

GSA TODAY

THE GEOLOGICAL SOCIETY
OF AMERICA®

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Mass Extinctions, Volcanism, and Impacts: New Developments

Edited by Thierry Adatte, David P.G. Bond, and Gerta Keller

This volume covers new developments and research on mass extinctions, volcanism, and impacts, ranging from the ancient Central Iapetus magmatic province linked with the Gaskiers glaciation to thermogenic degassing in large igneous provinces, the global mercury enrichment in Valanginian sediments, and the Guerrero-Morelos carbonate platform response to the Caribbean-Colombian Cretaceous large igneous province. This section is followed by a series of end-Cretaceous studies, including the implications for the Cretaceous-Paleogene boundary event in shallow platform environments and correlation to the deep sea; the role of wildfires linked to Deccan volcanism on ecosystems from the Indian subcontinent; rock magnetic and mineralogical study of Deccan red boles; and factors leading to the collapse of producers during Deccan Traps eruptions and the Chicxulub impact.

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MASS EXTINCTIONS, VOLCANISM, AND IMPACTS: NEW DEVELOPMENTS

Special Paper 544



Edited by Thierry Adatte, David P.G. Bond, and Gerta Keller

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GSA TODAY

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26–30 October
GSA 2020
CONNECTS ONLINE

Call For Papers

- **Submission deadline:** Tuesday, 4 August;
- Go to <https://community.geosociety.org/gsa2020/program/technical>
- **Submission fee:** US\$50 for professionals and US\$25 for students;
- Guidelines on preparing your submission: <https://gsa.confex.com/gsa/2020AM/categorypreparation.cgi>.
- By submitting an abstract, you are agreeing to participate during the virtual meeting;
- As a presenter, you will still need to register for the meeting;
- The due date for recorded presentations is 4 October;
- More details can be found on <https://community.geosociety.org/gsa2020/program/technical/topical>

Abstracts Submission: Expected Behavior

The submission of an abstract implies a sincere intent to attend the meeting and present research regardless of the meeting format (in person or online). Authors and presenters are expected to display integrity in disseminating their research; adhere to the content and conclusions of abstracts, as submitted and reviewed; remain gracious by offering collaborators the opportunity for recognition as a co-author; make sure that listed co-authors have made a bona fide contribution to the project, are aware of their inclusion, and have accepted that recognition; and be diligent in preparing a polished product that conveys high-quality scholarship.



Feed Your Brain—*Lunchtime Enlightenment*



Tom Gleeson

Michel T. Halbouty Distinguished Lecture

Tom Gleeson

Mon., 26 Oct., 12:15–1:15 p.m.

“Is Groundwater a Local and Global Resource? New Sustainability Ideas and Tools across Scales.”

Groundwater resources are the most reliable source of freshwater on the planet, so long as they are sustainably managed. While serious groundwater depletion and contamination are well documented in several regions around the world, other regions have the potential to leverage underdeveloped groundwater resources to fuel local human development. In his lecture, Gleeson will argue for the importance of global perspectives on groundwater governance and management, introduce a recent global groundwater sustainability initiative, and highlight research on new tools for protecting environmental flows from local groundwater pumping.

The Geological Society of America®

GEOCAREERS

If you are entering the job market or are supporting someone who is and want more information about career pathways in the geosciences, plan to attend one or more of the GSA 2020 GeoCareers events below.

<https://community.geosociety.org/gsa2020/geocareers>

GeoCareers Events

- Résumé, USAJOBS, CV, Cover Letter, and Workforce Outlook Webinars
 - Career Panels
 - Drop-In Mentoring
 - Early Career Professional Coffee
 - Geology Club Meet Up
 - Résumé/CV Review Clinic
 - Women in Geology Panel
- Diversity, Inclusion, and Ethics Panel
- Accessibility in Geosciences Panel

Transform Your Career by Attending a Short Course

- Learn a new topic
- Build your skills
- Network
- Take courses taught by industry professionals
- Earn continuing education credits (CEUs)

Register for a short course today! *Course costs go up US\$30 after 21 Sept.*

<https://community.geosociety.org/gsa2020/program/short>

Be a Mentor and Make a Difference

GSA has given me a platform to share my story and help students prepare for a career. —Brandy Barnes, Draper Aden Associates

- Drop-in Mentor
- On To the Future Mentor
- Résumé or CV Mentor
- Women in Geology Mentor

Learn more at <https://forms.gle/bZeKibPue7BXEsyQ9>.

2020 GSA Medal & Award Recipients

Penrose Medal

James G. Moore

U.S. Geological Survey

President's Medal

Solomon Hsiang

University of California, Berkeley, Global Policy Laboratory

Arthur L. Day Medal

Ariel D. Anbar

Arizona State University

Young Scientist Award (Donath Medal)

Christopher Spencer

Queen's University

GSA Public Service Award

Timothy Bechtel

Franklin & Marshall College

Randolph W. "Bill" and Cecile T. Bromery Award for Minorities

Martha Gilmore

Wesleyan University

Doris M. Curtis Outstanding Woman in Science Award

Marissa Tremblay

Purdue University

Florence Bascom Geologic Mapping Award

Robert D. Hatcher Jr.

University of Tennessee

GSA Distinguished Service Award

Rónadh Cox

Williams College

Margorie A. Chan

University of Utah

Honorary Fellows

Laura Giambiagi

IANIGLA/CONICET

Carlota Escutia

Spanish Research Council (CSIC)–Instituto Andaluz

2020 GSA Scientific Division Primary Awards

Engineering and Environmental Geology Division

E.B. Burwell, Jr., Award

J.V. Degraff*

California State University Fresno

W.J. Burns

Oregon Dept. of Geology and Mineral Industries

V. McConnell

Geological Society of America

2016, Landslide risk reduction in the United States—Signs of progress: *Environmental & Engineering Geoscience*, v. XXII, no. 3, p. 225–243.

Geoarchaeology Division

Rip Rapp Archaeological Geology Award

Gail Ashley

Rutgers University

Geoinformatics Division

M. Lee Alison Award for Geoinformatics

Erin Robinson

Earth Science Information Partners

Geophysics and Geodynamics Division

George P. Woollard Award

Donald Argus

Jet Propulsion Laboratory

Geoscience Education Division

Biggs Award for Excellence in Earth Science Teaching

Sue Ebanks

Savannah State University

History and Philosophy of Geology Division

Mary C. Rabbitt History of Geology Award

Ezio Vaccari

University of Insubria, Varese

Hydrogeology Division

O.E. Meinzer Award

William W. Woessner

University of Montana

International

Distinguished Career Award

Pinar Oya Yilmaz

ExxonMobil Exploration Company

Limnogeology Division

Israel C. Russell Award

Gail Ashley

Rutgers University

Mineralogy, Geochemistry, Petrology, and Volcanology Division

Distinguished Geologic Career Award

Cathy J. Busby

University of California Davis

Planetary Geology Division

G.K. Gilbert Award

Jim Zimbelman

Smithsonian Institution

Quaternary Geology and Geomorphology Division

Kirk Bryan Award for Research Excellence

Martha Cary Eppes

University of North Carolina at Charlotte

Russell Keanini

University of North Carolina at Charlotte

2017, Mechanical weathering and rock erosion by climate-dependent subcritical cracking: *Reviews of Geophysics*, v. 55, p. 470–508.

Sedimentary Geology Division

Laurence L. Sloss Award

Carlton Brett

University of Cincinnati

Structural Geology and Tectonics Division

Career Contribution Award

Robert S. Yeats

Oregon State University

*Deceased

2020 Cole Awards

Gladys W. Cole Memorial Research Award

J. Finley, Utah State University, will be awarded US\$7,145 from the Gladys W. Cole Fund for research in geomorphology of semi-arid and arid terrains for his project, “Late Holocene Arroyo Dynamics and the Evolution of an Early Dryland Agricultural Community in Dinosaur National Monument, Utah.”

W. Storrs Cole Memorial Research Award

No award given in 2020.



GSA FOUNDATION

The Gladys W. Cole and W. Storrs Cole Memorial Awards for postdoctoral research are funded by the GSA Foundation.

Get into the Field with GSA

2020 Field Award Recipients

J. David Lowell Field Camp Scholarship Award



GSA FOUNDATION

These 19 undergraduate students will be awarded US\$2,000 each to attend the summer field camp of their choice, based on diversity, economic/financial need, and merit.

Lana Axelsen, Utah Valley University
Abigail Axness, University of New Mexico
Andrew Bays, San Francisco State University
Jeremy Braun, University of Maine
Quentin Burgess, University of Nevada–Reno
Yueyi Che, University of California, Berkeley
Natalea Cohen, Fort Lewis College
Stephanie Finch, University of Minnesota–Twin Cities
Rebecca Fish, Temple University
Emma Fuentes, Angelo State University
Selena Kimball, University of South Florida
Anna Ledeczi, Columbia University
Priscilla Martinez, California State University, Fullerton
Jessica Patrick, Miami University
Daniel Riddle, Utah Valley University
Meagan Sherry, State University of New York at Plattsburgh
Bradley Smith, West Virginia University
Maria Solis, The University of Texas at San Antonio
Art (Arepa) Willoughby, California State University, Long Beach

GSA/ExxonMobil Field Camp Excellence Award



GSA FOUNDATION

ExxonMobil

This field camp will receive an award of US\$10,000 to assist with the summer field season. This award will be based on safety awareness, diversity, and technical excellence.

Raphael Gottardi, University of Louisiana at Lafayette

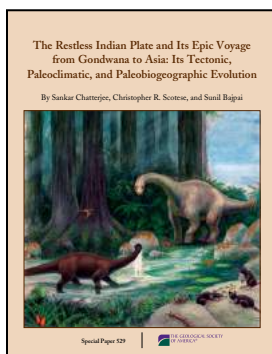
GSA Expanding Representation in the Geosciences Scholarships

These six undergraduate students from groups underrepresented in the geosciences have been awarded US\$1,500 scholarships plus one-year GSA memberships and full registration for the GSA 2020 Annual Meeting.

