NAGT
Geo2YC Division
FOUNDATIONS
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President's Column

by Dave Voorhees
Waubonsee Community College

I attended the recent SAGE 2YC workshop (*see article on page 4*) in Tacoma, Washington. It was a superb workshop in which we talked about how we can mentor our geoscience students into successful careers, from technical to transfer. During and following that workshop, I felt professionally reinvigorated by meeting with the inspired and motivated instructors and organizers at that workshop. Some of the concluding remarks by participants made me realize that workshops such as these not only move the Geo2YC community forward on the topic of that particular workshop (*i.e.*, careers), but they also help to bring us together and to help reduce our any sense of isolation. Since most of us are isolated from our geoscience colleagues, we often develop new ideas to improve our teaching on our own or by inspiration from the literature. When we try them in our classes, and find that they are successful, we want to be able to tell our colleagues. By attending this and other workshops, we are able to transfer these successful pedagogies to others. Often, I have heard at workshops and conferences that pedagogies I have tried, or are about to try, have been successfully implemented elsewhere. This sort of moral support can be critical to help reduce our feeling of isolation. I would urge you to seek out opportunities like the recent SAGE workshop as your schedule permits. Some at the recent SAGE conference have attended 2 to 4 workshops this summer alone. Also, many of the workshops have external funding that is able to pay for most or all of your travel expenses.

Please don't forget about the upcoming Geological Society of America conference in Charlotte, and to participate in the many technical sessions that are scheduled for geoscience education. Personally, I would like to suggest the sessions for which I am a Co-Advocate with Suzanne Metlay (T77a, b, and c: *Innovations & Challenges in Non-Major Instruction in Two- and Four-Year colleges*). No matter, there are many sessions and workshops, and there are also many activities scheduled for 2YC instructors. I am particularly looking forward to our very first Geo2YC Division Business meeting on Sunday, 4 November at 5:30 PM, where we can all meet and talk about the status and future of our Division. The business meeting will be immediately followed by a joint Geo2YC / Geoscience Educators (NAGT, GSA, IRIS, UNAVCO, *etc*.) reception. Other Geoscience Education related events at GSA can be found at http://tinyurl.com/cjt788u. We hope to have completed our brand new promotional flyer by then, and will have copies available for you to spread the word about our Division. We also hope to have the first step in defining our 'Best Practices' with a short online survey that will gather some basic data on who we are. See you in Charlotte!

As we near the end of the first year as a Division, and my term as President, I think that it is important to step back and get the big picture. We all get very focused on our daily classroom teaching, as we should, but it is important, professionally and intellectually, to sometimes reflect. Part of that reflection can be attending workshops and part can be by becoming engaged in improving 2YC geoscience education nationally. I have been honored and very fortunate to have been able to have many opportunities to do the latter this past year through conversations and interactions with many of you. I have been impressed with the talent, diversity and motivation that I have heard in these conversations, and I am truly humbled and honored to have had the opportunity to have been able to serve you as President of Geo2YC this past year, our first year as a Division. Thank you.

Foundations for Change

by Joshua Villalobos
El Paso Community College

Over the past few years community colleges have begun to play a more important role in the scene of higher education. Our new role is becoming more apparent as more students are beginning to look at our institutions as a starting point to begin their college career and the age of the average community college student has begun to decrease at many institutions. These changes have encouraged many of us to re-examine the way we teach and interact with our students. We are no longer teaching strictly through lecture, but incorporating unique pedagogies that integrate technology, field work, and research into the curriculum. As the population of first-time community college students gets younger, most students are entering our institutions with a greater understanding on what they want and how to achieve their educational goals. Many institutions and instructors are taking remarkable steps to ensure that that the best possible geoscience education is being provided. However, as a community of two-year colleges (2YC) we are still disconnected and often isolated or unaware on the innovative work that is being done by our peers. So what can we do to help keep up the momentum of positive change and continue the process that has shaped this new view of community colleges?

Here are four simple ideas on how we can achieve this:

1) Pass on knowledge you've gained to other 2YC faculty.

This summer I was fortunate to participate in several workshops that were geared to 2YC geoscience faculty. I was amazed at the work that is being done by fellow faculty and within the geoscience industry, although I was surprised how little our 2YC community, and I, knew about their efforts. The dissemination of their work and presentations at these, and future meetings is

important in keeping this positive momentum going at community colleges. The presentations at these workshops discussed a wide range of information regarding careers, internships, organizations, and 2YC pedagogy used by other 2YC faculty.

Here's where I went:

NAGT's (National Association of Geoscience Teachers) - On the Cutting Edge- project's workshop: Preparing for an Academic Career in the Geosciences Workshop.

The workshop was held June 27-30 at the University of North Carolina, Chapel Hill and was geared for graduate students and post docs, in which many were adjuncts at 2YC's. The workshop helped the participants stay up-to-date with both geoscience research and teaching methods at the various levels of higher education. The link provided would be useful not only for new full-time instructors but also for adjuncts who maybe considering pursuing a career in higher education.

http://serc.carleton.edu/NAGTWorkshops/careerprep2012/program.html

AGU's (American Geophysical Union) URECAS (Unique Research Experiences for 2 Year College Faculty and Students) planning workshop

The URECAS program and was held July 11-13 in Washington D.C. at AGU headquarters. The goals of URECAS (Unique Research Experiences for 2 Year College Faculty and Students) is to gain a robust picture of the successes in and barriers to engaging two-year college students in research, and to highlight initiatives aimed to overcoming these barriers. The highlights of the workshop's website are the presentation links by various institutions, organizations, and companies that highlighted 2YC programs that are doing innovative activities to engage 2YC geoscience students. Presentations and information from the meeting are found under the "workshop program" and "resources" tab.

http://urecas.agu.org/

SAGE 2YC (Supporting and Advancing Geoscience Education in Two-Year Colleges)

SAGE held a workshop on Preparing Students in Two-year Colleges for Geoscience Degrees and Careers at the University of Washington in Tacoma on July 18-21. The SAGE 2YC project strives to support the continued growth of a vibrant 2YC geoscience faculty community by providing a variety of professional development opportunities, fostering the growth of professional networks, and developing web-based resources for 2YC geoscience faculty and programs. Again, highlight from the projects website is the program link that offers a vast amount of material that was presented at the meeting (to see the material you must join, it's quick and puts your email on the list for future workshops and announcements).

http://serc.carleton.edu/sage2yc/workforce2012/program.html

2) Highlight collaborations and work being done at your institution.

