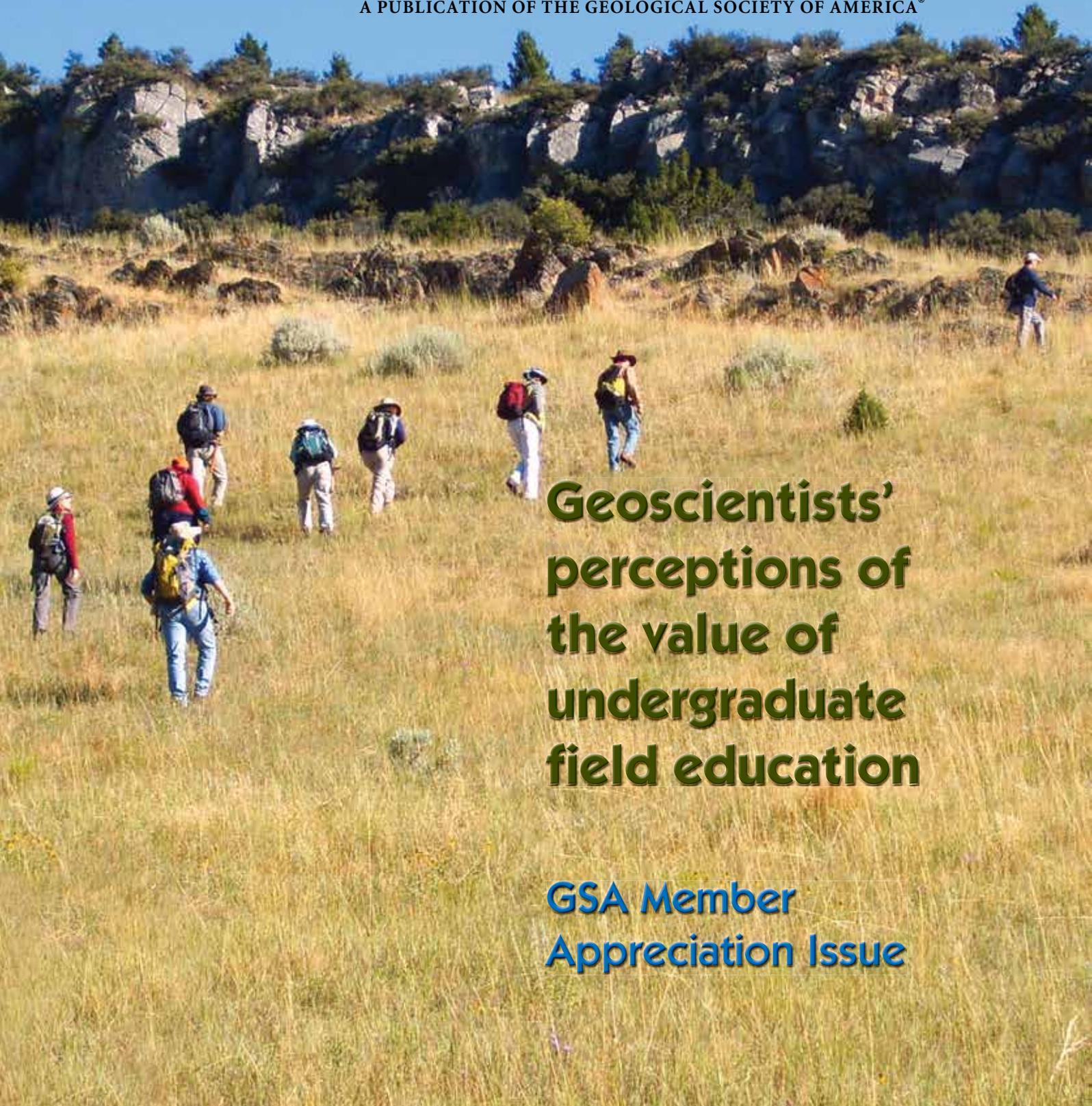


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**Geoscientists'
perceptions of
the value of
undergraduate
field education**

**GSA Member
Appreciation Issue**

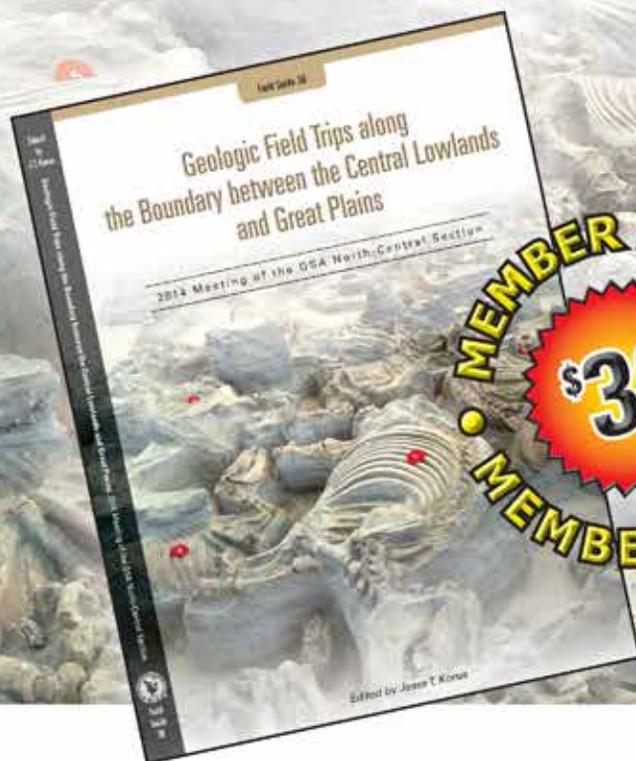
Geologic Field Trips along the Boundary between the Central Lowlands and Great Plains

2014 Meeting of the GSA North-Central Section

Edited by Jesse T. Korus

Geological and human forces have created some spectacular treasures at the boundary between the Central Lowlands and the Great Plains, and three of them are explored in this guide. In northern Nebraska, the Ashfall Fossil Beds site, a world-class *Lagerstätte* of articulated mammal, reptile, and bird skeletons, reveals the mass death of a Miocene biotic community. Chapter 1 provides a detailed overview of the geology, paleontology, and reconstructed paleocommunity at Ashfall. The bluffs of the Missouri River in eastern Iowa contain some classic type sections of Pleistocene stratigraphic units. Chapter 2 explores the historical development of Pleistocene stratigraphy in this area and presents new data to refine understanding of the area's complex geological history. Finally, Chapter 3 presents a unique tour of the Nebraska State Capitol in Lincoln, which is clad with Indiana limestone and adorned with igneous, metamorphic, and sedimentary rocks from European and U.S. quarries. The guide describes the historical, architectural, and geological aspects of these stones.

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Featured Article

SCIENCE:

4 Geoscientists' perceptions of the value of undergraduate field education

H.L. Petcovic, A. Stokes, and J.L. Caulkins

Cover: Geoscientists learning the local stratigraphy, Tobacco Root Mountains, Montana, USA. Photo by H.L. Petcovic. See related article, p. 4–10.



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Geoscientists' perceptions of the value of undergraduate field education

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ABSTRACT

Learning in “the field” has long held a prominent role in the education of geoscientists. Despite the expense, time, and liability risks associated with fieldwork, field experiences are widely perceived as integral to both learning and professional preparation. Yet, to date, little research has addressed questions of what types of field experiences are valuable and what outcomes are desired. We report findings from survey data collected at the 2010 and 2011 Geological Society of America Annual Meetings that characterize why undergraduate field education is valued within the geoscience community. While 89.5% of respondents ($n = 172$) indicated that fieldwork should be an integral and required part of undergraduate education, only 36.5% agreed that a course in bedrock mapping was necessary. Fieldwork is valued mainly for perceived cognitive gains, such as knowledge and understanding, and for enabling learners to interact with geological phenomena in their natural state. We found few statistically significant differences between self-identified groups, suggesting that students, instructors, and professional geologists hold largely similar opinions about the value of field education. This study helps to identify long-term goals and outcomes of undergraduate educational fieldwork experiences and points to actions needed to align fieldwork experiences with educational goals, workforce needs, and actual learning outcomes.

INTRODUCTION

Few would dispute that fieldwork as a learning activity is highly valued by the geoscience community. Indeed, the following sentiment continues to generate widespread agreement among geoscientists:

The reading of books and the study of specimens will never make the geologist; the geologist is made in the field, not in the laboratory. (Himus and Sweeting, 1955)

Less clear is **why** so much value is attached to fieldwork as a means of educating geoscientists. At its most fundamental, fieldwork provides a means of collecting primary data about Earth, from its atmosphere to its inner core. From an educational perspective, it enables learners to gain knowledge and expertise

through direct engagement with the natural world, and to develop the skills necessary for professional practice (e.g., Butler, 2008; Whitmeyer et al., 2009). It is also, for many learners, the first step toward carving their personal identity as a geoscientist by “learning to do what geoscientists do.” On the other hand, fieldwork, especially multi-week residential courses and camps, is expensive, resource-intensive, and logistically complex; in addition, the liability issues around taking groups of undergraduates into the “wild” can be daunting (e.g., Boyle et al., 2007).

So closely aligned is fieldwork with the identity of geoscience that its inclusion in the undergraduate curriculum is more-or-less ubiquitous. In the UK and Ireland, fieldwork forms a compulsory, and significant, component of all undergraduate geoscience programs (Boyle et al., 2009; Butler, 2008; Geological Society of London, 2013). The situation in the United States is more variable; however, most geoscience undergraduates receive some training in field methods, typically achieved through a combination of short (day or overnight) field visits and culminating with a “capstone,” multi-week summer field camp (Whitmeyer et al., 2009).

While fieldwork per se is not unique to the geosciences, the activity of geologic mapping is. Learning to recognize and map bedrock units, geologic structures, and landscape features in situ is arguably essential to the education of future geologists. However, in reality, the majority of students will never go on to map bedrock in their professional careers. In the UK, the compulsory requirement to complete an independent mapping project means that bedrock mapping is likely to remain part of the undergraduate curriculum for the foreseeable future. The case in the USA is less clear. Although the number of students enrolled in field camps is up, the total number of universities offering field camps has decreased by 60% since 1995 (Whitmeyer et al., 2009). Furthermore, many U.S. universities have dropped “traditional” (bedrock mapping) field courses in favor of more specialized courses (e.g., hydrogeology, geophysics, limnology) in response to the changing nature of the geosciences as a profession. We therefore ask, given the increasing diversity of fieldwork that geoscientists engage in, whether mapping should continue to play such a prominent role in undergraduate education.

So what, precisely, makes fieldwork so valuable to learning geoscience? Pyle (2009) identifies the main goals of field courses as (1) synthesis and application of knowledge; (2) acquiring the field skills and techniques typically required for an entry-level, professional geologist; (3) enculturation into the values and ethics of practicing geoscience; and (4) exposing students to the variety of geologic phenomena they may encounter. Similarly, Mogk and Goodwin (2012) review arguments based on “practitioner’s wisdom” (p. 134) claiming that field education yields improvements in students’ knowledge and problem-solving skills,

enhances students' ability to reflect on their own thinking (metacognition), generates positive feelings that lead to enhanced learning, offers direct and immersive experiences of geologic phenomena, and introduces students to professional practice.

This research suggests that field education has both cognitive (knowledge and skills) and affective (emotional and attitudinal) dimensions. Stokes and Boyle (2009) found that students clearly recognized the value of field experiences in enhancing their geologic knowledge and problem-solving skills but undervalued the impact of field education on their personal and professional skills. Other studies have advanced our understanding of how novice to expert geoscientists think, reason, and behave in the field (e.g., Kastens et al., 2009; Petcovic et al., 2009; Riggs et al., 2009; Feig, 2010; Hambrick et al., 2012; Baker et al., 2012) and considered some of the wider social and cultural aspects of field education (e.g., Elkins and Elkins, 2007; Riggs et al., 2007). This recent work has been a critical start toward understanding what we hope to accomplish in field geoscience education and the role that field courses play in the professional preparation of geoscientists.

Our purpose here is to report the first empirically driven attempt to directly capture perceptions from the professional geoscience community of why specific aspects of field education are of value. We specifically consider three research questions:

1. What do geoscientists broadly perceive as the value of undergraduate field education, including fieldwork, courses, and camps?
2. What do geoscientists perceive as the value of bedrock mapping education?
3. How do perceptions of value differ across groups of geoscientists (students, instructors, and industry professionals)?

Our goal is to better understand the role of field training in the education of new geoscientists and contribute to the expanding empirical literature on field-based geoscience education. Finally, we make recommendations for future action that can be taken based on our findings.

METHODS

The study used a mixed-method, concurrent triangulation research design (Creswell and Plano Clark, 2007). A convenience sample of passing volunteers completed a 10–15-minute written survey at an exhibit hall booth at the 2010 and 2011 Annual Meetings of the Geological Society of America. Survey items were modified from two existing instruments (Orion and Hofstein, 1994; Stokes and Boyle, 2009), face validated with two experts, and pilot-tested on a small group of geoscience education graduate students. The final survey consisted of three open-ended questions, 24 Likert-type items (statements to which respondents indicate their level of agreement on a scale of 1–4 or 5), four statements that participants ranked by importance, and 10 demographic questions.

In order to characterize the spectrum of values expressed by participants, responses to the open-ended questions were

qualitatively analyzed using a three-step emergent thematic coding procedure (e.g., Creswell and Plano Clark, 2007): (1) authors individually generated lists of ideas represented by the data, then merged lists to develop a coding scheme; (2) the scheme was tested on a random sample of data and revised; and (3) the final scheme was applied to the full data set. Once coded, responses to the open-ended questions were treated quantitatively by counting the frequency of particular ideas (sub-themes). Counts and ranked items were treated as nominal rank-level data for statistical analysis. The 24 Likert-type items were treated as ordinal data and analyzed at the level of individual items using non-parametric tests (after Clason and Dormody, 1994). Statistical analyses were performed in SPSS v. 20. Results of the independent qualitative and quantitative analyses were then compared (i.e., triangulated), enabling the drawing of more robust conclusions than a single data set would allow (e.g., Creswell and Plano Clark, 2007). A detailed description of the study methods is available in Part A of the GSA Supplemental Data Repository item associated with this paper¹.

STUDY PARTICIPANTS

In total, 172 complete, individual surveys (91 from 2010, 81 from 2011) were included in the analysis. Respondents self-identified as a “learner” (50.5%), “instructor” (35.8%), or “industry professional” (13.6%), and completed the survey based on this perspective. Ten participants selected more than one perspective (e.g., instructor and learner); these responses were included and analyzed in all selected categories, thus yielding 184 individual perspectives.

Overall, study participants ranged in age from 19 to 75 years old (mean: 32.5 years). Slightly fewer than half were female (45.9%), and most were white, non-Latino (88.1%), with 87.1% overall working or residing in the USA. The majority of respondents (75.4%) had attended, or planned to attend, a field camp, although relatively few (16.3%) had taught a field course or camp. Learners were dominantly students (45.7% undergraduate, 53.2% graduate), with a mean age of 25 and typically <5 years of work experience. Instructors were dominantly employed in college/academic settings (75.4%) or were graduate students (23.2%), with a mean age of 41. Industry professionals worked mainly in government (46.2%) and industry (42.3%), with a mean age of 48. Additional demographic data are available in Part B of the GSA Supplemental Data Repository (see footnote 1).

THE PERCEIVED VALUE OF UNDERGRADUATE FIELD EDUCATION

Analysis of the open-ended data revealed five broad themes, together with accompanying sub-themes, described below and listed with example quotes from participants in Table 1.

Theme 1: Fieldwork is Important

This category merely claims that fieldwork is important or integral to understanding, learning, or practicing geoscience without further explanation.

¹GSA supplemental data item 2014174, detailed description of study methods and participant demographics, is online at www.geosociety.org/pubs/ft2014.htm. You can also request a copy from *GSA Today*, P.O. Box 9140, Boulder, CO 80301-9140, USA; gsatoday@geosociety.org.

Table 1. Emergent themes and sub-themes based on analysis of open-ended responses

Theme and sub-theme	Example survey response
<u>Theme 1: Fieldwork is important</u>	Field experience is integral. (learner/instructor)
<u>Theme 2: Impacts on knowledge and skills</u>	
2a. Enhances broad understanding	Field experience is crucial to a well-rounded understanding of any earth sciences field. (industry professional)
2b. Enhances specific skills, knowledge, or practice	Fieldwork is the basis of geoscience through practical methods learned in class to using techniques of observation in the field. (learner)
2c. Develops transferrable skills	Regardless of whether or not a student will directly utilize the field methods, learning to operate and cooperate with others and/or within a group under imperfect conditions is a necessary and beneficial skill. (learner)
2d. Puts theory into practice	Fieldwork is the best way to integrate classroom with the real world. The best way to learn geology is to see it first-hand and learn from experience. (instructor)
2e. Physical interaction with phenomena	Seeing and touching the rocks is necessary for full understanding. (learner)
<u>Theme 3: Personal and emotional impacts</u>	
3a. Inspiring, motivating, exciting, or engaging	Absolutely! ... It acts as a “hook” to those students on the fence! (learner)
3b. Develops a geologist’s identity	Geologic mapping is the foundation and starting point for all geologic endeavors, you cannot call yourself a geologist if you don’t know how to map. (industry professional)
3c. Develops self-awareness and identity	Fieldwork strengthens your knowledge through application and helps you become aware of weaknesses. (learner)
<u>Theme 4: Prepares for career or graduate school</u>	Whether they go on to grad school, or into industry, or any geoscience profession, having at least some field experience helps them to develop an appreciation for several facets of real world geology. (instructor)
<u>Theme 5: Negative aspects of fieldwork</u>	
5a. Time, expense are prohibitive	Field camps, in my opinion, are old fashioned, expensive, and concepts can be taught equally well in shorter field oriented experiments. (instructor)
5b. Negative impact on attitude or interest	This [fieldwork] should certainly be required for geology, but not other branches of geoscience. Keep in mind that not everyone is cut out for fieldwork and/ or harsh field conditions. (learner)
5c. Skills can be learned elsewhere	Students can learn methods from field camp elsewhere, in research in the field as an undergrad through an REU [Research Experience for Undergraduates program] or through their own. (learner)
5d. Too specialized for all sub-disciplines or careers	Some specialties do not focus on bedrock mapping. (industry professional)
5e. Not all students are interested	Only if these specific skills apply to the student’s area of focus. (instructor)
5f. Should be recommended but not required	No [not necessary], though I do believe it should be strongly encouraged. (learner)

Theme 2: Impacts on Knowledge and Skills

The knowledge and skills gained by field experience are *products* of learning (sub-themes 2a–2c). These include cognitive gains, such as knowledge and higher order thinking skills (Bloom, 1956), together with practical skills (Dave, 1975). Three relevant sub-themes were identified. First, fieldwork teaches students to integrate concepts and broadens their general understanding of geoscience. Second, fieldwork develops the skills and knowledge specific to understanding and “doing” geoscience. Third, fieldwork teaches skills that transfer to other fields, such as cooperation, time management, and independent thinking. Theme 2 also addresses the *processes* by which students gain knowledge and/or skills through fieldwork (sub-themes 2d and 2e). The immersive nature of fieldwork provides the physical context for geoscience, allowing students to apply their knowledge to the real world. Embedded within this idea is the notion that physical interaction with the landscape and rocks is the means by which this understanding of geoscience is attained.

