Geoscience Academic & Employer Workshop

Improving Geoscience Graduate Student Preparedness for the Future Workforce

Welcome

Sharon Mosher, University of Texas at Austin

Jeff Ryan, University of South Florida

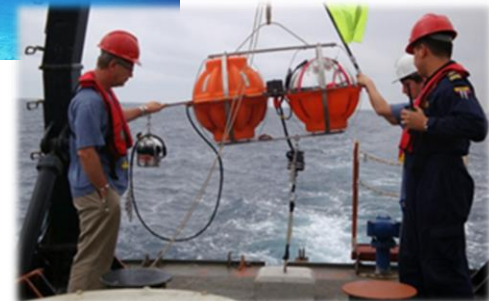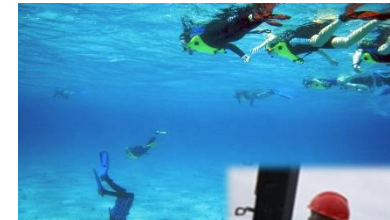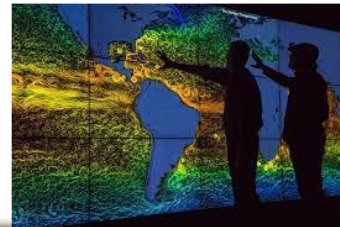**Chris Keane, American Geoscience Institute**

May 23, 2022

Most PhD & M.S. STEM students will not go to academia!

So, in addition to their specialty,
### what do they need to learn in graduate school?

Improving Geoscience Graduate Student Preparedness for the Future Workforce

Project Goals:

- **Identify the skills and competencies that should be part of graduate geoscience education for PhD & MS students in Earth, Ocean, & Atmospheric Sciences**

- **Investigate best means of developing these in graduate geoscience programs nationally**

- **Work with Heads/Chairs and Graduate Program Directors on implementation strategies to develop the skills and competencies identified by the geoscience employers workshop & other studies**

Builds on Vision and Change in the Geosciences: The Future of Undergraduate Geoscience Education
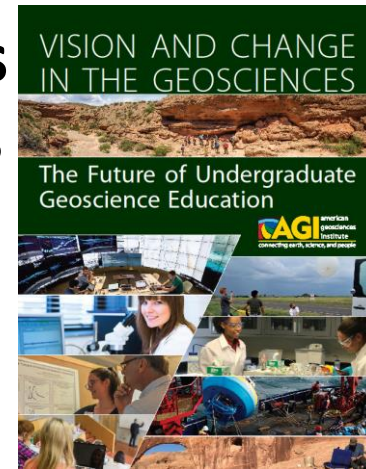
Geoscience Employer Workshop
Oct. 2018

- ~52 participants representing broad spectrum of geoscience employers of PhD & MS students in Earth, Ocean & Atmospheric Sciences
  - Industries, Non-profits, other organizations: Weather/climate, Energy/natural resources, Oceans/fisheries, Environment, Reinsurance/hazards
  - Government agencies – NASA, NOAA
  - Research labs & universities
  - Professional societies

- Discuss & provide feedback to academia on skills & competencies needed by PhD & MS students for current and future workforce
  - Build on results of Future of Undergraduate Geoscience Education initiative & National Academy & Council of Graduate Schools Graduate STEM reports
  - Define geoscience skills & competencies needed for MS & PhD graduates
    - Discuss methods for developing skills & competencies & employers role
    - Discuss balance between preparing for workforce, research and general educational goals

- Determine next steps towards completing & implementing vision
  - Role for Industry, Government Agencies, Universities & Professional Societies

Heads/Chairs Summit
May, 2019

- **74 participants, primarily Department Heads, Chairs & Graduate Program Directors**
  - **59 PhD granting universities/colleges; 5 MS only**
  - **Earth, Oceans & Atmospheric Science programs**
  - **2 NSF, 4 industry, 4 professional society participants**

- **Discuss input from geoscience employers & other studies on skills & competencies needed by PhD & MS students for current and future workforce**
  - *General agreement with employers in terms of what graduating PhD/MS students have and lack*

- **Discuss methods for developing skills & competencies**
  - **Discuss balance between preparing for workforce, research and general educational goals**

- **Develop implementation strategies for integrating these in graduate programs**
  - **60 Action Plans**
  - **2020-2022 Progress reports – 30% of total; 15% two progress reports**
  - *Pandemic March 2020….*

Goals of Workshop

- Connect & encourage dialogue between academic leaders & employers of Ph.D. and M.S. students in Earth, Ocean and Atmospheric Sciences

- Discuss what skills/competencies graduate students need & how graduate programs can effectively develop these for their students

- Shape the education of geoscience graduate students by incorporating a set of universal skills into their graduate programs to prepare students for all future careers

- Develop strategies for transformative changes in geoscience graduate education

Geoscience programs will grow & thrive when their graduates

...can demonstrate that their knowledge & skills are grounded in innovative thinking

...are well prepared for their role in a dynamic society.

The world needs geoscientists -- more than ever before!