Department websites (http://www.ccsf.edu/NEW/en/educational-programs/school-and-departments/school-of-science-and-mathematics/earth-sciences/Newsletter.html), Facebook pages (http://www.facebook.com/SOLARISGEOLOGY), or other multimedia outlets highlighting past student's achievements or projects can be a great resource for potential students and other 2YC/4YC programs interesting in replicating the same idea or

collaborations. Unlike 4YCs that have a long history of collaborating with each other 2YC are not very well connected and rarely know about some of the incredible initiatives being done at 2YC across the US.

3) Be a great host for incoming high school students.

Students still want to be courted and recruited, even by an institution that they know they will be guaranteed admission. Knowing that they are valued as a student and not a number will be a major factor in their success. Consider giving presentations at local high school Earth Science classes that highlight careers in geology as well as at new student orientations at your institution, create flyers regarding the geoscience department or your classes, and be available whenever possible for new students interested in geology. Having a faculty member they can turn to for advice regarding a career in geology will ensure that they are on the right path during their time at your institution.

4. Highlight the benefits of starting at a 2YC to your students.

There are many characteristics of 2YCs that make them the ideal starting point for many students entering higher education. Smaller class sizes, personalized attention from faculty, student enhancement programs, and the emphasis on "teaching first" by the faculty. Most students have a preconceived notion that 2YCs are only for remedial courses or are just for those who want to enter a technical program. Many 2YC have programs that award honor credit or an honor degree for those students who are intellectually engaged in their courses. Having students be aware of these programs helps dismiss that preconceived notion of 2YCs.

There are many other ways for us to continue to strive to be better institutions and faculty, and I hope to encounter and try as many as I can. So I look forward to hearing from my fellow peers on their new ideas, collaborations, relationships, and interactions with their students that will help us continue down our exciting road of challenges and experiences as geoscience faculty at community colleges.

Preparing Students in Two-year Colleges for Geoscience Degrees and Careers

Participants in the July 2012 SAGE 2YC workshop in Tacoma, Washington.

by Heather Macdonald, Eric Baer, Robert Blodgett, and Jan Hodder
The College of William & Mary, Highline Community College, Austin Community College, and Oregon Institute of Marine Biology

Building a strong and diverse geoscience workforce is a critical national challenge. Two-year colleges (2YCs) can play an important role in meeting this challenge by increasing both the number and diversity of geoscience transfer students and graduates. In July, 2012, 40 two-year and four-year college and university faculty and professional organization representatives participated in the *Preparing Students from Two-year Colleges for Geoscience Degrees and Careers* workshop in Tacoma, WA. The workshop focused on the successes and challenges of programs, strategies, and activities that support the preparation of 2YC students for geoscience careers, either as geotechnical graduates or as geoscience majors at four-year colleges and universities. The workshop program, and links to presentations and discussions, can be found at http://serc.carleton.edu/sage2yc/workforce2012/program.html.

Workshop participants explored how successful 2YC-employer and 2YC-four-year institution

partnerships could be replicated and adapted for local employment needs. They shared successful techniques for supporting 2YC students in their career path, such as early research opportunities, curricular and extracurricular internships, joint field trips with transfer institutions, and curriculum alignment between two and four-year institutions. Participants also discussed supporting workforce development at 2YCs by making connections with local employers, using social media and other means to identify geoscience students planning to transfer, supporting student geoscience clubs, and developing an online repository of geoscience employment information targeted to 2YC students. Professional organizations provided information about career options and salaries, networking and research opportunities, and student technology competitions. The American Geophysical Union, the American Geoscience Institute, the Association of Environmental and Engineering Geologists, Incorporated Research Institutions for Seismology (IRIS), and the Marine Technology Society gave brief overviews of what their organization has to offer 2YC faculty and students and then solicited input on ways that they could better serve the 2YC geoscience community.

Participants recognized significant challenges to incorporating career training and information into the curriculum at 2YCs. These include a predominance of non-geoscience students in classes, a lack of institutional support or rewards for improving the preparation and increasing the number of geoscience majors, and a significant range in the quantitative skills of 2YC students. With many 2YC students place-bound in their employment outlook, there is a strong need for career resources at the local and regional scale. In addition, institutional governance, state regulations, and curricular demands at individual 2YCs can significantly restrict or limit reforms and new initiatives. Addressing these challenges will require a diversity of resources and models for improvement. The Tacoma workshop was an initial step in establishing a broad network to promote and support activities that prepare 2YC students as geotechnicians and geoscience majors and to increase the number and diversity of geoscience professionals coming from two-year colleges.

Let's all recognize your outstanding adjunct faculty!

by Allison Beauregard & Kaatje Kraft
Northwest Florida State College and Mesa Community College

Our adjunct faculty often work lousy hours, aren't compensated what they deserve, and educate more than 50% of our students nationally. We would like to be able to recognize those adjunct faculty members who deserve accolades. As a division, we would like to officially start a new tradition of honoring a different adjunct faculty for each of our *Foundations* newsletter. We ask for nominations from any members of the division. Short nomination forms are available on the Division website and should include a brief description why you think this particular individual is deserving of recognition. The winning adjunct will be featured in the next edition of *Foundations* and will receive a complimentary one year membership to the Geo2YC division (if already a member of NAGT).

Meet the new Geo2YC VP!

Merry Wilson
Scottsdale Community College

Education: BA. Geology Augustana College, MS. Geological Sciences, Arizona State University, Ed.D. Arizona State University. Teaching Experience: Adjunct Instructor Geology at Mesa Community College (00-02); Professor of Geology, Scottsdale Community College (03-present) ; Professional Experience: President NAGT Southwest Sec (05-11), Vice President NAGT Southwest Section (02, present)

Congratulations to Bob Blodgett for being elected as a Fellow of the Geological Society of America!