Theme 3: Personal and Emotional Impacts

As well as promoting cognitive gains, learning also impacts motivation, attitudes, and values—collectively termed “affective responses” (Bloom, 1956; Krathwohl, 2002). Three key ideas emerged within this theme. First, fieldwork impacts positively on students’ attitudes and feelings toward geoscience (e.g., Kern and Carpenter, 1984; Boyle et al., 2007). Second, fieldwork is an enculturation experience that enables students to develop their identity within the community of professional geoscientists. Finally, fieldwork can promote self-awareness by helping students to recognize their personal strengths and limitations.

Theme 4: Career Preparation

This theme concerns the practical outcome of preparing students to progress further in geoscience, either to graduate education or to geoscience careers.

Table 2. Results of quantitative analysis of open-ended questions

Questions		All respondents (n = 172)	Learners (n = 93)	Instructors (n = 66)	Industry professionals (n = 25)
1. Should fieldwork be an integral and required part of undergraduate programs?	% agreement	89.5	91.4	87.9	88.0
	% disagreement	1.7	2.2	1.5	0.0
	% mixed	8.1	6.5	9.1	12.0
2. Should a geologic field methods course or camp be required?	% agreement	79.4	76.3	78.5	87.5
	% disagreement	6.5	6.5	7.7	0.0
	% mixed	13.5	16.1	13.8	12.5
3. Should a field course or camp focused on bedrock mapping be required?	% agreement	36.5	35.5	38.5	37.5
	% disagreement	28.2	30.1	23.1	20.8
	% mixed	29.4	28.0	33.8	37.5

Note: Percentages within each category do not total to 100% because a small fraction of responses were too ambiguous to be interpreted. Results of a Pearson chi-square test for independence indicate no statistically significant differences in agreement frequency between categories of participants.

Theme 5: Negative Aspects

Many responses stated reasons why fieldwork should not be required in undergraduate education, and these are grouped into the final theme. Several sub-themes emerged. First, many respondents recognized that field camps are expensive and that the financial burden and time commitment may be prohibitive to some students. Second, some students simply do not enjoy fieldwork, and a requirement to undertake outdoor work may discourage those students from pursuing geoscience majors in college, and subsequently from careers in geoscience. Third, respondents recognize that skills taught in multi-week field courses or camps can be learned elsewhere, either via undergraduate research experiences or on shorter, targeted courses. Fourth, the skills taught in field courses and mapping camps are too specialized for all fields within the geosciences. A related fifth idea is that field experience should be tailored to students' areas of interest. Finally, several respondents commented that fieldwork should be offered and recommended but not compulsory, due to the challenges mentioned above.

The themes emerging from our qualitative analysis are consistent with those identified from previous research into the value of field education (e.g., Pyle, 2009; Stokes and Boyle, 2009; Mogk and Goodwin, 2012) indicating broad consensus within the geoscience community on why field education is valuable. However, quantitative findings imply that some of these potential outcomes are valued more highly than others (Tables 2, 3, and 4).

A large majority (89.5%) of participants agreed that fieldwork *in general* should be a required part of undergraduate programs (Table 2). Code counts (expressed here as % of responses assigned to a theme or sub-theme) indicate that participants perceive a positive impact on knowledge and skills, enabling learners to put theory into practice (sub-theme 2d, 35%) and enhancing specific geoscience knowledge, skills, and problem-solving (sub-theme 2b, 18.3%). On the negative side, 5% indicated that fieldwork may not be needed for all potential careers or disciplines in the geosciences (sub-theme 5d). Using a scale from zero (not important) to 10 (absolutely essential), participants assigned a mean score of 9.6 to the value of field experience. They expressed strong agreement that fieldwork should be required in undergraduate education, thus corroborating the qualitative findings, and that knowledge and skills learned in the field could not be learned in the classroom (Table 3). They also agreed that professional geoscientists

should be able to solve problems in the field, while disagreeing with the notion that geoscientific expertise can be gained without fieldwork experience (Table 3).

A smaller, though still strong majority (79.4%), agreed that a geologic *field methods* course or camp should be required in undergraduate programs (Table 2). These experiences are most valued for enhancing geologic knowledge and skills (sub-theme 2b, 24.1%), although a minority identified expense as an issue (sub-theme 5a, 4.2%). Participants assigned a mean score of 8.4 to the value of participating in a field camp or residential fieldwork, while the three most important learning outcomes of residential fieldwork were identified as improvement in critical thinking and problem-solving skills, enhanced understanding of fundamental geoscience concepts, and gaining proficiency in field skills (Table 4).

In summary, study participants valued undergraduate geoscience fieldwork for its perceived effectiveness in developing knowledge and skills (cognitive and practical) through direct engagement with geologic phenomena. Consistent with previous investigations (e.g., Boyle et al., 2007; Stokes and Boyle, 2009), affective responses were viewed as important to the learning process but did not emerge as valuable. Overall, the study population expressed strong support for the requirement of fieldwork per se in undergraduate education but slightly less support for residential field courses or camps.

THE PERCEIVED VALUE OF BEDROCK MAPPING

Findings relating to bedrock mapping are interesting and somewhat contradictory. Only 36.5% of respondents agreed that a mapping course should be required. Despite the roughly equal proportions of positive, negative, and mixed responses to this question (Table 2), a higher proportion of negative themes to positive themes emerged from the data. Respondents were predominantly concerned by the specialized nature of bedrock mapping (sub-theme 5d, 27.9%), although the positive impacts on knowledge and skills were again recognized (sub-theme 2b, 18.1%). Participants held reasonably positive perceptions about the ability to map bedrock, awarding it a mean value score of 6.7, and expressed general agreement that training in bedrock mapping should be provided in undergraduate programs (Table 3). While recognizing that the process can help students to understand how geologic maps are created, they were neutral on whether training

Table 3. Responses to survey items using a 5-point Likert scale*

Survey item	All respondents (n = 172)	Learners (n = 93)	Instructors (n = 66)	Industry professionals (n = 25)
Fieldwork experience should be compulsory for all geoscience majors/students on undergraduate geoscience programs. [†]	5 (5)	4 (5)	5 (5)	5 (5)
The knowledge and skills gained through fieldwork cannot be learned in the classroom.	5 (5)	5 (5)	5 (5)	4 (4)
All professional geoscientists should know how to solve problems in the field.	4 (5)	4 (5)	4 (5)	4 (4)
It is possible to become an expert geoscientist without fieldwork experience.	2 (2)	2 (2)	2 (2)	2 (2)
The best geologists are those who have seen the most rocks.	3 (2)	3 (2)	3 (3)	3 (3)
All colleges and universities should provide some kind of training in bedrock mapping.	4 (4)	4 (4)	4 (4)	3 (3)
Bedrock mapping is what geoscience is all about.	2 (2)	2 (2)	2 (1)	2 (2)
No matter what career path a student takes, s/he should have training in bedrock mapping.	3 (3)	3 (3)	3 (3)	3 (3)
Is it important for students to learn bedrock mapping so that they understand the process by which geologic maps are created.	4 (4)	4 (4)	4 (4)	4 (4)
The process of making a geologic map (i.e., learning the skills and knowledge required to make the map) is more important than the outcome (i.e., producing a good map). [§]	4 (4)	4 (4)	4 (4)	3 (4)
Bedrock mapping is less important today than it was 20 years ago.	3 (2)	3 (2)	2 (2)	2 (1)

* Likert scale: 1 = strongly disagree; 5 = strongly agree. Data are reported as median (mode) value.

[†] Results of Kruskal-Wallis test indicate that a significant difference between groups exists ($p = 0.046$). Results of Mann-Whitney U test indicate a significant difference between learners and industry professionals ($p = 0.037$).

[§] Results of Kruskal-Wallis test indicate that a significant difference between groups exists ($p = 0.044$). Results of Mann-Whitney U test indicate a significant difference between both learners and industry professionals ($p = 0.028$) and instructor and industry professionals ($p = 0.014$).

Table 4. Percentage of participants choosing each statement as one of the three most important learning outcomes from a residential field course or camp

Learning outcome	All respondents (n = 172)	Learners (n = 93)	Instructors (n = 66)	Industry professionals (n = 25)
Better understanding of fundamental geoscience concepts	13.8	13.7	13.9	21.5
Enhance critical thinking and problem-solving skills	18.1	18.8	19.4	15.4
Develop social and professional relationships with peers and instructors*	3.3	3.7	1.7	0.0
Increased confidence in working with "real" data and problems	12.3	12.2	11.7	10.8
Better preparation for a career in the geosciences	4.9	5.2	4.4	1.5
Better appreciation for how geosciences applies to the real world	6.8	7.4	5.0	9.2
Integrating knowledge from a range of courses	8.0	8.1	10.0	6.2
Developing geoscientific expertise	2.3	1.8	2.2	3.1
Proficiency in field skills	12.6	11.8	13.9	10.8
Proficiency in generic skills	6.0	5.9	5.6	6.2
Developing expert-like behavior	4.9	5.5	3.9	4.6
Learning how geoscientists think and reason	6.8	5.9	7.8	10.8
Other (Learning about one's abilities, skills, and weaknesses)	0.2	0.0	0.6	0.0

*Results of Pearson chi-square test for independence indicate a statistically significant difference between groups for this item ($p = 0.029$).

in bedrock mapping was necessary for all career paths and disagreed that mapping is a fundamental component of geoscience (Table 3).

In summary, the data indicate a perception that bedrock mapping has some value and courses should be available, but not required, for all undergraduates. Mapping is perceived to enhance knowledge and skills and to help students understand how maps are created; however, it should only be required when in the interest of the student.

PERCEPTIONS OF VALUE ACROSS GROUPS

Overall, we found perceptions across the three participant groups to be highly consistent. No statistically significant differences were found in the levels of agreement with the three open-ended questions across categories of participants (Table 2). Industry professionals expressed greatest support for undergraduate residential field courses or camps (Table 2) and were more likely to consider physical interaction with geoscience phenomena as critical to undergraduate learning (sub-theme 2e, 20.6%). Although these data were not statistically significant ($p = 0.054$ – 0.058), the Likert data (Table 3) revealed significantly greater support for undergraduate residential field courses or camps among industry professionals than among learners ($p = 0.037$).

In summary, our findings indicate broad agreement among the participant groups concerning the value of undergraduate field education, with the following interesting exceptions: (1) the favoring of compulsory residential field camps and courses by industry professionals (Table 3); (2) the valuing of social interactions in field courses by learners (Table 4); and (3) the valuing of creating good maps by industry professionals (Table 4).

STRENGTHS, LIMITATIONS, AND FUTURE WORK

This research makes an important contribution to the existing literature on fieldwork pedagogy by enabling values relating to field education to emerge directly from the population under study, rather than enforcing a preexisting framework. The triangulation process used with data analysis and interpretation (GSA Supplemental Data, Part A [see footnote 1]) lends credibility to the findings by demonstrating convergence between the emergent coding and quantitative data.

Some significant limitations to this study need to be recognized. First, participants were drawn from a convenience sample of geoscientists within a single professional organization with a predominantly North American membership. Second, the sample is small and non-representative. The American Geological Institute reports ~24,000 undergraduate geoscience majors and 9,000 graduate students at U.S. institutions in 2011 (Gonzales and Keane, 2011). The U.S. Bureau of Labor Statistics (2013) reports that ~76% of roughly 35,000 employed geoscientists work in various industries with the remainder in state or federal government, and ~13,000 work as post-secondary faculty in atmospheric, earth, ocean, marine, and space sciences. Even with these rough estimates, we have clearly under-sampled industry professionals, particularly those who work in non-government positions.

This issue of sample representativeness is more likely to impact the quantitative analysis than the qualitative coding. Themes describing the value of fieldwork bear a striking resemblance to the outcomes of field education derived from “practitioners’

wisdom” (Mogk and Goodwin, 2012) and analysis of selected field course syllabi (Pyle, 2009). Thus, we argue that the emergent categories or values of field education are robust, but that the quantitative analysis should be interpreted with caution. The next step is therefore to extend this survey with a larger and more representative international population, in order to achieve a more informed perspective on the value of field education.

CONCLUSIONS AND RECOMMENDATIONS

Geoscience field education is rapidly approaching a critical crossroads. With 89.5% agreement that fieldwork should be a fundamental requirement for undergraduate geoscience programs, this study empirically supports the general perception among our community that “fieldwork is good” (Boyle et al., 2007). However, this perception alone is not enough to withstand the increasing pressures of expense, liability, and accountability related to taking students into the field. Considering our findings in light of the current state of field education, we recommend the following courses of action. First, there is a clear need for critical and open discussion between academia and industry about the role of bedrock mapping in field education. This dialogue must extend across the international geoscience community to ensure that the diversity of opinions over how to best use field education to prepare students for the wide range of geoscience professional opportunities are properly debated and addressed. Next, the observed discrepancies between learners, instructors, and industry professionals merit further investigation. Again, this reflects the necessity for robust dialogue between academia and industry; ideally, students’ educational field experiences should prepare them for the workforce, and thus the learning goals of field education and employer needs should be well-aligned. Next, academic institutions need the vocal support of industry to ensure that field education continues to have a place in resource-strapped undergraduate programs. Finally, we call on the geoscience education research community to further investigate the actual impacts and benefits of field education, in order to test empirically whether the value that our professional community perceives in field education is justified.

ACKNOWLEDGMENTS

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GSA President Hap McSween invites all students registered for the meeting to attend a free breakfast buffet sponsored by ExxonMobil Corporation. Hap and members of GSA leadership will be on hand to answer questions and address student issues. ExxonMobil will also be presenting the GSA/ExxonMobil Field Camp Scholar and Bighorn Basin Field Awards.

Each student registered for the meeting will receive a complimentary ticket for the breakfast buffet. This is one of the most popular events at the meeting for students, and with good reason! Take this opportunity to network with fellow students and meet the officers of GSA at this casual event.

Top 5 Things to See & Do in Vancouver this Fall

Fall is one of the best times to visit Vancouver. Summer crowds are gone, and the weather is often divine, with long, mild days and cool nights. It's a good time for exploring the great outdoors and getting to know the city's sophisticated side, from hip neighborhoods to first-class restaurants.

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- 2 **Explore the historic Gastown neighborhood:** First settled in the 1860s, waterfront Gastown is Vancouver's oldest neighborhood. Today, its narrow cobblestone streets are lined with progressive restaurants specializing in fresh, local cuisine, and trendy gastropubs.
- 3 **Get your street food fix:** Think street food is all hot dogs and pretzels? On Vancouver's street corners, you'll find everything from salmon burgers to authentic Indian curries and Korean-style short-rib tacos—all served fresh daily.
- 4 **Escape to Granville Island:** A lively waterfront neighborhood of craft shops and gourmet food markets, Granville Island is just a quick, two-minute ferry ride from downtown Vancouver. Take a tour of the enormous Public Market, with hundreds of booths selling artisan meats and cheeses and fresh veggies, or sample some of the city's craft ales during a Granville Island brewery tour.
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Vancouver

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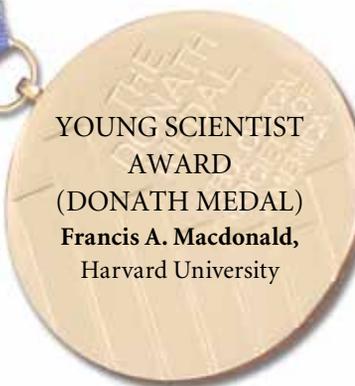
ARTHUR L. DAY MEDAL
Lisa Tauxe, Scripps Inst. of
Oceanography, UC-San Diego

GSA PUBLIC SERVICE AWARD
Mark C. Quigley,
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**SUBARU OUTSTANDING
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IN SCIENCE AWARD**
Ami L. Riscassi, Oak Ridge
National Laboratory

**RANDOLPH W. "BILL" AND
CECILE T. BROMERY
AWARD FOR THE MINORITIES**
Isaac J. Crumbly, Ft. Valley
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(DONATH MEDAL)**
Francis A. Macdonald,
Harvard University

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JOHN C. FRYE AWARD
The Groundwater Atlas of Nebraska:
Resource Atlas no. 4b, 2013, third
(revised) edition, by Jesse T. Korus, Leslie
M. Howard, Aaron R. Young, Dana P.
Divine, Mark E. Burbach, J. Michael Jess,
and Douglas R. Hallum, with
contributions from R.F. Diffendal Jr. and
R.M. Joeckel. Edited by R.F. Diffendal Jr.



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OF IAN CAMPBELL**
James F. Davis, former California
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2014 GSA Division & Section Primary Awards

RIP RAPP ARCHAEOLOGICAL GEOLOGY AWARD

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William R. Dickinson, University of Arizona–Tucson

GILBERT H. CADY AWARD

Coal Geology Division
To be determined

E.B. BURWELL, JR., AWARD

Engineering and Environmental Geology Division
A. Keith Turner and Robert L. Schuster for *Rockfall; Characterization and Control*: Transportation Research Board, National Academies Press, 2012.

OUTSTANDING CONTRIBUTIONS AWARD

Geoinformatics Division
Ian Jackson, formerly of the British Geological Survey

GEORGE P. WOOLLARD AWARD

Geophysics Division
Joe Kirschvink, California Institute of Technology

BIGGS AWARD FOR EXCELLENCE IN EARTH SCIENCE TEACHING

Geoscience Education Division
Callan Bentley, Northern Virginia Community College

MARY C. RABBITT HISTORY OF GEOLOGY AWARD

History and Philosophy of Geology Division
Henry Robert Frankel, University of Missouri–Kansas City

O.E. MEINZER AWARD

Hydrogeology Division
Charles F. Harvey, Massachusetts Institute of Technology

ISRAEL C. RUSSELL AWARD

Limnogeology Division
Robin W. Renaut, University of Saskatchewan

DISTINGUISHED GEOLOGIC CAREER AWARD

Mineralogy, Geochemistry, Petrology, and Volcanology Division
Frederick A. Frey, Massachusetts Institute of Technology

G.K. GILBERT AWARD

Planetary Geology Division
Bill McKinnon, Washington University in St. Louis

KIRK BRYAN AWARD FOR RESEARCH EXCELLENCE

Quaternary Geology and Geomorphology Division
John C. Ridge, Greg Balco, Robert L. Bayless, Catherine C. Beck, Laura B. Carter, Jody L. Dean, Emily B. Voytek, and Jeremy H. Wei for “The new North American varve chronology: A precise record of southeastern Laurentide Ice Sheet deglaciation and climate, 18.2–12.5 kyr BP, and correlations with Greenland ice core records,” *American Journal of Science*, 2012, v. 312, p. 685–722.

LAURENCE L. SLOSS AWARD

Sedimentary Geology Division
Chris Paola, University of Minnesota

CAREER CONTRIBUTION AWARD

Structural Geology and Tectonics Division
Darrel Cowan, University of Washington

2014 Section Primary Award

DISTINGUISHED CAREER AWARD

International Section
Farouk El-Baz, Boston University



2014 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 www.geosociety.org/members/fellow.htm.

GSA's newly elected Fellows will be recognized at the 2014 GSA Annual Meeting Awards Ceremony on Sunday, 19 October, at the Vancouver Convention Centre. *We invite you to read some of what their nominators had to say.*

Carlos Lynn Aiken (The University of Texas at Dallas): Carlos Aiken has applied gravity, magnetic, GPS, and cybermapping methods to advance our knowledge of the crust in the Southwestern USA. —Kevin Lee Mickus

Charles B. Andrews (S.S. Papadopulos & Associates Inc.): Charlie Andrews is a groundwater hydrologist with expertise in groundwater flow, contaminant fate/transport, water resources, and site remediation. He is president of S.S. Papadopulos Associates with nearly 40 years of experience and has published extensively. He has served as a trustee of GSA Foundation since 2007, currently as Treasurer. —Paul G. Feiss

Christopher M. Bailey (College of William and Mary): Bailey has inspired a multitude of students at all levels of college teaching. In addition, he has a remarkable record of mentoring undergraduate students in significant research projects, leading to student-authored abstracts, journal articles, field guides, and geologic maps. —Brent E Owens

Larry Band (University of North Carolina): Elected to Fellowship as the Hydrogeology Division's 2014 Birdsall-Dreiss Lecturer.

