to 2019. In 2018, Mai was recognized by SSA as an Outstanding Reviewer for his thorough and prolific work on *BSSA*. He has been a regular reviewer for the journal since 1999, and SSA is delighted to welcome him to the editorial team.

# A Year of Peer-Reviewed Research

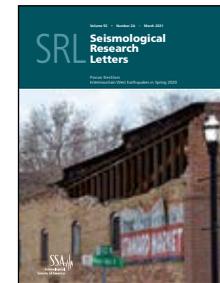
## Bulletin of the Seismological Society of America

The premier journal of advanced research in earthquake seismology and related disciplines, publishes original papers advancing our understanding of seismology and seismic hazard analyses, as well as review articles summarizing important research topics.



## The Seismic Record

SSA's newest journal, is open access and online-only, providing an outlet to cover recent events and current topics of strong significance that warrant rapid publication. It features short-form articles on the broad range of seismology and earthquake science.



## Seismological Research Letters

Seeks to publish informative articles for a broad scientific audience, highlighting recent seismic events and contemporary topics relevant to the seismology of central and eastern North America and intraplate tectonics.

## Which journal is right for your paper?

→ Learn more about each of SSA's peer-reviewed journals and how you can submit a paper today at: [seismosoc.org/publications](http://seismosoc.org/publications)



A 2021 study published in *Seismological Research Letters*, demonstrates how seismic monitoring can be used to track permafrost stability under global climate change.

# Working Around the Globe

**How do SSA members advance earthquake science? Through their daily work at computers, inside classrooms and in the field.**

Our monthly “At Work” columns tell the stories of these important contributions to our mission. The stories are one more way that SSA shares best practices, explores our broad span of disciplines and keeps telling the world why seismology matters.

## At Work: Rengin Gök

MARCH 2021

Rengin Gök’s work day starts early, with text messages and email from all around the Middle East, Central Asia, Southeast Asia and the Caucasus regions. Even before the pandemic, she kept odd office hours, responding to her colleagues in these regions late into the night and on weekends.

“I have collaborators, but for me they are like family,” says Gök, who is the program manager for the Seismic Cooperation Program at Lawrence Livermore National Laboratories (LLNL). “I feel like I have this invisible family that I interact with all day.”



*Rengin Gök with her newest collaborator, Beanie, a “pandemic puppy,” who joins her on an early-morning calls.*

In her position as program manager, Gök helps to develop and improve the capacity in seismic monitoring and understanding Earth structure throughout the regions and to connect experts across the world with seismologists in 15 countries to develop seismic hazard and risk assessment models. The program is funded by grants from the U.S. Department of Energy.

“I’m always interested in solving seismology-related problems, looking at a new seismogram, talking to somebody from a new region and working with them in establishing research collaboration,” she says. “It’s sort of my passion.”

The goal of the program is to support advanced and high-quality data collection in the regions that improves seismological research globally, upgrades seismic hazard maps and modernizes national building codes, Gök says.

Before the COVID-19 pandemic, Gök was traveling to each of the countries in her program for days or sometimes a week at a time to meet with her family of colleagues. She thought that the travel lockdowns would make her work more difficult, but “things have turned out way better than I thought for this program,” she says. New partners in places like Egypt, which had not been a member of the program, are now reaching out to her at her desk in California.

**“I have collaborators, but for me they are like family. I feel like I have this invisible family that I interact with all day.”**

— RENGİN GÖK,  
program manager, LLNL



*Gök and LLNL team with Saudi colleagues at the entrance of National Center for Earthquake and Volcano Monitoring of Saudi Geological Survey in Jeddah, Saudi Arabia.*

“People all over are ready to bloom and do really good science,” Gök says, but they are often working in difficult conditions with low pay. “If we want to them to engage with science, we have to offer, as a developed country, as a developed community, things that we can build together.”

She encourages her colleagues to include researchers from these regions in scientific meetings and to write papers with them. Outreach to Ph.D. candidates or other young researchers is especially important, Gök says, to help countries recruit more people to the earth sciences.