Brittany Bray, University of Oklahoma
Amanda Mayo, The University of Tennessee at Martin
Alice Morris, South Dakota School of Mines and Technology

McKenna Riggen, University of Texas at Austin
Alexa Terrazas, University of California, Los Angeles
Kierra Wilk, Rensselaer Polytechnic Institute

Available at
the GSA Bookstore



The Restless Indian Plate and Its Epic Voyage from Gondwana to Asia: Its Tectonic, Paleoclimatic, and Paleobiogeographic Evolution

By S. Chatterjee, C.R. Scotese, and S. Bajpai

The fossil history of animal life in India is central to our understanding of the tectonic evolution of Gondwana, dispersal of India, its northward journey, and its collision with Asia. This thorough, up-to-date volume is a must-have reference for researchers and students in Indian geology, paleontology, plate tectonics, and collision of continents.

SPE529, 147 p., ISBN 9780813725291

price \$25.00

<https://rock.geosociety.org/store/>



Be a Part of Our Community

647 OTF Scholars + 219 Mentors = On To the Future

Support from members is instrumental in shaping careers, changing lives, and diversifying our profession. Join us as we look forward to another successful year of On To the Future.

Support a student: <https://www.gsafweb.org/fund/on-to-the-future-fund/>

Learn more or be a mentor: <http://bit.ly/2q0iCCT>

50-Year Member Anniversaries

GSA salutes the following members and Fellows on their 50-year membership anniversaries. We appreciate their dedication and loyalty to GSA. To view a full list of members who have surpassed the 50-year mark, go to <https://rock.geosociety.org/membership/50YearFellows.asp>. Asterisks indicate GSA Fellows.

Patrick Leon Abbott*	John Erwin Damuth*	David A. Link	L. Don Ringe
Buzz Aldrin*	William P. Dillon*	J.G. Liou*	Brian A. Robinson
Ina B. Alterman*	Jim Alan Drahovzal*	Leon E. Long*	Edwin S. Robinson*
Robert S. Andrews	Joe W. Fandrich	Bruce P. Luyendyk*	John Brandt Roen*
Walter Joseph Arabasz	Michael E. Field*	Richard F. Madole*	Donald D. Runnells*
Tanya M. Atwater*	Donald W. Fiesinger	Robert J. Malcuit	Douglas Smith*
Paulo F. Bahia-Guimaraes	Andrew M. Gombos Jr.*	Vincent Matthews III*	Arthur W. Snoke*
George L. Bain	Stan C. Grant	Richard L. Mauger*	James M. Soule
Norman G. Banks	Frederick T. Graybeal*	John E. Mawby	Daniel P. Spangler
Charles S. Bartlett Jr.	Hershel Gene Hawkins	Fred W. McDowell*	Dennis M. Sparks
Glenn Rolf Bauer	James R. Hein*	Robert J. McLaughlin*	Douglas W. Sprague
John C. Behrendt*	Herwart Helmstaedt*	Robert G. McWilliams*	John C. Steinmetz*
Stig M. Bergstrom*	Robert H. Higgs	Calvin F. Miller*	Gary F. Stoney
Daniel Bernoulli*	Alan D. Howard*	James P. Miltimore	James M. Stroh
Richard S. Bishop*	Bryan L. Isacks*	William E. Motzer	John S. Stuckless*
Bill Bonnicksen*	Michael Jaron	Roger A. Newell	John R. Sumner*
John Van Brahana*	Raymond L. Joesten*	Alan R. Niem*	Don A. Sundys
Martin L. Bregman	Robert J. Kamilli*	Bruce James O'Connor	Robert Hadley Sydnor*
Bruce A. Brown	Alan E. Kehew*	Stephen D. Olmore	Patrick T. Taylor*
David L. Campbell	Christopher G. Kendall	David M. Patrick	James T. Teller*
Kerry J. Campbell	Eva B. Kisvarsanyi Sr.*	Hans O. Pfannkuch*	Peter C. van de Kamp
William F. Cannon*	Huybert Marinus Kluijver	Hermann W. Pfefferkorn*	W. Randall Van Schmus*
Edith Andrea	Daniel H. Knepper Jr.*	Robert Warren Pinker	John D. Vitek*
Chasen-Cerreta	Robert L. Kovach*	J. Preston Prather	Brian White
Jon J. Clague*	Robert D. Lattanzi	G. Michael Reimer	David F. Work
Russell G. Clark Jr.*	Robert C. Laudon	Richard L. Reynolds*	Robert H. Wright
Richard L. Cooley*	David A. Lindsey*	Larry R. Rhodes*	

25-Year Member Anniversaries

GSA salutes the following members and Fellows on their 25-year membership anniversaries.
We appreciate their dedication and loyalty to GSA. Asterisks indicate GSA Fellows.

Jared D. Abraham	Tracy D. Frank*	La Rae N. Landers	Douglas M. Ryder
Kenneth D. Adams	Carl Fricke*	P. Patrick Leahy*	Demian M. Saffer*
Gerardo J. Aguirre-Diaz	Robert R. Gaines*	Cin-Ty Aeolus Lee*	Joseph I. Satterfield
Moses L. Alcalá	Stephen P. Garabedian	Peter M. Leffler	Kathryn C. Schalk
Kai S. Anderson	Roberto Stanley Molina Garza*	John Leland	Volker Schenk
Daniel K. Asiedu	Rick E. Gerber	Jonathan C. Lewis	Ronald I. Schindler
Aida A. Awad*	Thomas D. Gibbons	Rosaly M.C. Lopes*	Colin A. Shaw
Dirk Baron	Casey Giordano	Michael A. Manship	Alan M. Shiller
Ruth A. Barrett	James D. Gleason*	Jeffrey S. Marshall	Jennifer D. Shosa
Hope A. Barton	Laurent Godin	Anna M. Martini*	John C. Sieving
Nathan C. Becker	David A. Gonzales	Maria Mastalerz*	Derek J. Sjostrom
Barbara A. Bekins*	Mark A. Gottlieb	Michael Mayhew	Linda V. Smith
Michael Bemski	John P. Graham	Patricia A. McCrory*	Kristen E.K. St. John*
Deborah Bergfeld	Neal C. Grasso	William F. McDonough*	Robert F. Stallard
Ed D. Bertch	Todd Halihan*	Robin John McDowell	David V. Strand
DelWayne R. Bohnenstiehl	Galen P. Halverson	Erwin A. Melis	Edward A. Sudicky*
Thomas J. Borra	David P. Harper	Kirsten M. Menking	Susan K. Swanson*
Lisa D. Boucher	Bill D. Haworth	Ron Metzger	John A. Tarduno*
Daniel J. Brabander	Nicholas W. Hayman	Karen D. Meyers	Uri S. ten Brink*
Marcia L. Branstetter	Henry P. Heasler	Mitch G. Mihalynuk	Harold J. Tobin*
Brook E. Brosi	Matthew T. Heizler*	Scott R. Miller	R. Thayer Tutt Jr.
Pamela C. Burnley	Wayne G. Henderson	Thomas E. Miller	Mark D. Uhen
Diane M. Burns	Francisco Herve*	Andreas Moeller	David R. Van Alstine
Emily Burns	Robert Hiergesell	Thomas L. Moore	Carolyn H. van der Bogert
David M. Bush	Pennilyn Higgins	Roger H. Morin	Stephen J. Van der Hoven*
Kurt T. Byanski	Sean M. Higgins	Gregory Nadon*	Stephen R. Van Horn
Denny McLane Capps	Carol A. Hill	Klaus Neumann	Michael A. Wacker
Yue-Gau Chen*	Kip V. Hodges*	Robert M. Newton	Christian P. Walls
Shafiul H. Chowdhury	Joshua W. Holloman	Kimberley D. Norris-Jones	Alian Wang*
Beth A. Christensen	Ferenc Horvath*	Thomas W. Oesleby	Laura E. Webb
Leon J. Clarke	Victoria C. Hover	Sakae O'Hara	William A. Webster
Kurt N. Constenius	Bernard E. Hubbard	Thomas D. Olszewski	Josef P. Werne*
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Jack E. Deibert	David L. Jeffery	Maureen Padden	Christopher Waldo Wheeler
Susan L. Dougherty	David G. Jewett	Mitchell Louis Parsons	David E. Wilkins
Mihai N. Ducea*	Karen H. Johannesson*	Sarah C. Penniston-Dorland	Kirk D. Williams
Bruce Dunkle	Steven D. Jorgensen	Shanan E. Peters	Cornelius V. Wingerden
Barbara L. EchoHawk	Lura E. Joseph	Michael S. Petronis	James M. Wise
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Robert J. Finley*	Jasper Knight	Andrew S. Reeve	Hongbin Zhan*
Tom Fitz	Daniel J. Koning	James Repka	Haibo Zou*
Faith A. Fitzpatrick	Andrew Kozlowski	Patrick H. Reynolds	
Eric Anders Flodin	Peter A. Kukla	Moira K. Ridley	
Scott E. Foss	Michael W. Lambert	Joyanto Routh	

2020 GSA Fellows

Society Fellowship is an honor bestowed on the best of our profession by election at the spring GSA Council meeting. GSA members are nominated by existing GSA Fellows in recognition of their distinguished contributions to the geosciences.

Learn more at <https://www.geosociety.org/fellowship>.

Jeffrey M. Amato (New Mexico State University): Jeff Amato is being nominated for GSA Fellow for exceptional scholarship in structural geology and tectonics through his work on Cordilleran tectonics, Precambrian of southwestern North America, and accretionary prism processes, as well as student mentoring and service to the society. —Terry L. Pavlis

Paul A. Baker (Duke University): For fundamental research contributions that further understanding of the geochemistry of marine carbonates, the history and dynamics of the South American summer monsoon system, and the geologic record of biotic diversification in tropical South America. —Sherilyn C. Fritz

Kathleen Counter Benison (West Virginia University): Kathleen Benison utilizes her training in terrestrial sedimentology and geochemistry to inform astrobiology studies and educate the next generation of geoscientists. Her distinguished academic accomplishments inform her public interactions that raise awareness of the importance of the interdisciplinary nature of Earth and planetary systems. —Francisca E. Oboh-Ikuenobe

“... among the most compelling and enthusiastic advocates for the value and role of geology in helping to make the world a better place.”