Eric S. Cowgill (UC-Davis): Eric Cowgill is internationally recognized for innovative research in active tectonics of the India-Asia collisional system, for developing rigorous approaches to quantifying active fault slip rates, and for leading advances in cyberinfrastructure for geological interpretation of high-resolution imagery and topography. He has strong mentoring and service records. —Eldridge M Moores

William L. Cunningham (U.S. Geological Survey): Publication of geologic research: Bill's broad field experiences have led to numerous publications in refereed journals and USGS reports. He's co-authored many publications from his hydrogeologic fieldwork in Ohio and in North Carolina. More recently, as a division chief, he's co-authored reports dealing with national water issues using larger databases. —Edwin S. Bair

Gareth J. Davies (Tennessee Dept. of Environment): Davies is nominated for conducting high-quality hydrogeological investigations utilizing comprehensive tracing studies to document rapid subsurface flows and subsurface connections over very long distances. His subsurface tracing expertise has allowed him to provide expert oversight as a regulator as appropriate. —Malcolm S. Field

Daniel M. Deocampo (Georgia State University): Deocampo is recognized for his groundbreaking work describing the geochemistry and mineralogy of saline lakes addressing the development of terrestrial climate proxies via clay mineral analyses. Deocampo is the founding member of the Limnology Division of GSA. He is currently serving as Department Chair of Geosciences at Georgia State University. —W. Crawford Elliott

David L. Dilcher (Indiana University): David Dilcher, Fellow of the U.S. National Academy of Sciences, is arguably the most respected paleobotanist in the world. He has some 250 published papers to his credit with a number in *Science* and *Nature*. His contribution to the origin of flowering plants has been seminal and the first. —Abhijit Basu

Nelia W. Dunbar (New Mexico Bureau of Geology and Mineral Resources): Nelia Dunbar is nominated for the quality and breadth of publications and collaboration applied to magmatic volatiles, tephrochronology, volcanology, and glacial geology. By sharing access and data from her electron probe lab she has aided projects from Antarctica to the western U.S., including student research and training. —Charles E. Chapin

Jay Famiglietti (University of California–Irvine): Elected to Fellowship as the Hydrogeology Division's 2012 Birdsall-Dreiss Lecturer.

G. Lang Farmer (University of Colorado–Boulder): Farmer's achievements in understanding continental volcanism, applying Nd isotopes to understanding lithospheric structure and sedimentary provenance are complemented by his multiple selfless contributions to improving education and research at CU-Boulder, his participation in community service such as NAVDAT, and his ability to educate non-geochemists on geochemistry. —Craig H. Jones



Carl Fricke (self-employed): As GSA-GSAF Investment Committee Chair, Carl Fricke has provided the leadership and dedication to the financial success of the Society. For over 35 years, he has been a recognized expert in promoting and applying the geosciences to resolving water resource, engineering, and energy development issues. —David A. Stephenson



William J. Fritz (College of Staten Island, CUNY): For two decades William J. Fritz trained many field geologists in the field geology courses that he taught. He has published several seminal articles that have helped us understand the geology of the Yellowstone hotspot, tectonic sedimentation in associated graben basins, and deposition of volcanoclastic and lacustrine sediments. —Hassan A. Babaie



Peter Geiser (Global Microseismic Services): Geiser is nominated on the basis of his persistent, imaginative, and productive program of pure & applied research on the deformation mechanisms, geometry, kinematics, and mechanics of fold-and-thrust belts. —Ray Fletcher



Rob Govers (Utrecht University): Rob Govers is nominated for fundamental advances in our understanding of plate tectonic processes, plate driving forces and plate boundary evolution. —Kevin P. Furlong



Gabriel Gutierrez-Alonso (University of Salamanca): Gutierrez-Alonso is nominated for his provocative research that has demonstrated that entire mountain belts can buckle about a vertical axis of rotation, that buckling involves the entire lithosphere, and that the formation of Pangea involved buckling of the Appalachian–Variscan mountain system; and for his commitment to the advancement of the earth sciences in Spain and internationally. —Stephen Thomas Johnston



Roy D. Haggerty (Oregon State University): Haggerty has significantly advanced the state of the science in the fields of ecohydrology and surface- and groundwater solute transport. —David A. Benson



FELLOWSHIP NOMINATIONS ARE SUBMITTED IN THE FOLLOWING CATEGORIES:

- Publication of the results of geologic research
- Applied research
- Training of geologists
- Administration of geological programs
- Public awareness of geology
- Professional organizations
- Editorial, bibliographic, and library responsibilities
- Other

Gordon B. Haxel (U.S. Geological Survey): Haxel is a geological leader largely responsible for recognizing the widespread occurrence of Jurassic terranes in southern Arizona and elucidating the close relations between thrust faulting, regional metamorphism, and synorogenic plutonism, as well as his extensive research into the origin of the enigmatic Orocopia schist, an enigmatic, landlocked oceanic terrane. —Robert S. Hildebrand



Tucker Fox Hentz (The University of Texas at Austin): Tucker Hentz has made distinguished contributions to the geosciences through publication of his geologic mapping and applied research in the fields of clastic sequence stratigraphy and depositional systems. His research and publications have direct application to development of geologic resources. Editorship of geologic publications supports his nomination. —Shirley P. Dutton



Thomas D. Hoisch (Northern Arizona University): Hoisch is nominated for GSA Fellowship in recognition of sustained and influential contributions in development and application of techniques to elucidate *P-T-t* histories of metamorphic rocks, including empirical calibration of geothermobarometers, fluid-rock interactions, thermal modeling, and understanding the tectonic history of mid-crustal rocks in the hinterland of the Sevier orogen. —Michael L. Wells



Peter Kyle House (U.S. Geological Survey): Elected to Fellowship as a QG&G Division 2013 Kirk Bryan Award recipient.



"I am pleased to offer this nomination for a scientist with a long and productive career that focused on geoscience issues of national and global importance."

2014 GSA Fellows

Alan D. Howard (University of Virginia): Elected to Fellowship as the Planetary Geology Division's 2013 G.K. Gilbert Award recipient.



Akira Ishiwatari (Tohoku University Center for Northeast Asian Studies): Akira Ishiwatari, president of the Japanese Geologic Society, is nominated for his pioneer contribution on petrologic diversity and tectonics of many ophiolite belts in Japan and subsequently for those in the Alps, Russia, Mongolia, and Bonin forearc. His recent papers on Japanese greenstones contributed to a new concept of the plume-type ophiolite. —Juhn G. Liou



Nancy L. Jackson (New Jersey Institute of Technology): Jackson's principal research contributions focus on dynamic beach processes. She is the international leader in research on estuarine beaches, and she has made fundamental contributions to research on aeolian transport in the coastal zone and the interaction between biota and geomorphic processes. —Karl F. Nordstrom



Linda C. Kah (University of Tennessee): This nomination is based on Kah's outstanding publications on the topics of (i) sedimentology of ocean sediments formed during the Mesoproterozoic and Ordovician periods of Earth history; and (ii) geochemical and depositional environments of sedimentary rocks on Mars as a member of Mars Science Laboratory Mission. —Larry D. McKay



Carl S. Kirby (Bucknell University): Carl Kirby's scholarship has been intellectually rigorous, influential in the literature, and effectively transferable to informing solutions to vexing environmental problems. Moreover, his watershed-scale research has provided exceptional training for undergraduate students and education/outreach for the general public. —R. Craig Kochel



Eric Kirby (Oregon State University): Eric Kirby has made fundamental and substantial contributions to our understanding of the topographic evolution of orogens during the approach to steady-state. Through his research we better understand the dynamic interplay among active tectonics, landscape topography and fluvial incision during the growth and evolution of the Tibetan Plateau. —Thomas W. Gardner



"[He] provides his time and expertise generously, without bartering for compensation or acclamation."

Karen M. Kortz (Community College of Rhode Island): Karen Kortz was nominated for her many contributions to geoscience education, including workshops, textbooks, research, and governance. She is a strong advocate for geoscience in the community colleges and the incorporation of best teaching practices in the class, and a superb mentor. —Daniel P. Murray



Richard Derek Law (Virginia Tech): Richard Derek Law has provided profound insights into the tectonics of active and ancient collisional mountain belts through the integration of macro- and microstructural data. He has been an enthusiastic advocate of meticulous field-based structural research with an outstanding record of teaching and service to the international Earth Science community. —Richard H. Sibson



"She is a star in the geoscience education community."

Naomi Levin (Johns Hopkins University): Elected to Fellowship as the 2013 Donath Medal Award recipient.



Thomas V. Lowell (University of Cincinnati): For his research contributions to the study and understanding of the nature and dynamics of Late Quaternary glaciation of the Americas. —Lewis A. Owen



Jeff McDonnell (University of Saskatchewan): Elected to Fellowship as the Hydrogeology Division's 2011 Birdsall-Dreiss Lecturer.



William C. McIntosh (New Mexico Bureau of Geology and Mineral Resources): Bill McIntosh has an exceptional research record on the geochronology and volcanology of the major volcanic provinces of western North America and Antarctica. Bill has been a world leader in developing and implementing techniques in $^{40}\text{Ar}/^{39}\text{Ar}$ dating through his highly productive New Mexico Geochronology Research Laboratory. —Christopher D. Henry



Damian Nance (Ohio University): For his prolific and highly cited research spanning four decades into tectonic processes, especially supercontinent cycles, his contribution to GSA publications and IGCP-UNESCO Programs, mentorship to several generations of students, and outreach to the general public. —Brendan Murphy



“His research and collections have touched in some form or another every continent on the globe.”

Nathan A. Niemi (University of Michigan): Nathan Niemi has utilized many approaches to understand continental deformation in several settings. He has applied tectonic geodesy and neotectonics methods to better understand the mechanics and dynamics of crustal extension. He has used and refined low-temperature thermochronologic and paleo-altimetry techniques to better understand orogen growth and exhumation processes. —John W. Geissman

Dani Or (ETH Zurich): Elected to Fellowship as the Hydrogeology Division’s 2013 Birdsall-Dreiss Lecturer.

Philip A. Pearthree (Arizona Geological Survey): Elected to Fellowship as a QG&G Division 2013 Kirk Bryan Award recipient.

“She was responsible for hiring well over one hundred geoscientists from all over the world.”

S. George Pemberton (University of Alberta): George Pemberton is one of the pioneers and world’s leading authority in ichnology—animal-sediment relationships and the study of trace fossils. His groundbreaking research includes fundamental developments in ichnology and its application to invertebrate paleontology, clastic sedimentology, and genetic stratigraphy, leading to paradigm shifts in hydrocarbon exploration and production worldwide. —Stephen T. Hasiotis

Michael E. Perkins (University of Utah): Elected to Fellowship as a QG&G Division 2013 Kirk Bryan Award recipient.

Patrice F. Rey (University of Sydney): Rey is a creative and productive tectonicist who uses a combination of computational and field-based approaches to make significant contributions to understanding the evolution of the lithosphere, including mechanisms and consequences of crustal flow, the development of topography, processes related to rifting of continental margins, and the origin of opal. —Donna L. Whitney

Scott D. Sampson (Denver Museum of Nature & Science): Elected to Fellowship as the 2013 Public Service Award recipient.

Geary M. Schindel (Edwards Aquifer Authority): Geary Schindel has significantly contributed to the administration of geologic programs and public awareness of geology throughout the mid-continent. Under his management, through a series of innovative projects and outreach programs, he has facilitated meaningful understanding of complex karst systems to many organizations and a diverse range of stakeholders. —John V. Brahana

Steven C. Semken (Arizona State University): Semken is an active researcher making important contributions to the field through research publications, teaching, and presentations. He plays important leadership roles in professional societies, geoscience education programs, and Earth science research projects, and is an active participant and leader in the geoscience education community. —Marilyn J. Suiter

Brian L. Sherrod (U.S. Geological Survey): Brian has significantly increased our understanding of the role of upper plate faulting to earthquake hazards in the active Cascadia forearc and backarc through his seminal demonstrations of the power of airborne LiDAR for mapping hazardous faults in glaciated, forested, and urbanized terranes. —Alan R. Nelson

Reginal W. Spiller (Allied Energy): Elected to Fellowship as the 2013 Bromery Award recipient.

Robert J. Sterrett (Itasca Denver Inc.): Recognized for his applied expertise in groundwater flow, groundwater well and drilling technologies, and practical application of hydrogeology to addressing contaminated groundwater. Sterrett is editor and contributor to the third edition of *Groundwater & Wells*, and serves on the GSA Foundation Board and Executive Committee, where he had made instrumental contributions. —Margaret R. Eggers

John S. Stuckless (U.S. Geological Survey): John Stuckless is nominated for his highly productive and geologically diverse career with the USGS and the University of Northern Illinois emphasizing the application of various isotope geochemical methods to a variety of economic and environmental issues including paleo-hydrologic studies in the evaluation of Yucca Mountain as a potential nuclear waste repository. —Zell E. Peterman

2014 GSA Fellows

Lori L. Summa (ExxonMobil Upstream Research Co.): Lori Summa has had a distinguished career in the geosciences at ExxonMobil Upstream Research. Her primary area of expertise is integrated basin and hydrocarbon systems analysis. Lori has made significant contributions to research and has educated thousands of young geoscientists by teaching courses at GSA, other professional societies, and ExxonMobil. —Norman (Bob) R. Stewart

Dawn Y. Sumner (UC-Davis): For her contributions to our understanding of life in extreme environments, with an emphasis on understanding the origin and evolution of life on Earth, and in the evolution of Mars and the potential for discovering life on other planets, as well as for her commitment to geoscience education and public outreach. —Isabel P. Montanez

Hans Thybo (University of Copenhagen): Thybo is a world leader in application of seismic methods to studies of the tectonic and magmatic evolution of the continental lithosphere. —Seth Stein

Tatsuki Tsujimori (Okayama University, Misasa, Institute for Study of the Earth's Interior): Tatsuki Tsujimori is nominated for illuminating the petrotectonic processes of cold subduction zones including recycling of fluids + crustal materials. His global researches in active continental margins demonstrate that some lawsonite-bearing rocks recrystallized under “forbidden zone” *P-T* conditions. His comprehensive data syntheses are formulated in 2013 papers on jadeitites, plate-tectonic gemstones, and the fate of subducted continental crust. —Juhn G. Liou

Fred Webb Jr. (Appalachian State University): Fred Webb Jr. is a consummate teacher of geology, especially in the field where geology is best taught. Teaching a range of courses and administering academic programs and field camps, he has sought to bring the field to the classroom, as well as classroom teaching to the field. —William A. Thomas

John C. Weber (Grand Valley State University): John Weber is an accomplished scientist who has bridged geology and space geodesy and has defined the New Madrid seismic zone and the plate motion at the Caribbean-South America boundary. He has been a tremendous educator and inspiration for undergraduate students and a generous citizen of the international tectonics community. —Christian Teyssier

David Williams (Arizona State University): David Williams has tirelessly and selflessly served the Planetary Geology Division of GSA both before and after serving as an elected officer for the division. He enthusiastically promotes planetary science through public outreach and education, reminding the voters of the importance of supporting space science. —Tracy P. Gregg

John A. Wolff (Washington State University): John Wolff is a world-leader in volcanological research. He has been an exemplary geological educator, with an enviable record of student engagement and mentoring in research. He has also served his professional community through leadership in editorial activities and active memberships in professional societies. —Shanaka L. de Silva

William I. Woods (University of Kansas): Elected to Fellowship as the Archaeological Geology Division's 2013 Rip Rapp Award recipient.

Xiaoping Yang (Chinese Academy of Sciences): Xiaoping Yang is an insightful researcher in drylands who bridges science cultures East and West. He is active in service to the geo community, editing *Quaternary Research* and *Quaternary Science Reviews*. He has received the Huang Jiqing Prize in China and the El Baz Award for Desert Research at GSA. —Alan R. Gillespie

Guochun Zhao (University of Hong Kong): Guochun Zhao is a gifted researcher who was one of the first to propose a coherent model for the Paleoproterozoic supercontinent, Nuna, to provide new insight into tectonothermal processes in high grade terranes, and to produce the first integrated model for the subdivision and assembly of the North China craton. —Peter A. Cawood

“His papers show an unusual combination of creativity, energy, breadth, and depth.”

GSA Celebrates New 50-Year Members for 2014

GSA salutes the following members and Fellows on their **50-year** membership anniversaries.
We appreciate their dedication and loyalty to GSA for all these years.

For a list of members who have *surpassed* the 50-year mark, please visit <http://rock.geosociety.org/membership/50YearMembers.asp>; the list of Fellows can be found at <http://rock.geosociety.org/membership/50Yearfellows.asp>.

Asterisks (*) below indicate those members who have not yet been honored by election to GSA Fellowship. **GSA Fellows:** You can help maintain a dynamic, vibrant cohort by nominating these and other deserving geoscience colleagues for Fellowship. Guidelines and nomination forms are online at www.geosociety.org/members/fellow.htm. If you have questions, please e-mail awards@geosociety.org.



Roger Y. Anderson*
Thomas B. Anderson*
James E. Andrews
Antonio M. Arribas*
Roger P. Ashley
Fred Barnard*
Richard B. Berg
C. Alan Berkebile
Larry A. Beyer*
Michael Bikerman
Herbert E. Bradshaw*
Willi K. Braun
William J. Brennan*
B. Clark Burchfiel
Phillip E. Butler*
Wayne F. Canis*
Martin M. Cassidy*
Stanley E. Cebull
Henry S. Chafetz
Eugene V. Ciancanelli*
Malcolm M. Clark
Robert T. Clarke
Lindrieth Cordell
Roger J. Cuffey
Donald M. Davidson Jr.
Hugh L. Davies
Mary R. Dawson
Robert G. Dickinson

Robert F. Diffendal Jr.
Jack D. Donahue
Bernard W. Evans
John R. Everett*
Robert J. Floyd
William K. Fyson*
Dave L. Gaskill
Harold E. Gill*
John T. Goodier*
Charles G. Groat
Sherman Gromme*
John M. Guilbert
William J. Hail
Donald E. Hallinger*
Hilary J. Harrington
James W. Head III
M. Allen Heinrich*
James R. Heirtzler
James E. Heppert*
Alfred J.J. Holck
Earl R. Hoskins
Richard W. Hutchinson
Wayne C. Ispording
Marvin L. Ivey*
Odette B. James
Diana Chapman Kamilli
Joseph H. Kravitz
Andrew E. Kurie*

Michael T. Lukert
York T. Mandra
Constantine T. Manos
Charles L. Matsch
Robley K. Matthews
Paul N. McDaniel
Levi Gordon Medaris Jr.
Robert L. Melvin*
Frederick Wayne Meyer*
James L. Moore*
JR Morgan*
Thornton L. Neathery
Gerald A. Nicoll*
C. Barry Raleigh
Frank F. Reckendorf*
Philip E.C. Reed*
Stanley R. Riggs
Peter U. Rodda
Thomas H. Rogers
K.A. Rottweiler*
Don H. Rousell
Peter D. Rowley
Kendall W. Sageser*
J. William Schopf
Reginald J. Scolaro*
Karl E. Seifert
Peter L. Siems*
Marcia A. Smith*

Norman D. Smith
Jesse O. Snowden*
David H. Speidel
Frank L. Stanonis II*
Lawrence D. Taylor
Sam Bayliss Upchurch
Carl F. Vondra
Robert H. Washburn
Gerald J. Wasserburg
Reinhard A. Wobus
David H. Wozab
Richard A. Young
Robert E. Zartman
Herman B. Zimmerman*

Thanks for your membership!