### → Discover more

Read the rest of the story and more than 50 others in our ever-expanding collection of At Work columns: [seismosoc.org/inside/ssa-at-work](https://seismosoc.org/inside/ssa-at-work)

→ Have an “At Work” story to tell? Contact: [press@seismosoc.org](mailto:press@seismosoc.org)

# Connecting with Capitol Hill



“While Congress closed their doors to COVID, we kept the lines of communication open and continued to work with legislators and staff to address funding for earthquake programs in the federal government.”

—LISA GRANT LUDWIG, chair of SSA's Government Relations Committee

**Years of budget cuts at the federal level, coupled with an anticipated wave of retirements in the government, academic and private sectors of geoscientists, have called our Society to advocate for an increased focus on U.S. STEM programming, from the kindergarten through the post-doctoral level.**

SSA's policy statements are one tool in our advocacy arsenal. In 2021 we updated our Society's Workforce Development Statement and shared it with key stakeholders. The clear and concise overview helped our Government Relations Committee and its growing cadre of volunteers engage U.S. Congress on the need for increased funding in STEM education at all levels, a need to bring parity to underserved populations and a need to increase funding to federal programs that support research in the geosciences.

We put the same thought and care into our latest statements on seismic event monitoring. These underscore the continued need for the federal government to support and improve all of the observing and hazard monitoring networks, alert programs and products under federal jurisdiction, as well as make sure that qualified staff are in place to operate and maintain them.

Significant investment has been made by the government, independently and in collaboration with academic and private partnerships, to develop, implement and maintain several monitoring networks that can detect earthquakes, tsunamis, landslides and volcanic eruptions as well human-caused events like explosions and induced earthquakes. Data from these networks allows state, local and tribal governments to make informed decisions in the event of disaster and can save lives and property. The newly approved statement on Monitoring Earthquakes Tsunamis and Other Hazards will also be used to inform discussions with Congress to address the funding and continued support of these critical monitoring networks. In addition, SSA is working jointly with the American Geophysical Union to update and reaffirm its statement on monitoring the Comprehensive Nuclear Test Ban Treaty.

U.S. earthquake science protects Americans and the places they live and work. Sustained federal funding for seismology is key to that protection. Seismic networks also play an important role in detecting nuclear testing treaty verification, helping make the world a safer place. SSA maintains a close connection with Capitol Hill to ensure that our policymakers understand the need to continue supporting seismology.



© Kurt Hickman

*Students gather atop Mount Vesuvius in southern Italy and listen as geophysicist Tiziana Vanorio discusses how volcanic activity has shaped the surrounding region.*

## DID YOU KNOW?

Based on the age demographics of the current geosciences workforce as identified by the U.S. Bureau of Labor Statistics, with an average retirement age of 65, then 27% of the existing geoscience workforce will be retiring by 2029.

The number of geoscience graduates entering the workforce each year will not be sufficient to fill the gap created by these retirements and the addition of over 22,000 new jobs that are projected to be created in the profession by 2029. As a result, the expected geoscience workforce deficit will be approximately 130,000 full-time equivalent geoscientists by 2029.

— *Geoscience Workforce Projections 2019–2029, American Geosciences Institute*

# Stepping into New Roles

## Peggy Hellweg, SSA President-Elect

Hellweg, operations manager for the Berkeley Seismological Laboratory at the University of California, Berkeley, was elected president-elect by the SSA Board on 14 April. Hellweg previously served as SSA secretary and co-chaired the 100th Anniversary Earthquake Conference, SSA's joint meeting with the Earthquake Engineering Research Institute and Disaster Resistant California to commemorate the 1906 earthquake.

"I am greatly honored by the trust of the Board," said Hellweg, adding that she is excited to "contribute to stewardship of the services and support that SSA provides its members, and ideas toward strategic planning that will guide their improvement and growth. Two of the most important directions will be broadening the understanding and acceptance of high-quality earthquake science through our three journals and other outreach activities, and nurturing the growth of diversity, equity and inclusion in our Society and our wider community."



©Derek Rensburg/dailycal.org

## Kris Pankow, SSA Secretary

Pankow, a research professor at the University of Utah and the associate director of its Seismograph Stations, is looking forward to her new role as secretary of SSA. "I'm happy to have an opportunity to give back to this group," she said. "SSA's always been my go-to organization."