Bob Blodgett, Austin Community College, is recognized "for his contributions as a passionate geoscience educator, a noted textbook author, a persuasive advocate for faculty and students at two-year colleges (2YC), and a strong leader for the Geo2YC Division of the National Association of Geoscience Teachers."

How I spent my Dottie Stout grant: Homeschooling

by Cassie Strickland
Columbia Basin College

Ellensburg, WA, is most often known for being the home of Central Washington University, and the famous Ellensburg Rodeo. Ellensburg, and the rest of Kittitas County, however, is also home to a large and active alternative education initiative. This group (over 100 families) represents a large range of alternative learning methodologies, including traditional homeschooling, parent-teacher cooperatives (which combine some public school with homeschool), and the homeschool cooperative. In 2012, I proposed to offer a class (or classes) in Earth Science to the Kittitas County homeschoolers, and was given enthusiastic permission (from most families). To support this, I applied for and won a Dorothy LaLonde Stout grant so that I could purchase supporting materials (rocks, minerals, testing tools, maps). With this grant, I will be able to purchase some basic material to create a hands-on learning environment.

The courses I will teach include Earth Science for 7-12th graders, and Physical Geography for 4-6th & 7th-12th grade. I will also offer geology field trips aimed at understanding the evolution of the Columbia Plateau, evolution of the south-central Cascade Range, and Missoula Floods geology. I purposefully use the word 'evolution' as I discuss the geology of these regions, to help redefine the verb for some of these families, and make the connotation more neutral. I have already led one field trip, and will be teaching my first geoscience class for the homeschool co-op during winter 2013.


Cassie Strickland

The families participating in alternative education in Ellensburg do so for a variety of reasons, including frustrations with state-standardized testing (teaching to the 'test'), lack of individual attention in public schools, and social fears (drugs/alcohol). These are just a few examples for secular homeschooling. Also represented in this group, however, are a number of non-secular families that homeschool in protest of state science standards. As all geoscience educators know, the most common misconceptions these families share concern evolution: not only biological evolution, but also Earth's evolution and age. My goal is to bring geoscience to all of these homeschooling families, primarily in terms of Earth composition & processes, and help them meet state science standards.....but also to help educate in the ways of observation-based science. I hope not to 'convert', but rather help all develop analytical skills based on understanding the scientific method, and how this applies to Earth Science.

I am grateful to the NAGT for helping me offer these classes to this sub-sector of academics. Thank you!

Oceanography tools for *YOU*

by Katryn Wiese
City College of San Francisco

On the Cutting Edge has Oceanography teaching resources for you to use and to which you can contribute, including:

- course syllabi
- visualizations
- web resources
- data sets
- teaching activities
- upcoming workshops

Website:
http://serc.carleton.edu/NAGTWorkshops/oceanography/index.html

Please mark your calendars -- we'd love to have your participation in our June 2013 Teaching Oceanography workshop in San Francisco:
Website:
http://serc.carleton.edu/NAGTWorkshops/oceanography/workshop2013/index.html

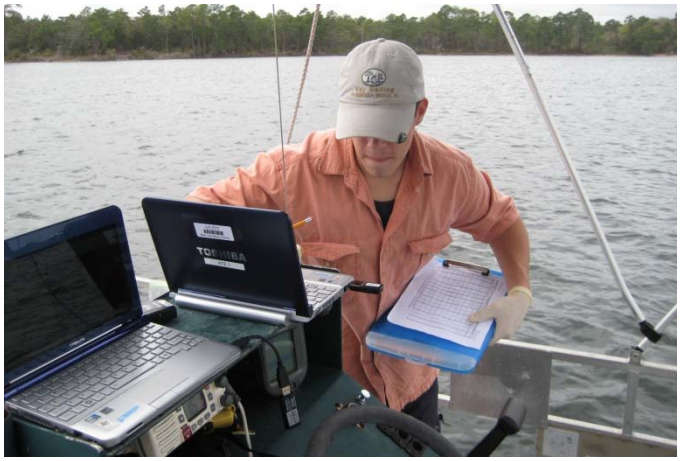
June 17-21, 2013
Chinatown/North Beach Campus
City College of San Francisco

This workshop is designed specifically for instructors of **Introductory Oceanography**. Session topics focus on exploring ways to effectively teach this topic in undergraduate Earth science courses. Each participant will submit and participate in the review of teaching activities. One of the important results of the workshop will be contributions of teaching materials, insights on teaching methodology, and the development of classroom resources that take advantage of cutting edge technology.

For more information, review the website, and feel free to send questions to Katryn Wiese (katryn.wiese@mail.ccsf.edu)

Field oceanography course in conjunction with local university

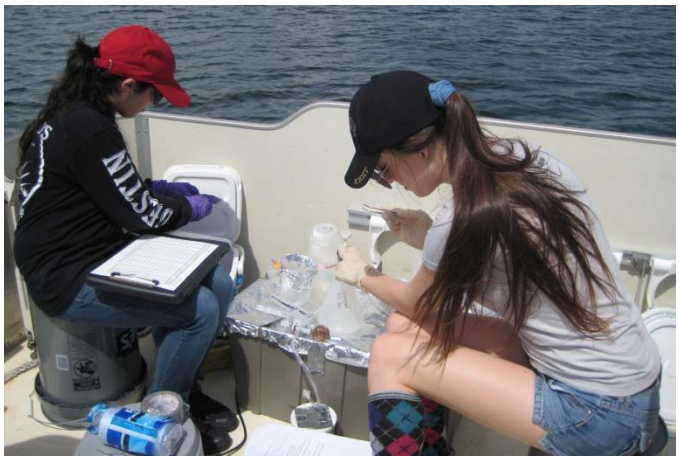
by Allison Beauregard
Northwest Florida State College



NWFSC student entering water quality data into a field laptop.