2014 GSA Research Grant Recipients

The 2014 GSA Committee on Research Grants awarded US\$683,535 to 401 graduate students (52% of the 774 who applied), with an average grant of US\$1,680. The committee also selected 10 alternate candidates in the event that any grantees return all or part of their funds due to a change in their research project or receipt of funds from another source. The GSA Graduate Student Research Grant Program is funded by GSA, the GSA Foundation, GSA Divisions, and the National Science Foundation.

Committee members: Stephen Johnston (Chair), Olivier Bachmann, Luis Buatois, Shanaka de Silva, Elizabeth Diesel, Amy Draut, Maya Elrick, Robert Gastaldo, Stacia Gordon, Madeline Gotkowitz, Sarah Hayes, Micah Jessup, Lisa Park, Sarah Penniston-Dorland, Jeffrey Pigati, Michael Pope, Philip Prince, Richard Saltus, Jacob Sewall, Sarah Titus, Barry Warner, Paul Wetmore, Brent Wolfe, and Shuhai Xiao.

The following awards will be presented Monday, 20 Oct., at the 2014 GSA Annual Meeting & Exposition in Vancouver, British Columbia, Canada.



2014 OUTSTANDING MENTIONS

(proposals of exceptional merit in conception and presentation)

Kathryn Eccles

Boston University

Joshua Garber

University of California–Santa Barbara

Julie Griffin

University of California–Davis

Allan Lerner

Oregon State University

Adonara Mucek

Oregon State University

Bethany Murphy

Oregon State University

William Nachlas

University of Minnesota

Jason Nolan

University of Nebraska–Lincoln

Amanda Pruehs

Wayne State University

Marie Turnbull

University of British Columbia



ExxonMobil

2014 ExxonMobil/GSA Student Geoscience Grants

New in 2014: ExxonMobil recognized 10 of the top 30 GSA student research grant proposals with a grant of US\$7,500 each.

Ross Anderson

Yale University

Rebekah Cesmat

University of Washington

Kyle Deatrick

University of Texas at El Paso

Erika Freimuth

University of Cincinnati

Joshua Garber

University of California–Santa Barbara

Kealie Goodwin

University of Texas at Austin

Bethany Murphy

Oregon State University

Thomas Neal

University of Kansas

Nadine Orejola

Plymouth State University

Sarah White

University of California–Santa Cruz



2014 SPECIALIZED AWARDS

Sponsored by the GSA Foundation

MARLAND PRATT BILLINGS AND KATHARINE FOWLER-BILLINGS RESEARCH AWARD

James Farrell, University of Connecticut

This award encourages and promotes geological fieldwork and related research in New England and adjacent regions.



GRETCHEN L. BLECHSCHMIDT AWARD

Andrea Price, McGill University

This award was established for women in the geological sciences who have an interest in achieving a Ph.D. in the fields of biostratigraphy and/or paleoceanography, sequence stratigraphy analysis, particularly in conjunction with research in deep-sea sedimentology, and a career in academic research.



JOHN T. DILLON ALASKA RESEARCH AWARD

Nicholas Bill, Oregon State University

This award honors Dillon's work on radiometric age-dating work in the Brooks Range, Alaska. Two areas which serve as guidelines for selection of the award are field-based studies dealing with the structural and tectonic development of Alaska, and studies which include some aspect of geochronology (either paleontologic or radiometric) to provide new age control for significant rock units in Alaska.



ROBERT D. HATCHER RESEARCH AWARD

Ross Anderson, Yale University

This award supports field-based research and geologic mapping through an annual award to an outstanding graduate student in the earth sciences to conduct research for that student's master's thesis or Ph.D. dissertation. Preference may be given to students working in the Appalachian orogeny broadly construed but is not restricted to this region.



JOHN W. HESS RESEARCH AWARD

Jacquelyn Cresswell, Texas A&M University Galveston

This award in karst research studies supports student research involving any aspect of cave and karst studies aimed at providing improved understanding of how caves and karst work, including how these resources can be better managed.



ROSCOE G. JACKSON II AWARD

Kealie Goodwin, The University of Texas at Austin

This award funds one recipient per year in the field of sedimentology.

LIPMAN RESEARCH AWARD

Emily Devers, Northern Illinois University

This award, which promotes and supports student research grants in volcanology and petrology, was established in 1993 and is supported by gifts from the Howard and Jean Lipman Foundation. The current president of the Lipman Foundation, Peter W. Lipman, was the recipient of a GSA research grant in 1965.



JOHN MONTAGNE AWARD

Nadine Orejola, Plymouth State University

This award was established in 2000 to support student research in the field of Quaternary geomorphology.



BRUCE L. "BIFF" REED SCHOLARSHIP AWARD

Benjamin Johnson, West Virginia University

This award was established to provide research grants to graduate students pursuing studies in the tectonic and magmatic evolution of Alaska (primarily) and also can fund other geologic research.



CHARLES A. & JUNE R.P. ROSS RESEARCH AWARD

Sarah White, University of California–Santa Cruz

This award was established in 2002 to support research in the fields of biostratigraphy, stratigraphy and stratigraphic correlation, paleogeography and paleobiogeography, interpreting past environments of deposition and their biological significance, and the integration of these research areas into better global understanding of (1) past plate motions (plate tectonics and sea-floor spreading); (2) past sea-level events, including their identification and ages; and/or (3) climate changes and effects of those climate changes on Earth's inhabitants through geologic time.



2014 GSA Research Grant Recipients

ALEXANDER SISSON RESEARCH AWARD

Thomas Neal, University of Kansas

This award was established by family members of Alexander Sisson to promote and support research for students pursuing studies in Alaska and the Caribbean.



PARKE D. SNAVELY, JR., CASCADIA RESEARCH AWARD

Rebekah Cesmat, University of Washington

This award supports field-oriented graduate student research that contributes to the understanding of the geologic processes and history of the Pacific Northwest convergent margin, or to the evaluation of its hazard or resource potential.



HAROLD T. STEARNS FELLOWSHIP AWARD

Alida Bailleul, Montana State University

This award was established by Harold Stearns in 1973 for student research on aspects of the geology of the Pacific Islands and the circum-Pacific region.



ALEXANDER & GERALDINE WANEK AWARD

Olivia Miller, University of Utah

This award was established in 2002 to support research dealing with coal and petroleum resources, mapping, and engineering geology, marine resources, petroleum economics, appraisal, and evaluation, and the geology of phosphate resources.



LAUREN A. WRIGHT & BENNIE W. TROXEL STUDENT RESEARCH AWARD

Michael Mohr, North Carolina State University

Abigail Ruksznis, Stanford University

This award supports two graduate students in masters or Ph.D. programs conducting field-based research (1) in the region broadly centered on Death Valley National Park or (2) in the western and southern Basin and Range Tectonic Province. This research grant is associated with the Structure and Tectonics Division.



DIVERSITY IN THE GEOSCIENCES MINORITY RESEARCH GRANT AWARD

Md. Aminul Haque, University of Manitoba

This award was established to promote and support minority students in the geosciences.



FAROUK EL-BAZ STUDENT RESEARCH GRANT

Abdel Mawgoud M.M. Mohammed, Western Michigan University, for his study, "Hydrochemical characteristics and potential tectonic influences on groundwater quality of the continental-scale Nubian Sandstone Aquifer System (NSAS)."

Elizabeth J. Rozar, Boise State University, for her study, "Modeling structural controls of antecedent topography and their effect on antecedent boundary conditions at Coral Pink Sand Dunes, Kane County, Utah."

This grant was established to encourage and support desert studies by students worldwide, either in the senior year of their undergraduate studies or at the masters or Ph.D. level.



EAST ASIA GEOSCIENCE AND ENVIRONMENT RESEARCH (EAGER) AWARD

This award, presented since 2003, provides one-year grants to support the Ph.D. theses and post-doctoral research of East Asian scientists. The award is open to scientists of the country hosting the annual CCOP conference. Past countries include: Cambodia, China, Indonesia, Japan, Korea, Malaysia, Papua New Guinea, Thailand, and Vietnam. The 2014 recipient will be announced in October.





2014 GSA Research Grant Recipients

(listed in alphabetical order by university)

Arizona State University

Chelsea Allison
Marina Foster
Emily Kleber
Kate Potter

Auburn University

Justin Cox
Peter Starnes

Baylor University

Andrew Flynn
William Lukens

Boise State University

Amanda Laib
Claire Ostwald
Mark Robertson
Robin Trayler
Jesse Walters

Boston College

Shaina Cohen
Kathryn Eccles
William Montz
Martha Parsons

Bowling Green State University

Krishna Borhara

Brown University

William Daniels

California Institute of Technology

Florian Hofmann
Francis Sousa

California State University–Bakersfield

Kathy Randall

California State University–Long Beach

Iwo Lojasiewicz
Elizabeth Niespolo

California State University–Northridge

Brian Clements
John Wiesenfeld

Carleton University

Cole Kingsbury

Central Washington University

Sylvana Bendana
Kevin Delano
Jake Meyer
Dan Pittenger

Colorado School of Mines

Evan Jones
Jenna Shelton
Emily Voytek
Long Wu

Colorado State University

Natalie Anderson
Audrey Crockett
Alexander Hamilton
Adrian Kahn
Charlene King
Katherine Lininger
Crystal Rauch
Dan Scott

Columbia University

Logan Brenner
Samuel Phelps
Cassandra Rose

Cornell University

Jansen Smith

Dalhousie University

Sharane Simon

Dartmouth College

Evan Dethier

East Carolina University

Elizabeth Maurer
Jessica Strand

Florida Atlantic University

Caitlin Hanley
Alexander Modys

Fort Hays State University

Mackenzie Kirchner-Smith

Harvard University

Justin Strauss

Humboldt State University

Kelly Matsunaga
Sylvia Nicovich
Jessica Vermeer

Idaho State University

David Huber
Kathryn McAbee

Indiana State University

Jase Hixson

Indiana University

Rebecca Caldwell
Paul Farrugia
Brendan Fenerty
Robin Green
Elizabeth Olliver

Indiana University–Purdue University

Indianapolis
Owen Rudloff

Iowa State University

Sergey Ishutov
Rebecca McCracken
Madelyn Mette
Diana Thatcher
Deserae Wojcik

Johns Hopkins University

Heather Ahrens

Kansas State University

Shovon Barua
Anna Downey
Jennifer Roozeboom
Brien Wilson

Kent State University

Andrew Gerwitz
Matthew Marinelli

Lehigh University

Helen Malenda

Loma Linda University

Ken Coulson

2014 GSA Research Grant Recipients

Louisiana State University

Tessa Hermes
Anna Hoffmann

Massachusetts Institute of Technology/ Woods Hole Oceanographic Institution

Jacob Nienhuis

McGill University

Timothy Gibson
Andrea Price

McMaster University

Mary Armour
Shawn Edward Kovacs

Miami University

Furkan Bozukluoglu
Michelle Burke
Ersin Kaya

Montana State University

Lori Babcock
Alida Bailleul
Travis Corthouts
Lauren Thomas

New Mexico State University

Mark Brown
Jacob Buettner
Chelsea Ottenfeld

New Mexico Tech

Mark Green
Phoebe Nicholls

North Carolina State University

Michael Mohr
Stephen Smith

Northern Arizona University

Robert Dandrea
Angela Lexvold
Jonathan Paklaian
Kurt Winner

Northern Illinois University

Emily Devers
Matthew Fleming
John Hanke
Cory Hunter
Richard Jayne
Elizabeth Olson
Joshua Zodarecky

Northwestern University

Gregory Lasher
Jamie McFarlin

Ohio University

Michael Blair
James Brown

Oklahoma State University

Kitso Matende
Mark McCollum
Kathleen Robertson

Oregon State University

Nicholas Bill
Richard Bradshaw
Na Hyung Choi
Jennifer Digiulio
Allan Lerner
Nicole Moore
Adonara Mucek
Bethany Murphy
Henri Sanville
Gaylen Sinclair
Elinor Utevsky
John Zunka

Pennsylvania State University

Elizabeth Denis
Michael Donovan
David Oakley
Rebecca Vanderleest

Plymouth State University

Nadine Orejola

Portland State University

Gabriela Ferreira
Megan Masterson
Leslie Mowbray

Princeton University

Xingchen Wang

Purdue University

Wai Allen
Ruth Aronoff
Wendell Walters

Queens University

Rohanna Gibson
Renaud Soucy La Roche
Lindsay Waffle

Rutgers University

Guangyu Xu
Ying Zhu

Rutgers-Newark University

Ashley Samuel

Saint Louis University

Patrick Luetkemeyer
Ethan Shavers

San Diego State University

Diana Cheung-Harris

Southern Illinois University

Caitlyn Korren
Joseph Wnukowski

Southern Methodist University

Michael Aiuvalasit
Lu Zhu

Stanford University

Thomas Benson
Samuel Johnstone
Caitlin Keating-Bitonti
Tim O'Brien
Abigail Ruksznis

Stony Brook University

Adam Pritchard

Syracuse University

Mariana Bonich
Kayla Christian
Kara Dennis
Daren McGregor
David Moss
Chilisa Shorten
Pedro Val

Temple University

Trevor Klein

Texas A&M University

Mohammad Almukaimi
Paul Laverty

Texas A&M University–Galveston

Jacquelyn Cresswell

Texas A&M University–Kingsville

Nima Ghahremani

Texas Christian University

Chelsea Toews

Tulane University
Christopher Esposito

University of Alabama
Sara Kozmor

University of Alaska–Fairbanks
Nicole Knight
Demi Mixon

University of Alberta
Lauren Davies

University of Arizona
Elizabeth Balgord
James Chapman
Andrew Kowler
Jill Onken
Andrea Stevens
James Worthington

University of Arkansas
Todd Knobbe
Evan Thaler

University of British Columbia
Shah Faisal
Alexis Moyer
Sudip Shrestha
Marie Turnbull
Katharina Unglert

University of California
Elisabeth Steel

University of California at Berkeley
Dori Contreras

University of California at Davis
Roxanne Banker
Julie Griffin
Galen Griggs
Allison Rubin
Charles Trexler
Trevor Waldien

University of California at Riverside
Scott Evans
Tracy Thomson

University of California at San Diego
Bradley Peters

University of California at Santa Barbara
Sophie Briggs
Aaron Bufe
Joshua Garber
Graham Hagen-Peter
Janelle McAtamney

University of California at Santa Cruz
Tracey Conrad
Delphine Defforey
Michelle Drake
Sarah White

University of Cincinnati
Jason Cesta
Erika Freimuth
Janine Sparks
Matthew Vrazo

University of Chicago
Stewart Edie

University of Colorado, Boulder
Daniel Feucht
Melissa Foster
Ulyana Horodyskyj
Joshua Johnson

University of Connecticut
James Farrell
Molly Patterson
Jaclyn White

University of Delaware
Margaret Christie

University of Denver
Gary Lavanchy

University of Florida
Alina Bricker
Mary Lusk
Chong Ma

University of Georgia
Annaka Clement
James Deemy
Laura Fackrell
Kristopher Kusnerik
Joanna Wilford

University of Hawaii at Mānoa
Alexandra Hedgpath

University of Houston
Kurt Sundell

University of Illinois
Laura Demott

University of Illinois at Chicago
Bharathi Vallalar
Kristin Woycheese

University of Iowa
David Majewski
Kathryn Rathbun
Brennan Van Alderwerelt

University of Kansas
Tyson Berndt
Andrew Connolly
Sean Fischer
Alexa Goers
Adam Jackson
Michelle Mary
Thomas Neal
Michael Rawitch
Isabel Villaneda-Van Vloten

University of Kentucky
Dibya Koirala
Cole Musial

University of Maine
Maura Foley
Stephanie Mills

University of Manitoba
Md. Aminul Haque

University of Maryland
Huan Cui
Carolyn Plank
Ming Tang

University of Massachusetts
Jonathan Reeves
Sean Regan

University of Massachusetts–Boston
Lars Anderas

University of Miami
Sharmila Giri
Arash Sharifi

University of Michigan
Molly Blakowski
Mark Robbins
Meghan Taylor
Allyson Tessin

2014 GSA Research Grant Recipients

University of Minnesota

Megan Korchinski
Daniel Maxbauer
William Nachlas
Michele Stillinger
Benjamin Tutolo

University of Minnesota–Duluth

Michael Doyle

University of Montana

Kurt Imhoff
Anna Phelps
April Sawyer

University of Nebraska–Lincoln

Tom Baldvins
Victoria Chraibi
Jason Nolan
Matthew Peppers

University of Nevada–Las Vegas

Wyatt Bain
Melisa Bishop
Kara Marsac

University of Nevada–Reno

Joel Desormeau

University of New Hampshire

Samantha Sinclair

University of New Mexico

Rickey Bartlett
Rebecca Frus
Jesse Robertson

University of North Carolina

Sean Gaynor

University of North Carolina–Wilmington

Jeri Burke
Kelly Cronin
Brent Dober
Wesley Massoll
Nicholas Moore

University of North Dakota

Matthew Weiler

University of Notre Dame

Elizabeth Koeman

University of Oklahoma

Jacob Hernandez

University of Oregon

Matthew Goslin
Randy Krogstad
Angela Seligman

University of Pittsburgh

Aubrey Hillman
Damara Kautz

University of Rochester

Nandini Kar

University of San Diego

Stephen Campbell

University of Saskatchewan

Sara Worsham

University of South Carolina

Benjamin Oliver
Natalie Umling

University of South Florida

Joshua Breithaupt
Christian Haller
Scott Ishler
Anita Marshall
Joshua Slattery
Cristina Subt
Jessica Wilson

University of Tennessee

Miles Henderson
Erik Johanson
Jason Muhlbauer

University of Texas at Arlington

Jennifer Beyer
Min Gao

University of Texas at Austin

Veronica Anderson
Douglas Barber
Rachel Bernard
Meredith Bush
Amanda Calle
Marina Frederik
Kealie Goodwin
Rosemary Hatch
Michelle Hulewicz
Renas Mohammed
Maria Prieto

Sebastian Ramirez

Valentina Rossi
Kelsi Ustipak

University of Texas at Dallas

Jayeeta Chakraborty

University of Texas at El Paso

Kyle Deatrack

University of Toronto

Alexander Humphreys
Magdalena Sobol
Siobhan Williams

University of Utah

Christopher Bradbury
Olivia Miller
Cornelia Rasmussen
Jelle Wiersma
Brennan Young

University of Vermont

Gina Accorsi

University of Victoria

Jordan Eamer

University of Washington

Landon Burgener
Rebekah Cesmat
Camille Collett
John Fullmer
Sarah Harbert
Elisha Harris
Keith Hodson
Yan Hu
Julia Kelson
Sarah Schanz
Eva Stueeken

University of Waterloo

Benoit Charette

University of Wisconsin

Zachary Michels
Randy Williams

University of Wisconsin–Madison

Christine Barsewski
Breana Hashman
Kristin Michels
Ryan Quinn

University of Wisconsin–Milwaukee

Na-Hyun Jung
Snejana Karakis
Jonah Novek
Libby Woodford

University of Wyoming

Matthew Dunlop
Robert Mahon
Connor Marr
Rose Pettiette

Utah State University

Sara Kelly
Kirk Townsend

Vanderbilt University

Jennifer Bradham
Aaron Covey
Siobhan Fathel

Virginia Tech

Natalia Bykova
Aida Farough
Hannah King
Anthony Muscente
Jarek Trela
Brady Ziegler

Wayne State University

Amanda Pruehs

West Virginia University

Shuvajit Bhattacharya
Benjamin Johnson
Fei Shang

Western Michigan University

Kyle Cox
Racha El Kadiri

Western Washington University

Adrian Bender

Winona State University

Kristen Dieterman

Woods Hole Oceanographic Institution

Alejandra Ortiz

Wright State University

Mohamad Reza Soltanian

Yale University

Ross Anderson
David Auerbach
Eric Bellefroid
Robin Canavan
Simon Darroch
Victoria McCoy

Back for an encore in 2014 is the highly successful workshop for early-career geoscientists on the process of preparing and publishing papers.



