NAGT Geo2YC Division

FOUNDATIONS

NEWSLETTER OF THE GEO2YC DIVISION OF THE NATIONAL ASSOCIATION OF GEOSCIENCE TEACHERS
Volume V, Issue 1: March 2016

Moving Forward: The Future of Undergraduate Education in the Geosciences

By Joshua Villalobos
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Over the past two decades the landscape of undergraduate geoscience education has dramatically changed. Technology has now merged with our lectures, research is now part of our curriculum, students learn through a variety of new pedagogies, and community colleges are now seen as an important gateway into the geoscience. That being said, these changes often occur so rapidly (and in some cases so slowly) that they are often overlooked by some faculty, administrators, and employers. Thanks to funds awarded to Sharon Mosher, Dean of the U.T. Austin's Jackson School of Geoscience, from the National Science Foundation's Division of Earth Science, a large-scale conversation regarding these changes, and how to move forward, was initiated to key members of the geoscience community. Three recently held summits brought together a broad spectrum of key individuals from the geoscience community to undertake an in-depth review of undergraduate geoscience education. Each summit focused on issues encountered by key components along the pipeline of undergraduate education ranging from faculty, employers, to administrators.

The first summit was held January 2014 in Austin at the Jackson School of Geoscience, and brought together over 180 faculty from across the U.S. representing the spectrum of higher education institutions. Over 25 2YC faculty were present at this summit and contributed valuable insight on the issues and roles that 2YC institutions have in undergraduate education. Over the two day summit working groups composed of 2YC and 4YC institutions came together to discuss and debate issues on undergraduate education. The data collected from these discussions was compiled and synthesized and highlighted areas of curriculum, pedagogies, and institutional roles in higher education. A summary of the results from this first summit can be found here.

The material learned from the first summit was then the foundation for discussion at a second meeting for geosciences employers in Washington D.C. that was held in May 2015 at the Geoscience Employers Workshop. Participants included employers from petroleum industries, environmental consulting companies, federal agencies, and non-governmental organizations in the geosciences. This summit gave employers an opportunity to hear about changes in undergraduate geoscience education as well as a chance to discuss issues they felt needed to be addressed in undergraduate curriculum and skill development. Summit organizers gained insight on the issues that employees feel are important for future successful geoscientists in their particular field and in some cases are currently lacking in their new hires and interns. The list of key concepts and skills that employees are looking for and, if applicable, should be taught in undergraduate courses can be found here.

The final summit was held earlier this year in January where the summits first began at the Jackson School of Geoscience. At this meeting department heads, chairs, and faculty who play key administrative roles in their geoscience departments, from across the U.S., discussed the

information collected from the previous two summits. The goal of this summit was for the participants to develop action plans that they could implement, due to their roles at their institutions, which incorporated the information learned from previous two summits. The summary of results from the final summit are currently being compiled and summarized and will be published online later this year.

For those 2YC participants who had attended both the first and last summit a noticeable change had occurred in the working group discussions with 4-year institutions. Our 4YC peers realized that 2YC institutions need to be included and supported in all key issues of geoscience undergraduate education. This realization was shown by the fact that almost all the action plans from 4-year institutions included working with and supporting their local community colleges as a fundamental goal for their departments! Our role and importance in higher education is nothing new to many of us in the 2YC system. These realizations from our 4YC colleagues at the summit should be seen as an affirmation of the work many 2YC leaders and supporters have done over the past decade highlighting the importance of 2YCs in the geosciences as well as an indication of the work that we still need to get done.

Over the course of the next year these institutions will be contacted to see if they have implemented their action plans and, if so, what the results have been. The final objective will be to use the data compiled from the summits to begin a process that would develop a vision and road map for the undergraduate geoscience education community for the 21st century. As the geoscience education community continues to serve an ever-changing student population on issues that are increasingly geoscience related (climate change, natural hazards, and scarcity of natural resources) we need to be able to ask ourselves: How can we best prepare our undergraduate students for future careers in the geosciences involving these issues? What should an undergraduate geoscience curriculum cover? What are the best practices for student learning and the use of technology in geoscience education to convey these issues? What can we do to broaden the participation of underrepresented minorities in the geosciences as the make-up of our population begins to change?

