2\textsuperscript{nd} Summit on the Future of Undergraduate Geoscience Education

Welcome!

Sponsored by

Jackson School of Geosciences
University of Texas at Austin
January 8-10, 2016
Why are we here?

1st Summit on the Future of Undergraduate Geoscience Education: 2014

Goals:
• Address questions of importance to the geosciences
• Begin developing a collective vision for undergraduate geoscience education

Topics:
• What do undergraduates need to know to be successful in graduate school and the future workforce?
• What are the best ways of teaching and using technology for student learning?
• How can we broaden and increase participation in the geosciences?
Future of Undergraduate Geoscience Education

2014 Summit:
• ~200 educators representing broad spectrum of undergraduate geoscience education community
  – R1 research universities with undergraduate programs, 4-year and 2-year colleges
  – Faculty, heads & chairs, education researchers
  – Industry, government & professional society representatives (~20)
• 1st step in development a high-level community vision for the geosciences
  – Surprising collective agreement

Ongoing Community Survey
455 respondents
– 354 academics (78%), 76 industry (17%), 13 government (3%), 7 other (1%), 5 professional societies (1%)
– 85% not Summit participants

Geoscience Employers Workshop (May, 2015)
– 46 participants: 6-7 each from energy, hydro/engineering/environmental, govt. agency, prof. societies, academics; 1 mining
– Plus ~13 NSF program directors
2\textsuperscript{nd} Summit on Future of Undergraduate Geoscience Education

Goals:

• Heads, chairs & administrator discussion of general community consensus
  – Skills, competencies, conceptual understandings needed for undergraduate education
  – Effective ways of developing these and how to implement into different undergraduate programs
  – Recruitment and retention of underrepresented geoscience students, empowering transitions between 2YC and 4YC, science teacher preparation

• Implementation of departmental plans
  – Barriers, solutions, incentives, rewards
  – Implementation into own department curriculum, courses, programs
Motivations: Geoscience Research today & in the future...

- **Interdisciplinary, multidisciplinary and transdisciplinary**
  - strength in their discipline
  - ability to work across disciplinary boundaries
- **Complex interactions between different parts of the Earth system**
  - Earth’s interior and surface, hydrosphere, atmosphere, cryosphere, and biosphere
  - Coupling of chemical, physical, biological and geological processes
  - Deep time, present day processes, future impacts
- **Important in addressing societally important issues**
  - ethics, economics, policy and communication

As research changes – education must change
Motivation: Transformation in Undergraduate Education

- Electronically focused digital generation
- New pedagogies for STEM education; discipline-based education research (DBER)
- Increased use of experiential learning, focus on student learning outcomes
- Flipped classrooms, blended learning, online education, open source materials, virtual experiences
- Computational modeling, simulation, visualization of BIG DATA, processes and global-scale events
- Opportunities for shared resources and courses with local customization

As technology, populations & data change – how and what we teach must change
Geoscience Workforce today & in the future...

- Need for multi-disciplinary approaches to problems
  - More integration of different types of datasets
  - Cross disciplinarily teamwork
- Different paradigms – thinking about rocks in fundamentally different ways
- Different types of jobs for geoscientists
- Technological advances – changing skill sets
  - More digital & modeling skills
  - Black box mentality without understanding how works
- BIG DATA – manage, use, model; statistical analysis
- More interaction between business & society
  - Economics/law/business practices/ethics/risk/environment
- Cultural diversity, global perspective

As the workforce changes – student learning must change
Motivations: Diverse & Informed Future Workforce

• Broadening Participation and Retention of Underrepresented Groups
  – Geosciences: <10% low-income, first-generation, and underrepresented minorities
  – 12% of geoscientists retire in 10 years
  – 35% increase in geoscience jobs in 10 years

• Preparing K-12 teachers
  – ~10-15% take geosciences in middle or high school
  – Educate informed citizens
  – Instill interest in geoscience careers
  – Next Generation Science Standards
  – Geoscience Literacy documents
External Motivations

For increasing student learning to prepare students for future (not present) workforce

- Pressure nationally from above
  - OSTP, PCAST, NRC, NSF

- Pressure locally from above
  - Legislatures, coordinating and/or governing boards/regents, presidents/provosts

- Other external pressures
  - Public, alumni, parents, students

- Personal pressure
  - Joy, satisfaction, obligation

Why does this matter?

- Funding, Influence, Survival
• Sustained change in geoscience undergraduate education
  – Combined, coordinated efforts of departments and programs
  – Administrators, individual faculty innovators
  – Geoscience professional societies & future workforce employers

• Affect culture change - administration down to student level
  – Overcome roadblocks to implementation
Logistics

• Overall Schedule:
  – Panel Discussions
  – Individual workgroup breakout sessions
  – Individual working group reports & all participant discussion
  – Submission of individual (or group) plans
  – Final Discussion: Summary of Progress, Next Steps and Roadmap for Future

• Packet Material
Work Group Breakout Sessions

• Friday all day & Saturday afternoon: 8 pre-defined workgroups of 10-13 people – facilitator
  – Decide which questions to address as group
  – Summarize thoughts on the issues, consensus, and ideas on next steps on 1-2 PowerPoint slides
  – Present to entire group (3 minutes)

• Saturday & Sunday morning: different 8 pre-defined workgroups of 10-13 people – facilitator
  – Develop & discuss individual (or group) plans for implementation
  – Present progress to entire group (3 minutes) for discussion
  – Prepare and submit short plan for your department
  – Discuss unresolved issues, external help, etc.
Announcements

- Information Desk: Holland Family Student Center; JGB 2.102. JSG staff in burnt orange
- Parking Validation: Information Desk
- Meals: Holland Family Student Center, JGB 2.102
- Workgroup Rooms: Jackson Geoscience Building (JGB) – see list and building map
- Nametag has both of your WG numbers
- WiFi: code in packet & posted in each room
- Shuttle: 7:00 am sharp Fri./Sat.; 7:30 am sharp Sun. – at hotels loading areas
  - Return 7 pm Friday, 5:45 pm Saturday
  - 1pm Sunday – to hotel (15 minutes) then airport
  - Estimated airport time: 1:45-2:00 pm
  - Check out prior to coming Sunday; have room to store luggage
ORGANIZING COMMITTEE

Tim Bralower, Pennsylvania State University
Jacqueline Huntoon, Michigan Technological University
Peter Lea, Bowdoin College
David McConnell, North Carolina State University
Kate Miller, Texas A&M University
Sharon Mosher, University of Texas at Austin
Jeff Ryan, University of South Florida
Lori Summa, ExxonMobil Upstream Research
Joshua Villalobos, El Paso Community College
Lisa White, University of California – Berkeley