What's Your Problem; What's Your Point?

When: Saturday, 18 Oct., 8:30–11 a.m.

FREE (but an application is required) — *Light breakfast provided.*

Publishing your work is important, but how do you go about it? This workshop, led by science editors from GSA's journals, will focus on the process of preparing your research for submission to scholarly journals. Presentations by the three editors will be followed by roundtable discussions and a question-and-answer period.

- **Before You Begin:** Find out what editors and reviewers look for.
- **Writing and Revising:** Focus on the bigger creative picture. How do you frame your paper to meet the journal's aims and the reviewers' expectations?
- **Reviewing: Be a Part of Your Scholarly Community:** Peer review is integral to publishing, so both reviewing and being reviewed are essential parts of your role as a scientist.

Apply to Attend

Space is limited for this workshop. Please e-mail editing@geosociety.org for an application. We welcome applications from graduate students, early-career researchers, people getting back into research after a hiatus, post-docs, or anyone for whom this discussion is relevant.

Don't miss this year's event!

GSA 2014

19-22 October | Vancouver, BC, Canada





2014 GSA Division & Section Student Research Grant Awards

Six GSA Divisions and five GSA Sections have recognized the following student research grant recipients who submitted proposals of exceptionally high merit in conception and presentation in their fields. These students will be honored at the 2014 GSA Annual Meeting in Vancouver, British Columbia, Canada, in October.

DIVISION GRADUATE RESEARCH AWARDS

GEOPHYSICS DIVISION

Allan V. Cox Student Research Grant

Justin Cox, Auburn Univ.

Geophysics Student Research Grant Award

Ross Anderson, Yale

HYDROGEOLOGY DIVISION

Md. Aminul Haque, Univ. of Manitoba

Charlene King, Colorado State Univ.

Mary Lusk, Univ. of Florida

Jason Nolan, Univ. of Nebraska–Lincoln

Amanda Pruehs, Wayne State Univ.

MINERALOGY, GEOCHEMISTRY, PETROLOGY, AND VOLCANOLOGY DIVISION

Thomas Benson, Stanford Univ.

Joshua Garber, Univ. of California at Santa Barbara

Rohanna Gibson, Queen's Univ.

Ming Tang, Univ. of Maryland

QUATERNARY GEOLOGY AND GEOMORPHOLOGY DIVISION

Arthur D. Howard Student Research Award

April Sawyer, Univ. of Montana

J. Hoover Mackin Student Research Award

Lee Corbett, Univ. of Vermont

Marie Morisawa Research Award

Katherine Lininger, Colorado State Univ.

SEDIMENTARY GEOLOGY DIVISION

Sedimentary Geology Division Student Research Grant Award

Kelsi Ustipak, Univ. of Texas at Austin

STRUCTURAL GEOLOGY AND TECTONICS DIVISION

Ross Anderson, Yale

Rebekah Cesmat, Univ. of Washington

Benjamin Johnson, West Virginia Univ.

Andrea Stevens, Univ. of Arizona

Randy Williams, Univ. of Wisconsin

Long Wu, Colorado School of Mines

SECTION RESEARCH AWARDS

SOUTHEASTERN SECTION

GRADUATE RESEARCH GRANTS

Tenley Banik, Vanderbilt Univ.

Ziaul Haque, Auburn Univ.

Zachary Kiracofe, Virginia Tech

Mary Lupo, Florida State Univ.

Christine McNiff, Univ. of South Florida

Jessica Nester, Univ. of North Carolina–Wilmington

John Wall, North Carolina State Univ.

SOUTHEASTERN SECTION UNDERGRADUATE RESEARCH GRANTS

Saba Asefa, Vanderbilt Univ.

Chelsea Delsack, Virginia Polytechnic Institute

Bailey Donovan, Western Carolina Univ.

Devin Hoffman, Appalachian State Univ.

Sarah Lott, Northern Kentucky Univ.

Brian Simmons, Marshall Univ.

Derek Stokes, Radford Univ.

Alaina Wynes, Winthrop Univ.

ROCKY MOUNTAIN SECTION UNDERGRADUATE RESEARCH GRANTS

Seth Cordry, Winona State Univ.

Ryan Mann, New Mexico Highlands Univ.

Cameron Pritekel, Univ. of Colorado, Boulder

Eleanor Smith, Louisiana State Univ.

Sheryl Stephenson, Winona State Univ.

NORTHEASTERN SECTION UNDERGRADUATE RESEARCH GRANTS

Kate Grisi, SUNY Potsdam

Henry Meyer, Univ. of Maine–Presque Isle

Mariah Murphy, Dickinson College

Lyle Nelson, Harvard

Brice Rebeor, SUNY-Oswego

Ross Salerno, Syracuse Univ.

Nick Weidhaas, Union College

NORTH-CENTRAL SECTION UNDERGRADUATE RESEARCH GRANTS

Anna Clinger, Univ. of Michigan

Forest Friedrichs, Univ. of Wisconsin–Eau Claire

Wesley George Parker, Ohio Univ.

Chaz Topacio, St. Norbert College

2014 Cole Awards

The 2014 Gladys W. Cole and W. Storrs Cole Memorial Research Awards for postdoctoral research are funded by the GSA Foundation.



GLADYS W. COLE MEMORIAL RESEARCH AWARD

Kyle Nichols, Skidmore College, will be awarded US\$7,600 from the *Gladys W. Cole Fund for research in geomorphology of semiarid and arid terrains* for his project, "Timing and tempo of pediment abandonment at the Henry Mountains, Utah, determined using cosmogenic nuclides." The award will be presented at the QG&G Awards Ceremony at the 2014 GSA Annual Meeting in Vancouver, British Columbia, Canada, on Tues., 21 Oct.

W. STORRS COLE MEMORIAL RESEARCH AWARD

Miriam E. Katz, Rensselaer Polytechnic Institute, will be awarded US\$7,000 from the *W. Storrs Cole Fund for research in invertebrate micropaleontology* for her project, "Pilot study: Micropaleontological analysis of Holocene environmental changes in Lake George NY." The award will be presented at the Cushman Foundation for Foraminiferal Research Awards Ceremony at the 2014 GSA Annual Meeting in Vancouver, British Columbia, Canada, on Tues., 21 Oct.

2014 Subaru Minority Student Scholarship Recipients



SUBARU

Subaru of America, Inc., in partnership with the GSA Foundation, has generously funded a scholarship program to benefit diverse undergraduates considering a degree in the geosciences. The Subaru Minority Student Scholarship Program provides US\$1,500 to one student in each of GSA's six North American regional Sections and to one student in a low-income country from GSA's International Section (nominated by a GSA Campus Representative). The students also receive free registration to attend the GSA Annual Meeting and a one-year complimentary membership in GSA.

The purpose of this scholarship is to encourage minority students to continue studies in the geosciences as a degree choice. Nomination forms for the 2015 program will be e-mailed to GSA Campus Reps in early 2015. *Questions?* Contact Jamie Recio, awards@geosociety.org, +1-303-357-1028.

Krystal Rios, East Los Angeles College
(Cordilleran Section)

Marcus Vinícius Theodoro Soares, Instituto de Geociências,
Universidade Estadual de Campinas (São Paulo)
(International Section)

Marcella McKay, Northwest Missouri State University
(North-Central Section)

Roberto Armijo, Norwich University
(Northeastern Section)

Cheyenne Jacobs, North Dakota State University–Fargo
(Rocky Mountain Section)

Ross Kushnereit, Angelo State University
(South-Central Section)

Mercer Parker, Northern Virginia Community College
(Southeastern Section)

2014 GSA—ExxonMobil Field Camp Award Recipients

GSA/EXXONMOBIL FIELD CAMP EXCELLENCE AWARD

Miriam Barquero-Molina, University of Missouri
Branson Field Laboratory



GSA/EXXONMOBIL FIELD CAMP SCHOLARS AWARD

Linda Anderson, California State University, Bakersfield
Kristopher Ashton, East Carolina University
Erika Beyer, University of Arkansas
Julia Cisneros, Texas A&M University
Alexander Conti, University of Connecticut
Robin Daley, Eastern Washington University
Ana Gomez, EAFIT University
Elizabeth Gunnels, Georgia Southern University
Morgan Johnson, University of Arkansas at Little Rock
Shawn Lopez, Florida State University
Dylan McKevitt, Cedarville University
Nick Moreno, California State University, Bakersfield
Ijeamaka Okechukwu, Lamar University
Vanessa Reynolds, Missouri University of Science and
Technology
Elizabeth Roepke, University of Puget Sound
Azeal Salinas, California State University, Bakersfield
Alexander Short, University of Minnesota Morris
Natasha Trujillo, New Mexico Tech
Amanda van Haitsma, Central Michigan University
Daniel Vieira, Sonoma State University



GSA/EXXONMOBIL BIGHORN BASIN FIELD AWARD

UNDERGRADS

Zachary Burton, Bowdoin College
Jordan Dykman, Lehigh University
Kimberly Gloersen, Clemson University
Sean Kellarson, Eastern Connecticut State University
John Li, University of California, Berkeley
Laura Markley, Eastern Connecticut State University
Jessica Miller, Clarion University of Pennsylvania
Ashlyn Murphy, University of Oklahoma
Gift Ntuli, Colby College
Dillon Osleger, Montana State University
Alex Philipson, Southern Methodist University
Lindsey Reed, Santa Barbara City College
Mattie Reid, Bucknell University
Alec Schubick, University of Minnesota
Jason Williams, Salisbury University



GRADS

Ryan Berry, Texas Tech University
Annaka Clement, University of Alberta
Andrew Fornadel, Iowa State University
Ryan Kenyon, SUNY Binghamton
Stephanie Souza, Lehigh University



PROFESSORS

William Little, Brigham Young University–Idaho
Frank Pazzaglia, Lehigh University
Sally Potter-McIntyre, Southern Illinois University
David Sunderlin, Lafayette College
Emily Ward, Rocky Mountain College





GSA Division Awards

Questions? Contact Jamie Recio, P.O. Box 9140, 3300 Penrose Place, Boulder, CO 80301-9140, USA, +1-303-357-1028, awards@geosociety.org.

■ MINERALOGY, GEOCHEMISTRY, PETROLOGY, AND VOLCANOLOGY (MGPV) DIVISION

Nominations due 15 July

The MGPV awards emphasize achievements in geologic and multidisciplinary approaches, recognizing that geologic work is by nature generalistic and has an important field component, with Earth as the natural laboratory.

MGPV Distinguished Geologic Career Award

This award will go to an individual who, throughout his or her career, has made distinguished contributions in one or more of the following fields of research: mineralogy, geochemistry, petrology, and volcanology, with emphasis on multidisciplinary, field-based contributions.

Nominees need not be citizens or residents of the United States, and membership in The Geological Society of America is not required. The award will not be given posthumously.

MGPV Early Career Award

This award will go to an individual near the beginning of his/her professional career who has made distinguished contributions in one or more of the following fields of research: mineralogy, geochemistry, petrology, and volcanology, with emphasis on multidisciplinary, field-based contributions. This is a new award that was generously endowed by the estate of James B. Thompson Jr., who believed in the importance to geology of understanding minerals. J.B. Thompson's work, regardless of subject, was always based on solid field observations. In his acceptance speech for the Day Medal in 1964, he said, "True success in the laboratory should stimulate field investigations rather than discourage them. It would be embarrassing indeed if we were to construct an internally consistent geology, chemically and physically sound, perfect in fact but for one flaw: the lack of a planet to fit it."

Nominations are restricted to those who are within eight years of their final degree. For example, awards decided before 31 Dec. 2014 will include all candidates whose final degree was awarded no earlier than 1 Jan. 2007. Extensions of up to two years will be made for nominees who have taken career breaks for family reasons or serious illness. Nominees need not be citizens or residents of the United States, and membership in The Geological Society of America is not a requirement. The award will not be given posthumously.

How to Nominate

Submit a cover letter from an MGPV Division member, no longer than three pages, summarizing the nominee's most important accomplishments in geologic approaches to

mineralogy, geochemistry, petrology, and/or volcanology. Special attention should be paid to describing how the nominee's published work demonstrates field-based multidisciplinary geologic accomplishments of a ground-breaking nature. The letter should include the name, address, and contact information of the nominator as well as from whom letters of support can be expected. The nominee's curriculum vita and three letters of support (either from members or non-members of GSA and/or the MGPV Division) should also be included. Send materials to J. Alex Speer, Mineralogical Society of America, 3635 Concorde Pkwy Ste 500, Chantilly, Virginia 20151-1110, USA, jaspeer@minsocam.org. For more information, go to www.geosociety.org/divisions/mgpv/awards.htm.

■ LIMNOGEOLOGY DIVISION

Kerry Kelts Student Research Awards

Applications due 1 Aug.

This award (US\$1,000) for undergraduate or graduate student research related to limnogeology, limnology, or paleolimnology is named in honor of Kerry Kelts, a visionary limnogeologist and inspiring teacher. The award will be presented at the Limnogeology Division Business Meeting and Reception at the 2014 GSA Annual Meeting in Vancouver in October. Note that the 2015 award deadline will be earlier, in spring, to better serve students needing research funds during summer.

How to Nominate

The application consists of a research summary and a short CV (two pages max.). The research summary must contain a description of the proposed research, its limnogeological significance, why the award funds are needed for the project, and a brief description of the student's other funding sources. Be sure to include a title. The maximum length is five pages, including figures and captions; the list of references cited is not included in this limit.

Prepare your application as PDF(s) that include your last name in the file name(s), and send it to Amy Myrbo at amyrbo@umn.edu. Please include "Kelts Award application" in the subject line.

If you are interested in supporting this awards program, please send your donations, designated for the Kerry Kelts Research Awards of the Limnogeology Division, to GSA, P.O. Box 9140, Boulder, Colorado 80301-9140, USA. Or visit www.gsafweb.org/makeadonation.html and select the Kerry Kelts Student Research Award. For more information, please visit http://rock.geosociety.org/limno/Kelts_Award_2014_announcement.html.

Welcome New GSA Members!

The following individuals submitted their applications for GSA membership between 19 Sept. 2013 and 21 Feb. 2014 and were approved by GSA Council at its April 2014 meeting.

Top Three Reasons Geoscientists Become GSA Members

1. Career Development
2. GSA Meetings
3. GSA Publications

PROFESSIONALS

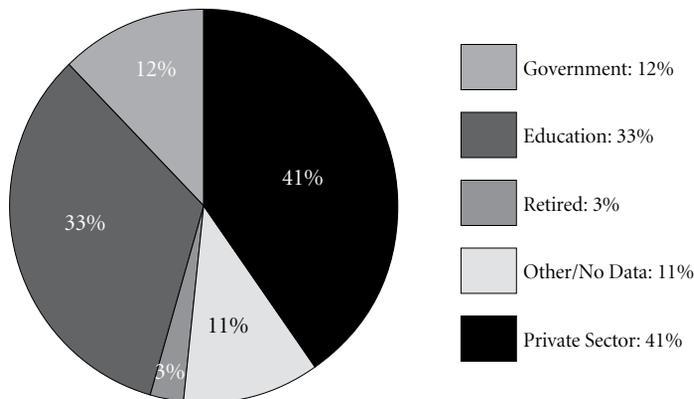
Mohammed Qasim
Abdulhussein
Alaa Talib Ajeel Sr.
Shamshad Akhtar
Denise Akob
Mohammad Eesa Aldabbagh
Kjell Aleklett
Ahuva Almogi-Labin
Janel R. Anderson
R. Scott Anderson
Ronald Antweiler
Steven Anthony Arcone
Tony Arnett
James William Asmus
Aswan Aswan
Bridget A. Ball
Larry John Bamford
Crina Ban
Anton Banin
Melanie Barboni
Hitesh Devdatta Barde
John M. Bates Jr.
Tina Batistic
Peter Anton Battuello
Allan J. Baxter
Randy Bechtel
Robert Donald Bentley
Mark Betts
Eric Billmeyer
Charles J. Bitting
David Bixler
Kathryn Melissa Boardman
Michael Grady Bowman
Carsten Braun
Francis Breen III
Glenn Adam Brennan

Elizabeth Briggs
David Broussard
Bruce Brown
Karen M. Brown
Christopher E. Brus
Luis A. Busso
Shane K. Butler
Don Ellis Byron
Crystal Cain
Kenneth Q. Carlile
Gregory T. Carling
Carl Hackley Carman
Mary C. Carpenter
Barbara Carrapa
Maria Veronica Castillo
Sandra L. Chandler
Yang Chen
Zhong-qiang Chen
German Chicangana
Eunseo Choi
Matthew Clark
Joel F. Collins
Ryan Connors
Thomas S. Cornuet
Thiago Simoes Correa
Kevin Crain
Samuel A. Crawford
Roger S. Crudo
James Duncan Cullis
Edgar Eginald D'abre III
William Dalness
Jeffrey Newton Damp
Matthew J. Davenport
Samuel Hallett Davin
Hugh C. Davis IV
Gregory Day
John P. de Neufville

Adriana Del Pino Sanchez
Eric B. Dieck
Alex Edward Downey
Susannah Duly
Kathleen A. Dwire
William James Dynes
Sally Catherine Eaton-Magana
John E. Ebel
Sara Edinberg
Nicholas P. Edwards
Victoria M. Egerton
Mohammed M. El Bastawesy
Olusanmi O. Emmanuel
Mary Ann Fajvan
Larry E. Fanning
Dimitrios George Farmakis
Annia K. Fayon
Tom Feldman
Grant Ferguson
Denis Edward Foley
Alessandro Forte
Corey M. Fortezzo
Trenton E. Franz
Sean M. Fullmer
Michelle Marie Garcia
Edward Garland
Michael Howard Geier
Sarah B. George
John S. Gierke
Paul Giesting
John J. Gillespie
Natalie H. Glines
Alexis Godet
Luis I. Gonzalez de Vallejo
Andrew D. Graham
Linda E. Graham
Timothy Green
James Greenwood

Lee A. Groat
Howard Carl Gustafson
Kristin Marie Guthrie
Izat Hamid Haji
Jeff Hamlin
Carl Hamming
James Patrick Hamski
Rob Harrap
Lucy Harrington
Gideon Hartman
Daniel Haymond
Ted Heath
Dan Hennessy
Marilyn Hess
Jason F. Hicks
Daniel Edward James Hobley
Kathleen Hodgkinson
Lynnette Hoerner
Terri Hogue
Mark Holland
John W. Holt
William E. Holt
Robert Hornung
French Tyler Huffman
Simon Hughes
Hejiu Hui
Adrian Paul Hunt
Dana Lee Hutchins
D. Jean Hutchinson
Michael Steven Iwashchenko
Engelbertus Jansen
Ann B. Johnson
Stephen Johnson
Edward Jonas
Jennifer Jones
Mark William Joop
Ferdinand Tubayan Jumawan
Hulya Kacmaz