Patricia H. Cashman (University of Nevada–Reno): Pat Cashman demonstrates sustained excellence in core contributions crossing teaching, mentoring, and research in linked disciplines crossing tectonic, structural geology, basin analysis, and energy. She is among the most compelling and enthusiastic advocates for the value and role of geology in helping to make the world a better place. —George Herbert Davis

Louis A. Derry (Cornell University): Using isotopic, major, and trace element and modeling approaches to integrate the Earth's sedimentary and erosional record into robust geochemical cycles. —Suzanne Mahlburg Kay

Patrick F. Dobson (Lawrence Berkeley National Lab): Over the last three decades, Dr. Patrick Dobson has made transformative scientific contributions associated with the hydrogeological and geochemical assessment of the subsurface for geothermal energy production and geologic nuclear waste disposal. —Jens Thomas Birkholzer

Stephen Quinn Dornbos (University of Wisconsin–Milwaukee): Stephen Dornbos has made extraordinary contributions to our understanding of Cambrian life, environments, and evolution. He is best known for his work on spectacularly preserved fossils in Asia. Steve is a professor at the UW Milwaukee, and currently an AAAS Science & Technology Policy Fellow at the Pentagon. —Mark A. Wilson

Mary L. Droser (University of California): Dr. Mary Droser is a pre-eminent scholar of Ediacaran fauna and trace fossils. Her paleoecological and paleobiological studies are the gold standard for analysis of early metazoan life. Droser's work has advanced our understanding of major evolutionary events, particularly the great radiations of the late Precambrian and early Paleozoic. —Paul M. Myrow

Mostafa Fayek (University of Manitoba): Mostafa Fayek's seminal work on the geochronology of uranium-ore systems has greatly affected the exploration for uranium deposits. He has developed and used a variety of mass spectrometry techniques and coupled these with other spectroscopic methods to study radionuclide migration (e.g., U) associated with ore systems. —Frank C. Hawthorne

Nicole M. Gasparini (Tulane University): I nominate Dr. Nicole Gasparini for election to GSA Fellow for her outstanding and sustained contributions to the understanding of fluvial landscape evolution, leadership in developing open-source software enabling others to engage in landscape evolution modeling, and her efforts to enhance opportunities for women and underrepresented groups in the geosciences. —Kelin X. Whipple

David H. Goodwin (Denison University): Professor Dave Goodwin is an exemplary mentor and exceptional teacher and educator. His excitement and commitment to training undergraduate students in the geosciences is outstanding. His service to his profession and the geosciences has been extensive, and his scholarly research in sclerochronology and isotope geochemistry is creative and transformative. —Alan D. Wanamaker Jr.

Madeline B. Gotkowitz (Montana Bureau of Mines and Geology, Montana Technological University): For her outstanding applied research related to groundwater management and contaminant transport, her administrative service with the Montana Bureau of Mines and Geology and the Wisconsin Geological and Natural History Survey, and her dedication to effectively communicating geologic and groundwater issues with the public. —Madeline E. Schreiber

“... selfless service to professional organizations and mentorship of students and colleagues.”

Stephen E. Grasby (Geological Survey of Canada): For his inspiring and exceptionally broad scientific curiosity; ground-breaking fundamental and applied research contributions in paleohydrology, hydrogeochemistry, geothermal energy, and mass extinctions; leadership organizing logistically complex and scientifically successful international Arctic field research programs; and selfless service to professional organizations and mentorship of students and colleagues. —Jennifer C. McIntosh

Brenda L. Hall (University of Maine): An internationally recognized expert on the glacial and Quaternary geology of Antarctica and other glaciated areas. From long and repeated field campaigns her reports generate new ideas and move the field along. She strives to invest in the next generation of geologists. —Thomas V. Lowell

“She strives to invest in the next generation of geologists.”

Galen P. Halverson (McGill University): Recognized for his forefront contributions to our understanding of the sedimentary and environmental context of early eukaryotic evolution, the eventual emergence of animals, the oxygenation of the atmosphere and deep oceans, and the spectacular climatic catastrophes of the Proterozoic Era. —Bradley B. Sageman

Nigel C. Hughes (University of California): Dr. Nigel Hughes is a leader in the study of trilobites, applying cutting-edge biological concepts to analyze past arthropod development. His studies of Himalayan strata have led to an orogen-wide stratigraphic architecture, which has been used to address major questions of the tectonic and paleogeographic evolution of South Asia. —Brian R. Pratt

Robert D. Jacobi (University at Buffalo): Dr. Robert D. Jacobi is a dedicated, enthusiastic geologist with diverse expertise and extensive publication record in structure, tectonics, sedimentology, stratigraphy, seismic interpretation, and seismicity in the Appalachian Basin as well as their balanced application to meeting the needs of society. He has also been a strong supporter of GSA. —Charles E. Mitchell

Darrell S. Kaufman (Northern Arizona University): Darrell Kaufman is nominated for Fellowship for his leadership in international syntheses of Arctic climate, but equally important are his basic research on the glacial and climate history of Alaska, and his development of novel approaches in the applications of amino acid biogeochemistry to a wide array of compelling questions. —Gifford H. Miller

Meredith A. Kelly (Dartmouth College): Professor Meredith Kelly is nominated as a 2020 GSA Fellow for her contributions to glacial geology, understanding climate change in the Arctic and high-altitude tropics using field mapping, lake cores, and radiocarbon and Be-10 chronologies, and her contribution to improving the methodology of Be-10 dating using in-situ cosmogenic nuclides. —Xiahong Feng

Venkataraman Lakshmi (University of Virginia): Dr. Lakshmi is nominated for his research into the key processes that control the physics of the land surface and the vadose zone, a vital area of the geological sciences that influences climate modeling, critical zone processes, surface runoff, etc., and his broad contributions to student training and science communication. —Michael Howard Young

Mitchell W. Lyle (Oregon State University): Mitch Lyle is nominated as a GSA Fellow for his published contributions to geologic research that document his broad and deep insights into process-based geochemistry, geophysical survey methods informed by understanding sedimentary systems, and leadership in designing and implementing innovative experiments to reconstruct the history and drivers of Earth’s climate. —Marta E. Torres

Stephen B. Mabee (University of Massachusetts): In his role as the State Geologist of Massachusetts Stephen Mabee has led a distinguished career both as an active researcher and providing important geologic services to the Commonwealth of Massachusetts. He has led and championed numerous state-wide mapping initiatives and has contributed extensively to furthering the use of geologic information for stakeholders. —David F. Boutt

Helena Mitasova (North Carolina State University): For significant and sustained fundamental research, teaching, and applied research/communication contributions to the fields of geospatial science, earth surface processes, and numerical-physical modeling in the geosciences over the course of a career. —Russell S. Harmon

“A model scientist-educator who spreads her knowledge to important groups not typically reached by University professors.”

Jennifer L. Pierce (Boise State University): Dr. Jennifer Pierce is recognized for her outstanding record of public outreach and education to raise awareness of climate change and environmental impacts. She is a model scientist-educator who spreads her knowledge to important groups not typically reached by university professors. —Tammy M. Rittenour

Nicholas Pinter (University of California): Professor Dr. Nicholas Pinter of the University of California at Davis is an excellent geologist with many publications in geology, has been a GSA member for 30 years, and has extensive internal service to GSA on the GSA Geology and Public Policy Committee. —Robert Hadley Sydnor

Sara B. Pruss (Smith College): Sara is a productive and influential scholar, known for her innovative ideas in paleobiology. She is an extraordinarily energetic mentor, and her lab at Smith is a model for what undergraduate-involved research can achieve, training young women, publishing with them, and putting them on the path to successful careers. And she is sought after as a colleague and leader, raising awareness of geology outside the professional community. —Rónadh Cox

“... extraordinarily energetic mentor.”

Anne Raymond (Texas A&M): Anne Raymond exemplifies the balance between service to students, university, and professional societies, and in refereed publications. She brings out the best in her colleagues, not just in research contributions, but also in her critical questions and comments, focusing their attention on critical, but otherwise overlooked aspects of the problem. —James Clyde Hower

Tracy A. Rushmer (Macquarie University): Dr. Tracy Rushmer is a recognized global leader in her research area, experimental petrology of the earth and planetary interiors. She has served her professional community through leadership in professional societies and editorial activities. She is an exemplary geological educator, with a demonstrated record of student engagement and mentoring. —Shanaka L. de Silva

Katherine Scharer (U.S. Geological Survey): Dr. Scharer's comprehensive research on San Andreas fault paleoseismology, application of novel Quaternary geochronology methods to estimate earthquake timing, and commitment to earthquake hazards outreach and education will have lasting impacts in the field of paleoseismology. Her leadership distinguishes her as one of the best in our profession. —Robert C. Witter

"... one of the best in our profession."