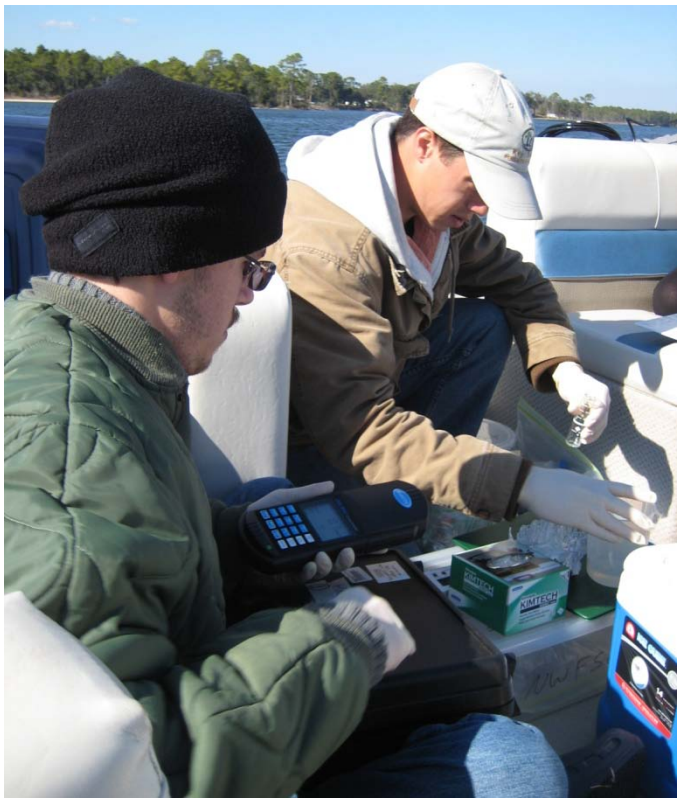
I am just finishing up a three year NSF-funded project to get my community college students out of the classroom and on the water. The project was built upon existing research and academic collaborations between my school and a neighboring four-year university. During a newly developed course called Aquatic Environmental Science, Northwest Florida State College (NWFSC) student teams are guided by an instructor from NWFSC and one from the local university, the University of West Florida (UWF), as well as a UWF graduate student.

Students learn to use field instruments to measure water quality variables (temperature, salinity, dissolved oxygen, and nutrients) during several field trips on a local estuary. While still in the field, students on multiple boats in different parts of the estuary use a wireless broadband interface to upload field data to a web-based GIS system interface developed as part of this project. This GIS system compiles the data and generates maps to show a whole-basin view of variations in water quality parameters that students access from the field. The capstone of each field trip is a “floating classroom”



NWFSC students preparing filters for chlorophyll analysis of a water sample.

during which students and instructors discuss summary results, test field hypotheses, and compare results with historical data collected during previous field trips. We are assessing the impact on student learning of this real-time geospatial assessment; early results suggest that student interest in environmental science and technology has been positively affected by the use of these methods. Furthermore, students show considerable improvement in their use of the technology and their understanding of the related scientific concepts (e.g., aquatic biogeochemistry).



NWFSC students analyzing the nutrient concentrations in a water sample.

The Unique Research Experiences for two-year College faculty And Students (URECAS) initiative: A strategic priority for the American Geophysical Union

by Pranoti M. Asher and Bethany Holm Adamec
AGU Education and Public Outreach

Two-year colleges play a vitally important role in the higher education system in the U.S., but when it comes to science, technology, engineering, and mathematics (STEM), many students from these institutions do not finish their degrees or succeed in transferring to and completing programs at four-year colleges. Fixing this 'leak' in the STEM pipeline is at the heart of a new effort being led by the American Geophysical Union (AGU). Unique Research Experiences for two-year College faculty And Students (URECAS) is intended to support and foster two-year college students in their Earth and space science educational careers, including those who choose to transfer to four-year institutions, and ultimately create pathways for them to enter the workforce. The opportunity to conduct research as an undergraduate student has been shown to increase student retention and success, so we focused on faculty-student research as a tool. Also, because two-year colleges attract a large population of students from underrepresented groups, URECAS is focused on building diversity in the Earth and space science professional workforce, which is a strategic priority for AGU. Planning for URECAS began in the fall of 2011, and after receiving a National Science Foundation (NSF) planning grant from the Opportunities for Enhancing Diversity in the Geosciences program in the NSF GEO Directorate, AGU began putting together an information gathering workshop. This workshop took place in July of 2012.

Throughout the 2-day workshop, presentations and small group discussions tackled issues such as challenges faced by students and faculty who are involved in undergraduate research, best practices in conducting and institutionalizing research at

2YCs, facilitating the transfer of research students to a 4-year campus, and addressing the needs of diverse students. Additionally, representatives from the Council on Undergraduate Research, the U.S. National Science Foundation, the U.S. Geological

URECAS participants discuss two-year college issues.

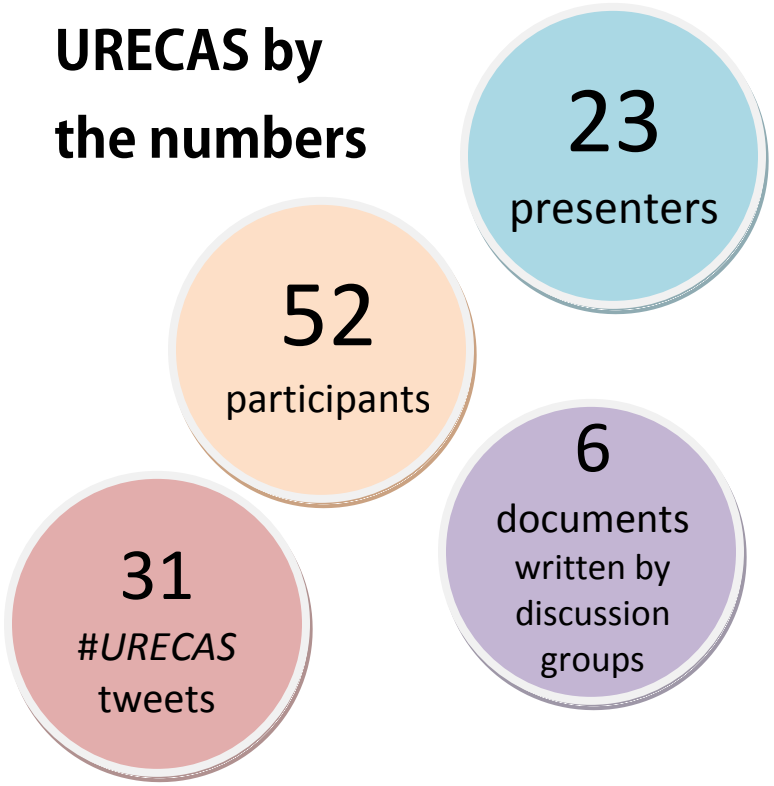
Survey, the American Association of Collegiate Registrars and Admissions Officers, the Association of American Geographers, the American Geosciences Institute, the Incorporated Research Institutions for Seismology, and LI-COR Biosciences provided information about tools and opportunities available at their institutions for faculty and students. For more information about the workshop content, including speaker presentations, see http://urecas.agu.org/workshop-program/.

