The Importance of the Global Professoriate in the Geosciences—The Students We Are Teaching, and Learn from, Today May Represent the Last Great Hope

Delivered to the GSA Annual Meeting in Minneapolis, Minnesota, USA, on Sunday, 9 October 2011, by GSA President ***John Geissman,*** *Dept. of Geosciences, ROC 21, The University of Texas at Dallas, 800 West Campbell Road, Richardson, Texas 75080, USA; geissman@utdallas.edu*

"Make them like me adorers of the good science of rock-breaking." —Charles Darwin giving advice to Charles Lyell, personal letter, 9 August 1838

I started thinking about the 2011 Presidential Address a year ago, vowing that I would be impeccably prepared and cool, calm, and collected, and of course would have the complete address finished for *GSA Today* well in advance of the deadline. Aspirations are one thing … then reality sets in. Knowing that, unlike previous Annual Meetings, at least in the recent past, this year's address was to be given after a full day of science and interactions with colleagues old and new, the typically well-attended, very early morning ExxonMobil Student Breakfast, AND the opening of the exhibit hall, with tickets that one can redeem for particular beverages, I thought it wise to choose a topic that likely is or has been near and dear to many a geoscientist's heart and that could be discussed with brevity and vigor.

The views expressed in this address are those of a single very appreciative and fortunate individual.

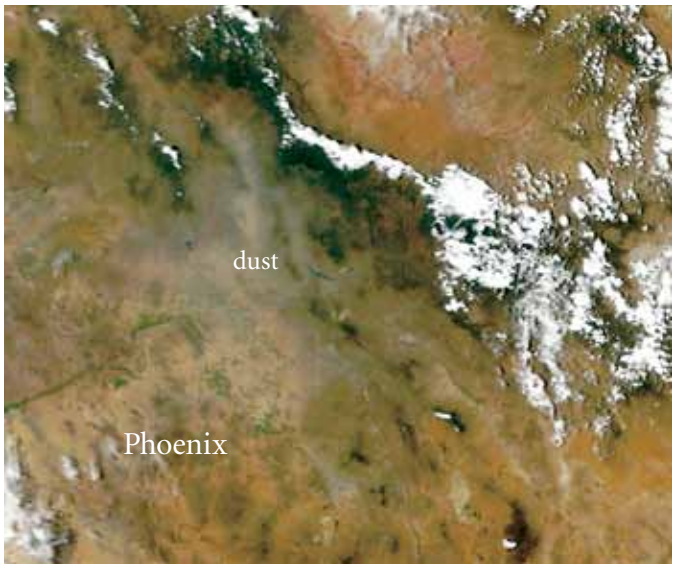
As the weeks and months passed since late October 2010, many chance events convinced me that the topic of this address was indeed a correct one, and that my title, as provocative as it may be, was far from unreasonable. On Wednesday, 15 Dec. 2010, I sat in the Moscone Center at the AGU meeting and listened, along with several hundred others, to an Oregon high school science teacher, Greg Craven, present his talk, "What is the Worst that Could Happen?" He started his talk with a phrase, repeated over and over, about what scientists really should do with their science, right now, because, in his opinion, their science mattered little in the grand scheme of things considering what was facing the human race in the near future. The phrase, if repeated in a classroom, certainly might land someone in a heap of trouble!

In late spring, in front of a large group of young, aspiring, excited students on the first day of their field geology class, on a lovely day in north-central New Mexico, after talking over all sorts of logistics-related matters with the students, we talked about why, in these times, a field geology course was still in their curriculum. They listened to my opinion, and then I closed by saying, "Besides, yet I hope that I am wrong about this, I am very concerned that you and your colleagues—geoscience students across the world—may represent the last great hope." Three weeks later, when the students had submitted their last field project and were relaxing that evening, a couple of them caught me and said, "We have been thinking about the comment you made on the first day of the class and cannot get it out of our minds. Now we understand why you said it."