Mentoring sessions, the recent report by the SSA Diversity, Equity and Inclusion Task Force and the Annual Meeting, "one of my favorite meetings of the year, make me really proud to be part of SSA," she added.

In one of her latest projects, Pankow and her many student and postdoc mentees are supporting the seismic monitoring for Utah FORGE, a field laboratory funded by the U.S. Department of Energy where scientists are developing and testing enhanced geothermal system technologies.



Above: Utah FORGE field laboratory where scientists are developing and testing enhanced geothermal system technologies.

©Eric Larson (Flash Point SLC)

## 2021: A Year of Unprecedented Generosity



The biggest Society news of 2021 arrived in September: a record-breaking gift of more than \$1.6 million. The bequest from the estate of Clarence Allen (1925–2021), SSA's 41st president, is the largest donation in the Society's 115-year history.

Following careful deliberation, the SSA Board of Directors decided to use Allen's gift to create a special fund supporting student and early-career member involvement in scientific conferences. The fund, planned to be fully operational within three years, will also provide community grants to support programs and events within the SSA community that serve to advance earthquake science, with a special focus on developing the seismologists of tomorrow.

## An Extraordinary Seismologist, An Extraordinary Gift

**In September a letter arrived at SSA headquarters that had to be read and reread several times. After all, it contained some unbelievably good news—the largest gift in our Society's history was on its way to our community.**

While SSA staff members were floored by Clarence Allen's generous bequest, those who knew the seismologist best were not surprised. They told us Allen was incredibly kind as well as humble. It was just like him, they said, to do something so thoughtful and in such a quiet way, essentially slipping more than one million dollars under SSA's door before the giant in seismology left us.

Allen, a renowned Caltech professor emeritus of geology and geophysics, was 96 when he died on 21 January 2021. Throughout his distinguished career, his dual expertise in seismology and geology served him well in his research, in his advocacy for effective hazard mitigation, and in his many leadership roles across the scientific community. Those roles included service as president of both SSA (1975) and the Geological Society of America (1974).

Allen's wisdom still speaks from his thesis, which shed light on the structure of the San Geronio Pass area of the San Andreas Fault ("a remarkable piece of work everyone appreciates," says Hiroo Kanamori, John E. and Hazel S. Smits Professor Emeritus of Geophysics at Caltech). It still speaks from the pages of many a well-worn copy of "The Geology of Earthquakes," (Oxford University Press, 1997), the book Allen co-authored with Robert Yeats and Kerry Sieh. And it speaks from his many influential papers such as 1974's "Geological Criteria for Evaluating Seismicity," in which he argued that the geologic record "is a far more valuable tool in estimating seismicity and associated seismic hazard than has generally been appreciated."

Allen's friends and former colleagues describe him as a gifted scientist and communicator. "I think that his greatest scientific accomplishment was in clarifying and advancing knowledge of the relation between seismicity and faulting," says Paul C. Jennings, Caltech professor emeritus of civil engineering and applied mechanics. "Because of his knowledge and gentle manner, he also was a very good member and often, chair, of many scientific committees."



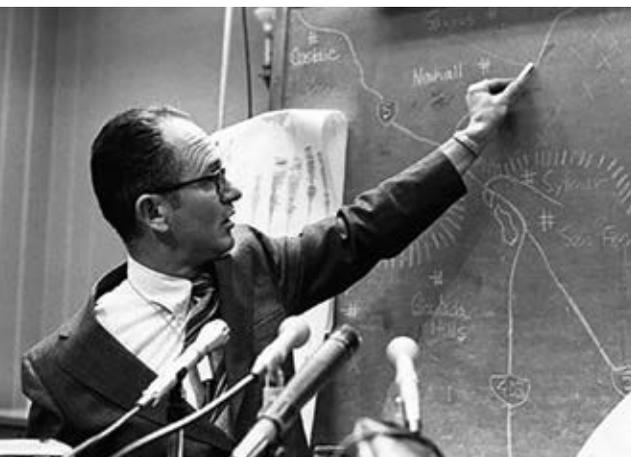
Photo courtesy of Caltech

**Clarence Allen • 1925–2021**  
**SSA's 41st president**

## Making the Rocks Talk

Terry Wallace, director emeritus of the Los Alamos National Laboratory and past president of SSA, earned his doctorate at Caltech and recalls how Allen always steered the conversation at the university's Seismological Laboratory coffees so that every scientist could participate. He still marvels at Allen's "incredibly evenhanded" evaluations of every single forecast that came to him as chair of the National Earthquake Prediction Council (1979–84). And no matter where he led students on field trips, Allen's geological insight made the journey "magical," Wallace says. "He could make the rocks talk and tell a story."