This planning workshop was the AGU's first step in implementing a larger program focused on engaging and retaining 2YC students in the Earth and space sciences. We have much more work to do on this issue. Still, some early workshop outcomes that will help us shape the full URECAS program were identified.

These include:

- Models for conducting student-faculty research at 2YCs, including students participating in typical 6–8-week intensive research experiences, research projects integrated into semester-long curricula, summer internships at federal agencies or research labs, and special topics courses where students work one-on-one with faculty during the semester.
- Challenges faced by 2YC faculty include, but are not limited to, lack of time to do research, a lack of value placed on research at some institutions, and research not counting toward professional development or the tenure process at many institutions.
- Challenges faced by 2YC students include, but are not limited to, the perception of research as being hard, socioeconomic factors, making the time to do research, and family and employment obligations.
- Faculty learned about resources on how to build partnerships with 4-year colleges and research institutions, how to take advantage of federal agency opportunities, and how to communicate with college administration.

Despite the many hurdles faced by 2YC faculty and students engaged in research, all workshop participants felt strongly that exposing their students to research and ultimately a professional meeting such as AGU's Fall Meeting would foster a sustained interest in the students' continuing their studies in the Earth and space sciences.



The AGU now looks ahead and is working to bring more 2YC students and their advisors to the AGU Fall Meeting in the near future and to foster these students' continued work and retention in Earth and space sciences.

Interview: Eric Baer brings in the money for 2YC faculty to travel to national meetings

The editor of Geo2YC Foundations recently got an email from **Eric Baer** of *Highline Community College*, informing him that he had been awarded almost a thousand dollars to help defray travel costs to the annual meeting of GSA in Charlotte, North Carolina. This isn't the first time that your editor has availed himself of this funding opportunity, but it got him to wondering: where did this money come from, and how did Eric get it? So we asked Eric some questions about his inititative to get Geo2YC faculty to national meetings…

Foundations: What was your motivation in seeking funding?

EB: I have found that every time I attended the Geologic Society of America national meeting I learned something new that I could use in my classroom. I often came back and had to tell the students that something I had taught them was wrong – whether it was something as small as the age of the oldest fish fossil or something as big as the nature of hot-spots. I also learned new teaching techniques and ideas and met others who became important colleagues or collaborators. I knew that I was extraordinarily lucky in working for a college that supported professional development, and that many others did not. I wanted more 2YC faculty to be able to have this experience.

At the same time, I was hoping seeing a nascent group of 2YC geoscience faculty beginning to take shape and I thought it would be extraordinarily helpful for us to have a place to meet and get to know each other, and I wanted to support that group. That group has now become the NAGT 2YC division, and it is a terrific source of ideas and inspiration to me. I knew that most folks would need financial support to be able to have these opportunities. Indeed, I even needed help the first year since the State of Washington banned out of state travel in 2009 as a result of the state budget crunch.

Eric Baer

Foundations: What were the sources you sought funding from? (both successfully and unsuccessfully)

EB: I only sought funding from NSF. Jill Kartsten, the Program Director for Education and Diversity in the directorate for Geosciences has been extraordinarily gracious and supportive in my and other's efforts. I suspect that very few 2YC instructors know how much NSF program officers care about what goes on in our institutions and classrooms.

Foundations: How many cycles of funding have you received? How much total funding has been awarded? To how many faculty?

EB: This year was the fourth year of funding 2YC instructors to attend the GSA National meeting. The first was for the Portland meeting in 2009. Frank Granshaw of Portland Community College and Portland State University solicited and received the funding for that meeting. Since then I have made awards of over $60,000 to 2YC faculty to participate in the GSA National Meeting. This year we supported 33 faculty with over $25,000 in awards. However, it was difficult. We had nearly $50,000 in requests.

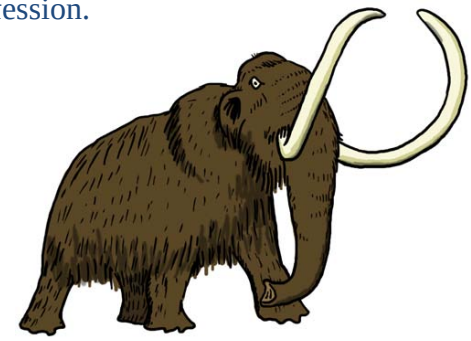
Foundations: Is this going to be a regular thing? Can Geo2YC faculty count on this opportunity in

the years to come? Is there any plan to scale it up? (more money, more people)

EB: There is no current plan to continue this program. After 3 years, I think my goals of supporting faculty, gathering a community have been achieved. I hope that through the experience that 2YC faculty have had in workshops, short courses and in sessions, that they will be able to secure their own funding in the future. I am hoping that the oceanography community will soon see a similar program, modeled after this one, to support faculty in attending the ASLO meeting in 2013.

Foundations: How would you like to see the program evolve in the future?

EB: I believe that there is sufficient critical mass in the 2YC community that we will continue to grow and develop even without this funding next year. I would like to see us continue to develop as the professionals we are: building networks on a local regional and national scale; not only developing new pedagogical techniques, but testing them and sharing them with others; continuing to grow and develop our geologic and pedagogic knowledge so we are the best teachers we can be; and finally I would like to see 2YC faculty develop as a cadre of geoscience professionals who can explain cutting edge geoscience discoveries to the general public and thus serve our community and profession.