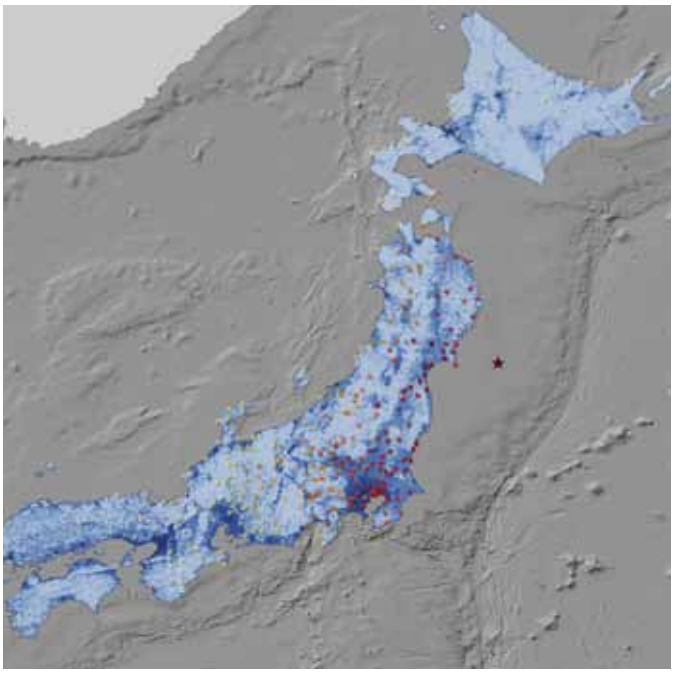
Earlier this fall, I participated in a lively and very productive series of events in Washington, D.C. At one meeting, a geoscience professor remarked publicly, during an engaging discussion, "Geoscientists are terrible teachers!" Two days later, while meeting with the staff of a U.S. Senator in the Hart Office Building, during the Geosciences Congressional Visits Days, the senator's executive assistant, who had served for several senators on both sides of the aisle, took a deep breath to quiet her colleagues and then said, "Professor Geissman, I have heard many of these types of conversations; tell me, is it really too late?"

And finally, after a very early transit to the Dallas/Fort Worth airport on the morning of Friday, 7 October, I settled in, Starbucks in hand and laptop open, to wait for my plane to depart. Across from me were a man and a woman with what were obviously poster tubes, engaged in a discussion about paleosols and the undergraduate courses for which they were currently teaching assistants. The passion, energy, and enthusiasm for both their research and teaching were hard not to listen to and feel really good about! Eventually, I looked up and said, "You must be on your way to the GSA meeting." My new friends were Ph.D. students at Baylor University; they asked me why I was going so early to the GSA meeting, and I remarked that I needed to chair an Executive Committee meeting for GSA later that afternoon. One remarked, "You're the GSA President!" I think that we could have talked almost forever. To the two of you—you know who you are—great fortune!

The Presidential Address begins, only appropriately, with a tribute to a legendary son of Minnesota. As Bob Dylan typed out in 1964 (not that long ago!) the lyrics to an American classic, "The Times They Are A-Changin'," I wonder if he contemplated how so very much they would apply to the future, say Fall 2011, RIGHT NOW. One might argue forever about what he meant by such lines as "and admit that the waters around yuh have grown" and "don't criticize what yuh can't understand," among others. On the last day of October 2011, somewhere on Earth, our seven-billionth person was born. In well less than a decade, the eight-billionth person is expected to be born. At the 2010 Annual Meeting, Past President Joaquin Ruiz spoke passionately about the grand accomplishments made by the geoscience community and the



NASA image acquired 6 July 2011 of dust storm near Phoenix, Arizona, USA; courtesy MODIS Rapid Response Team, Goddard Space Flight Center, http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=51285 (last accessed 10 Nov. 2011).



March 2011 Tohoku, Japan, earthquake ground motion and shaking intensity map. NASA Earth Observatory Image by Jesse Allen and Robert Simmon, using data from the USGS Earthquakes Hazard Program and Oak Ridge National Laboratory Geographic Information Science and Technology, http://earthobservatory.nasa.gov/IOTD/view.php?id=49719 (last accessed 10 Nov. 2011).

great opportunities for and challenges associated with future grand-thinking and groundbreaking research. I share his passion, optimism, and enthusiasm, yet, like many of you, I also have some concerns. An important component of the solution to many of these concerns is the first part of the title of this Presidential Address.

None of you would disagree that it is not uncommon for engaging and enjoyable conversations to center around testable hypotheses. After all, science is the organized exploration of the natural world and must be based on testing hypotheses, through rigorous intellectual discussion, with the most accurate information available. The testable hypothesis in this conversation with you is the second part of the title of this address. I hope that it will be proven invalid, yet I remain nervous about the possibility that my hypothesis has considerable validity, but also optimistic that wisdom and reason will be allowed to guide us. In the book *Eaarth*, Bill McKibben (2010) writes,

> My only real fear is that the reality described in this book, and increasingly evident in the world around us, will be for some an excuse to give up. We need just the opposite—increased engagement. Some of that engagement will be local: building the kinds of communities and economies that can withstand what's coming. And some of it must be global: we must step up to fight to keep climate change from getting even more powerfully out of control. (p. xv)

The geosciences will undeniably play a grand role in that engagement; our students we teach, and learn from today, are key to seeing it happen.