In the aftermath of the devastating 1971 San Fernando Valley Earthquake, Allen began making the rocks talk to policymakers. He used his experience in the field and what Wallace describes as "his clear, articulate voice" to tell legislators "you have to pay attention to geology. Geology could have told you this earthquake would happen where it did." Allen chaired the National Academy of Sciences Committee that examined the initial scientific and engineering lessons of the event and published its findings in 1971. The following year, the Alquist-Priolo Earthquake Fault Zoning Act was signed into law in California, prohibiting building across active faults.



Allen is also remembered for his contributions to the 1970 Report of the Task Force on Earthquake Hazard Reduction, published by the Office of Science and Technology Policy, and his work lobbying for the formation of the National Earthquake Hazards Reduction Program. "No one should underestimate his role in getting that first act passed [in 1977]," Wallace says. "He used his position at SSA as a bully pulpit for the public good."

**“He used his position at SSA as a bully pulpit for the public good.”**

—TERRY WALLACE, director emeritus, Los Alamos National Laboratory

Jennings recalls how Allen could "assess geological and seismological data and research from the viewpoint of its relevance to earthquake performance and engineering design," and points to one illustrative example. Allen's research that showed that "most, if not all, of the largest reservoir-triggered earthquakes were in areas where there was evidence of geologically recent faulting, a result that showed how to approach this problem."

Kanamori also counts Allen's work in hazard mitigation among his greatest contributions, contributions that many people may not appreciate, he says, because "Clarence was a very modest person."

Colleagues note that Allen wasn't one to publicize his contributions himself, but they were recognized with numerous awards and honors, from Allen's G. K. Gilbert Award from the Carnegie Institute of Washington, D.C. in 1960 to his George Housner Medal from the Earthquake Engineering Research Institute in 2001. He was elected as a fellow to the American Academy of Arts and Sciences in 1974 before his election in 1976 to both the National

*Clarence Allen fields questions about the San Fernando Earthquake during a press conference at the Seismological Laboratory on 10 February 1971. (Photo courtesy of Caltech)*

Academy of Engineering and the National Academy of Sciences. The California Earthquake Safety Foundation awarded him the Alfred E. Alquist Award for public service in 1994.

## The Path to Seismology

In 1996, Allen received the Medal of the Seismological Society of America for his contributions to seismology and earthquake science. At the awards ceremony he reflected on his childhood in a "family of inveterate travelers and campers," recalling the time his father piled the Allens into a 1927 Dodge to travel from their home in Southern California, to Eugene, Oregon, "without ever getting on a paved highway."

Allen said that his family's early expeditions, and later, during World War II, his volunteer service in the U.S. Army Air Corps, which found him examining maps over the Pacific as a B29 navigator, "were largely responsible for my interest in things geographical that ultimately—and luckily—led me into geology and geophysics."

Allen's military service interrupted his undergraduate studies at Reed College but he returned to earn his B.A. in physics in 1949 before heading to Caltech to pursue his master's degree in geophysics (1951) and his Ph.D. in geology (1954) with the aid of the G.I. Bill.

In a 1994 interview with Caltech, Allen described his migration from geophysics to geology: "It was a matter of what I was interested in. Particularly, I discovered I had this love for field geology, the mapmaking aspect of it, and trying to figure out what the three-dimensional configuration of geologic structures was. At that time, and even today, I hope, there's no great boundary between the two fields. No one was particularly worried that I had to be one or the other. When it came time to do my thesis, I decided I'd like to do a geologic field problem. And that's what I did out in San Geronio Pass. I wasn't giving up on geophysics, but I think that by the time I left here I was probably more of a geologist than a geophysicist."