New Professional Members Employment Type



Steven Kadel
Beryl C. Kahn
Jill Karsten
Mason Andrew Kass
James Preston Keay
Keith Kenyon
Sora L. Kim
Kerry Lynn Kleinfelder
Lyndsey Kleppin
Johanna Klukas
Michael S. Knapp
Mark William Korbitz
Katherine Kovac
Bernard Kueper
Richard G. Lahusen
Diane Mary Lamb
Kanani K.M. Lee
Lydia Lee
Alexandra Lefort
Adrienne Leinbach
W Christopher Lenhardt
Jennifer Renee Lennon
John C. Lennon
Matthew J. Levy
Kevin Lewis
Jianwu Li
Xinya Li
Angela Noelle Lilly
Mingxing Ling
Vadec Marcin Lobza
Maria A. Lorente Alonso
Andrew Louchios
Scott Kelley Lowe
Herbert Lowell Magley
Scott Keegan Manwaring
Wendy Mao
Giulio Mariotti
Maia Marie Matarrese
Samuel Dean Matson
Yo Matsubara
Kristin J. McCallister
Daniel Thomas McCoy
Mark William McLarty
Susan McLean
Fatiha Bourbia Meghezzi
Steven Micklethwaite
Benjamin Joseph Miller
Bridgette Marie Miller
Krystine Marie Millerzelewski
Lonnie Mills
Jerry X. Mitrovica
Abuh Momoh
Gary Moody
Samuel L. Moore
Lynn Morales
Ladislado Eduardo Moreno
Bhushan Mulpuri
Hugh Murphy
James H. Natland

Dragana D. Nebrigic
Sterling Nesbitt
Terrence W. Neufeldt
Therese Nganje
Jeremy David Nicoletti
Peter D. Noerdlinger
Chuck O'Connor
Cathy Olkin
Andrew M. O'Reilly
Joan Marie Otahal
Philip Oviatt
Marcela Rossana Oyarzún
Wendy R. Panero
Ralfwaldo Sueta Parcon
Paul N. Pearson
Alba R. Perez
Erin C. Pettit
Daniel Pierce
Natalie J. Pietrzak-Renaud
Britta Planer-Friedrich
Eric M. Prasse
Rhea Presiado
Andrew Pruet
Michael Gay Purcell
Aaron Ervin Putnam
David Pyles
Deborah J. Quade
Samuele Quattrini
Mark Quigley
Bruce Rabe
Craig Rasmussen
Leonard Rawlings
Charles F. Ray
Larry L. Redinger
Robert Christian Reinhardt
Devon Renock
Donald Keith Rhoton
Natascha Riedinger
Dan Roach
Farsheed Rock
Rafael Jose Rodriguez Ortiz
Catherine Lisa Ronck
Alan Rooney
Robert A. Root
Gregory Thomas Roselle
Julie Brooks Rudisill
Rebecca Rudolph
Jason Russell
Tracy Saguibo
Jeff Salacup
Troy P. Sampere
Shankar Sanyal
Muhammad Shahzad Sarfraz
Meghan M. Schaub
Reyno Scheepers
Britney Elyce Schmidt
David Ian Schofield
Shiladitya Sengupta
Thomas Servais

Jacob Setera
Sue Shallenberger
Lee Shannon
Kelley Ann Shaw
Julia Meyer Sheets
Jonathan T. Shemwell
Vartika Singh
Jennifer Leigh Sliko
Caroline P. Slomp
James E. Smalligan
Michael P. Smith
Monte Smith
Fredrick Stuart Solheim
Einar Jamandre Stauber
Nelson Stauffer
Andri Stefansson
Douglas Stephen
Robert Ronald Stewart
Amy Stinson
William J. Stone
Jacqueline Stonebraker
Evan Douglas Strickland
Kim M. Stumpe
David A. Sutherland
Michelle Sutherland
Brian Szenay
Joseph W. Tarnowski
Michael Tarullo
Teresa H. Teague
Fangzhen Teng
Nathan Thacker
James Tolbert
Adi Torfstein
Ramon J. Torres
João Trabucho-Alexandre
Rebecca Travis
Thomas Tremblay
David G. Trench
Robert Tremain
Joyce Trygstad Nelson
John H. Turbeville Jr.
William Bedford Turner
Sara Unsworth
Ravikant Vadlamani
Velimir Vesselinov
Carlos Villon Sr.
Noel B. Waechter
Alex Forster Wall
Abby May Walters
Weihong Wang
Tessa Watson
Shoshana Weider
Dominique Am Weis
Susan Welch
Paul Joseph Wendel
Maggie Elaine West
Peter Weston
Christopher David White
Tom Wild

David D. Wilson
Graham Wilson
Gregory C. Wilson
Kim S. Wilson
Henry C. Winsor
Katrina D. Withers
Lynn C. Wnuk
Gerhard Worner
Sandow Mark Yidana
Li Zhang
Zhuanfang Fred Zhang
Wei Zhou

RECENT GRADUATES

Mohammed Sultan Alam
Jordan Aldridge
Ryn Alger
Julio Fernando Alvarez
Matthew Amidon
David Andaverde II
Alexander D. Armenta
Christopher Duane Barnes
Jorge Barrera
Rudy Michael Baum Jr.
Lydia Elisa Benitez
Brittany A. Boetel
Christopher I. Bolen
Adrian Bouknight
Heather Bray
Phillip P. Broache
Sasha Brown
Christopher Shane Burnette
Geoffrey Kevin Burtner
Megan Shiffler Bush
Rachel Bryce Cackett
Catherine Chamberlin
Talia Chorover
Brian Cook
Erin Crafa
Haley Craig
Christa Rae Cronk
Lydia Curliss
Brian Davidson
Keith Dawson
Tobin Deen
Jaime E. Delano
Max Dieckmann
Sitindra Sundar Dirghangi
Patrick E. Donnelly
Sandipan Dutta
Audrey L. Dwyer
Alexander Edgar
Jesse Enfield
Patrick Owen Englehardt
Maryanne M. Evans
Elise M. Fitzpatrick
Jerad Paul Flynn
Luke Forsberg

Robert Russell Fortney
 Lauren M. Frost
 Joy Gerhards
 Max E. Gilbertson
 Patrick Gillespy
 Annie Gilliland
 Alexis Godeke
 Noah Alexander Griffin
 Kelly Elizabeth Grove
 Rashad Gulmammadov
 Benjamin Peter Gultch
 Artemis Harbert
 Alan Harris
 Brianna Iva Haugen
 Evan Haxo
 Sean K. Heaton
 Ian Rodger Higgins
 Karri Beth Hildebrandt
 Mark Carpenter Hirons
 Teymur Huseynov
 Robert D. Janzen
 Rachel E. Jensen
 Benjamin Lee Jessen
 Christopher Eric Johnson
 Danielle Marie Johnson
 Katrina Dolores Kaiser
 Sean Keefe
 Younoh Kim
 Ryan M. Korth
 Karina Anna Kuc
 Timothy Lane
 Jesse D. Lawler
 Geneva K. Lee
 Peter Joseph Leech
 Michael J. Lesiak
 Nathan Loesch
 Alexi Taylor Lovechio
 Chelsea Lucas
 Alexandra Lunder
 Alexandra Macho
 Christine Anne Maday
 Zohair Malik
 David Mason
 Mitchell Alexander May
 Cameron Andrew McCulla
 Jeni Amber McDermott
 Jordan McGrew
 Kaitlyn McMullen
 Elizabeth A. Merritt
 Helen E. Metts
 Grant Miller
 Angela Mohar
 Lisa Mol
 Shannon Montano
 Isidro Montemayor Jr.
 Gregory E. Morrow
 Caitlin A. Murphy
 Elizabeth Anne Mussmann
 Stephen Nelson

Bryan Nichols
 Marko Nikic
 Uchechukwu Genevive Njoku
 Cassie Mae O'Connor
 Kevin T. Ogorzalek
 Kevin O'Keefe
 Kyrt Olejniczak
 Theresa O'Reilly
 Brittany R. Ostertag
 Christopher Lee Penton
 Kaitlyn Perham
 Jacqueline H. Pope
 Christina Porter
 Alyssa Mahin Pourmonir
 Rachel Elizabeth Powell
 Timothy J. Prather
 Kyle Radach
 Taylor Rapp
 Jack E. Rayl III
 Eric J. Rayner
 Mitchell Allen Read
 Christina Richardson
 Parker Bailey Richmond
 Casey Argyle Ricks
 David Craig Riddell
 James G. Rose Jr.
 Sasha Rothenberg
 Bryant J. Ruiz
 Brooke Joy Rumley
 Matthew Albert Sadler
 Robin Sarabia
 Logan N. Schultz
 Carrie Schwartz
 Kathryn Sechrist
 Andrew Thomas Seiler
 Rebecca Selin
 Kyle Stephen Sexton
 Katherine Sharp
 Allan Dale Shingleton
 Carissa Silvis
 Scott Simpson
 Robert S. Solorzano
 Skyler J. Sorsby
 Brittany Sousa
 Vincent Spinazola
 Tara Spinos
 Spencer E. Staley
 Chelsey Lynn Talhelm
 Michael E. Tharby
 Drew Thayer
 Phaedra C. Tinder
 Cristina Torres
 Beverly Simone Vaughn
 Rafael Velazquez II
 Kevin Walshe
 Bruce O. Welch Jr.
 Moira Wentworth
 Heather Lanay Wheeler
 Arthur Douglas Wickham

Eli Witkin
 Aleah V. Worthem
 Campbell Paul Young
 Jesse Richard Zacher
 Jenna Marie Zechmann
 Toufic Zeidan
 Margeaux M. Zwang

STUDENTS

Archaeological Geology

Salvador Amador
 Rachel Barnes
 Rebecca Barzilai
 Mackenze Sintay Burkhardt
 Matthew Butler
 Rachel Cajigas
 Salvatore Samuel Caporale
 Tavia Carlson
 Alyssa Marie Coburn
 Samantha Anne Cohen
 Nora J. Dwyer
 Brendan Fenerty
 Will J. Franta
 Emily Giuliano
 Cory T. Glover
 Graham Goodwin
 Elizabeth Haussner
 Alice Hale Hayden
 Behnaz Hosseini
 Hanna Marie Jackson
 Tyler S. Long
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 Tegan S. McGillivray
 Hannah Marie Moots
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 Kristine Korzow Richter
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Biogeosciences

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 Samuel Robert Anderson
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 Rachael Bentley
 Keren Bitan

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 Tomasz Borszcz
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 Leah Danielle Brandt
 Joshua Breithaupt
 Larry Alan Burch
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 Katherine Joanna Cooper
 Elizabeth Katherine Coward
 Caroline Dietz
 Therese Festin
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 Jeffrey David Kiiskila
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 David A. Lee
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 Shoh Tagawa
 Zack Valdez
 Jessica May Vickers
 Lena Vishni
 Bridget Wade
 Nicholas C. Weidhaas
 Yasmine Wiersema
 Siobhan Williams

Climatology/Meteorology

Nick Anderson
 Samuel Cornwell Collitt
 Michael John Dandrea
 Ryan William Danielson
 Emily Reynolds Farr
 Caleb C. Fisher
 Matt R. Glenn
 Rachael Griffin
 Taylor Mae Grysen
 Samantha Harrison
 Amber Nicole Huston
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Owen M. Rudloff
Jeri Tebbetts
Celia Thomas
Rain Tsong

Economic Geology

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Erica Dawn Allen
Greg Allen
Peter Ivan Anderson
Sam Tyler Avila
Carli Balogh
Chase Bridges
Benjamin Stapleton Calder
Clint Callanan
Sommer Mellora Casady
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Steve David Knighton
Jason M. Kulp
Nathan Michael La Fontaine
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Erik Lovelace
Justin Lowe
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Stephen Krikorian
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Audrey Elizabeth Laroche
Sandra Elizabeth Lazare
Victoria Ann Leffel

Top Five Reasons Students Become GSA Members

1. Career Development
2. GSA Meetings
3. GeoCorps™ America Program
4. Research Grants
5. Free Online Access to GSA Journals

Trenity Dallas Ford
Jared A. Franze
Shane Fussell
Yuqian Gan
Gabriela Garcia
Jessica Gerow
Janine M. Giambalvo
Lee Gilden
Stephen Graham
Brandon M. Grau
John Anthony Greene
Ryan Gustafson
Paul Hagan
Byron T. Halavik
Wyatt Randall Hall
Kenneth Lee Harmon
Javin Hatcherian
Eric Heaton
George Anthony Hergenroder
Ryan Herz-Thyhsen
Dalton O'Neal Hills
Sarah Kathleen Hinshaw
John Hodges
Sarah Rose Homan
Tyler Howe
John A. Hribik
Hal (Thomas) Harland
Hundley
Cory W. Hunter
Dayna Jacob
Adam Michael Jannke
Timothy Joseph Janousek

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Nathan Liechty
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Eric Joseph Peroli
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Alex Paul Philipson
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Austin Chandler Pierce
Natalie Rae Plotkin



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 Calvin Schubbe
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 Kevin Tankoo
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 Kolten Van Damme
 David T. Wang
 Bailey Leo Welch
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 Brien Howard Wilson
 Yang Yang II
 Ashley Elizabeth
 Yates-Williams
 Shan Ye
 Richard Duane Yovichin III
 Juan R. Zamora
 Chi Zhang
 Melody Morales Zuniga
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Engineering Geology

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 Tarik Bob
 Samuel Bolton
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 Mary Beth Boyett
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 Conor Bury
 Quinn Butler
 Derek Maxwell Carpenter
 Grace Chang
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 Sean Robert Cowie
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 Lyndsey Leann Dickson
 Thomas Dong
 Brandy L. Edinger
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 Jesse Favia
 Jesse Felgenhauer
 Erik Andrew Fulmer
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 Ingunn Gunnarsdottir
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 Eric George Howard
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 Binal Rana
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 Gabriella Rossetto
 Federico Salinas II
 Jesse Sheridan
 Rebecca Shields
 William Sutley
 Jessica Elaine Taggart

David Jacob Tamborrell
 Thach Tran
 Patrick K. Trout
 Julie Van de Valk
 David Wampler
 Tabatha Williams
 Zach Williams
 Joshua Zimmermann

Environmental Science

Marco Lorenzo Allain
 Noah T. Anderson
 Aaron John Andriese
 Osvaldo Arroyo
 Eric J. Babura
 Joleen Marie Baker
 Raymundo Balderas Jr.
 Savannah JoAnne Ballengee
 Sarah Elizabeth Barbee
 Christina Jennifer Bargel
 Kevin Davies Barrett
 Ellen R. Barringer
 Camie Michelle Bearup
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 Michael Adam Burklow
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 Samantha Catalanotto
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 Clayton D. Collins
 Joseph Lloyd Connors
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 Kyle Patrick Costello
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Sarah L. Faga	Jeremy Kemp	Anastasia Omelchuck	Luke Edward Spencer
Lindsey T. Farris	Gregory Klisuric	Aida Ines Orozco	Trinity Stirling
Ryan R. Faulkner	Benjamin Joseph Krausmann	Cassandra Jo Osterhoudt	Patrick Stovall
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Anne Fetrow	Kori Ktona	Jean Palacios	Jing Sun
Rachel A. Fifield	Chayan Lahiri	Chiana Palmer	James Suptic
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Beata Fiszler	Samadhi K. Lee	Michael Pate	Theo Sweezy
Sarah Whitney Francis	Kelly Leffler	Kellyn M. Patros	Aaron Michael Taddeo
Francesca Summers Gardner	Asha T. Lewis	Courtney Michelle Payne	Angelo Robert Teachout
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Dori Lee Gorczyca	Harrison Edward Lorens	Ryan Petr	Chris Thurman
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Seth Robert Grier	Alissa Sierra Magana	Kajori Purkayastha	Thomas Alvah Veatch
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Brandy Marie Gutkowski	Rusu Ramona Maria	Brittany Ramsey	Eve Elizabeth Wallingford
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Jonathan James Halama	Claire Sophia Martini	Michelle Rathe	Susan Washko
Jared C. Hall	Melissa Maslowski	Jenna L. Reindel	Brian J. Webster
Katherine Halter	Claire Lucy Mather	Brianna Joy Rick	Jessica Lea Wehrle
John R. Hamblen	Griffin Mc Mullen	Samuel Wade Riedell	Charlotte Weinstein
Lindsey Hannah	Mary Grace McClellan	Matthew G. Ripley	Katherine Faye Wentz
Rose Harris	Allison McCluskey	Robert Sterling Robinson	Sarah Wheatley
Ashley Lauren Hayes	James McCoy	William A. Rodrigues	Jacob Raymond Wickemeyer
Lewis Lester Haynes IV	Katherine Eileen McNulty	Collin Roland	Kirsten Willer
Alexandria L. Heald	Sarah Elaine Medley	Braden Rosenberg	Forrest Faix Williams
Catherine Ann Heindel	Sara Merrick-Albano	David Rounce	Michelle Williams
Johannah R. Heller	Matthew Merson	Abbie Lee Russo	Jacqueline Wilson
Stacy Hendricks	Daniel C. Mettenburg	Rachel G. Sagalow	Virginia Winkler
Rachel Nicole Hill	Henry Michael Meyer	Marisa B. Sames	Kimberly Wood
Caroline Ann Hinze	Kristin Michels	Victoria Ava Samuelsen	Jennifer Woods
Daniel James Holets	Sonja Michelsen	Anteneh Sarbanes	Roslyn Sophie Woods
Andrea Holm	Jessica Miles	Shane G. Sawicki	Rachel Wormington
Stuart Waldron Holmes	Amanda Miller	Holly Shea Sayre	Rongxi Wu
Daniel Mark Holtkamp	Autumn Miller	Kelsey Rae Scareshawk	Nathan S. Yeomans
Emily Marguerite Honn	Luke Andrew Miller	Sydney Schaefer	
Lihai Hu	Sam A. Miller	Alyssa M. Schmid	Geography
Stephanie Hummel	Ben Misiuk	Logan Scholl	Bradford Lee Bates
Natalie Kathryn Iwamoto	Samantha Abigail Mizusawa	Cullen Scott	David Karl Beattie
Isaac J. Jackson	Christopher Moreno	Amanda Katherine Sellers	Brian Beyeler
Rhianna E. James	Anne Elizabeth Morgan	Corinne Selvin	Eric Steve Bledsoe

Jean Carlos Colón
 Taylor Crowl
 Philip Marshall Devine
 Lucas Earl
 Gina Fonseca
 John Franks
 Erin Hastings
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 Ryan Thomas Horrocks
 Courtney Catherine Jackson
 Erik N. Johanson
 Brandon Kaiser
 Repenstar Khongjee
 Daniel Kim
 Cameron J. King
 Samuel M. Kraft
 Carl Andrew Larsen
 Darius Naraine
 Kevin M. O'Connell
 Hayden C. Passarelli
 Kayla Anne Patel
 Bethany J. Patrick
 Hannah Colleen
 Poisson-Smith
 Matthew J. Pollock
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 Manuel Rauch
 Amanda Mary Rice
 Zoe Ritter
 Jeffrey Milton Rollins
 Christina Marie Shintani
 Jared Lynn Skadberg
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Geoinformatics

Kristen A. Adams
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 Austin R. Buckingham
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 Evan M. Lavery
 Troy Lawson
 Matthew Marinelli
 Shanna Leigh Mason
 Bryan Menegazzo
 Danna K. Muise
 Kyle Todd Nicholas
 Kunjalkumar Prakashkumar
 Patel
 Amanda Louise Ross

Yuen Tsang
 Ronald Dale Waterbury

Geology and Health

Maggie Aurelio
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 Kristiana Marie Dickhut
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 Julia Ellis Favorito
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 Jared Lamar Hopkins
 Patrick Lathrop
 Katie Maloney
 Ian William McBrearty
 Michaela Mitchell
 Lilia Karina Morales
 Laura Ann Norris
 Gwendolyn H. Parker
 Alexander Quay Patterson
 Elizabeth Pidgeon
 Madeleine Leilani Pluss
 Aaron H. Pudlicki
 Rachel Rahib
 Laura Rochlitz
 Zachary C. Schwarz
 Joseph R. Spencer
 Robert Charles Springs
 Ellyn Marjorie Swenson

Geophysics/Tectonophysics

Azizuddin Abdul Aziz
 Abdelrahman Aqel Abueladas
 Mary Armour
 Victor M. Avila
 Urbi Basu
 Mark Matthew Baum
 Shuvajit Bhattacharya
 Benjamin R. Bloss
 Andrew Michael Johnson
 Borges
 Krishna Borhara
 Christopher N. Borjas
 Chloe Sierra Boucher
 Jade Bowers
 Esther E. Bowlin
 Bryan Brasher
 Kelly Marie Brigham
 David Brown
 Denine L. Calvin
 Leah Campbell
 Sauvik Chakraborty
 Spencer Robert Clayton
 Dawz Cochran
 Michael Paul D'Antonio
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 Skyler Tiannong Dong
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 John Heil
 King Yin Kennis Ho
 Shannon K. Hunter
 Vlad Iordache
 Dakota Rose Isaacs
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 Nicholas Talavera
 Olubukola O. Tejumola
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 Kimberly Grace Tweet
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 Courtney L. Wagner
 Gyliane Weisenfeld
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 William Luther Yeck
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 Geoffrey Bruce
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 Tanner Wayne Corbin
 Victoria F. Crystal
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 Jordan Dekel
 Scott Deutsch
 Mariah Jordan Doll
 Sara M. Drotzer
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Geothermal

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History and Philosophy of Geology

Zoe Yvonne Grunder-Dilles
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Hydrogeology/Hydrology

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Taylor Ree
Patrick Reilly
Madeline Richards
Roy T. Richeson
John Roberts
Luis Daniel Rojas-Jimenez
Victor Lee Roland II

GSA Graduate Student Research Grants

- Funded 401 out of 774 student member proposals (52%).
- \$683,535 was disbursed to student members.
- Range of grants awarded: US\$400–US\$2,500; average: US\$1,680.
- Ten student members were awarded US\$7,500 each (sponsored by ExxonMobil).

