

2nd Summit on the Future of Undergraduate Geoscience Education

Welcome!

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National Science Foundation
WHERE DISCOVERIES BEGIN

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

2nd 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

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