*Clarence Allen (first row, second from right) with his fellow B-29 crew members, Okinawa, 1945. (Photo courtesy of EERI)*

After a brief teaching stint at the University of Minnesota, Allen returned to his home state to join the Caltech faculty in 1955, and enjoyed the stimulating exchange of ideas with colleagues like Kanamori, Don Anderson, Beno Gutenberg, Frank Press and Charles Richter.

## Connected to the SSA Community

In the 1960s, Allen was known to keep a packed backpack and suitcase inside his office so he was ready to explore any surface fault that called from around the globe. Kanamori recalls one of Allen's most interesting stories from these research trips. "Hugo Benioff had an idea that the entire Pacific is rotating clockwise and expected to find a right-lateral fault in the Philippines. Clarence was sent there to find out. He went there and found the opposite (left-lateral), and Benioff quickly dropped his idea," says Kanamori. "I thought that this illustrates very well how scientific research goes. It does not always go forward; very often it goes backward, but after all we make progress. I learned many lessons from Clarence."

It's been said that Allen had an impressive skill for 3-D visualization and a photographic memory for faults. But there is one word that comes up again and again when talking with the people who knew him best.

"His kindness," says Lucile Jones. "That is the first thing that comes to mind about Clarence." The founder and chief scientist of the Dr. Lucy Jones Center for Science and Society remembers getting to know Allen at the Caltech Seismological Laboratory when she began work at the USGS. At the time, she was the only female with a doctorate in earthquake science at both the university and the agency. "Clarence was the kindest person to me at a place where I was finding my feet. He didn't care if I was a man or woman. He made me feel comfortable. He didn't have an ego. He was never competitive."

Jones recalls how their mutual interests in China and earthquakes sparked many interesting conversations. And she still laughs when she remembers the time they needed to determine the magnitude of an earthquake in the face of an equipment mishap that left their data clipped. "Clarence studied the paper we had just pulled off the drum and said, 'It looks like a 6. What do you say we call it a 6?'"

**“He was just a genuinely happy person with an open curious mind.”**

—LUCILE JONES, head of Lucy Jones Center for Science and Society

"He had this twinkle in his eye," she says. "He was just a genuinely happy person with an open curious mind. He found joy in his work and the people he knew."

"Exceptionally gracious and kind" is also how Susan Newman remembers Allen. Newman, the executive director of SSA during Allen's presidency, describes him as a "highly respected leader" whose "clear observations, quick wit and easy manner brought varied people together—geologists, seismologists and engineers."



Clarence Allen fly fishing for big browns on the Ruakituri River in New Zealand, 1986. (Photo by Paul Jennings)

### An Outdoor Adventurer

An avid hiker and fly fisherman, Allen once quipped that "my most remarkable discovery has been that big earthquakes and big trout tend to occur in the same parts of the world."

Allen's nephew Jim Lefeber was one of many he shared his love of the outdoors with, introducing him to the Eastern Sierra and taking him on many backpacking adventures in search of Golden Trout. It wasn't the only door he opened for his nephew, who describes his uncle as "an incredibly generous man." "My family could not afford for me to attend college," Lefeber said. "Uncle Clarence stepped up and paid for my tuition."

Jennings also accompanied Allen on many a trout fishing trip. "I will miss reminiscing about them and sharing with him results of my recent outings," he says.

Other SSA members say they will miss talking seismology over coffee with Allen and receiving his emails with questions to ponder about the natural world. But, through his gift, Allen will help spark new questions and ideas for the SSA community to ponder and resolve for many years to come.



## Funding Our Mission

### The SSA General Fund

This unrestricted fund supports the Society's programs in publishing, meetings and communications, including our newest journal, *The Seismic Record*, and the Global Travel Grant program, which sends student and early-career members to conferences worldwide.

### The Annual Meeting Travel Grant Fund

Provides students and early-career members with travel grants to attend the SSA Annual Meeting, an opportunity to network, present research and receive valuable feedback from the international seismological community.

### The Kanamori Fund

Supports the professional development of the seismological community, named in honor of Caltech Professor Emeritus Hiroo Kanamori. A few examples: the SSA Connects mentoring program, Annual Meeting workshops and travel grants to SSA meetings from countries that are members of the European Seismological Commission.