Logistics

- Brief presentations to set stage for each breakout session
- Breakout sessions – each of you has been assigned to a working group (~1 hour 40 minutes) – see # on name tag
  - Discuss questions on agenda
  - Facilitator to ensure everyone has a chance to talk & stays on topic
  - Summarize your "answers" (discussion) on 2 PowerPoint slides
  - Choose one person to present – ideally different person each breakout session
  - Break (15 minutes)
- Entire group discussions (~ 1 hour 15 minutes)
  - Each of the 4 working group presents results
  - Group discussion
  - Presenters should repeat questions before answering

Logistics

Presentations/entire group discussions: Volcano & Mountain View rooms

Breakout rooms for Working group
WG #1 - Volcano
WG #2 – Mountain View
WG #3 – Luna
WG #4 – Marble

Lunch Monday: 12:30 p.m.-1:15 p.m.
Lunch Tuesday: 11:30 a.m.-12:15 p.m.

Monday 8 a.m. to 5 p.m.
Tuesday 8 a.m. to 3 p.m.

Masks not required in meeting rooms; required in public/general areas

Working Group #1

Name	Affiliation
Ryan, Jeff	University of South Florida
Osoro, Bonface	GEORGE MASON UNIVERSITY
Rodriguez, Lizzette	University of Puerto Rico - Mayaguez Campus
Schreiber, Madeline	Virginia Tech
Wood, Lesli	Colorado School of Mines
Garrison, Dan	NASA Johnson Space Center
Kostyu, Eva	AGU Bridge
Levy, Gad	NorthWest Research Associates
Murray, Laura	Chevron
Feng, Leyang	Johns Hopkins University

Working Group #2

Name	Affiliation
Mosher, Sharon	University of Texas at Austin
Collier, Jackie	Stony Brook
Kirby, Eric	University of North Carolina, Chapel Hill
Kubicki, James	The University of Texas at El Paso
Commander, Okiemute	Illinois State University
McCarthy	University of Alaska Fairbanks
Freeman, Leigh	Timberline Resources
Grant, Bernard	NSF
Kaye, Jack	NASA HQ
Rolle, Tiffany	Smithsonian Museum of Natural History
Suwa, Makoto	World Bank

Working Group #3

Name	Affiliation
Keane, Chris	AGI
Cooke, Michele	University of Massachusetts Amherst
Dam, Hans	University of Connecticut
Efobo, Oghenevwede	Illinois State Univeristy
Feinberg, Joshua	University of Minnesota
Gomez, Francisco	University of Missouri
Auad, Guillermo	Bureau of Safety and Environmental Enforcement
Nocita, Bruce	SM&E
Ransom, Barbara	NSF
Tipton, Emma	AMS
Keenan, Sarah	South Dakota School of Mines and Technology

Working Group #4

Name	Affiliation	
Asher, Pranoti	AGU	
Behl, Mona	University of Georgia	
Carpenter, Brent	University of Oklahoma	
Liu, Paul	NC State University	
Harris, Pat	Sam Houston State University	
Gezovich, Luke	Colorado School of Mines	
Andrews, Ben	Smithsonian National Museum of Natural History	
Hall, Jessica	Florida State Fire Marshal	
Plumlee, Geoff	USGS	day 1 only
Rambo, Doug	ASBOG	
Werkheiser, Bill	USGS	day 2 only

Number on name tag

Breakout Session #1: Skills and competencies needed for future geoscience workforce.

- **What skills and competencies make PhD and MS graduates successful today in a wide variety of geoscience careers? Does it differ for MS and PhD graduates, or differ in level of competency?**

- **What from the 2018 Geoscience Employers Workshop needs updating or more specifics? (i.e. what changes have occurred in the workplace and what wasn't covered or stressed sufficiently). How has the pandemic changed needed skills or the development of these skills in graduate programs?**

- **What changes do you see in your field and organization over the next ten years that will require different competencies? What new or improved skills do you predict graduates will need in the future?**

- **How can we prepare our students to be leaders, innovators and creators?**

Breakout Session #2: Ways of developing skills and mentoring

- **What skills and competencies can graduate students develop while doing research that are important for a variety of future careers?**

- **What graduate coursework will develop the skills that students need for the future workforce? If no courses are required for the degree program, how do you incentivize faculty to offer and students to take them?**

- **What other professional experiences or external opportunities should graduate students have? Does this vary with MS and PhD students?**

- **What are effective ways to mentor students and insure they develop the skills they need for their career path? Who should be involved in the mentoring?**

Breakout Session #3: Creating change to graduate education programs

- **What will convince faculty and upper administration of the importance of improving skills for graduate students and mentorship?**

- **How do you change culture – e.g. preparing PhD's only for academia/replicating self? Student focused education instead of advisor centric education and control?**

- **How do you overcome resistance to change through incentives and rewards?**

- **Are there defined learning outcomes graduate programs could use to document skills and competencies beyond just coursework taken by students?**

- **How can employers assist, during formal education, co-curricular opportunities, professional development activities, or other means? What training should be a responsibility for the employer post-graduation?**

Breakout Session #4: Importance of field specific skills and research experiences

- **What balance is needed between the specific skills development process and the fundamentals of learning to and conducting research within a graduate program?**

- **How do employers value specific skills versus experience conducting research?**

- **How do these translate to needed current and future job skills for PhD and MS graduates? What level of competency is needed? How does the relative weighting vary with employers? Does it vary between MS and PhDs?**

- **Overall, which skills have most current graduates have acquired and which do they generally lack? What challenges are employers and academics finding now in terms of specific strength in skills or social challenges?**

Final Group discussion:

- **What can we do to ensure graduate students develop a portfolio of skills and competencies that they need for employment in a variety of future careers?**