Marcia K. Schulmeister (Emporia State University): Dr. Marcia Schulmeister excels at educating geoscientists. At Emporia State University, she co-founded an online M.S. program, established a research station, and connects to industry to give students experience and research opportunities. She's provided leadership for GSA's South-Central Section, including serving as chair for its very successful 2010 meeting. —Susan Stover

Richard L. Smith (U.S. Geological Survey): Dr. Smith is an eminent microbiologist who reaches across disciplines to explore hydrogeologic controls on microbial communities and biogeochemical processes in aquifers, rivers, and lakes. His expertise, creativity, leadership, and collaborative approach have resulted in new holistic approaches to quantifying transport and reaction of nutrients and contaminants in aquatic systems. —John Karl F.P. Bohlke

David B. Spears (Virginia Dept. of Mines, Minerals, and Energy): David Spears has had a significant impact on the field of geology as a researcher, advocate, and member of the GSA community. He is directly sought for his involvement and expertise, with the ability to translate the complexities of science and make them understandable to policy makers and the public. —Joe Gillman

Robin Strachan (University of Portsmouth): For outstanding contributions to structural geology, to understanding the geology of the Appalachian-Caledonide-Variscan orogen and to the geoscience community as science editor of several journals including *Geological Society of America Bulletin* and the *Journal of the Geological Society* of London. —J. Brendan Murphy

Donna Surge (University of North Carolina): Dr. Surge is an internationally renowned sclerochronologist and a dedicated educator who blends paleontology, low-temperature geochemistry, paleoclimatology, paleoecology, and archaeology to understand past climates. She has a strong commitment to training the next generation of geoscientists. —David P. Gillikin

Michael H. Taylor (University of Kansas): Dr. Michael H. Taylor has made outstanding contributions to our current understanding of continental deformation through creative integration of detailed field mapping with cutting-edge analytical methods in the fields of remote sensing, digital-topographic-data analysis, space geodesy, thermochronology, seismology, and evolutionary biology. —An Yin

Ashraf Uddin (Auburn University): Professor Ashraf is nominated for Fellow of the Geological Society of America for his extensive research on the geology of the Bengal basin, including the geochemistry of arsenic enriched sediments in the basin, as well as his studies of the Carboniferous history of the southern Appalachians. —John W. Geissman

Sally E. Walker (University of Georgia): Sally Walker's contributions include outstanding research in paleobiology and taphonomy in settings from Antarctica to Ecuador to Iceland; spectacular efforts in teaching, including memorable annual field trips to Sapelo Island; extensive outreach to the public at all levels; and dedicated service in editing journals and books and organizing scholarly meetings. —L. Bruce Railsback

Ray J. Weldon II (University of Oregon): Ray Weldon has made significant contributions to neotectonics and paleoseismology by combining detailed field studies of recently active faults with analytical work. Much of his research success stems from his exceptional skill at training and mentoring geologists over at least the past 30 years. —Marli B. Miller

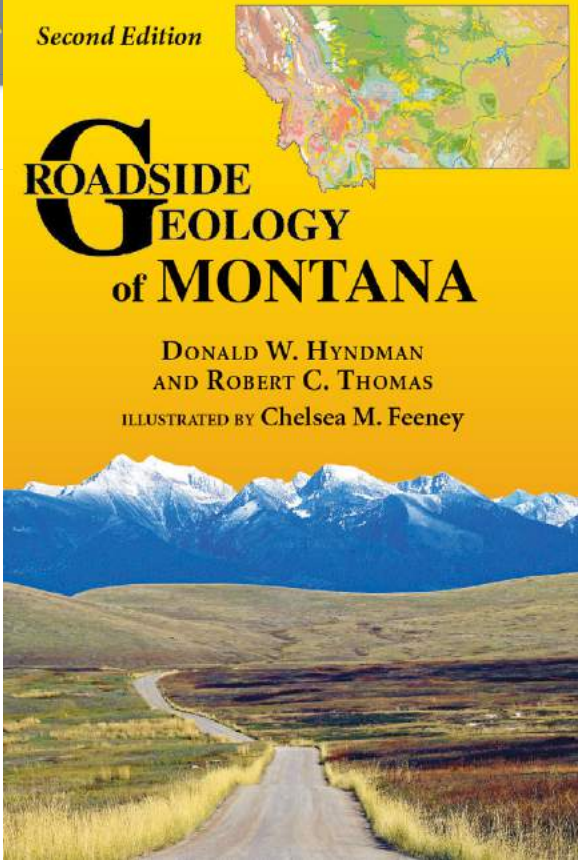
Julia Smith Wellner (University of Houston): Dr. Wellner is an internationally recognized marine geologist, having participated in eleven Antarctic expeditions, including as co-chief scientist on IODP Expedition 379 to the Amundsen Sea, off West Antarctica, and chief scientist for the THOR (Thwaites Glacier) Expedition. She is also recognized as an innovative educator and mentor. —Suzanne O'Connell

Andrew C. Wilcox (University of Montana): Andrew Wilcox's applied research in fluvial geomorphology builds from fundamental research on hydrology, hydraulics, and sediment dynamics to examine questions relevant to societal management of rivers, including dam removal, environmental flows, the effects of mining contaminants, and numerical modeling of vegetation-sediment interactions in the context of changing river flows. —Ellen E. Wohl

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This highly successful, free workshop for early career geoscientists on the process of preparing and publishing papers will be held for its eighth year during the 2020 GSA Annual Meeting. Watch for information on how to apply in upcoming issues of *GSA Today*, *GSA Connection*, and on GSA's social media sites.

Welcome New GSA Members

The following new members joined 25 July 2019–17 Feb. 2020 and were approved by GSA Council at its spring meeting.

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James Warren Ashley
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Lynn Carter
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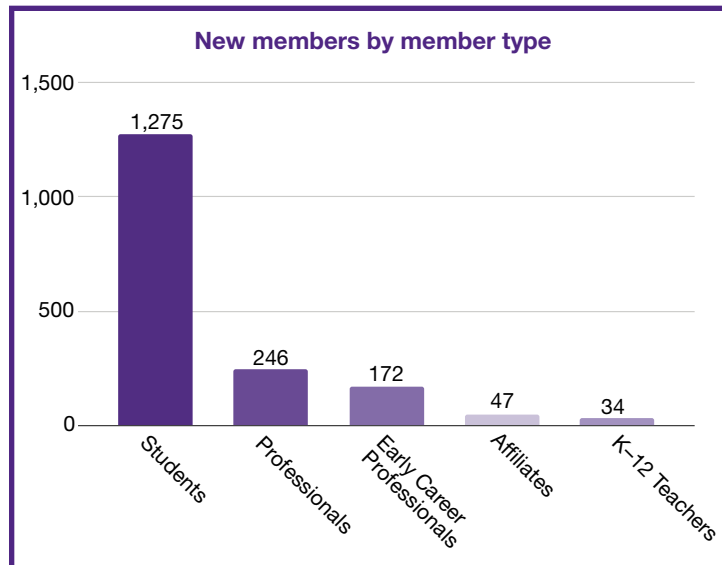
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Inessa Yurchenko
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Lijun Zhou
Valentin Zuchuat

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(listed by professional interest)

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R.P.D. Cromwell
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Evan Morton
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Anmol Barla

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Brett Capps
Vivian Cho
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Rosalie T. Recchia
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Andrew Isaac Stearns
Jonas Toupal

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Jacob Murchek
Alexander Michael Navarra
Catherine Nield

Top three reasons for joining GSA:



1. GSA Meetings



2. Career Development



3. Research Grants

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Shouxu Pan
Joseph Phillips
Liam Thomas Pittenger
Sara Katherine Puff
Yiqian Qu
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Samuel Walker
Xin Wang
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Adrian Alan Wiggins
Bailey Revere Wild
Cierra Nicole Wilson
Zhuoya Wu
Binqian Yin
Yuchen Zhang
Yunzhao Zhang

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Dalton Curtis Anderson
Kevin D. Andrade Sr.
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Jackson Armstrong
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Erin Bessette-Kirton
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Adeboye Olalekan Habeeb Sr.
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James Greyson Hoelzel
Chantel Jensen

Asha Lang
Chunxiao Li
Edward Martin
Jared William McAvoy
Baylee McGinnis
Laura Maria Victoria Navarro
Moreno
Nnaemeka Christopher Ngobidi
Jenna Petty
Tomsen Reed
Bethany M. Reeves
Gabriel Neil Shotton
Sarah Smart
Tong Wang
Kevin J. Woodard

Environmental Science

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Cecilia Albert-Black
Alexandra Evan Almaguer
Esther Claire Badon
Ruslana E. Baker
Jazlyn Jo Beeck
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Darian Sugarman
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Jordan C. Vest
Caroline Elizabeth Vickery
Thuy Trang Trang Vo
Katlyn Anne Ward
Christopher David Wilson
Natalie Renee Young
Nina Zamanialavijeh
Kenzie Elizabeth Zaph
Lucas Zeller

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Brett Daily
Anderson Ribeiro de Figueiredo
Hunter Delikowski
Taber L. Friedel
Daniel James Gardner
Madison L. Heffentrager
Sean Hickey
Ann M. Hill
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1. Mineralogy,
Geochemistry, Petrology,
and Volcanology
2. Hydrogeology
3. Environmental
4. Paleosciences
5. Structural Geology

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SPECIAL PAPER 514

The Interdisciplinary Earth: A Volume in Honor of Don L. Anderson

Edited by Gillian R. Foulger, Michele Lustrino, and Scott D. King



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This volume is a memorial to Don L. Anderson, former director of the Seismological Laboratory of the Caltech Institute of Technology, recipient of the Crafoord Prize, the National Medal of Science, and numerous other awards. A geophysicist extraordinaire, he contributed much to our understanding of the structure and dynamics of the interior of Earth. This volume includes papers on anisotropy, the seismic structure of the mantle, mantle convection, the statistics of melting anomalies, planetary geology, tectonics, the thermal budget of Earth, lithospheric structure, geochemistry, and flood basalts.

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Orono, Maine, USA
Date of death: 17 Mar. 2020

Donald W. Boyd

Laramie, Wyoming, USA
Date of death: 8 Apr. 2020

Bruce Alan Carter

Monrovia, California, USA
Date notified: 30 Apr. 2020

Paul A. Catacosinos

Canton, Michigan, USA
Date of death: 5 Apr. 2020

Robert R. Clemons

Norman, Oklahoma, USA
Date notified: 9 Jan. 2020

Jerome V. De Graff

Fresno, California, USA
Date notified: 26 Mar. 2020

Maarten J. De Wit

Port Elizabeth, South Africa
Date of death: 15 Apr. 2020

Tomas Feininger

Vieux-Quebec, Québec, Canada
Date notified: 5 Feb. 2020

Marzieh Foroutan

Waterloo, Ontario, Canada
Date of death: 8 Jan. 2020

Richard C. Fountain

Deland, Florida, USA
Date of death: 1 Jan. 2020

Frederick D. Larsen

Northfield, Vermont, USA
Date notified: 10 Jan. 2020

Christopher C. Mathewson

College Station, Texas, USA
Date notified: 6 Feb. 2020

Jack B. Mills

Lake Oswego, Oregon, USA
Date of death: 30 Mar. 2019

James Casey Moore

Santa Cruz, California, USA
Date of death: 16 Mar. 2020

Richard L. Nielsen

Golden, Colorado, USA
Date notified: 22 Jan. 2020

Neil D. Opdyke

Gainesville, Florida, USA
Date of death: 7 Apr. 2019

Waite R. Osterkamp

Tucson, Arizona, USA
Date of death: 8 Mar. 2020

Harry McDougal Parker

Incline Village, Nevada, USA
Date notified: 6 Jan. 2020

Allen O. Perry

Mansfield, Massachusetts, USA
Date notified: 27 Mar. 2020

David Pierce

Lompoc, California, USA
Date notified: 3 Jan. 2020

Robert P. Self

Martin, Tennessee, USA
Date notified: 12 Mar. 2020

Robert Smit

Bloemendaal, The Netherlands
Date of death: 21 Mar. 2020

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Virginia Tech
Blacksburg, Virginia, USA

TOOLS FIELD

Geologist's Wish List



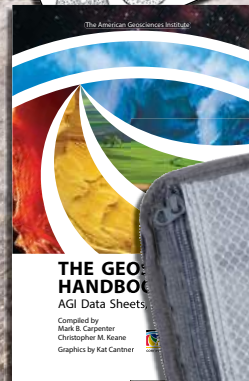
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All Hands on Deck: What a Scientist Brings to the Front Lines of a Crisis



Mike O'Connor

“OK, we’ll plan for that. Or not. No one knows anymore.”