Foundations: How can other people in the Geo2YC community help?

EB: To help, you can look around your institution and your local area and encourage your fellow 2YC geoscientists to continue their professional development, join NAGT-2YC, sign up for the geo2YC discussion list, find young teachers to mentor, participate in a SAGE-2YC workshop or short course, and, of course, just keep on doing what we do so well – teach.

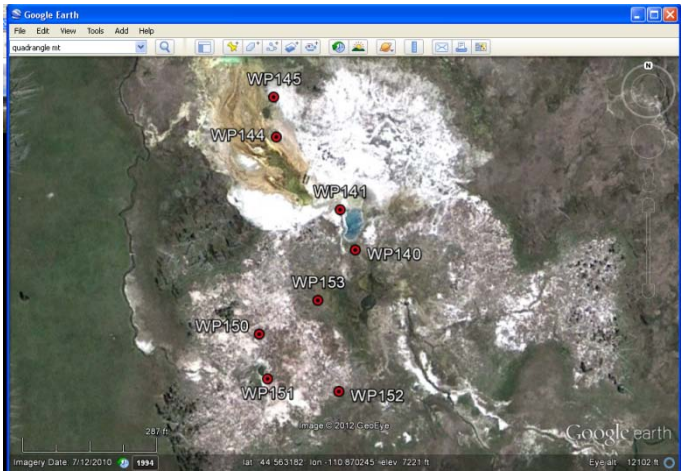
Virtual Fieldwork in Introductory Geoscience

Fieldwork without the muddy boots?

by Frank Granshaw
Portland Community College

With the increasing use of virtual reality as a research tool by geoscientists and the widespread availability of desktop virtual reality environments, virtual field environments (VFEs) are being recognized as an important tool in geoscience education. In addition to providing a vehicle for students to "visit" field sites that they may never be actually set foot in, VFEs provide students with a means of gathering data and solving problems in a way that is similar to how it would be done in the field. This is important for several reasons. First, in situations where getting into the field is not possible, virtual fieldwork in these environments gives students experience with a foundational activity in the earth sciences. Second, doing virtual fieldwork augments actual fieldwork by familiarizing them with sites and helping them plan their work. Finally in those instances where students are engaged in constructing VFEs, the environments provide them with a way of analyzing, presenting, and archiving field data.

Though the field / virtual field activities described in the previous paragraph sound as if they are intended for geoscience majors and researchers, there are numerous instances in which VFEs have been used successfully with a wide spectrum of geoscience novices (e.g. college nonscience majors, K-12 teachers, and middle and high school students). For example in teacher education VFEs have been used to prepare teachers for field trips that were part of professional development programs, as well as providing them with a vehicle for taking something of their field experience back to their classrooms (Granshaw 2011). Constructing VFEs has been used as a focal activity for teacher education (Granshaw and Duggan-Haas, 2012; Duggan-Haas and Granshaw 2011) and in field experience courses for college non-science majors (Granshaw 2011). Descriptions of these efforts may be found in the publications list after this article.



Google Earth is a favorite platform for virtual field environments.

A library of VFEs for the Pacific Northwest is now being constructed with the cooperation of the region's community college geoscience educators. With this project comes an invitation to other educators in the region to become engaged in expanding the library by providing ideas for sites, participating in the fieldwork needed to digitally capture these sites, and develop activities to accompany them. More information on this project can be found on the project website.

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Links

Resources for Virtual Fieldwork (Granshaw 2012) – Links to virtual fieldwork projects and resources for constructing virtual field environments (August 2012)

Why does the Earth Look the Way it Does? - The website of virtual fieldwork.org (August 2012)

Teaching Paleontology at a community college?

Yes, it's time.

by Paul Fitzgerald
Northern Virginia Community College

Many Community Colleges, such as Northern Virginia Community College, are riding high on a wave of student enrollment. More and more, students are using the Community College as the beginning of a true university experience and are looking for coursework that is as diverse as any that can be found in a typical four-year university. With that in mind, many community colleges are expanding their offerings to include more specialized courses that are on par with any at a major university. To science faculty looking to offer a novel and compelling course I would suggest Paleontology. Paleontology – the study of the history of life as evidenced by the fossil record – combines the fields of Geology, Biology, and Mathematics, and is therefore a truly multidisciplinary field of study. Because of this, it can be offered as an upper division course at a two year college and even as a capstone course in an Honors program.

Anytime a new course with a lab component is offered consideration has to be given to the monetary cost of startup. Again, in this regard Paleontology is a good choice as many valuable resources are either free or are available at low cost. Most scientific supply companies have reasonably priced fossil materials that you can use to start your fossil collection. Of course, as more field trips are taken, you will expand your collection of local fossil specimens which will enrich the course the next time it is offered. Additionally, for the lab component, one shouldn't be limited to fossil materials alone. Many of the materials that I have used when teaching Paleontology were borrowed from the Organismal Biology and Sedimentary Geology teaching collections.

Below, I list some materials that are commonly used in Paleontology courses today. Admittedly, there are not many textbooks that are available for you to choose from.

- Benton, M.J. and D.A.T Harper. 2009. *Introduction to Paleobiology and the Fossil Record*, 1st edition. Wiley-Blackwell: Oxford.

- Foote, M. and A.I. Miller. 2007. *Principles of Paleontology*, 3rd edition. W.H. Freeman: New York

For the lab component, nothing is going to take the place of actual fossil materials. However, fossil identification is not the only hands-on component to a Paleontology lab. To answer the question of how life on Earth has progressed, paleontologists today marry biological inference with geological context using the tools of mathematics. The Paleontology student will have to spend time learning the electronic tools of modern paleontology, including the use of digital media, online databases, and modern statistical methodologies. Some resources that I find useful are listed below. Electronic resources available for free or at low cost:

Silicified Brachiopod community in the Lower Devonian Helderbergian of Schoharie County, New York.

PAST - PAleontological STatistics

PAST is a computer program for Windows utilizing many standard statistical tests used in the analysis of paleontological data. It is GUI based and free.