### The William B. Joyner Memorial Fund

Makes possible the William B. Joyner Lecture Series and the Charles F. Richter Early-Career Award. The lecture series fosters the exchange of information at the interface of earthquake science and earthquake engineering. The Richter Award inspires students to aim high in their seismological endeavors.

### SSA's Planned Giving Program

Allows donors to support our mission beyond their lifetime with a larger gift than they might be able to make through their current income alone.

→ Help SSA continue to deliver dynamic offerings in publishing, meetings, government relations and communications. Learn more and make a gift at: [seismosoc.org/give](https://seismosoc.org/give)

Thank you for supporting seismology.

Your gifts in 2021 helped SSA members overcome obstacles, make new connections and advance science.

We are grateful for your continued partnership in the SSA mission.

**INDIVIDUAL DONORS**

Duncan Agnew  
Sean Ahdi  
Tim Ahern  
Jon Ake  
Gerardo Alguacil  
Clarence Allen  
Charles Ammon  
Douglas Anderson  
Rasool Anooshehpour  
Walter Arabasz  
Ralph Archuleta  
Richard Aster  
Luciana Astiz  
Brian Atwater  
Pascal Audet  
Laurie Baise  
Michael Baker  
Natalie Balfour  
Dirk Becker  
Allison Bent  
Gregory Beroza  
DelWayne Bohnenstiehl  
Gilbert Bollinger  
Julian Bommer  
Luis Fabian Bonilla  
Roger Borchardt  
Oliver Boyd  
Amy Brown  
Ethan Brown  
Roland Burgmann

Paul Burton  
Eric Chael  
Joanne Chan  
Emmy Chang  
Martin Chapman  
Po-Fei Chen  
John Cipar  
Michael Cline  
John Collins  
Graham Cook  
Vernon Cormier  
Fabrice Cotton  
Kevin Cristiano  
Anthony Crone  
Timothy Dawson  
Steven Day  
Lori Dengler  
Heather DeShon  
Tzvetan Dilov  
Luis Donoso  
John E Ebel  
John Egan  
William Ellsworth  
Eric Engdahl  
Michael Fehler  
Joao Fontiela  
Donald Forsyth  
Bill Foxall  
Gerard Fryer  
Carmine Galasso  
Lind Gee

Eric Geist  
Matthew Gerstenberger  
Hafdh Ghalib  
Jeffrey Given  
Ewa Glowacka  
Christine Goulet  
Nick Gregor  
Annabel Haendel  
Thomas Hanks  
Kathryn Hanson  
Hans Hartse  
Robert Hawman  
Margaret Hellweg  
Austin Holland  
Barbara Homer  
Leigh House  
Ruey-Der Hwang  
Izzat Idriss  
Katsuhiko Ishibashi  
Miaki Ishii  
Paul Jennings  
Jessica Johnson  
Thomas Jordan  
James Kaklamanos  
Hiroshi Kawase  
Brian Kennett  
Robert Kirkham  
Yann Klinger  
Keith Knudsen  
Karl Koch  
Keith Koper

Albert Kottke  
Kayla Kroll  
Ittai Kurzon  
Jerome Kutliroff  
Christodoulos Kyriakopoulos  
Vic Lamanuzzi  
Charles Langston  
Thorne Lay  
Donald Leavy  
William Leith  
Vedran Lekic  
Alanna Lester  
Yong-Gang Li  
Che-Min Lin  
Nicola Litchfield  
Joe Litehiser  
Dunyu Liu  
Leland Long  
John Louie  
Revathy M. Parameswaran  
Raul Madariaga  
Harold Magistrale  
Paul Martin Mai  
Stephen Malone  
Takanori Matsuzawa  
Timothy McCrink  
Keith McLaughlin  
Stephen McNutt  
Andrew Meigs  
Robert Mellors  
Mark Meremonte

Andrew Michael  
Hiroe Miyake  
James Mori  
Morgan Moschetti  
Yosio Nakamura  
Hidemori Narahashi  
Kseniia Nepeina  
Shin-ichi Noguchi  
Edmundo Norabuena  
Robert Nowack  
Jeffrey Nunn  
Summer Ohlendorf  
Adrien Oth  
Kristine Pankow  
Jeffrey Park  
Howard Patton  
James Pechmann  
William Phillips  
Eugenio Polanco Rivera  
Christine Powell  
Robert Powell  
William Prescott  
Richard Quittmeyer  
Mircea Radulian  
Robert Reinke  
Jeroen Ritsema  
D. Rivers  
Arthur Rodgers  
Adrian Rodriguez-Marek  
Jorge Roman-Nieves  
Barbara Romanowicz