That phrase captures a Congressional Science Fellowship experience that, although only half-way done, must be at least in the running for the strangest, and most interesting, of all time.

My first day in Congressman Paul Tonko’s (D-NY) office was Thursday, 26 September 2019, and I was greeted upon my entrance to

the Rayburn House Office Building by the entire Washington Press Corps. Joe Scarborough waved hello to me on my way in. They were all there, of course, to cover the earth-shattering announcement that Speaker of the House Nancy Pelosi was formally directing Congress to begin the process to impeach the President of the United States. It was the third time in history such a thing was happening, and I thought, without a doubt, this cataclysmic political development would be the lens through which my Fellowship year was to be viewed.

Oh, to be young, naïve, and within six feet of other people.

Yes, it was impossible to predict the onset of a pandemic in September 2019. However, had I known, I would still have been eager to work in Congress, in the House, and in Tonko’s office. Although the substance of my work changed dramatically, the lessons learned from it remained the same.

The COVID-19 crisis demanded a massive shift in our office priorities: Our top priority in September was to lead the comprehensive Democratic effort to pass meaningful clean energy legislation. The time scale of this work was long term, and the topics to be addressed were specific, technical, and related to my training as a geoscientist. COVID-19 flipped the script. Our job was to lead advocacy efforts for hospitals, small businesses, and nonprofits, and to provide assurance and comfort to an exceptionally frightened constituency. Everything about it was opposite: the time scale was NOW (and often, now wasn’t soon enough), and the topics we worked on were extremely broad, far-reaching, and had absolutely no tangible connection to the geosciences. It is easy to look at that situation and, well, chalk the year up as a loss.

There is one crucial mental reason why I am still exuberant to work each day: My goal entering this Fellowship year, simply put, was to use my scientific training to help make a tangible, beneficial difference. Working in Congress during the COVID-19 pandemic ensures that you not only can, but you MUST, make that difference. The public demands it.

COVID-19 changed my day-to-day in a huge way. Pre-pandemic, my primary job was to shepherd a number of climate, energy, and science-related bills through what our office calls the “regular process.” The process follows a standard blueprint: research the topic of interest, reach out to as many expert groups as you can find to get their opinion on the topic, identify where the federal government can be useful, identify if there is a political appetite for such legislation, write the legislation, publicize the legislation, edit the legislation as feedback pours in, drum up support for the legislation, and then (hopefully) vote on the legislation. It is relatively evident that many of

the steps in the “regular process” are similar to designing and undertaking a research project: In particular, I found substantial similarities between the art of writing a scientific proposal and the art of writing a bill. Both require rapid and creative synthesis of a wide variety of viewpoints and information, and both require the ability to communicate those concepts to wide audiences that are outside your field of expertise. As scientists, I’d like to think we’re quite good at that.

Post-pandemic life, at first glance, looks nothing like academia. The precious weeks to months afforded in the regular process to develop thoughtful, community-based legislation simply don’t exist. The office has morphed into an all-purpose crisis hotline as thousands of requests from individuals, businesses, nonprofits, schools, and any other group imaginable pile up. Our primary jobs became to manage and advocate for these requests. I was assigned requests related to agriculture and education, and the requests I had to advocate for ranged from government buybacks of surplus milk to paycheck protection for children’s museums. It is my job to figure out any pathway to assist our critically important but ailing constituent groups, through whatever means necessary: letters, appropriations language, public TV interviews, even Twitter posts. There is seemingly nothing in my current job that sounds related to the time-intensive, careful, and painstakingly slow process to develop Ph.D.-level research. However, with just a little digging, I was able to find some very clear analogues.

Scientists, particularly early career professionals and Ph.D.s, are often confronted with tasks they have no idea how to complete. My years of fieldwork and modeling were replete with these experiences. I had had to develop a method from scratch to sample slushy, peaty mud without compression, and before my degree, I had no experience in soil sampling. I had to develop code in C++, XML, and Python, without ever having taken a coding class. The scientific training process is replete in valuable lessons, but paramount for me was this: You give me any task, and I’m confident I can get it done, somehow.

Leaving the lab for the government took a leap of faith and required me to get over some serious fears, but I wish I wasn’t so nervous. As scientists, we’re lucky enough to be trained thoroughly in skills the world desperately needs: competency, communication, and creativity. This skillset, I believe, makes us as useful in regular business as it does in crisis. I am so thankful to GSA that this opportunity exists, and I hope to help continue its legacy as my career moves forward.

This manuscript is submitted for publication by Mike O’Connor, 2019–2020 GSA-USGS Congressional Science Fellow, with the understanding that the U.S. government is authorized to reproduce and distribute reprints for governmental use. The one-year fellowship is supported by GSA and the U.S. Geological Survey, Department of the Interior, under Assistance Award No G19AP00110. The views and conclusions contained in this document are those of the author and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. government. O’Connor works in the office of Rep. Paul Tonko (D-NY) and can be contacted by e-mail at michael.oconnor@mail.house.gov.

Position Statement Update

GSA Council recently approved minor revisions to the climate change position statement. The summary is below. Full versions of the statement, along with all GSA position statements, are online at <https://www.geosociety.org/positionstatements>. GSA members are encouraged to use the statements as geoscience communication tools when interacting with policymakers, students, colleagues, and the general public.

Climate Change

Human-induced increases in greenhouse gases, especially CO₂, are the main drivers of recent global warming. Sound public policy and successful climate change mitigation and adaptation

require scientifically validated assessment of current and future climate impacts.

This position statement (1) summarizes the scientific basis for the consensus among earth scientists that human activities are the primary cause of recent global warming; (2) describes the significant effects on humans and ecosystems as greenhouse-gas concentrations and global climate change reach projected levels; (3) provides information for policy decisions guiding mitigation and adaptation strategies that are designed to address the current and future impacts of human-induced climate change; and (4) recommends opportunities for GSA members to advance understanding of climate change.

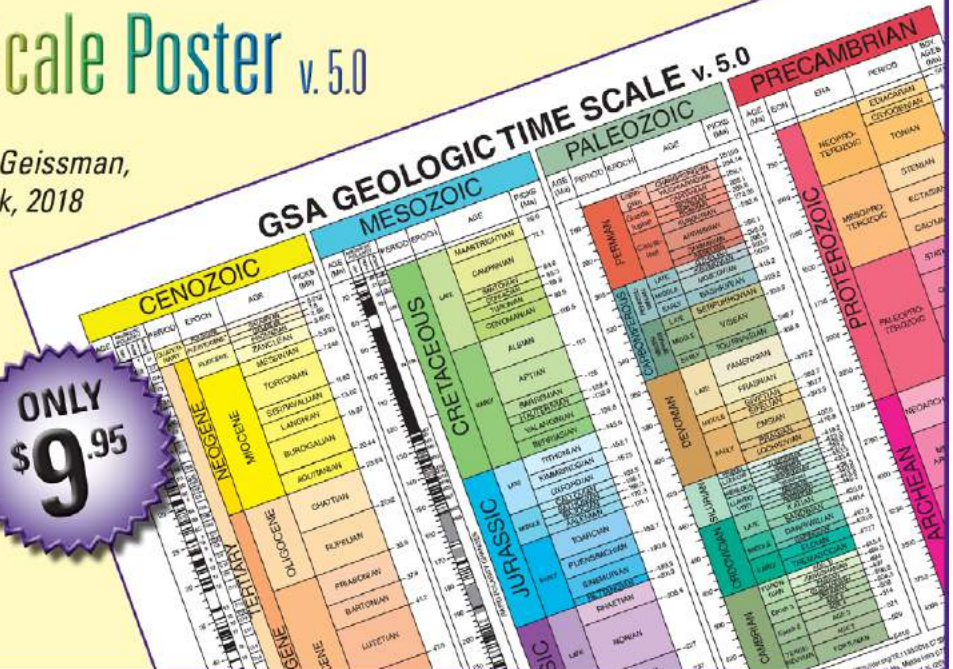
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Students: Why Should Geologists Be Licensed?

Jason A. Patton

As students in the discipline of the geosciences, you have probably become aware that the degree program that you have chosen is an entanglement of numerous overlapping subdisciplines of geology. In preparation for your career as a practicing geologist, it is important to understand that many employment opportunities require you to become a licensed/registered geologist. Licensure is different than certification (e.g., AIPG certification) in that it is the legal authority granted to you by a state to practice the profession of geology—similar to a medical license or even a driver's license. Most commonly, licensure applies to geologists working at environmental/engineering/construction firms, but also applies to many federal, state, and local government jobs.