Correlation of Stratigraphic Units of North America (COSUNA)

This resource shows stratigraphic correlations for geologic formations of the continental United States and Alaska. COSUNA maps are categorized by geographic region. Each map costs $10, making it a valuable, yet inexpensive resource for a Paleobiology lab or field experience.

Paleobiology Database

The Paleobiology Database project was initiated by the National Center for Ecological Analysis and Synthesis (NCEAS). This is a database of search-able occurrence records from over 40,000 different publications, over 130,000 fossil collections, and over 1,000,000 taxonomic occurrences. The real value of this resource for the undergraduate paleontology instructor is in the specific locality information that it contains. If you want to know what fossils are nearby to your location and what you can expect to find in the field, this database will give you a fairly complete picture. This database is a constant work in progress, but geographic coverage in North America is fairly complete.

Mesquite – A Modular System for Evolutionary Analysis

This freely available software program enables the student to perform fairly complex analysis of evolutionary relationships. Although it is limited in the complexity of the cladistic and likelihood based analyses it can perform, I find it more than adequate for an undergraduate paleontology lab. The results of the 'natural experiments' that have played out over the last 4.6 billion years of changing environments are contained within in the fossil record, evidenced in populations which have either adapted through the process of Natural Selection or have become extinct. With the emergence of the community college as a first half of a college experience for more students than ever before, we too must adapt to changing conditions.

Area waterways are living laboratories for Daytona State College students

by Harry Russo (Communications Manager)
Daytona State College

Dr. Debra Woodall anchors her 21-foot skiff beside a spoil island on the Halifax River in Volusia County, Florida, and her students immediately begin their assigned tasks of collecting data. Ocean engineering major Brandon Cavanaugh begins using a seine net with marine science major Summer Solana, collecting biological specimens from the waterway, while marine biology student Anna Hrabovsky takes water temperature and salinity measurements.

Theirs is a field experience that is rare among two-year college students interested in preparing for careers or pursuing advanced degrees in the marine sciences. Such field work is part of the curriculum for 370 students enrolled in Daytona State College's Institute of Marine and Environmental Studies (IMES), established by Woodall nearly two years ago. The institute offers an associate of arts (AA) degree with university transfer tracks in marine science, marine biology, environmental science and ocean engineering. A common core of field-study courses links the tracks, giving graduates opportunities to transfer to a growing list of universities to pursue bachelor's degrees in their fields. In addition, the institute also offers a two-year associate of science degree program in environmental science technology designed to train students for immediate workforce placement upon graduation.

Dr. Debra Woodall, founder of the Institute of Marine and Environmental Sciences at Daytona State College, inspects for biological specimens collected with a seine by students Brandon Cavanaugh and Anna Hrabovsky during a recent field excursion.

"The residents of Daytona State's service area are fortunate to live in a unique and environmentally sensitive part of Florida," said Michael Vitale, senior vice president of academic affairs. "Ours is an area that is primed for environmentally focused business and industry, and as the core focus of the two-year college mission is to meet the needs of the communities it serves, the Institute of Marine Sciences and its associated academic programs are helping to create opportunities for our students and graduates while helping to preserve the area's natural resources for future generations."

Creation of IMES has been a labor of love for Woodall, whose passion for preserving the marine environment goes back to her childhood growing up within view of the oil rigs that line the Louisiana coast and their effect on the ecosystem. She also recognized an opportunity to take advantage of the area's unique proximity to one of North America's most diverse chains of ecosystems.

"Our students will be far ahead of those at most other colleges because of the variety of field experiences we are able to offer them," she said. "Daytona Beach is at the front door of the Indian River Lagoon Estuary. We have the Atlantic Ocean

right out the back door and a myriad of freshwater bodies throughout the region. There is a wonderful diversity of marine ecosystems here that gives us an advantage and provides opportunity for our students that many universities can't even provide."

Woodall joined Daytona State in 2008, initially teaching an introductory course in oceanography as a physical science elective. During this period, Woodall gained administrative support to develop articulation agreements with various public and private universities around the state, which viewed the field study component of her upper-level marine science course, in particular, as a valuable learning experience for her would-be transfer students. Developing the curriculum for the AA programs was the easy part, she said, noting it took a minimal investment and didn't require approval by Daytona State's accrediting body, the Southern Association of Colleges and Schools (SACS). "The biggest effort was in building relationships with the universities and developing articulation agreements that would ease the transfer process for our graduates," Woodall said. "Each four-year university has recommended courses they would like their students to take to make them competitive with other undergraduates; however, in every case, the universities want our students to take one upper-level marine science field course to better prepare them for the challenges required in their baccalaureate programs."

For example, the 61-credit hour marine science program requires students to take courses in biology, chemistry, physics, geology, and oceanography, including Aquatic Environmental Science and an upper-level oceanography course called Ocean Studies in Biochemistry, as well as their corresponding labs and field study experiences.

Daytona State has marine science articulation agreements that allow students to transfer seamlessly to the University of South Florida, University of Central Florida, Stetson University, Florida Gulf Coast University and Northwest Florida State College, to name a few. Woodall also is working on agreements with the University of North Florida and University of Miami.
"The programs have come a long way in a relatively short time," Woodall said as she guided the students through their recent field excursion. But establishing IMES was not without its challenges, particularly in times of tightened budgets for higher education.

"I think the administration was somewhat caught by surprise when they became aware of what it would take to fully put the marine science program together," she said. "It can be a challenge, especially for college administrators who come from mostly classroom-exclusive experiences.

Starting a marine science field program is quite a bit different than, for instance, starting up a program in health care or one that is similar to others, where start-up expenses are perhaps more predictable and only require a little tweaking here and there." Programs offered through IMES required the up-front purchase of a variety of field and laboratory instruments. Of course, it also required the college to purchase a boat (a pre-owned Jones Brothers skiff) and reconfigure it from a fishing vessel to one that can be used for aquatic research. Along with the boat came all the planning and logistics that went along with having one – where to store it, maintenance, insurance, providing Coast Guard training to faculty who would use it and addressing the safety needs of students.