Our anticipation is that the outcome of these summits will provide a road map or vision for how geoscience education will enhance the ability for our undergraduate students, particularly those from diverse backgrounds, to be better prepared to address fundamental geoscience questions in their academic and professional careers. Having the broader community, and our students, realize that geoscientists play a critical role in addressing key societal issues is a goal that all geoscience educators, regardless of their institution type, must strive for. Therefore, having this goal and road map for achieving this vision for all geoscience educators, employers, and administrators will definitely ensure that it will be achieved!

AGU's Virtual Poster Showcase - a Faculty/ Student Experience

By Laura Guertin[1] and Judy Smith[2]
1. Penn State Brandywine, Media, PA
2. Penn State University Park, State College, PA

There is quite the buzz and excitement around a new option for students to share their undergraduate research results – the American Geophysical Union's Virtual Poster Showcase. Pranoti Asher (AGU) wrote about this opportunity in the FOUNDATIONS December 2015 issue and in EOS, and Laura Guertin blogged about this at her AGU Blog GeoEd Trek. But what exactly happens before and during the Virtual Poster Showcase? And what is the experience like for both the faculty mentor and the student researcher? We (Laura, faculty; Judy, student) would like to share our recent participation in AGU's Virtual Poster Showcase in September-December 2015.

Judy started her undergraduate career as a geography/GIS major at Penn State Brandywine, a campus whose primary mission is to serve as a two-year feeder campus for Penn State University Park. During the summer after her sophomore year, Judy participated in summer undergraduate research focusing on the Society of Exploration Geophysicists (SEG) Wiki with Laura and fellow

undergraduate student researcher Stamatina Mattie Mylonas (photo). At the end of the summer, Judy had to transfer campuses to complete her degree, but Laura still wanted to give Judy the opportunity to present her project outcomes. Since Judy was now at a different campus, there were no travel funds from Brandywine (where Judy did the research and was no longer a student) or University Park (where Judy was now a student but completed the research at Brandywine). The AGU Virtual Poster Showcase was the perfect solution to allow Judy to disseminate her results, yet not burden Laura with trying to address the logistics of arranging and finding funding for travel. In fact, the appeal to Judy of not having to travel and miss some of her classes to attend a conventional conference was very helpful.

Judy Smith (on right) and Stamatina Mattie Mylonas (on left) working on the SEG Wiki summer research project.

Before Judy moved on to PSU University Park at the end of the summer, Laura and Judy worked together on her abstract and the poster for the Virtual Poster Showcase (VPS). After a few additional email communications, Judy was ready to submit the abstract (Judy did not have to be a member of AGU, but there was a $35 fee for her to participate). After the abstract was submitted, Judy now had to complete a poster and create a video, no more than five minutes in length, of her "presenting" her research. Instead of trying to figure out how to print and ship a poster between the two campuses, Judy was able to use the One Button Studio (http://onebutton.psu.edu/) at her campus to project her poster on to a blank wall, and then record herself talking about her work. (Laura had a backup plan for Judy to project her poster in a classroom with someone video recording her speak on an iPhone). With the poster and video completed, Judy uploaded both of these items on the VPS website, which she emphasizes was an extremely easy step.

The next phase of the Virtual Poster Showcase was the Peer Judging portion, where students were assigned three other student posters to review and post questions for asynchronous discussions on the work shared in the video and in a PDF file of the poster. Judy especially liked that fellow students reviewed posters, as that gave her experience in critically thinking about the research other students were doing as well as her own. She found the rubric provided by AGU for judging the posters was overall very helpful. Then, after the Peer Judging portion was complete, it was Judy's turn to be evaluated by the Expert Judges, the professional scientists and faculty that volunteered with AGU who utilized the same rubric and also posted questions for the students in an online discussion forum. Laura participated as an expert judge and was very impressed with the detailed responses students were able to provide to her questions and the questions of the other professionals. (Naturally, Laura was not assigned Judy's poster to judge!)

In the end, Judy felt that the AGU Virtual Poster Showcase was well run and easy to participate in, even without her faculty mentor looking over her shoulder making sure everything was going OK! Laura was challenged to remove her "overprotective mentor hat" as she could not log in and see if Judy had completed the steps by the deadline, see the reviews by other students or the expert judges, etc. But based upon Judy's feedback and the impact this experience had on her, Laura would not hesitate to have students participate in the VPS again, even if the students is at another campus/university. Overall, Judy shares that for her first major multi-collegiate poster conference, she feels that the online nature actually helped allay some of her nerves a bit for participating, and that there was no difficulty for her participating with Laura at another campus – having another person help her record the video was the only time she felt she needed someone in the room to work with. Both of us give two-thumbs up to the AGU Virtual Poster Showcase and encourage others to participate!