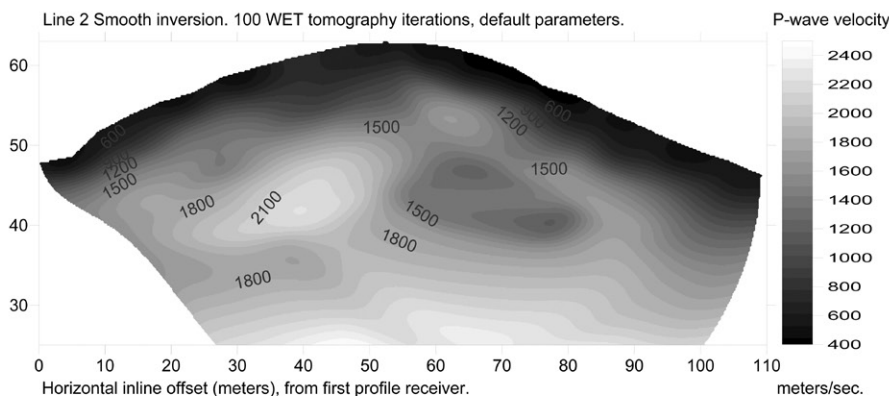
To become licensed, one must complete the three E's: Education, Examination, and Experience. The National Association of State Boards of Geology (ASBOG®) fills one of the "E" roles by providing state licensure boards the examinations necessary to become licensed. Two examinations must be completed, the Fundamentals of Geology (FG) and the Practice of Geology (PG). In most states, you are eligible to take the FG exam either during your senior year

or immediately upon graduation, while you are generally required to have at least five years of work experience before taking the PG exam. Many geologists wait until their work experience requirements are fulfilled before taking the FG exam and then realize they have forgotten many of the core fundamentals they learned during their undergraduate education. ASBOG® recommends that students and recent graduates take the FG exam as soon as they are eligible in their state to increase their chances of success.

Given that licensure laws vary from state to state and can be very complicated, it is incumbent upon geoscience candidates to educate themselves on the details regarding licensure in each licensure state, including the examination dates, study information, and a candidate handbook. For more information, go to ASBOG®'s website (https://asbog.org/state_boards.html) for details about licensure offered in each state. You can also follow ASBOG® on Twitter, LinkedIn, and Facebook.

Dr. Jason A. Patton, P.G., is department head of physical sciences and associate professor of geology at Arkansas Tech University. He is the 2020 ASBOG® president elect.

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GSA Ethics & Compliance Update

Almost two years have passed since GSA hired an ethics & compliance officer to oversee GSA's ethics programs and projects. GSA created this position because ethics is fundamental in the work we do as geoscientists, and our Society is committed to playing a leadership role in this important area.

Ethics Program Framework

GSA has implemented several policies, procedures, and programs to guide its members and event participants in fostering a culture of integrity, respect, and scientific excellence. A few examples include:

- *Code of Ethics & Professional Conduct* (“Code of Ethics”): sets forth aspirational and mandatory conduct standards for GSA members’ professional activities.
- *Ethics Disclosures*: requires individuals selected for honors, awards, and leadership roles to certify their compliance with GSA’s ethical standards.
- *Events Code of Conduct*: establishes a conduct standard for all individuals who participate in GSA meetings, field trips, and other GSA-sponsored events.
- *Respectful, Inclusive, Scientific Events (RISE) and Complaint-Handling Procedures*: encourages individuals to report conduct concerns so that GSA may respond appropriately and fairly.

Ethics Cases

GSA follows established procedures to ensure that all complaints submitted under the Code of Ethics and Events Code of Conduct are

promptly addressed and managed properly. We also provide GSA Council—the Society’s governing body—with biannual summaries of such cases. This oversight prevents cases from being “swept under the rug,” identifies patterns of conduct that GSA can address through policy changes and outreach, and enables GSA to identify ways to continuously improve its ethics program.

In 2019, GSA received a total of eleven reports, including three complaints about behavior at GSA-sponsored events, one publishing-related complaint, and seven complaints arising under GSA’s Code of Ethics. As is its practice, GSA investigated each of these cases. While the complaints involving GSA events and publishing did not result in adverse findings, in April 2020, the GSA Council determined that two GSA members violated its Code of Ethics or bylaws and should be disciplined. Of the five remaining Code of Ethics cases, two were closed without findings and three are pending.

For privacy and confidentiality reasons, GSA does not release details about specific ethics cases. However, when GSA Council determines that a member has violated the Code of Ethics, it may direct GSA’s Executive Director to carry out whatever disciplinary action it deems appropriate. A non-exhaustive list of examples includes restricting a member’s attendance at GSA events, revoking honors and awards, and terminating membership.

For additional information about our ethics program, please refer to GSA’s ethics homepage. To access this homepage, navigate to the “About” tab on GSA’s website (<https://www.geosociety.org>) and then click on “Ethics.”



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Access the online application at <http://jobs.nmsu.edu/postings/38905> through 10 July 2020. Please direct questions to Nancy J. McMillan at 575-646-5000 or nmcmilla@nmsu.edu.

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Special Paper 541



Circum-Arctic Structural Events

Tectonic Evolution of the Arctic Margins and Trans-Arctic Links with Adjacent Orogens

Edited by Karsten Piepjohn, Justin V. Strauss, Lutz Reinhardt, and William C. McClelland

Circum-Arctic Structural Events: Tectonic Evolution of the Arctic Margins and Trans-Arctic Links with Adjacent Orogens

Edited by Karsten Piepjohn, Justin V. Strauss, Lutz Reinhardt, and William C. McClelland

The circum-Arctic region has received considerable attention over the past several decades with vigorous debate focused on topics such as mechanisms for opening the Eurasian and Amerasian basins, the importance of plume-related magmatism in the development of the Arctic Ocean, and mechanisms for ancient terrane translation along the Arctic margins. In recognition of the 25th anniversary of the Circum-Arctic Structural Events (CASE) program, an international polar research effort organized and led by the Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) of Germany, this volume presents results from 18 major field expeditions involving over 100 international geoscientists from a broad spectrum of disciplines. The resulting publication focuses on the Proterozoic to Cenozoic tectonic evolution of the circum-Arctic region with correlations to adjacent orogens.

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Individual Development Plans (IDPs): An Underutilized Advising Tool in the Geosciences

Deborah E. Eason, Department of Earth Sciences, University of Hawai'i at Mānoa, Honolulu, Hawai'i 96822, USA, deborahe@hawaii.edu; Barbara C. Bruno, Hawai'i Institute of Geophysics and Planetology, University of Hawai'i at Mānoa, Honolulu, Hawai'i 96822, USA; Daniela Böttjer-Wilson, Center for Teaching Excellence, University of Hawai'i at Mānoa, Honolulu, Hawai'i 96822, USA

INDIVIDUAL DEVELOPMENT PLANS

Effective mentorship plays an important role in student retention and success. However, many faculty lack formal training in mentoring and may not be aware of some available tools, such as individual development plans (IDPs). IDPs have received little attention in the geosciences despite their growing popularity in other science fields.

IDPs are designed to help research trainees set academic goals, develop professional skills, explore career opportunities, and conduct long-term career planning. Originally developed to help prepare students for a tightening academic job market (FASEB, 2002), IDPs are also a useful advising tool, highly valued by mentors for facilitating communication and identifying areas for improvement (e.g., Hobin et al., 2014). IDPs have been gaining popularity at the graduate and postdoctoral level and were recently featured by the National Academies of Sciences, Engineering, and Medicine (NASEM) in their new report on effective mentoring (NASEM, 2019).

Developing an IDP is an iterative process that includes self-assessment and action planning components. IDPs leverage effective practices in goal setting (e.g., Gollwitzer, 1999) with a focus on skills development rather than specific performance metrics. Ideally, the mentee obtains guidance and feedback on their IDP from their advisor and/or others.

Some university departments and even individual lab groups (e.g., Vincent et al., 2015) have developed their own forms to guide this process. For those interested in more extensive career exploration tools, there are also several free online IDP platforms,

such as myIDP (<http://myidp.sciencecareers.org/>) for STEM, and ImaginePhD (<https://www.imaginephd.com>) for the humanities and social sciences.

While data on IDP effectiveness are sparse and generally based on small sample sets, initial studies are promising (e.g., Tsai et al., 2018). A 2014 survey of postdocs (Hobin et al., 2014) found relatively low usage rates but high perceived value among those who had used IDPs (71% of postdocs, 90% of mentors).

THE 'IKE WAI PROJECT

Since 2017, we have been piloting a small IDP program as part of 'Ike Wai, a multidisciplinary research project focused on water resources and sustainability at the University of Hawai'i. Funded by the National Science Foundation's (NSF) Established Program to Stimulate Competitive Research, 'Ike Wai (Hawaiian for *water knowledge*) includes a capacity-building initiative to develop a diverse local workforce in hydrology and related fields. IDPs form part of a larger professional development program that includes holistic mentoring, research training, and broad skills development.

'Ike Wai graduate students and postdocs develop their IDP with guidance from both their research advisor and an external professional development (PD) mentor. The PD mentor, a faculty/staff member selected by the trainee from outside their discipline, serves as an additional resource and perspective. All parties work together to ensure the action plan is both useful and realistic. We emphasize that completing an IDP is a trainee-driven process—they are ultimately responsible for defining and communicating

their future goals and aspirations and soliciting feedback on their plan.

Survey results indicate students particularly value their interactions with their PD mentor, and a majority agreed or strongly agreed that completing the IDP helped them think about their long-term career goals (Fig. 1). In spite of the time required to complete and update their IDP on a regular basis, only 16% said they would not recommend an IDP to other students or postdocs, consistent with what we hear as facilitators—most find the process useful and are ultimately glad to have done it. Similarly, 81% of 'Ike Wai advisors and PD mentors agreed they would recommend IDPs, with 90% agreeing that completing an IDP helped students think about their academic and long-term career goals (GSA Supplemental Data Fig. S1¹).

While possibly coincidental rather than causal, we note that the trainees in our IDP program have shown exceptional leadership, taking on responsibilities beyond that of typical graduate students. Examples include convening conference sessions and workshops, requesting representation on the project's leadership committee, mentoring undergraduates, and taking a leading role in drafting project reports, planning fieldwork, and managing lab budgets.

Alumni report that they value, and continue to use, the goal-setting skills they learned from IDPs. As recent graduate Julie U'ilani Au wrote, "By setting personal and professional goals for myself, I have been able to gain a clear vision of what I want to do with my time and my career. Whenever I feel overwhelmed or confused, I think back to the IDP structure and make goals that I can hold myself accountable to."

GSA Today, v. 30, <https://doi.org/10.1130/GSATG3GW.1>. Copyright 2020, The Geological Society of America. CC-BY-NC.