Stephanie Ross  
 Linda Rowan  
 Natalia Ruppert  
 Theresa Sawi  
 Charles Scharnberger  
 Nicholas Schmerr  
 David Schwartz  
 Margarita Segou  
 Anjana Shah  
 Robert Shcherbakov  
 Peter Shearer  
 Anne Sheehan  
 Julie Shemeta  
 Yang Shen  
 Yuichi Shoji  
 Richard H. Sibson  
 Gerald Simila  
 Monika Sobiesiak  
 Yuri Starovoit  
 Seth Stein  
 Seth Stein  
 Edward Steiner  
 Lynn Sykes  
 Fumiko Tajima  
 Tetsuo Takanami  
 Stephen Thompson  
 M Nafi Toksoz  
 Nino Tsereteli  
 Michael Tsesarsky

Elizabeth Vanacore  
 Elizabeth VanBoskirk  
 Aaron Velasco  
 Christa Von Hillebrandt-Andrade  
 Marianne Walck  
 Terry Wallace  
 William Walter  
 Dun Wang  
 Joachim Wassermann  
 Elise Weldon  
 Donald Wells  
 Ray Wells  
 Rodney Whitaker  
 Lorraine Wolf  
 Ivan Wong  
 Chris Wood  
 Yih-Min Wu  
 Michael Wyession  
 Xiao-Bi Xie  
 Tadashi Yamashina  
 Hongfeng Yang  
 Lingling Ye  
 Seung-Hoon Yoo  
 Lian-Feng Zhao



©Mark Stone/University of Washington

Above: A team from the UW-based Pacific Northwest Seismic Network installs a new solar panel array at a seismic monitoring site in Enumclaw, Washington. The seismometer, one of hundreds that provide data for ShakeAlert, is in the hole in the foreground. A trench brings cables to the newly installed solar panels, on the right, that power the system, and an aluminum box containing electronics that digitize and transmit the seismic data.

Front cover: Swasti Saxena; Meghan Miller (Trevor Waldien); Morocco's Anti-Atlas Mountains (USGS/NASA); Nicole Richter; Alina Shevchenko and Carla Valenzuela Malebran (GFZ Task Force); Laura Wallace and Demian Saffer (Tim Fulton, IODP JRSO); Weisen Shen (John Griffen/Stony Brook University); Folarin Kolawole; Emily Wolin; Michael West and Nate Murphy (Charles Mason/Alaska Earthquake Center).

Back cover: Fagradalsfjall volcano (Mathias Berlin); Matthew Pritchard; HVO field crew (J. Chang/USGS); Louisa Brotherson, Figure from Steven G. Wesnousky, *Seismological Research Letters* (2021) 92 (2A): 755–772; Brook Tozer, Andrea Fabbrizzi, Drake Singleton, Yao Yu, and David Sandwell (Scripps Institution of Oceanography at UCSD); Ezgi Karasözen.



## Connect with SSA in 2022

- » **Join our community:**  
[seismosoc.org/membership/  
individual-membership](https://seismosoc.org/membership/individual-membership)
- » **Share your ideas for increasing  
diversity, inclusion and equity:**  
[DEI@seismosoc.org](mailto:DEI@seismosoc.org)
- » **Submit a paper to SSA's  
peer-reviewed journals:**  
[seismosoc.org/publications](https://seismosoc.org/publications)
- » **Help SSA tell policymakers  
why seismology matters:**  
[policy@seismosoc.org](mailto:policy@seismosoc.org)
- » **All other questions and  
comments about SSA:**  
[info@seismosoc.org](mailto:info@seismosoc.org)

## Together We Advance Earthquake Science

**Seismological Society of America**  
400 Evelyn Avenue, Suite 201  
Albany, California 94706-1375  
510-525-5474 • [info@seismosoc.org](mailto:info@seismosoc.org)

[seismosoc.org](https://seismosoc.org)