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Bryant Mountjoy

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Sam Santoso
Ferry Schiperski
Matthew Schley
Jacob Schmetterer
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Logan C. Seipel
Huimei Shan
Zachary M. Shephard
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Claudia Renee Shuman
Morgan Leigh Shuman
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Taylor Upole
Nathan Russell Vanarendonk
Genevieve Vander Velden
Marcus Joseph Veltri
Sarah Ashley Vitale
Michael Z. Weathers
Ryan Wells
Wade Welton
Tracy L. Wenman
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Karst

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Limnogeology

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Angela Marie Miller
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Mineralogy, Geochemistry, Petrology, and Volcanology

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Esther Adelstein
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Natalie Belle Anderson
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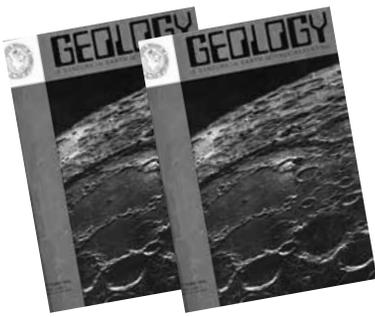
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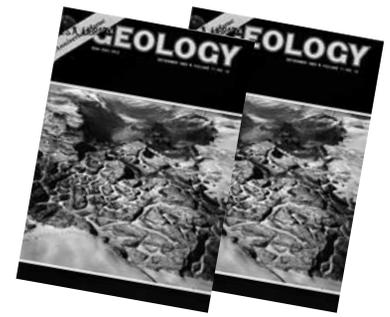
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Geology—Past & Future REVISITED



Editor's note: The following is the fifth installment of our encore presentation of articles that highlighted the 10th anniversary of the first issue of *Geology*, as published in *Geology* in Dec. 1983 [v. 11, no. 12, p. 679–691, doi: 10.1130/0091-7613(1983)11<679:GAF>2.0.CO;2]. Each section was written by a different author (author affiliation notations are as originally published in 1983). See the August 2013 *GSA Today* (v. 23, no. 8, p. 18–19) for the first installment and table of contents. In this issue: article 10: “**Engineering geology**,” by Robert L. Schuster; and article 11: “**Paleontology**,” by Philip W. Signor III and Peter D. Ward.

Engineering geology

Robert L. Schuster, *U.S. Geological Survey, Denver, Colorado 80225, USA*

Ten years ago the biggest challenge for the field of engineering geology in North America involved the development of energy resources. Of particular concern were environmental problems related to extracting massive domestic coal resources to help meet the world-wide energy shortage. The solution of these problems became paramount in the formulation of mined-land reclamation laws for both surface and deep coal mines.

One response to North America's energy needs was the rapid development of nuclear power, which was beset with engineering geologic problems in siting of nuclear facilities and disposal of radioactive wastes. The potential for seismicity and faulting required the assessment of maximum credible earthquakes and faults. Preliminary studies were begun to locate environmentally safe nuclear-waste repository sites. In addition, engineering geologic solutions were sought for the safe disposal of other wastes, liquid and solid, toxic and nontoxic, which were accumulating at an alarming rate. As a result of the energy crisis during the early 1970s, engineering geology began to play a greater role in selection and design of underground installations for storage of both energy products and wastes.

Of continuing importance was the application of geology to the study and mitigation of “ground-failure” hazards, primarily landslides and subsidence. These hazards received greater public notice because of increasing pressures for engineering projects in areas that were only marginally safe. As a result, new emphasis was placed on engineering geologic mapping for land-use planning. Population and land-use pressures also resulted in new engineering geology mapping programs in several major cities in the United States.

Screening of possible sites in the United States for selection of the first deep repository for high-level radioactive wastes has resulted in nine candidate sites in basalt, welded tuff, and bedded

and domed salt. Much has been learned about the thermomechanical-hydrologic problems in radioactive-waste storage and the technology required for large-scale testing programs. Reasonable progress also has been made in solving engineering geologic problems related to disposal of other toxic and nontoxic solid and liquid wastes.

Continuing research has led to better understanding of the mechanisms of geologic hazards and to development and use of improved mitigative procedures, including land-use planning concepts. However, the public may have acquired an overly optimistic impression of our technical ability to predict where and when geologic “catastrophes” might occur.

Dealing with environmental issues, or geologic hazards requires major funding for research, mapping, and action. An area of major activity in engineering geology in the next 10 years will be the solving of problems related to storage or disposal of toxic and nontoxic liquid and solid wastes. Regarding high-level radioactive wastes, the U.S. Department of Energy has stated that it plans to select three sites (of the nine noted above) for construction of exploratory shafts and initiation of large geotechnical testing programs in these shafts. Additional research, the setting of standards, and enactment of legislation concerning disposal of these wastes will be high-priority items for the next 10 years.

Research on geologic hazards will involve trying to quantify risk (interrelation of hazard and vulnerability). When we become more successful at this, the results will be applied to land-use planning.

Much of the infrastructure of highways, bridges, and water supply and sewage systems in the United States is reaching a critical state of disrepair; major maintenance and (or) replacement is essential in the near future. Engineering geology will undoubtedly play a major role in the required planning, design, and construction.

Paleontology

Philip W. Signor III and Peter D. Ward, Department of Geology, University of California, Davis, California 95616, USA

The past decade has seen the dawn of an innovative new era of paleontological research. As never before, paleontologists devoted their research efforts toward interpretation of biological pattern and process in the history of life. The goal was not to replace the more traditional paleontological endeavors of biostratigraphy and taxonomy, but to supplement them with paleoecological and evolutionary analyses at scales ranging from single species to the entire biosphere. Collectively, these studies compose the growing subdiscipline of paleobiology, which has become the subject of an ever-larger fraction of paleontological publications.

Ten years ago, community paleoecology seemed destined to provide new insight. Research programs that would later form the core of paleobiology were initiated about this time, including punctuated equilibrium, probabilistic paleontology, and constructional morphology. Cladistics, a relatively new approach to systematics, also appeared in the paleontological literature.

The wave of interest in paleocommunities had peaked by 1973. In spite of countless examples of recurring associations of Phanerozoic benthic organisms, their biological implications remain uncertain. The difficulty lies not so much in defining communities, though this too is a source of confusion, but in inability to establish the extent to which communities are either biologically integrated units or arbitrarily defined aggregates of species with more or less similar ecological requirements. Rather than providing new insights, community paleoecology has become a sterile effort to identify, describe, and document endless recurring assemblages.

New ideas on punctuated equilibrium at once explain the lack of transitional forms in the fossil record and the apparent lack of evolution in established species. Extension of these ideas has led to the concept of species selection, an evolutionary phenomenon analogous to natural selection but operating at the species level. Despite counter-arguments that gradual evolution may be

dominant or that data may be inadequate to test it, punctuated equilibrium is now widely accepted.

In a series of papers beginning in 1973, D. M. Raup, S. J. Gould, T.J.M. Schopf, and D. Simberloff showed that random processes can mimic a variety of patterns in the fossil record. Faithful replication of some patterns raised suspicions, since laid to rest, that random fluctuations might account for observed changes. Random models provide null hypotheses that allow previously unavailable rigor in testing other models.

Interest in functional morphology has continued apace, fueled by some tremendous successes and by efforts to introduce a broader conceptual framework for functional analysis. Constructional morphology attempts to incorporate phylogenetic history and ontogenetic factors into functional studies. Although sometimes seen as emphasizing constraints on evolution, constructional morphology attempts to place functional analysis in a broad evolutionary context.

The more traditional fields of invertebrate paleontology have remained active. Cladistics has gained increasing acceptance among systematists, despite reservations about its too strict application.

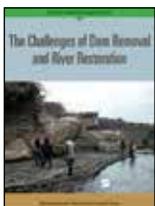
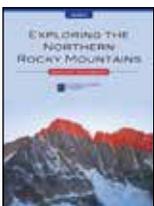
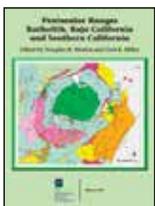
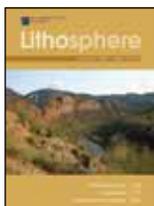
We see three important trends in paleontology for the future. First, statistical techniques and quantitative rigor will be increasingly important. Second, paleobiology will remain subordinate to the more traditional endeavors of biostratigraphy and systematics. There will be more intensive assaults on the primary data source, the fossil record, through new collection, analytical, and data reduction techniques. Just as important, the kinds of data collected will change in order to answer new questions about pattern in the history of life. Finally, paleontologists will interact more with those in other disciplines, as in the collaborations generated by the recent asteroid-impact hypothesis for the Cretaceous-Tertiary mass extinction. International working groups, such as the phenomenally successful mid-Cretaceous Events group, will continue to expand our understanding of the past.

1983 finds paleontology in robust health. Not since the end of the last century has such public and professional attention been focused on paleontological debates. More importantly, paleontology is continuing its transition from a necessary but uninteresting descriptive effort to a modern nomothetic science, a change that will in the long run benefit all geology.



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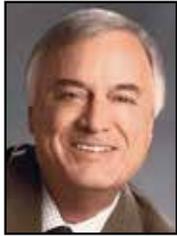
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2014–2015 GSA-USGS Congressional Science Fellow Announced



Susanna Whitman Blair

Susanna Whitman Blair will serve as the 2014–2015 GSA-USGS Congressional Science Fellow. Blair has extensive training in geological sciences, teaching, and science consulting. She received a B.A. in geology at Colgate University in Hamilton, New York, USA, in 2003, with a research focus on the eruption histories of Wolf and Darwin Islands in the Galapagos Island chain. In

2006, Blair completed her M.S. in geology at the University of Florida, where she investigated the use of neodymium isotopes extracted from the iron-manganese oxide coatings of ocean sediments as a method to track ancient ocean circulation. After graduation she worked for an international environmental consulting firm in Jacksonville, Florida, USA, conducting Phase I and II environmental assessments.

Blair earned a Ph.D. in geology from the University of Florida in the spring of 2014. Her research investigated the accumulation of trace metals in northern Florida lake sediments and the effects of drought induced lake level low-stands on the distribution of these metals in sediments. This research has implications in light of climate change projections and potential human and ecosystem health concerns associated with metal pollution.

As a student, Blair held a NSF IGERT (Integrative Graduate Education and Research Traineeship) Fellowship focused on the adaptive management of water, wetlands, and watersheds. She also co-taught, via NSF-funded SPICE (Science Partnerships in Collaborative Education), physical science in a public middle school for two years. Additionally, she worked extensively with environmental law students and lawyers as a science consultant on a number of inland and coastal water projects throughout Florida.

This fellowship brings together the interdisciplinary background of her career so far: scientific research, policy issues affecting local communities and the environment, teaching and communicating science to diverse audiences, and engaging with the public science education. She is passionately committed to science literacy and looks forward to continuing this work.

Blair notes she is humbled and honored to serve as the 2014–2015 GSA-USGS Congressional Science Fellow. She is eager to use her science communication skills to engage a range of audiences. Her goal is to contribute a credible and pertinent voice for science and science education policy during the upcoming fellowship year.





Anna K. Mebust

What is Congress Doing on Climate Change These Days, Anyway?

My time working for Senator Bernie Sanders (I-VT) has primarily focused on climate change, a topic for which my scientific training provides a very strong background. In graduate school, I studied how pollutant emissions from wildfires vary as a result of fire conditions, a topic intricately intertwined with climate change. Fire emissions can impact climate: Many of the emitted species directly affect incoming solar radiation, and some also interact with other gases, affect clouds, or participate in other important processes that indirectly influence climate. In turn, climate change can impact fire emissions: In a changing climate, the number, size, and intensity of fires may change, and these factors all influence the amount and composition of the emissions. Climate feedback effects like this one shape the relationship between greenhouse gas emissions and warming, and the accuracy of predictions of future climate depends on our understanding of these processes. Arming policymakers with knowledge about the state of climate science requires an understanding of the complicated nature of some of these relationships, and I brought that background with me to Washington.

There are a number of thorough summaries of global and regional climate science, including GSA's Position Statement on climate, the recently released IPCC Fifth Assessment, and the even more recently released National Climate Assessment, just to name a few. These and many other climate studies agree: our global and regional climate is warming, and human activities are primarily responsible. There is certainly more room for debate within the details; for example, how quickly will the climate warm, what are the specific risks at regional scales, and which policy solutions will best address the problem with limited negative impacts elsewhere. (I will not go into these details here; please refer to the summaries just mentioned.) At the end of the day, however, there is a scientific consensus that anthropogenic climate change exists.

Regardless of this consensus, these days Congress is caught up in what some might call unprecedented gridlock. Legislative movement on any topic, even those considered to be highly bipartisan, is extremely difficult. At this stage, climate change remains a contentious topic here; some members dismiss the scientific consensus entirely, while those who accept it sometimes differ on the "details" I mentioned before, and can disagree about the best way to move forward. Sweeping legislation of any kind is difficult to enact in Congress even in the best of circumstances. In the current environment, the political reality is that major legislation on climate change will not come up anytime soon.

So, what am I doing with my year on the Hill? Legislation on climate change might be off the table, but fortunately for my fellowship experience, that does not mean there is nothing going on. There are plenty of ways for Congress to act without major legislation, and here is a window into some of the strategies I have witnessed being applied to climate change:

1. Use the "bully pulpit" to bring attention to the topic.

Senators occupy a unique position in their ability to generate conversation around an issue; potential strategies include writing letters to each other and other major public figures, holding press conferences, writing op-eds, or giving speeches. In January, some senators announced the formation of a new "Climate Action Task Force" with the explicit purpose of bringing attention to climate change. For the task force's major action thus far, 31 senators came together for a "climate change all-nighter"—after wrapping up the day's business, they continued to speak on the Senate floor about climate change throughout the night. Topics ranged from the scientific evidence supporting climate change, to the effects that senators had witnessed in their own states and elsewhere, to the possible policy strategies that could be used to lower greenhouse gas emissions.

The event was effective as an awareness tool, generating plenty of press coverage as well as a trending Twitter hashtag, #Up4Climate. For me, it was also one of the best experiences of my fellowship so far. I helped the rest of our energy and environment legislative team prepare a speech for my boss, and then I was lucky enough to be able to go to the Senate floor with him and watch him give it. Access to the floor is very restricted; at the beginning of his speech, Senator Sanders had to ask his colleagues for their unanimous consent to give me access. I will never forget hearing my name spoken on the Senate floor, followed by Senator Sanders thanking me for my hard work! In fact, it cannot be forgotten, because those statements are now printed in the Congressional Record. Thanks to this fellowship, incredible opportunities like this one keep coming up, and I am so grateful for them.

2. Work with (or against) the Executive Branch through Congressional oversight.

Congress may be stuck in perpetual gridlock, but agencies within the Executive Branch already have several authorities that they have determined allow them to take several actions on climate change. For example, the Environmental Protection Agency is in the process of issuing carbon dioxide emission regulations for new and existing power plants; the Department of the Interior is expanding permitting for renewable energy, like utility-scale solar, wind, and geothermal power projects, on public lands. Congressional action is not needed for the Executive Branch to undertake these efforts, but Congress still maintains its oversight role over the agencies, and much of their work comes before us during hearings or in other ways. Members have the opportunity to support or to challenge the Executive Branch and to weigh in with what they think are better strategies.

3. Direct federal funding.

When most people think about Congress's role in the government, they typically think about lawmaking. Congress is also responsible for funding the government, however, and this provides several opportunities to generate action within the broader appropriations process. Members who sit on the

appropriations committees are best equipped to act here, but all members play a role in the process and can push funding for the programs they prioritize. Senators often sign letters to the chairs and ranking members of the Senate Appropriations subcommittees (e.g., the Energy and Water subcommittee) in support of particular programs and funding levels for those programs (e.g., the Department of Energy Office of Energy Efficiency and Renewable Energy). These letters can support funding levels from the President's budget request, ask for additional funding, or request decreased or eliminated funding. Members take action on climate by helping to direct funding towards (or away) from climate change-related programs that they support (or oppose).

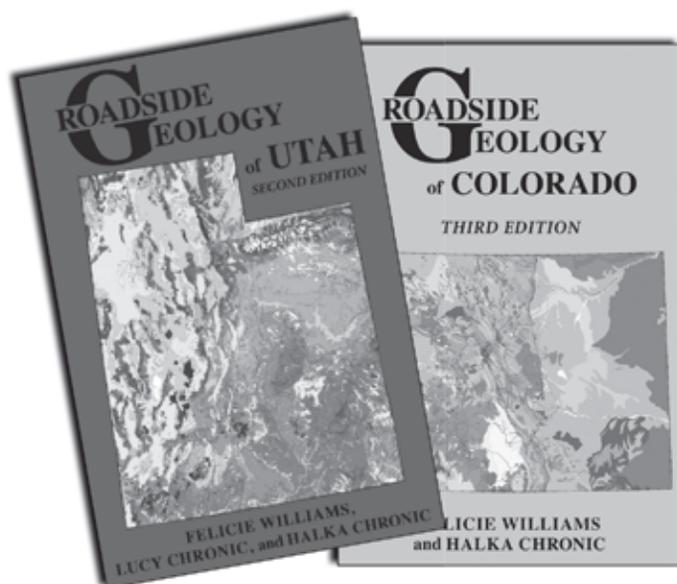
4. Take smaller legislative actions wherever you can.