¹Supplemental Material: Additional program information and implementation details, advisor/mentor survey results, and a copy of the basic IDP template used in the 'Ike Wai project. Please go to <https://doi.org/10.1130/GSAT.S.12130890> to access the supplemental material, and contact editing@geosociety.org with any questions.

All Responses (2017–2019)

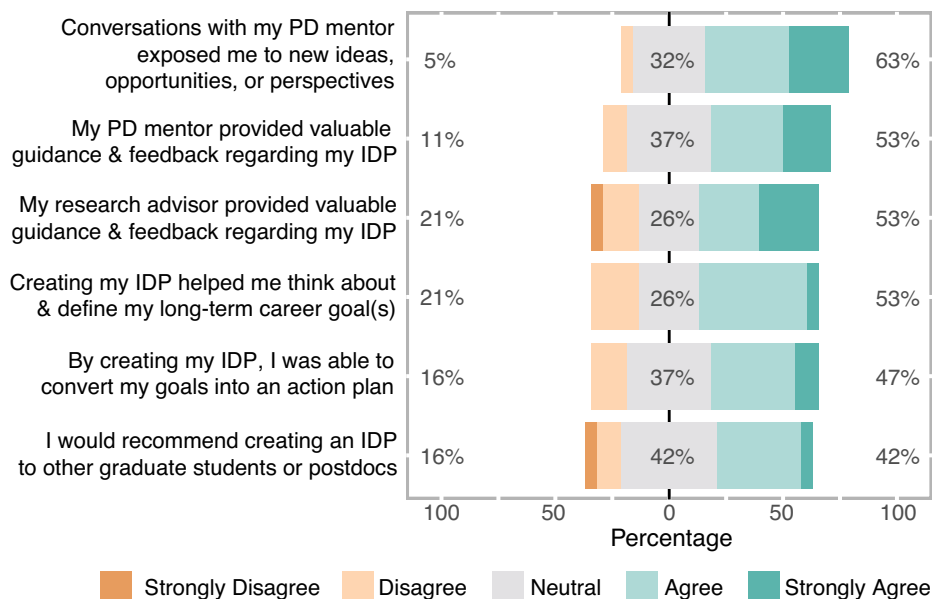


Figure 1. Aggregated results from our annual, anonymous survey of graduate students (2017–2019) ($n = 21$). Percentages shown correspond to the total responses for disagree or strongly disagree (left), neutral (center), and agree or strongly agree (right). IDP—individual development plans; PD—professional development mentor.

IMPLEMENTATION

Based on our experiences with this ongoing pilot program, we outline a few key considerations for those interested in implementing their own IDP program.

A Flexible Template

We created a simple custom form suited to the 'Ike Wai project that includes six core competencies: Research, Teaching and Mentoring, Leadership, Communication, Career Development, and Place and Culture (Supplemental Data Fig. S3). The last category was added to formalize the importance and relevance of cultural knowledge and skills. The project has an unusually diverse student cohort, including a high proportion of Native Hawaiians, women, and others from historically underrepresented groups. Moreover, a significant project component entails engaging with a diverse community of landowners and other stakeholders, which requires an additional set of knowledge and skills that were not well captured by most standard IDP templates. Although we provide forms, we also give trainees the option of using alternative formats as long as they capture the critical elements of an effective action plan: having specific, actionable milestones with clearly

defined outputs and a realistic timeline. While many students stick to the provided template, some have opted to use an online calendar or custom color-coded timelines. We also provide links to online IDP platforms with extensive career exploration tools as additional resources (e.g., myIDP).

Expanded Mentoring Network

According to our survey results, our trainees highly value PD mentors. The additional time burden on the mentor is minimal (most report spending ~1 hr or less per term; Supplemental Data Fig. S2), and while students could cultivate such relationships themselves, providing a formal match removes some of the psychological barriers to asking for help. This second mentor may play a particularly important role if the advisor-advisee relationship is strained, or their PD goals are poorly aligned with their research project. We also note this role has been particularly useful for underrepresented students seeking the guidance of someone from a similar background and shared cultural values. Particularly in the geosciences, one of the least diverse STEM fields (NSF, 2019), connecting students with faculty members outside their immediate discipline is one option for expanding and diversifying their support network.

Advisor Buy-In

Some of our experiences and feedback point to the importance of advisor buy-in and engagement, consistent with other studies that find advisees are more likely to value the IDP process if their advisor also does (e.g., Hobin et al., 2014). In other words, this process is not a fix for a disengaged advisor or one who is dismissive of non-academic careers. However, we note the potential power of the IDP process to open a dialogue on future career plans and perhaps dispel incorrect assumptions advisors may have about an advisee's goals and aspirations. Everyone benefits from starting this conversation early and helping trainees build the skills they will need for their future, whatever their chosen path.

ACKNOWLEDGMENTS

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Assembling Laurentia—Integrated Theme Sessions on Tectonic Turning Points

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The North American continent records the evolution of tectonic processes and tectonic environments from the earliest Archean to modern times. The continent hosts a rich Archean (and possibly Hadean) record, at least three great Proterozoic orogenic belts, and a wide range of Phanerozoic tectonic, sedimentary, and paleobiologic environments, including active plate boundaries. In many ways, Laurentia (ancestral North America) might be thought of as the prototypical continent, with a little—if not a lot—of everything. With its long record of changing tectonic settings, supercontinent cycles, and geologic outcomes, one question persists: Does Laurentia preserve a record of fundamental, relatively short duration changes in tectonic processes on Earth, or rather, a gradually changing configuration of continents in a slowly evolving plate tectonic system? The resolution of this question requires a continent-wide perspective on tectonics through time, and it requires the integration of many fields of geoscience. One way to approach the question is to ask (1) what is the holistic geological character of Laurentia at particular times in Earth history?; and (2) what are the apparent controlling factors at those times, from mantle dynamics to plate interactions, to surface weathering, to biological evolution?

The GSA 2020 Annual Meeting provides an opportunity to address the tectonic evolution of Laurentia and the evolution of tectonic processes in general as an international geoscience community. A meeting-long series of topical sessions have been organized that will focus on important times—which we call “Turning Points”—in the assembly, disassembly, modification, and growth of North America (Fig. 1). These sessions will be

headlined by a Pardee Symposium, which will provide an overview of the tectonic evolution of Laurentia and an introduction to the concept of key “Turning Points.” Seven related topical sessions, under the general heading “Assembling Laurentia,” will span the GSA meeting. Each session will scrutinize key periods in the long history of the continent when the character, rate, or style of tectonic processes may have changed or when the plate tectonic process itself may have changed in some fundamental way. The ultimate goal is to identify potential drivers for,

and the broader implications of, these changes, and to widen the scope of investigation beyond a particular boundary or regional geological event to the scale of Laurentia itself. The time slices for the topical sessions are as follows (with brief explanations from each session proposal):

2.8–2.5 Ga: Neoproterozoic Crust Formation and Cratonization

The Neoproterozoic time interval was the last, great episode of Precambrian crust formation prior to the Paleoproterozoic assembly

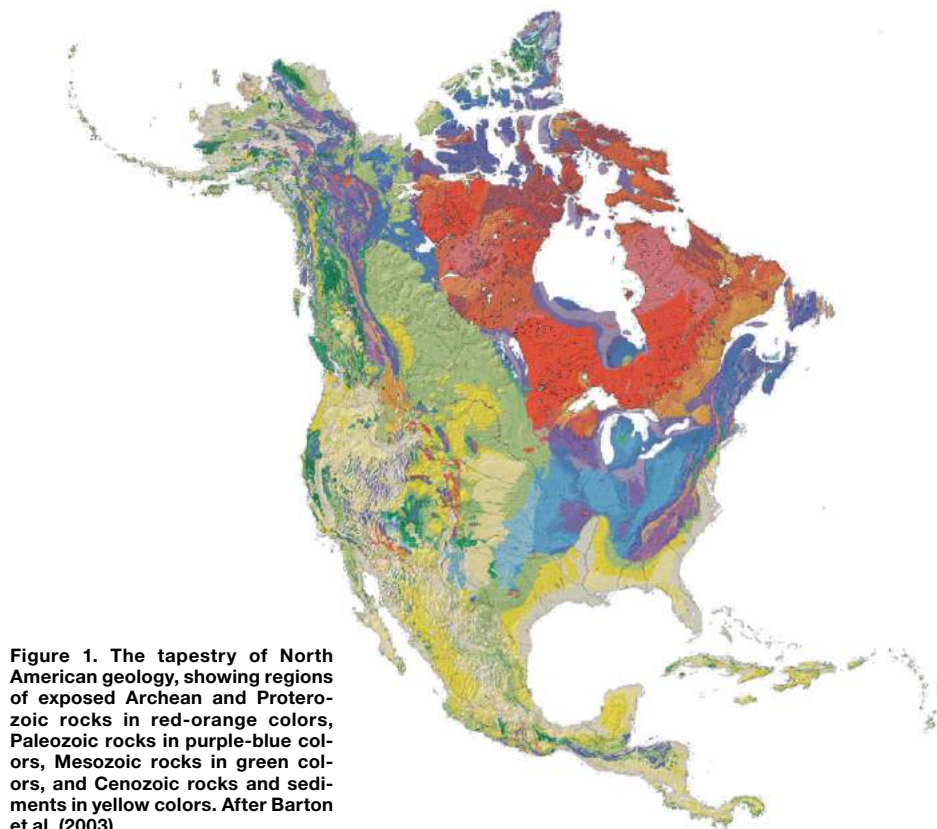


Figure 1. The tapestry of North American geology, showing regions of exposed Archean and Proterozoic rocks in red-orange colors, Paleozoic rocks in purple-blue colors, Mesozoic rocks in green colors, and Cenozoic rocks and sediments in yellow colors. After Barton et al. (2003).

of Laurentia. These continental nuclei form Laurentia's core.

1.9–1.7 Ga: Turning Points in Paleoproterozoic Tectonic Evolution

The Paleoproterozoic time interval saw the formation of the first recognizable passive margins, formation and accretion of oceanic crust, arcs, back-arc basins, foreland basins, and other environments arguably characteristic of modern plate tectonics.