I suspect many of you as well are genuinely concerned about what is ahead of us in terms of the ongoing and inevitable changes in the environment of the surface of our home. We cannot deny that several activities and factors are presently conspiring to make what we describe, and take for granted, as life on our only home more and more unsustainable. There is thus a need for reality to be understood as clearly and as universally as possible. As Dianne Dumanoski (2009) wrote in *The End of the Long Summer*, "In times of danger, bitter truths serve us better than sweet lies" (p. 247). These concerns exist at a time of tremendous opportunities in the geosciences. Besides the great advances in understanding Earth processes and deep time over the past decades, we are witnessing an enormous increase in demands for base and precious metals, rare earth elements, and other critical minerals, with some of this demand reflecting the increase in the recognized need for alternative energy sources. Many institutions are experiencing large increases in geoscience majors; yet, at the same time, geoscience workforce concerns become more and more acute (Gonzales and Keene, 2011). We are striving to improve the overall representation of minority groups in the geosciences, at all levels, yet increasingly recognize that we must do better (O'Connell and Holmes, 2011).

In my Presidential Address, I showed image after image, many scanned from newspapers, of just what has taken place, or has been front and center, over the past year, from the March Tohoku earthquake off northern Japan, to the enormous dust storms affecting Phoenix, to the huge Wallow and Las Conchas fires in the southwest, to the major volcanic eruptions in Iceland and Indonesia, to record-breaking high temperatures across much of North America, to rapidly fluctuating demands for (and costs of) conventional energy, to the 6% jump in annual global emissions of carbon dioxide in 2010. These frames, and many similar to them (e.g., Rosenthal, 2011), are cause for concern. The next to the last frame in the series was filled with covers of recent books or popular science articles dealing with what is happening to our planet (McKibben, 2010; Kolbert, 2006; Dumanoski, 2009; Mann

and Kump, 2009; Kump, 2011). To exacerbate this, we are challenged by well-organized and large groups of individuals whose goal is to destroy science education in the United States and elsewhere by interjecting completely non-scientific means of "understanding" the natural world in science classrooms.

One wonders if, and when, it may become necessary for alternative approaches, whatever they may be, to be used to make certain that we have not placed ourselves on an irreversible path. In 1975, the economist Nicholas Georgescu-Roegen asked, "Will mankind listen to any program that implies a constriction of its addition to … comfort? Perhaps the destiny of man is to have a short, but fiery, exciting, and extravagant life?" (p. 381).

I have a reason for drawing your attention to the fact that in 1959, a master's student at the University of New Mexico was contemplating these kinds of issues, admittedly from more of the perspective of social unrest and change. He wrote in his thesis,

> Is violence the only possible means for the achievement of the desired result? If violence is regarded as an intrinsic evil, then its use cannot be fully justified through success alone; to give it a sufficient justification the anarchist must establish that his revolutionary ends cannot be achieved through better, meaning non-violent, means. Rather than resorting to violence and bloodshed, in other words, would it not be possible, perhaps even easier, to effect the desired improvements in the social order through education and propaganda, through peaceful agitation in one form or another, through piecemeal and incremental reforms, through a broadly evolutionary course of action, rather than a violently revolutionary one? (p. 62)

I suspect that all of you know him—Edward Abbey. We must rise above the common human trait of frustration; there are solutions "through a broadly evolutionary course of action."

We, as members of a soon-to-be 125-year-old professional society, have important responsibilities to students—not just those who are presently aspiring toward careers in the geosciences but also the many others whose intellectual curiosity draws them into numerous geoscience courses, public lectures, national parks and monuments, museums, and other venues for geoscience learning. If we do not speak, and speak vigorously, in support and defense of the geosciences and geoscience education, at all levels, with an obligation to confront reality with wisdom and reason as our guide, who will? I contend that the geosciences professoriate is a key part of that responsibility, and is thus vital to the future of our home and must itself have a tremendous future. Rather than being about "for the sake of our *grandchildren*" (a phrase that I bet if Craig Schiffries had a nickel for every time he heard on Capitol Hill he would be a very wealthy person), this issue may be first and foremost about the sake of our *children*—then we'll see what comes next. From the hallowed halls of what some describe as the elite institutions in America to the large-volume state bastions of public education to smaller four-year and two-year institutions and community colleges, as well as the many other forms it takes around the world, the professoriate must remain a rewarding, stimulating, and downright enjoyable profession. It must remain allowed and supported to seek, and speak, the "bitter truth." I assert that many, if not all, of you, no matter what career path (or paths) you have chosen (including K–12 education as well as higher education), were influenced in a profoundly positive manner by one or more geoscience faculty member in higher education and that your memories are indelible.

