Jahns recap and comments on supporting development of new engineering geoscientists

Vince Cronin, GSA Annual Meeting 2023

SLIDE 1 I am very thankful for the privilege of being the Jahns Lecturer this year on behalf of AEG and GSA. It has been a wonderful experience, and I think a good investment by those organizations.

The final tallies are not yet in, but I anticipate finishing the year <SLIDE 2> having made about 50 face-to-face presentations.

SLIDE 3 These included 1 consulting firm, ...
SLIDE 4 ... 27 colleges or universities,
SLIDE 5 ... 1 field conference that involved students from several schools, and ...
SLIDE 6 ... 17 AEG chapter events. Several face-to-face presentations were live-streamed to remote audiences.

SLIDE 7 Those events took place in 16 states across the country.

SLIDE 8 I have also presented 3 webinars covering 3 different topics.

SLIDE 9 I will have driven over 8,000 miles and <SLIDE 10> caught 39 flights traveling to events.

SLIDE 11 I stayed 48 nights in hotels and <SLIDE 12> 10 nights in 6 private homes.

SLIDE 13 Very little of that would have happened without the assistance of the fine people who volunteer on behalf of AEG chapters and GSA sections, in all roles from grand poobahs to worker bees, <SLIDE 14> and the university faculty and staff members who welcomed me into their classrooms and lecture halls across the country.

SLIDE 15 I am very grateful for their help, <SLIDE 16> which enabled me to reach many students <SLIDE 17> who might not have considered a career in geoscience applied in the public interest <SLIDE 18> without having been invited to and welcomed at an AEG- or GSA-sponsored event.

SLIDE 19 I offered six different Jahns lecture topics. The most frequently requested was How can engineering geology help society meet the challenge of a changing climate?

That lecture identified three fundamental tasks we have before us as professional engineering geoscientists confronting global warming.

SLIDE 20 First, we need to master the knowledge and skills needed to create sustainable solutions to problems created or made worse by the effects of global warming. Ignorance is not useful. But hope is useful — even essential — in the sense of establishing goals, finding pathways to reach the goals, and acting to achieve those goals.

SLIDE 21 Second, we need to communicate effectively with the public and, specifically, with people and groups who have the power to effect change. We need to establish our profession as a source of reliable information and solutions to problems, at all scales, posed by global warming. And we need to teach through words and actions — including our personal example.

SLIDE 22 And third, we need to make decisions and recommendations in light of knowledge of how global warming will affect whatever we are working on over the coming decades. We need to devote our time and energy to help develop, propose, and implement solutions to the problems of a warming world.

SLIDE 23 In short, engineering geoscientists will play many essential roles helping society navigate the effects of global warming. We will be most effective when we set aside old assumptions about a static climate and start planning to meet the challenges of a warming climate, with geoscience practiced in the public interest.

SLIDE 24 The next-most-requested lecture topic was "The search for the Dog Valley fault," which is an earthquake – active fault – potential disaster story involving the possible failure of an earth-fill dam with a clay core upstream from a similar dam.

My talk considered the possible effect of a Magnitude 6+ earthquake along a fault located directly under <SLIDE 25> Stampede Dam along the Little Truckee River in California. If Stampede Dam fails, <SLIDE 26> Boca Dam will also fail <SLIDE 27> and towns along the Truckee River, including downtown Reno, will be devastated. Estimated casualties from such an event are around 150,000.

SLIDE 28 If this sounds familiar, it should. A few weeks ago, eight months' worth of rain fell in just six hours on desert terrain near Derna, Libya, upstream of an earth-fill dam with a clay core. That upper dam failed by overtopping, as did the one downstream from it, causing more than 11,300 known deaths with about 10,000 missing.

Engineering geoscientists need to understand that the intensity of weather events is expected to continue increasing through this century and beyond, due to the increased energy associated with a hotter ocean, atmosphere, and land surface.

SLIDE 29 I want to shift gears now and offer a few comments about the challenge of attracting and developing students interested in becoming engineering geoscientists.

University geoscience departments are increasingly focused on the causes and geologic history of climate change — especially anthropogenic contributions to current global warming. This reminds me of the sea-change that occurred in geoscience programs in the early 1970s when plate tectonics gained traction as a unifying model for solid-earth geoscience.