Apply to Participate in an NSF-Funded Paleoclimate Teaching Workshop: the MSI-REaCH Program

By Kristen St. John
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Climate change is a global challenge that crosses political, economic, social, and cultural boundaries. Geologic perspectives on climate change provide students with critical context for evaluating causes, rates, and consequences of modern and future global warming. Interest in adding paleoclimate content in introductory courses is growing, but needs to be met with training opportunities for instructors whose background is outside of paleoclimatology. The MSI-REaCH (Reconstructing Earth's Climate History) program was developed to help meet this need for instructors at minority serving institutions, **including those at 2 year colleges** with 25% or greater population of underrepresented minority students.

Undergraduate curriculum developers, professional development specialists, and paleoclimate scientists work together in the MSI-REaCH program to provide MSI faculty with scientific training, mentoring, and collaboration opportunities. Central to the scientific training is an advanced professional development workshop at the International Ocean Discovery Program (IODP) Gulf Coast Repository in College Station, TX. The 2016 MSI-REaCH workshop will be held August 1-5 and will support 16 faculty in immersive training. During this time, participants will use sediment cores, datasets, and inquiry learning to understand the marine sediment paleoclimate archive and climate change through time**. The application deadline for the 2016 summer workshop is March 22**. The application and more information on the program can be found at http://msi-reach.oceanleadership.org/.

Evaluation data collected by *WestEd* on the 2015 MSI-REaCH workshop show that teaching via guided inquiry, using real samples and accessible datasets provided participants with a valuable model to follow for future use. Rick Jones from University of Hawaii's comment resonates with the evaluators' findings: "*Participation in MSI-REaCH has given me multiple experiences that have transformed my Geology and Climate courses. To be able to bring data and actual samples from ocean drilling sites that are relevant to my students …. has made the laboratory experiences 100% more relevant*."

Participants of the 2015 MSI REaCH Workshop getting to the core of the matter at the Gulf Coast Repository at Texas A&M.

In addition to the workshop, the MSI-REaCH program incorporates year-round mentoring so participants have colleagues to turn to for questions and ideas on paleoclimate curriculum and developing of small scale undergraduate student research projects. To date, MSI-REaCH participants have drawn from their 2015 workshop experience and post-workshop mentoring to design new labs on marine sediments, new field trips to local outcrops, new course-based research projects on marine sediments, and even whole new courses on past climate change for general education students. We would love to have more 2YC faculty at the 2016 workshop so please consider applying. Participant expenses are fully covered.

President's Column

by Kaatje Kraft
Whatcom Community College,
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Happy-ALMOST-spring! In my last letter, I mentioned that I was preparing to attend the 2016 heads/chairs on the future of undergraduate geoscience education summit in Austin, TX. As you'll see from Josh Villalobos' report, it was a huge success from the standpoint of 4-year colleges recognizing all that we bring to the conversation. But many of the issues you contacted me about to raise as concerns with our four-year counterparts were issues that weren't even on their radar. This reinforces the need for our own community to find ways to support each other and speak with a larger voice as a collective. To that end, I hope you'll be able to find a way to attend the Earth Educator Rendezvous or some gathering opportunity this summer with other geo2yc faculty. The momentum from the summit is building, and there's some exciting energy in the air, I hope you can help take advantage of it!

This is the time we start to look to summer for our plans on how to continue to support our students. We may be thinking about opportunities to get out into the field, doing our own research or with our students, professional development for teaching or teaching through the summer. As you're in that planning mode, be sure to consider participating or recommending early career faculty to the Early Career Workshop (details within the newsletter). As both an alum and an upcoming facilitator, I can speak to the value of its experience, but also the importance of a strong 2yc presence. It helps to dispel myths so many of our 4-year counterparts have about us and our students, plus provides an opportunity to gain a cohort that can provide important sources of support and collaboration. Another opportunity for collaboration with other 2yc and 4ycs is taking advantage of the traveling workshop program particularly 'building stronger courses,' it's a great way to have regional conversations about introductory courses and think about alignment. The application deadline is March 15th, if you have any questions about the program, please don't hesitate to contact me as I am one of the traveling workshop facilitators.