That said, I consider myself a very fortunate individual, for many reasons. For one, in the fall semester of 1970, fresh out of high school, I was one of several hundred in Professor Frank H.T. Rhodes' physical geology (Geology 101) course at the University of Michigan. Professor Rhodes rose through the administrative ranks at Michigan and was President of Cornell University for 18 years (at the 2002 GSA Annual Meeting, he received the AGI's Ian Campbell Award). I still have my notes from that class, and his subsequent Historical Geology course, and I will never forget the lectures. His remarkable clarity, wisdom, and passion riveted the packed Natural Science Building lecture hall every Monday, Wednesday, and Friday. Similarly, the energy, intelligence, intellectual curiosity, kindness, and friendship of last year's Penrose Medalist, Eric J. Essene, will be remembered forever, not just by this student, but by countless others who benefitted from his mentorship. I suspect that such memories pervade the geoscience community; they are irreplaceable. The geosciences professoriate must remain strong, vibrant, stimulating, and exciting in order for current and future students to have the positive intellectual experiences that have guided and instilled confidence in many generations of geoscientists.

Yet there are large—if not daunting—challenges. The years' old downturn in the U.S., as well as global, economy is resulting in a rapidly changing "climate" in higher education. Efforts by institutions to "cheapen" the education of their students (e.g., online classes taught to students who are regularly enrolled members of the institution's student body) are not uncommon today. I wonder if I would be writing this, right now, were I to have taken physical geology as an online course in fall 1970. Consistent with this is the "shrinking professoriate syndrome"—beginning in 2006, fewer than 50% of the full-time, professional positions in higher education were held by faculty (Jaschik, 2008). Federal support for geoscience research, in particular the kind of support that directly affects individual or small groups of faculty, is not growing; in fact, such support could actually decrease. State support of public institutions, as a percentage of total operational costs, continues to decline; for many institutions, 2008 was the beginning of major decreases in support. With such recent changes in higher education, new faculty may begin to formulate new sets of questions: What really are the expectations placed on me? Can they actually be the same as even ten years ago? What are my expectations? Can they, realistically, be the same as even ten years ago? Can I devote sufficient quality time to both teaching and research? When will my department be able to fill vacant faculty positions? Answers to many of these questions lie in the hands of deans, provosts, and presidents of institutions, who struggle with tough budgetary decisions.

Geoscience departments cannot be considered as sacrificial lambs. The geoscience professoriate must be recognized for its broad importance to the institution, in part to assure that future aspirants to the professoriate will have meaningful and rewarding careers. A large part of that assurance is intimately tied into the need for the geoscience professoriate to recognize our part in the broader community of higher education. As much as we may enjoy the sanctity and quiet of our relatively unique opportunities to conduct much of our "work" on remote and, perhaps, peaceful parts of Earth, we still do not operate in a vacuum. To my readers who aspire

Photo by John Geissman.

to make the geosciences professoriate a rewarding life experience, and to my readers in the professoriate who might like a "refresher," much has been written about that community. I cite Kerr (1963), Gardner (1968), Rosovsky (1990), Kennedy (1997), Kernan (2000), Rhodes (2001), and Vest (2004) as examples of required reading. In *The Creation of the Future*, Frank H.T. Rhodes (2001) writes,

> The research university places heavy demands upon the individual faculty member: he or she must be a successful investigator, a scholar of originality, a successful entrepreneur and fundraiser, a substantial author, an effective mentor of graduate and professional students, a challenging and inspiring undergraduate teacher and adviser, an effective participant in the life of the department, an informed citizen in the affairs of the college and university, and a responsible public servant contributing the benefits of professional insight to the continuing needs of the local community, the larger society, and the professional guild. (p. 24)

After such a statement, one might ask, "Is it worth it?" My answer is, absolutely, and that it must continue to be! *The Creation of the Future*, and the other contributions cited above are, in my opinion, celebrations of the many positives associated with institutions of higher education, not just in the United States, but throughout the world. That said, the success and stature of such institutions did not just appear overnight. Rhodes (2001) continues,