But the effort has ultimately paid off for Woodall's students. "They are gaining a unique undergraduate experience that puts them at a great advantage over other classroom-only based marine science programs," she said, noting that the active learning component carries the benefits of improved student motivation, confidence and success.

Marine science major Hrabovsky can attest to that. Woodall's program has sparked in her a desire to learn all she can about the ocean and the diversity of its ecosystems. After completing her AA degree, she plans to earn her bachelor's degree from Stetson University, then a graduate degree before pursuing a career as a shark biologist.

"They are a threatened marine species, and I have a huge interest in researching and protecting them," she said. "More than 100 million are killed every year and some species are on the brink of extinction. I want to be a part of the effort to preserve them and all marine life."

Be seen on the GeoScene
Artificial outcrops in geology education

by Merry Wilson
Scottsdale Community College

Geologic field trips are among the most beneficial learning experiences for students as they engage the topic of geology, but they are also difficult environments to maximize learning. This study explored one facet of the problems associated with teaching geology in the field by attempting to improve the transition of non-major community college students from a traditional laboratory setting to an authentic field environment by utilizing an artificial outcrop, called the GeoScene (*above*).

The GeoScene was utilized in this study as an intermediary between laboratory and authentic field based experiences, allowing students to apply traditional laboratory learning in an outdoor environment. The GeoScene represented a faux field environment; outside, more complex and tangible than a laboratory, but also simplified geologically and located safely within the confines of an educational setting.

Several types of data were collected and analyzed, including: visual recordings of the intervention, interviews, analytic memos, student reflections, field practical exams, and a pre/post knowledge and skills survey, to determine whether the intervention affected student comprehension and interpretation of geologic phenomena in an authentic field environment, and if so, how. Students enrolled in two different sections of the same laboratory course, sharing a common lecture, participated in laboratory exercises implementing experiential learning and constructivist pedagogies that focused on learning the basic geological skills necessary for work in a field environment. These laboratory activities were followed by an approximate 15 minute intervention at the GeoScene for a treatment group of students (n=13) to attempt to mitigate potential barriers, such as: self-efficacy, novelty space, and spatial skills, which hinder student performance in an authentic field environment. Comparisons were made to a control group (n=12), who did not participate in GeoScene activities, but completed additional exercises and applications in the laboratory setting.

Qualitative data sources suggested that the GeoScene treatment was a positive addition to the laboratory studies and improved the student transition to the field environment by: (1) reducing anxiety and decreasing heightened stimulus associated with the novelty of the authentic field environment, (2) allowing a physical transition between the laboratory and field that shifted concepts learned in the lab to the field environment, and (3) improving critical analysis of geologic phenomena. This was corroborated by the quantitative data that showed the treatment group significantly outperformed the control group in geology content related skills taught in the laboratory, and supported by the GeoScene, while in an authentic field environment ($p \leq 0.01$, $\delta = 0.507$).

This study is encouraging, suggesting that we can, in fact, improve student understanding in authentic field environments by transitioning learning through pseudo-field experiences, like the GeoScene, at our home institutions. This can also be accomplished within the time frame of a single geology course with a non-major community college population.

Science Meets Culture

Using the Rock Art Stability Index to Teach Geosciences at the Petrified Forest National Park

Geometric petroglyphs on sandstone in Petrified Forest National Park in Arizona.

by Niccole Villa Cerveny
Mesa Community College

Have you ever thought of capturing your geoscience students with culture? For the past three years I have been teaching the many details of rock decay and the evolution of landscapes by linking the practical classroom lessons to cultural resources. Specifically, I have been utilizing a scientific assessment tool, the Rock Art Stability Index (RASI), to teach critical interdisciplinary concepts from geography, geology, archaeology, and biology. The students are willing to engage in the science because the rocks we are analyzing contain Native American rock art – petroglyphs and pictographs. The students connect to their cultural heritage, determine that it is under threat, and learn that we should study it and record the details before they may be lost. The data collected by the students become part of the federal record for the National Park Service and are utilized in resource management planning. And more importantly, freshmen and sophomore college students are engaging in undergraduate research by collecting and analyzing primary data.

MCC Geology Student Karen Wisniewski points at a spiral petroglyph on sandstone in Petrified Forest National Park in Arizona.

RASI is a low-cost geology-based "triage" assessment of rock art panels that generates a baseline value for informed decisions concerning preservation and management. Examining approximately three-dozen weathering (rock decay) characteristics in six overall categories, it can be taught quickly with reproducible and useful results. Students engage in observational analysis of the geologic setting, identify potential loss of rock materials, actual loss of rock material in large pieces, actual loss of material in small increments, rock coatings, and vandalism or other modern concerns. Details regarding the index can be reviewed at this website.

Mesa Community College RASI Research Team Fall 2009 after successful data collection in the field at Petrified Forest National Park in Arizona.

Students have been collecting data for all of the known, and some of the previously unrecorded, rock art sites in the Petrified Forest National Park in

Arizona. We are beginning to understand the full value of such a generous data set – for teaching and learning, as well as for conservation and preservation. Data and imagery collected are used in digital format by students who cannot go into the field (due to work, family obligations, physical ability, *etc*.). And now that data collection is complete for this National Science Foundation DUE-TUES funded project (#0837451), students are continuing to analyze specific weathering characteristics across the entire data set in class. Who knew so many students could be engaged in rock decay?!

Mesa Community College students collaborate while scoring an intricate petroglyph panel on sandstone at Petrified Forest National Park in Arizona.

Of course, not everyone has the convenient abundance of Native American rock art that we have in the Southwest United States. But, with a few minor modifications, the Rock Art Stability Index can be turned into the Cultural Stone Stability Index (CSSI). Your students can investigate natural stone decay in buildings, bridges, cemeteries, or monuments. They can even study the decay of cement structures. So much of our cultural resources throughout the world utilizes geology and is threatened by natural and human induced decay. Consider the recent damage to the Washington Monument in the 2011 Virginia earthquake or the interstate bridge failure in Minnesota in 2007. You have the opportunity to engage your students in geologic topics using something they care about.

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