Despite the extreme partisanship and gridlock that Congress is currently suffering from, there are still some opportunities for small legislative victories, either through bipartisan action or by using the amendment process. Energy efficiency measures often have some bipartisan appeal, for example. There is also some bipartisan support for many types of renewable energy, such as wind and biofuels, from members who represent states or districts with strong resources for those types of energy. This support does

not always lead to legislative action, but it can. For example, a modest, bipartisan energy efficiency bill passed the House in March and is awaiting Senate action. Members also look for opportunities to offer amendments on broader legislation; minor amendments with bipartisan appeal will sometimes pass.

Those are just a few ways that Congress can act on climate change even without major legislation, and a glimpse into my life here on the Hill. Perhaps one day the winds will shift here and legislative action on climate change will no longer be out of reach. In the meantime, I will continue providing my boss with the best science on climate change as he continues to work hard on climate change in all the little ways he can.

This manuscript is submitted for publication by Anna K. Mebust, 2013–2014 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 by the U.S. Geological Survey, Department of the Interior, under Assistance Award No. G13AP00095. 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. Anna is working in the office of Senator Sanders (I-VT) and can be reached at Anna_Mebust@sanders.senate.gov.



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Stanley A. Schumm Research Grant

Supporting research in fluvial geomorphology

Stanley Schumm's career as an acclaimed geomorphologist spanned 55 years as Distinguished Professor at Colorado State University and with the U.S. Geological Survey.



Robert T. Hatcher Research Grant

Supporting research in tectonics and structural geology

Robert D. Hatcher Jr. is a Distinguished Scientist and Professor at the University of Tennessee Dept. of Earth and Planetary Science and the recipient of the 2006 GSA Penrose Medal. Hatcher was first to apply concepts of plate tectonics to the southern Appalachians, and his tectonic map of the Appalachians has been used in subsequent international research. He served as president of GSA in 1993.



Bennie W. Troxel and Lauren A. White Research Grant

Supporting field-based research in Death Valley National Park or the southwest Basin and Range Tectonic Province

Lauren Wright and Bennie Troxel conducted research and coauthored numerous publications and geologic maps over 50 years of research in the Death Valley region.



John (Jack) W. Hess Research Grant

Supporting research in karst studies

Jack Hess has served as Executive Director of the Geological Society of America since 2001. Prior to joining GSA in 2001, he was Executive Director of the Division of Hydrologic Sciences and Vice President for Academic Affairs at the Desert Research Institute in Nevada. Hess currently serves on the board of the Karst Waters Institute and on the Longs Peak Council of the Boy Scouts of America.

Thank you to every member, corporation, and foundation that helps strengthen the breadth and depth of GSA's education, outreach, and student research efforts. Because of generous support from numerous sources (see table) the Foundation now transfers more than one million dollars to GSA annually to support GSA programs and priorities.

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In Memoriam



The Society notes with regret the deaths of the following members (notifications received between 24 February and 24 April 2014).

Daniel D. Arden Jr.

Bryan, Texas, USA
GSA notified: 17 Apr. 2014

Philip M. Bethke

Reston, Virginia, USA
Date of death: 14 Nov. 2011
GSA notified: 26 Mar. 2014

John George Cabrera

New York, New York, USA
Date of death: 1 July 2011
GSA notified: 20 Feb. 2014

Joanna Michie Connolly

Hickory, North Carolina, USA
Date of death: 17 Apr. 2014

Robert R. Evans

Wichita Falls, Texas, USA
Date of death: 4 Feb. 2014

Laing Ferguson

Sackville, New Brunswick, Canada
Date of death: 25 Dec. 2013
GSA notified: 11 Mar. 2014

William S. Fyfe

London, Ontario, Canada
Date of death: 11 Nov. 2013
GSA notified: 13 Feb. 2014

Augusto Gansser

Lugano, Switzerland
Date of death: 9 Jan. 2012
GSA notified: 22 Apr. 2014

Horace G. Goodell

Charlottesville, Virginia, USA
Date of death: 19 Dec. 2013
GSA notified: 25 Feb. 2014

Herbert E. Hendriks

Cedar Rapids, Iowa, USA
Date of death: 11 Mar. 2014

Mark Jancin

State College, Pennsylvania, USA
GSA notified: 25 Mar. 2014

Blair F. Jones

Reston, Virginia, USA
Date of death: 30 Mar. 2014

George E. Moore Jr.

Wakefield, Rhode Island, USA
GSA notified: 18 Mar. 2014

Paul W. Nygreen

Walnut Creek, California, USA
Date of death: 11 Nov. 2013
GSA notified: 25 Feb. 2014

Richard H. Ragle

Saint Johnsbury, Vermont, USA
Date of death: 1 May 2013
GSA notified: 13 Mar. 2014

David Ramaley

Boulder, Colorado, USA
Date of death: 24 Feb. 2006
GSA notified: 22 Apr. 2014

Peter A. Rona

New Brunswick, New Jersey, USA
Date of death: 19 Feb. 2014

Bernard Schieber

New York, New York, USA
Date of death: 8 Jan. 2014

Douglas W. Shakel

Tucson, Arizona, USA
GSA notified: 10 Feb. 2014

Alfred C. Spreng

Rolla, Missouri, USA
Date of death: 1 Sept. 2012
GSA notified: 18 Mar. 2014

Christopher Anne Suczek

Bellingham, Washington, USA
GSA notified: 11 Apr. 2014

George W. Walker

Los Altos, California, USA
GSA notified: 24 Apr. 2014

David E. Willis

Richmond, Texas, USA
Date of death: 2 Feb. 2014

E-an Zen

Reston, Virginia, USA
Date of death: 29 Mar. 2014



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EarthCaching gets people out in the field to learn about their planet first-hand. Participants in this annual event will learn all about EarthCaching, interact with EarthCachers from around the globe, meet EarthCache developers and reviewers, find local EarthCaches, and engage in many other exciting and educational activities. The 2014 event takes place one week before the GSA Annual Meeting & Exposition (19–22 Oct.), so join us at the event, explore the great geology of British Columbia, then attend the Annual Meeting!

For details, go to

- www.3iee.com
- www.earthcache.org
- www.facebook.com/earthcache

or

contact Gary Lewis at glewis@geosociety.org.

Let the Earth be your teacher!

GSA Senior Fellow **Kevin C.A. Burke** of the University of Houston has received the 2014 Arthur Holmes Medal & Honorary Membership Award of the European Geosciences Union (EGU) for exceptional international standing and achievements in solid earth geosciences.

GSA Fellow **Steven Driese** of Baylor University has been awarded honorary membership in SEPM (Society for Sedimentary Geology) for excellence in professional achievements and service.

GSA Fellow **W. Crawford Elliott** of Georgia State University in Atlanta has been elected President of the Clay Minerals Society (CMS) and began his term at the 51st meeting of CMS on 17 May 2014.

GSA member **Samantha Hansen** of the University of Alabama has received the Presidential Early Career Award for Scientists and Engineers (PECASE) for “innovative research that will provide critical constraints on the geodynamic evolution of the Antarctic continent as well as information to better constrain evolution of the Antarctic ice sheets, and for developing novel approaches to introduce underrepresented students to the geosciences.”

GSA Senior Fellow **George Devries Klein** has retired from petroleum geological consulting and has relocated to Barragada, Guam.

GSA Senior Fellow **Vince Matthews**, Colorado’s State Geologist, has been awarded the 2014 Pioneer Award from the American Association of Petroleum Geologists (AAPG). The award is given to longstanding members of the AAPG who have contributed to the association and who have made meaningful and significant contributions to the science of geology.

GSA Fellow **Marli Miller** of the University of Oregon answers questions about her writing and photography in a 17 April “Mary Anning’s Revenge” blog post at www.maryanningsrevenge.com/2014/04/interview-with-marli-miller.html.

The work of GSA Fellow **Terry Plank**, Arthur D. Storke Memorial Professor at the Lamont-Doherty Earth Observatory, is highlighted in a 14 Feb. Columbia University Earth Institute blog post at <http://blogs.ei.columbia.edu/2014/02/14/terry-plank-volcano-maven/>.

GSA member **Nathan Sheldon** of the University of Michigan has received SEPM’s James Lee Wilson Award in recognition of excellence in sedimentary geology by an early career scientist.

GSA Fellow **Seth Stein**, Deering Professor of Geological Sciences at Northwestern University, has been awarded the Royal Astronomical Society’s Price Medal for investigations of outstanding merit in solid earth geophysics, oceanography, or planetary sciences.

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Contact Davida Buehler at dbuehler@geosociety.org with questions about Field Camps.



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the field!**

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For more information on GSA's GeoVentures and Field Camps, visit www.geoventures.org.

Positions Open

ASSISTANT PROFESSOR SEDIMENTOLOGY/BASIN ANALYSIS DENISON UNIVERSITY

Denison University invites applications for a tenure track position in the Department of Geosciences, to begin in August 2015. We seek a broadly trained scientist engaged in the study of Sedimentology and/or Basin Analysis. Successful candidates are expected to be outstanding teacher/scholars, and contribute to the continued growth of the Department and College. Candidates must have a Ph.D. at the time of appointment.

We require a colleague who is committed to teaching excellence in the liberal arts tradition, is field-based, has broad interests beyond their individual specialty, and will provide a balance of classroom, field, and laboratory experiences for our students. Candidates must have the desire and ability to teach courses at all levels of the curriculum. In addition, successful candidates are expected to maintain a vibrant, ongoing research program that actively incorporates undergraduate students.

Denison University is a highly selective, private residential liberal arts college enrolling approximately 2100 undergraduate students from across the country and around the world. The college is located in the village of Granville, Ohio, 25 miles east of Columbus. For more information about Denison, visit our website at www.denison.edu.

All application materials will be handled electronically at <https://employment.denison.edu>. Applications must include (1) a letter of application addressing the position requirements listed above (2) a curriculum vita; (3) academic transcripts of undergraduate and graduate course work (unofficial acceptable); (4) a statement of teaching philosophy and experience; and (5) a statement of your research program in a liberal arts context. In addition, please include the contact information for three persons who know you well, who will then be requested to upload reference letters. Completed application materials submitted by 27 Oct. 2014 will receive full consideration, and evaluation will continue until the position is filled. We plan to meet with selected candidates at the 2014 GSA Annual Meeting in Vancouver, BC, Canada. Denison University is an Affirmative Action, Equal Opportunity Employer. To achieve our mission as a liberal arts college, we continually strive to foster a diverse campus community, which recognizes the value of all persons regardless of religion, race, ethnicity, gender, sexual orientation, disability, or socioeconomic background.

FACULTY POSITION IN CLIMATE CHANGE AND WATER CYCLE AT THE UNIVERSITY OF MICHIGAN

The Department of Earth and Environmental Sciences at the University of Michigan is searching for a tenure-track faculty candidate, at the assistant professor level, in either Climate Change or Water Cycle Research, for a university-year appointment starting 1 Sept. 2015.

Climate Change: We seek applicants who investigate Earth's climate system in order to understand processes and impacts of climate change. Candidates whose research focuses on the history of climate change or issues of societal interest are especially encouraged to apply. Areas of expertise may include but are not limited to (i) paleoclimate; (ii) paleoceanography; and (iii) modern climate processes and impacts.

Water Cycle: We seek applicants who investigate water cycling and/or aqueous interactions through the atmosphere, at the Earth's surface, in groundwater and during environmental processes. Candidates whose research has implications for the sustainability of water resources are especially encouraged to apply. Areas of expertise may include but are not limited to (i) large-scale hydrological cycling; (ii) physical and chemical surface and groundwater hydrology; (iii) catchment hydrology and fluvial geomorphology; and (iv) nanoparticles in the aqueous environment.

The Department will consider outstanding applicants in either area who use any technique applied to any time scale and environment. The successful candidate is expected to establish a leading research program and contribute to both undergraduate and graduate teaching. Applicants must have a PhD and should submit a CV, statement of current and future research plans, statement of teaching philosophy and experience, evidence of teaching excellence, and names of at least four persons who can provide letters of recommendation.

Further information about the Department and this search can be found at www.lsa.umich.edu/earth.

To apply please go to www.earth.lsa.umich.edu/facultysearch/newapplicant, complete the online form and upload the required application documents as a single PDF file. If you have any questions or comments, please send an e-mail message to Michigan-Earth-Search@umich.edu.

The application deadline is 1 August 2014 for full consideration, but applications will continue to be reviewed until the position is filled. Women and minorities are encouraged to apply. The University is supportive of the needs of dual career couples. The University of Michigan is an equal opportunity/affirmative action employer.

ASSISTANT PROFESSOR PALEONTOLOGY UNIVERSITY OF UTAH

The Department of Geology and Geophysics at the University of Utah solicits applicants for a tenure track position at the Assistant Professor level in Paleontology/Paleobiology. We seek an outstanding scientist whose research focuses in paleontologic studies that apply to geologic problems, with emphasis on such themes as deep time paleoclimate and paleoenvironmental change, paleoecology, and/or sequence stratigraphy/biostratigraphy. Applicants must have a Ph.D. and should demonstrate a potential to build a vibrant, externally funded research program involving graduate and undergraduate students. For further details and to apply, please go to

<http://utah.peopleadmin.com/postings/31808>.

The University of Utah is an Equal Opportunity/Affirmative Action employer and educator. Minorities, women, veterans and persons with disabilities are encouraged to apply. Reasonable accommodations are provided for employees with known disabilities. (For additional information regarding disabilities, see www.regulations.utah.edu/humanResources/5-106.html.) The University of Utah values candidates who have experience working in settings with students from diverse backgrounds, and who possess a strong commitment to improving access to higher education for historically underrepresented groups.

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Deadline for applications: 15 August 2014.

www.facultycareers.ubc.ca/17993

Inquiries: Associate Dean for Faculty, Irving K. Barber School of Arts and Sciences (Louise.Nelson@ubc.ca).

Opportunities for Students

Ph.D. position, Geomicrobiology, Rutgers University. A Ph.D. position is available at the Department of Earth and Environmental Sciences, Rutgers University–Newark in geomicrobiology with the start as early as January 2015. We are looking for a motivated student with interest in microbial ecology, biogeochemistry or biomineralization. An interest in planetary sciences and astrobiology is desirable. To learn more about the lab please visit www.geomicrobiologylab-rutgers.com.

Prospective students should contact Dr. M. Glamoclija (m.glamoclija@rutgers.edu) by e-mail and send their cv and a statement of research interests.

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SPE504, 132 p.
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Earth's Early Atmosphere and Surface Environment

Edited by George H. Shaw



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GSA Publications Highlights

EXPANDED GSA Bulletin Archive

GSA has completed digitizing another 23 years of *The Geological Society of America Bulletin* content. Published between 1922 and 1944, this content includes many well-known authors and subjects, including Joseph Pardee and J Harlen Bretz' work on the Channeled Scablands and papers by Beno Gutenberg, Charles Francis Richter, Ian Campbell, Arthur L. Day, and Kirk Bryan.

The cover-to-cover scanning included hundreds of large foldouts, all of which are available to *GSA Bulletin* and GeoScienceWorld subscribers. Nonsubscribers can access the content via pay per view or GSA's Bloc of Docs service, where access costs as little as US\$4 per paper. The Society plans to digitize the remaining archive, 1890–1922, this fall.

▶ Start reading at www.gsapubs.org.



Penrose Conference—Snake River, Twin Falls, Idaho, USA, 9–13 September 2009. Photo by Ken Clark.



March 2012 Penrose Conference location: Castelvetro Piacenti, Lucca, Italy.

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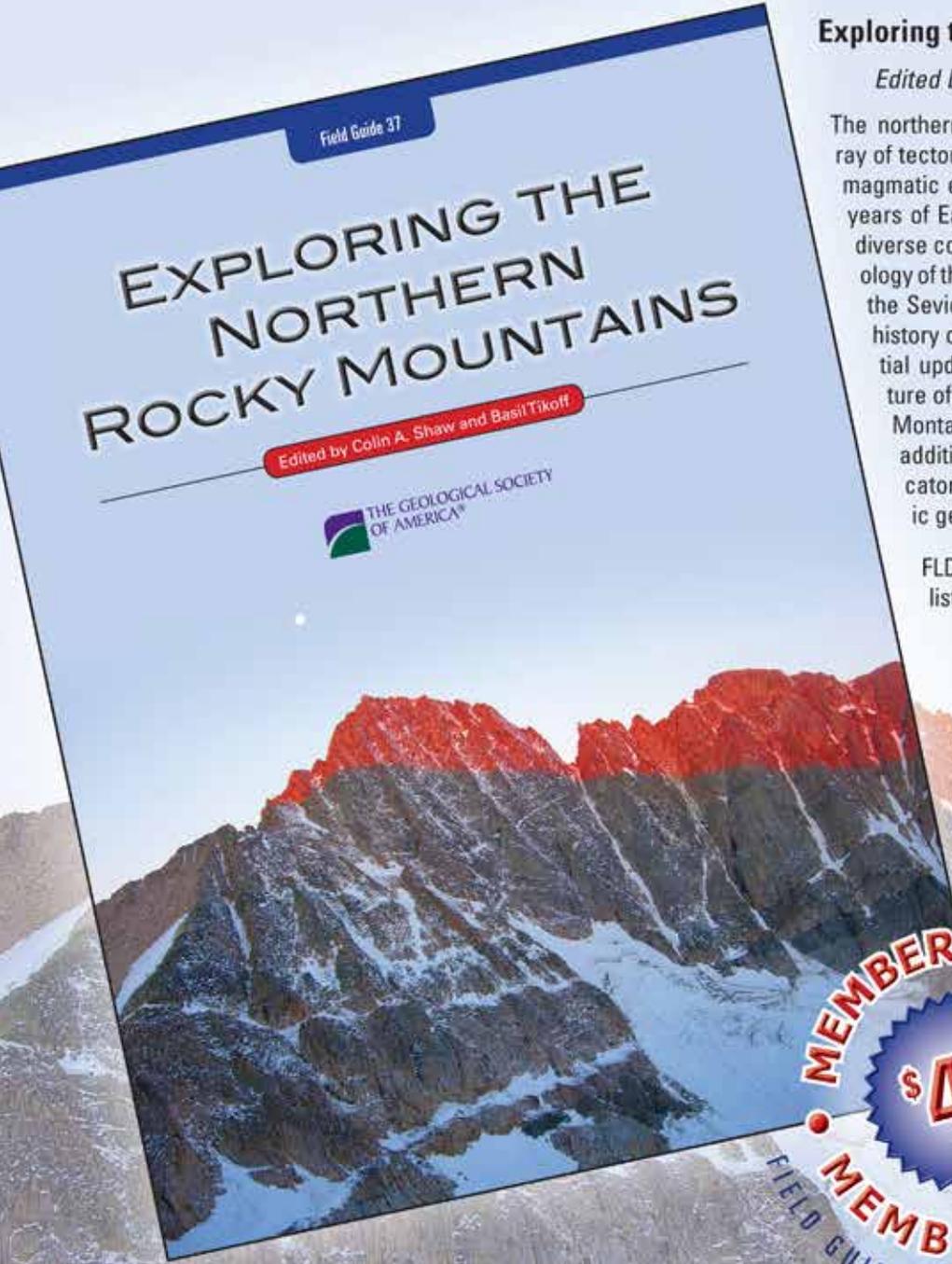
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Field Guide 37

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