We have made, and continue to make, significant investments of time and energy in collecting primary data and working-out causes and effects.

It is important to continue enhancing our understanding of the mechanisms of global warming. The work of the IPCC and its contributors is essential.

SLIDE 30 My concern is that we are not making the necessary investment in developing applied geoscientists — the trained, practical experts needed to help society avoid or mitigate the effects of global warming.

SLIDE 31 While answering questions about global warming, we must not ignore or neglect answering another important question: how do we develop engineering geoscientists with the practical knowledge and skills needed to be useful in a warming world, able to help society be resilient in the face of ...
SLIDE 32 ... flooding, ...
SLIDE 33 ... coastal inundation, ...

SLIDE 34 ... locally inadequate supplies of potable water, ...
SLIDE 35 ... more intense weather events leading to ...
SLIDE 36 ... landslides and debris flows, ...
SLIDE 37 ... problems with our system of dams, and so on.

SLIDE 38 Our goals are to help young folks establish useful careers as geoscientists, and to replenish a sufficient supply of new engineering geoscientists. I am promoting a student-centered approach focusing on career opportunities.

SLIDE 39 The process of developing most geoscientists involves higher education followed by, in effect, an apprentice system. Undergraduate schools with geoscience departments, like my *alma mater* Pomona College, only serve students pursuing Bachelor's degrees. All of the school's resources are devoted to undergraduate education.

SLIDE 40 Other schools, like those in the California State University System, only produce Bachelor's and Master's graduates. The highest degree earned by most engineering geoscientists employed in the US is the Bachelor's or Master's degree, so these schools should be a particular focus of our efforts to support development of new engineering geoscientists.

SLIDE 41 Universities that produce PhD graduates are not just an expanded version of non-doctoral institutions. The focus of faculty members serving as doctoral advisors is on research and the financial and educational needs of their doctoral students. The "next step" for a doctoral graduate these days tends to be a postdoctoral fellowship along the road to a research academic career.

In my view, doctoral research universities must not lose focus on Bachelors and Masters-level student development. High quality BS and MS-degree graduates supply us with the practical geoscientists needed to help society avoid or mitigate geological disasters.

So how can we have a positive impact on this system of higher education in the geosciences? I want to suggest a pathway that exists today — at least in part — several places that I visited on my Jahns lecture tour.

SLIDE 42 Whether a university faculty includes members who have experience as a professional applied geoscientist or not, any geoscience department can benefit from supportive interactions with the applied geoscience community.

SLIDE 43 The folks who might be best able to mentor current students about career paths in applied geology are the alums of a geoscience department who are applied geoscientists. Local professional geologists can also support a department even if they are not alums.

SLIDE 44 Professional geoscience organizations like AEG, AIPG, and GSA's Environmental and Engineering Geology Division should collaborate with each other to support geoscience departments effectively. Local student chapters of professional organizations, supported by local companies and professionals, should be the rule rather than the exception in geoscience departments.

State surveys and companies can help universities produce novice geoscientists equipped with the basic knowledge and skills that will make them productive apprentices. Surveys and companies can expose students to workshops, internships, and useful professional training such as OSHA's 40-hour course leading to HAZWOPER certification.

SLIDE 45 Support from the applied geoscience community can also bring a variety of opportunities to geoscience students, including grants and scholarships, career guidance, mentoring, networking opportunities at meetings of local geological societies, access to webinars and in-person training, and help in preparing for the ASBOG Fundamentals of Geology exams.

SLIDE 46 With help from the applied geoscience community, students at all degree levels can look forward along clearly marked paths to careers that will be of significant benefit to society.

SLIDE 47 In particular, this external support would allow undergraduate geoscience students to see a career path they can take as a Bachelor's degree holder — as an apprentice professional geoscientist.

SLIDE 48 Every geoscience student in our nation's colleges and universities should have access to good information about the path to careers in engineering geology and other applied geosciences.

Having a goal, a pathway to that goal, and agency to reach that goal is the essence of hope.

I want us to continue working to build a diverse and inclusive community that includes professional societies, applied professional geoscientists, and the faculty and students of university geoscience departments.

SLIDE 49 The Jahns Lectureship is a useful part of this effort. Thanks again for this opportunity to serve.

For more information about the Jahns lectureship, here's a web resource you can utilize: https://croninprojects.org/Jahns/.