> Faculty members must affirm that membership in a university—like American Express—has not only its privileges but also its price. And that price is a commitment to common discourse. The fundamental reason for the existence of the university is the benefit of shared dialogue. Without it, the claim to be a university or a collegium is groundless. (p. 54)

In *No Easy Victories*, Gardner (1968) writes,

> I like to think that no matter how much the university becomes entangled with the world on its outer fringes, the inner city of the university will be above the battle in some quite distinctive way. … I'd like to think that it will stand for things that are forgotten in the heat of battle, for values that get pushed aside in the rough-and-tumble of everyday living, for the goals we ought to be thinking about and never do, for the facts we don't like to face and the questions we lack the courage to ask. (p. 90)

In my opinion, these and many other comments that I could continue to quote in this address do far more than instill a sense of pride in the geosciences professoriate and professoriate in general. The global geosciences professoriate must continue to be as healthy as possible; it has tremendous commitments to its students. In C.P. Snow's (1959) *The Two Cultures* (the title of his May 1959 Rede Lecture at Cambridge University), he states, "To put it in provokingly stark terms, an education in physics or chemistry is a better preparation for handling the world's problems than an education in history or philosophy" (p. 1xx). I am willing to bet that had he given that same lecture in 1972, for example, five years after the acceptance of plate tectonics as a unifying theory of earth processes, he would have included the geosciences along with physics and chemistry. Again, to the aspiring professoriate, as well as those firmly entrenched in the geosciences professoriate: Remember that you never know with whom you may have that "common discourse."

In chapter five, "Teaching as a Moral Vocation," Rhodes (2001) writes,

> After thirty-five years of teaching American history, the most striking thing about Professor Walter LaFeber is that he has not lost a glimmer of his love for his subject, and still finds the birth of a similar passion in his students a cause

for celebration. "It's the best thing about teaching," he said, "You see them livening up in class. You see their interests take off. And you sit there, thinking, 'Is this going to be the next Secretary of State?'" (p. 82)

I close this conversation with some suggestions, or polite recommendations, if you will.

First, to Faculty with Students Who Aspire to the Professoriate:

1. Nurture them;
2. Engage them; and
3. Always consider what is best for them, not you.

To Deans, Provosts, Presidents, and Regents:

1. Treat your geoscience department with the great respect that it deserves;
2. Encourage and work with your geoscience department to strengthen the diversity of its faculty;
3. Do not pressure your geoscience department to teach "online" courses, at any level, to students who are physically present and enrolled at your own institution!; and
4. Recognize the continuing need for solid field-based instruction of geoscience majors and assure that adequate support is provided for those departments that still maintain field geology programs.

To Department Heads and Chairs (Current, Future, and Past):

1. Your junior faculty may become colleagues for decades—help them foster and grow;
2. Use GSA's position statement "Expanding and Improving Geoscience in Higher Education";
3. Use the AGI workforce documents "U.S. geoscience today and in the next decade" and the "Status of the Geoscience Workforce 2011" (Gonzales and King, 2011); and
4. Reward your colleagues, especially your junior faculty, who are willing to stick their necks out and commit themselves, and make the sacrifices associated with such commitment, to field-based geoscience education, including rigorous field geology courses.

To Faculty Teaching Lower Division "Introductory" Classes (e.g., "Physical", "Shake 'n Bake", "Environmental", "Earth History", etc.):

1. Read Manduca (2011) and utilize the array of resources available at SERC and other organizations established to foster quality geoscience education;
2. Walk into every class as excited (and as organized) as possible;
3. Refuse to teach "online" geoscience courses, at any level, to students who are physically present and enrolled at your own institution!; and
4. Consider the possibility that Student X in Introductory Physical Geology may be a future senator, or secretary of state, or science advisor to the president!

And Finally, to Students Entering or Aspiring to the Professoriate:

1. Yours is a most noble profession, but it only remains noble through your conscious efforts;
2. Your importance and relevance to all of society has never been greater;
3. Relish your interactions with YOUR students; and
4. As a close friend and outstanding geoscientist and past GSA President repeatedly says, "Don't take yourself too seriously!"

Let us strive to make certain that we, and our students, and then their students, will always have the opportunity to fulfill the words of T.S. Eliot in *Little Gidding*: "We shall not cease from exploration. And the end of all our exploring will be to arrive where we started and know the place for the first time."

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