My students are also thinking about summer, and have been coming to me asking about geology internship and/or research opportunities. I would love it if we could have more success stories and advice, perhaps dedicate a page on our website for us to be able to share positive experiences (and warnings) so we can all benefit from the wisdom of crowds. This summer, I'll be on one of the STEMSEAS transits, and I hope to meet a number of extraordinary 2yc students from around the country. Of course, between now and then, I have many miles to go. I was just giving a pep talk to my students about how to keep up their energy in the final push of this quarter. So I send the same message to all of you: "You got this!"

Nominate your Outstanding Adjunct Faculty
http://nagt.org/nagt/divisions/2yc/oafa.html

Outstanding Adjunct Faculty Quarterly Honoree: Jessica Moore

by Karen M. Layou
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Congratulations to Jessica Moore, our newest Quarterly Honoree for the Outstanding Adjunct Faculty Award. Ms. Moore teaches a variety of geoscience courses and laboratories at SUNY Ulster, and was nominated by Steven Schimmrich.

Schimmrich writes, "Ms. Moore has been an adjunct instructor at SUNY Ulster for several years now teaching 2-3 courses each semester. We're a small, rural community college with two full-time faculty teaching Earth sciences and we really do look upon Ms. Moore as an integral part of our team. Not only is she an excellent teacher, her energy and enthusiasm for the Earth sciences is contagious and she's responsible for recruiting many of our undecided students into additional

Earth science classes and a number of them have then decided to major in geology.

As an instructor, Ms. Moore constantly strives to improve her teaching and the presentation of material to the students. All of us share information back and forth (interesting papers we've read, relevant teaching information, etc.) and I would have no qualms about hiring her for a full-time position if we had one available."

Jessica's enthusiasm for the Earth sciences is recorded here at Mt. Rainier, and appreciated with this honor.

Thank you Jessica, for all of your efforts to engage your students and to be an active member of your department. We are pleased to support Jessica with a one-year complimentary membership to the NAGT Geo2YC Division, and she will be entered into the pool of quarterly honorees under consideration for the Annual Outstanding Faculty Award, which is sponsored by a professional development stipend of up to $750 from Pearson Publishing.

If you are an adjunct faculty working to enhance your classrooms or department, or if you have adjunct colleagues who are doing great things the Geo2YC community should know about, please consider completing a nomination form available through the NAGT Geo2YC division website.

Nominate your Outstanding
Teaching Assistants
http://nagt.org/nagt/students/ta.html
Deadline is June 15th!

The Deadline Calendar

by Tom Whittaker
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It is highly likely that most, if not all, of the following events have already crossed your radar (perhaps even multiple times due to cross-listing of event notifications via email), but we wanted to create a section in the newsletter that not only highlights events that you might participate in but also the *deadlines* associated with them. The calendar will look forward 3-4 months (basically until the next issue of the newsletter arrives) and will list upcoming deadlines for as many events as we are made aware of and that are likely to be of interest to our readers. Please contact me with event details for the June-September period and we will try and get these in the (late)May issue.

Workshop for Early Career Geoscience Faculty

Application Deadline: March 16th 2016

As an alum of this workshop I would encourage others to participate. The only way it could have been better was if there were more 2YC faculty there – maybe we should have our own, but until that happens this is a great experience.
The workshop takes place July 24-29 at the University of Maryland.

Earth Educator Rendezvous

Travel Stipend Application Deadline: April 1st
Early Bird Registration Deadline: May 2nd

An event that brings together researchers and practitioners working in all aspects of undergraduate Earth education. This year will also welcome a mix of college faculty, graduate students, and K-12 teachers.
This event takes place July 18-22 at the University of Wisconsin Madison.

Presidential Awards for Excellence in Mathematics and Science Teaching

Nomination Deadline: April 1st

The 2016 Awards will honor mathematics and science (including science) teachers working in grades K-6.

And, to repeat one from earlier…

MSI-REaCH Teaching Paleoclimate Workshop

Application Deadline: March 22nd

Letter from the Editor

by Tom Whittaker
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Dear Colleagues,

This issue of FOUNDATIONS is, and all future issues will be, augmented by the use of "alt tags" in an attempt to increase accessibility of the newsletter to our diverse audience. Only recently have I become aware of this tool so I am unsure how successful I have been at using it. I would be extremely grateful for any feedback on how well/poorly it was implemented, and where/how it would be possible to make further adaptations to further improve accessibility of FOUNDATIONS.

Beyond that, if you have questions or comments about the content of FOUNDATIONS, or have suggestions for future newsletter items please contact me at my new e-mail address (see above).

Thank you!