1.5–1.4 Ga: GEON 14 Enigmas and Advances in Understanding the Crustal Evolution and Paleogeography of the Early Mesoproterozoic North America

Mesoproterozoic Laurentia was dominated by an Andean-scale active, but still very enigmatic margin, spanning ~5000 km, from eastern Canada to the southwestern United States and Mexico.

1.2–1.0 Ga: Mesoproterozoic to Early Neoproterozoic Tectonic Evolution of Laurentia and Its Role within the Supercontinent Rodinia

The late Mesoproterozoic to early Neoproterozoic spans the rise and fall of the Grenville orogen at the center of the supercontinent Rodinia, the formation of the Midcontinent Rift, and the initial breakup of Rodinia.

700–540 Ma Neoproterozoic to Cambrian Rifting and Continental Margin Evolution during Breakup of Rodinia and Pannotia

The Neoproterozoic to Cambrian time interval marked the breakup of Rodinia and Pannotia, and formation of the margins of Laurentia. The Neoproterozoic was also a time of profound climatic and biologic change, which may have been related to these changing tectonic conditions.

420–340 Ma Paleozoic Mobile Margins

The Silurian–Carboniferous closure of the Iapetus and Rheic oceans and the progressive growth of the Appalachian–Caledonian orogen along eastern Laurentia marked the onset of a series of tectonic events that propagated around Laurentia between the Devonian and Permian.

190–70 Ma Growth of the Western Continental Margin by Subduction, With or Without Terrane Accretion

This 190–70 Ma time slice saw the formation of the wide North America Cordillera and the opening of the Gulf of Mexico, involving a number of processes, including extension, shortening, lateral translation, subduction, magmatism, metamorphism, erosion, and sedimentation.

The choice of time slices is based, at least in part, on the current literature and recent meeting symposia that have highlighted new insights and interpretations, as well as unresolved questions about Laurentia's geologic history. The selection of particular time slices and the duration of the time windows will certainly be debated, but it is hoped that the discussion will articulate critical questions or outstanding problems and foster future collaboration and innovation across the geological and geophysical research communities. One aim is to gather momentum for developing new tools for open-source, widely available, collaborative integration of time-slice data sets across geologic disciplines and across the continent. As indicated previously, we hope to distinguish times when Laurentia's plate tectonic setting led to major changes in tectonic style from times when the controlling tectonic processes themselves may have shifted.

Two or three session proposers/organizers—including Canadian, U.S., and Mexican researchers—have volunteered to chair and coordinate the individual topical sessions. The goal is to solicit the broadest range of researchers, research areas, and research disciplines (including sedimentology, structural geology, petrology, geophysics, geobiology, etc.) in order to capture all aspects of the evolving continent (including now external Laurentian fragments and traces) and its consequent implications during a particular time slice. The Pardee Symposium and the seven associated topical sessions have been endorsed by several GSA Divisions as well as the Mineralogical Society of America.

There are two reasons that this is a particularly opportune time to take such an adventurous approach at a national meeting. First, the conclusion of the EarthScope project in the U.S., the LITHOPROBE project in Canada, and many other more regional geology-geophysics collaborations make this an

appropriate time to think about the tectonic record in the broadest possible terms. Geophysical data sets are now widely available, and workers are processing and integrating the data in new ways to gain insight into 3D implications of surface observations. Actualistic models of plumes, drips, slabs, slab tears, mantle wind, Moho variation, and discontinuities at all levels of the crust, lithosphere, and deeper mantle can be integrated with the surface record in order to build a truly 4D model of Earth tectonics.

The second reason is more specifically related to the current time and environment in which we are living—itsself a distinct “Turning Point.” As we write this article, we are all sequestered in our homes in the hope that we can help mitigate the current pandemic threat. We are also unsure whether the 2020 GSA Montréal meeting will happen, and if so, in what form. This gathering of many geoscience disciplines under the framework of Laurentia's evolution will be a celebration of the creative, collaborative, and international efforts that have made the scientific advances possible. Plate tectonics is our unifying theory, and as such, inherently involves all the fields of the geological sciences. Moreover, understanding the evolution of Laurentia has always required an international effort, although most critically engaging people located in North America. We are not just “in it together,” but with respect to Laurentia, we are “on it together.” Our individual research programs have always benefitted from the research of colleagues, working in other places and on different problems in their respective subfields, leading us to insights and discoveries that would have otherwise been out of reach. It has become more important than ever to assemble (whether in person or virtually), make new connections across our fields, and together establish our collective understanding of the place we all share.

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GSAF Says Goodbye to Jack Hess, Welcomes Chris Maples



John W. (Jack) Hess,
Outgoing GSA Foundation President

Outgoing GSA Foundation (GSAF) President John W. (Jack) Hess joined the Foundation after serving 13 years as GSA's executive director, for which he received GSA's Distinguished Service Award in 2015.

As GSAF president, he oversaw the successful completion of the Campaign for GSA's Future and led GSAF to raise more support for GSA programs than any other time in its history. His extensive experience with

GSA and knowledge of its members contributed to his effective leadership of GSAF. The staff greatly appreciates him and his years of caring leadership.

Reflecting on his time with GSAF, Dr. Hess says, "Looking back over the past five plus years as president of the GSA Foundation, I am most proud of our success in raising over US\$6.3 million during the 'Campaign for GSA's Future' to support a broad spectrum of Society programs. Our staff continues to set new standards for excellence in quality and professionalism. Success has been assured by this great team."



Dr. Christopher Grant Maples,
Incoming GSA Foundation President

GSAF welcomes Dr. Christopher Grant Maples as the next GSAF President. Maples earned his M.S. and Ph.D. degrees at Indiana University and his B.S. at West Georgia College. He has held senior leadership positions at both geoscience centers (Dept. Chair, Geological Sciences, Indiana University; executive vice president for research, Desert Research Institute) and tech-

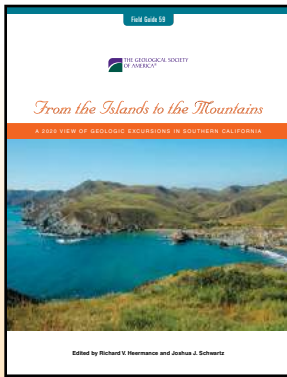
nology-focused universities (president, Oregon Institute of Technology; interim chancellor, Missouri University of Science and Technology). Just prior to joining the Foundation, he was the interim president at the Pacific Northwest College of Art (PNCA). He also has served at the National Science Foundation and the Kansas Geological Survey. In addition, he has some 16 years of continual advanced leadership training at several prestigious institutions. He is a GSA Fellow and a Fellow of the Paleontological Society.

The Foundation Board feels that he has excellent skills as both a manager and fundraiser and will help us expand our ranks of friends and donors to the Society.

Dr. Maples joins GSAF in July. Looking forward to his new role, he says, "I'm excited to return to my academic roots in the geosciences, especially in the role as the GSA Foundation president. Jack Hess and the GSAF Board have done a terrific job setting the stage for future success for GSA and all of its members."

The Foundation gives its most sincere thanks to Jack Hess for many years of thoughtful, bold, and very successful leadership and we welcome Chris Maples into our family.

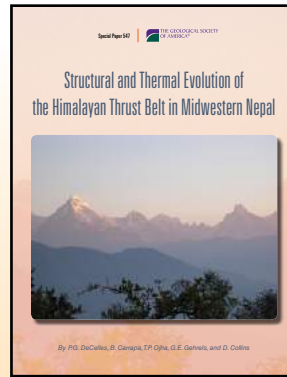
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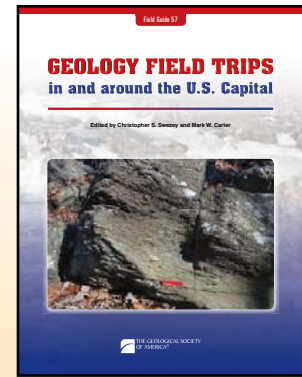
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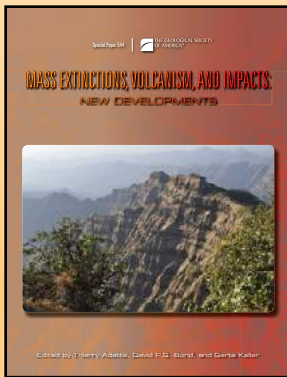
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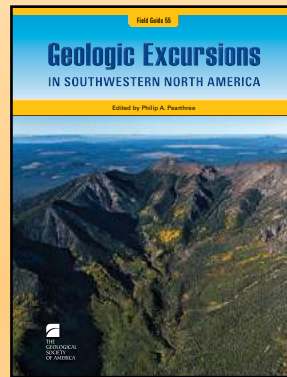
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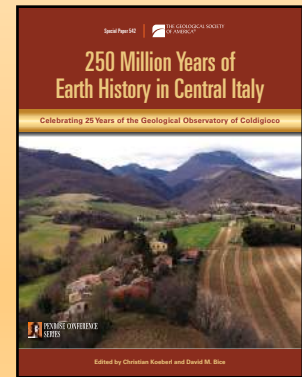
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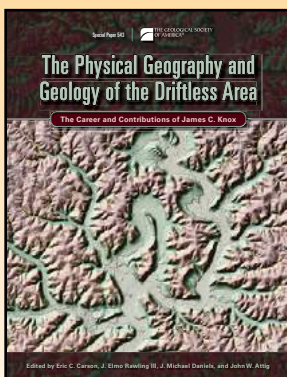
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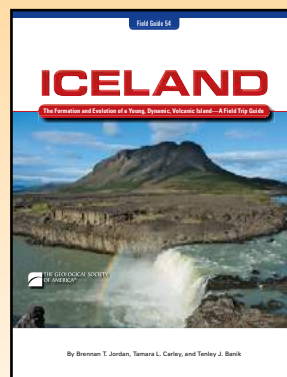
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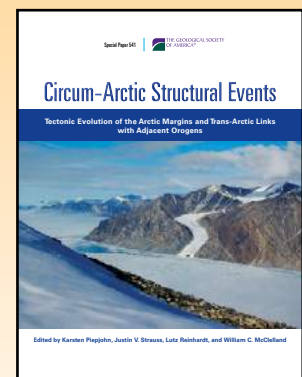
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