

FOUNDATIONS

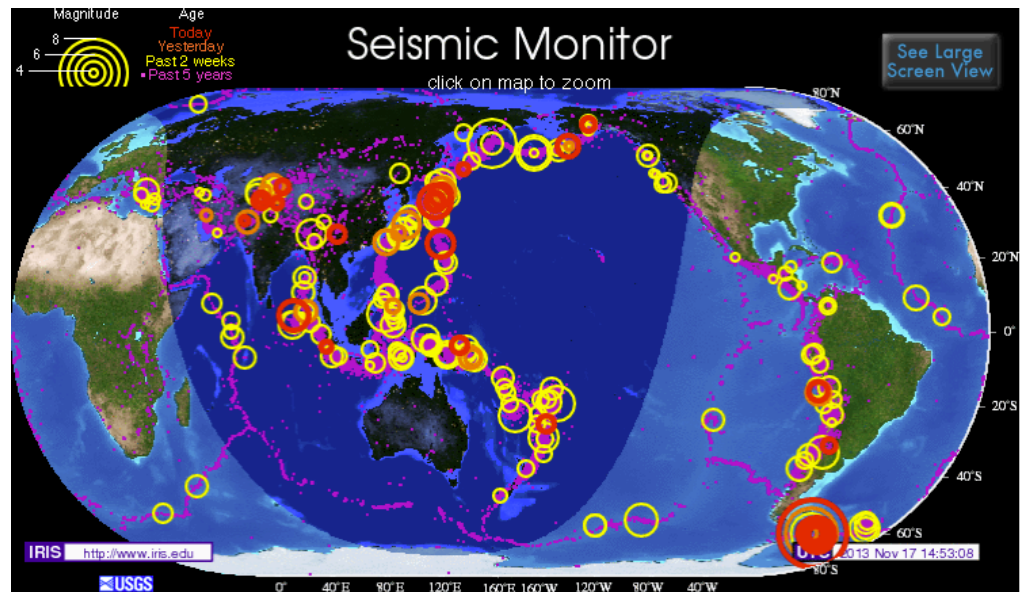
Newsletter of the Geo2YC division of the National Association of Geoscience Teachers
Volume II, Issue 4: December 2013

Seismology is more than drawing circles

by **David Voorhees**
Waubonsee Community College

If you spend most of your time in class talking about earthquakes in terms of drawing circles and triangulation, let the Incorporated Research Institutions for Seismology (IRIS) help expand your horizons into the world of seismology. Founded in 1984 with support from the National Science Foundation, IRIS is a consortium of over 120 universities dedicated to facilitating the investigation of earthquakes and Earth dynamics, promoting the exchange of geophysical data and knowledge, and fostering cooperation. The Education and Public Outreach Program of IRIS (http://www.iris.edu/hq/programs/education_and_outreach) has assembled a vast library of resources and data that are readily accessible and updated in real-time that can easily bring the true work of seismologists into your classroom and lab.

Perhaps the resource that I have come to use most frequently is the 'Teachable Moments' PowerPoint presentation (<http://www.iris.edu/hq/retm>) sent out within 24 hours of a major earthquake. These are immediately usable in your class, and include descriptions of the regional tectonics and seismology associated with that event, and often include pertinent animations. There are often images and discussion of the damage caused by that event. With the current arrangement of the Transportable Array in the United States, there is



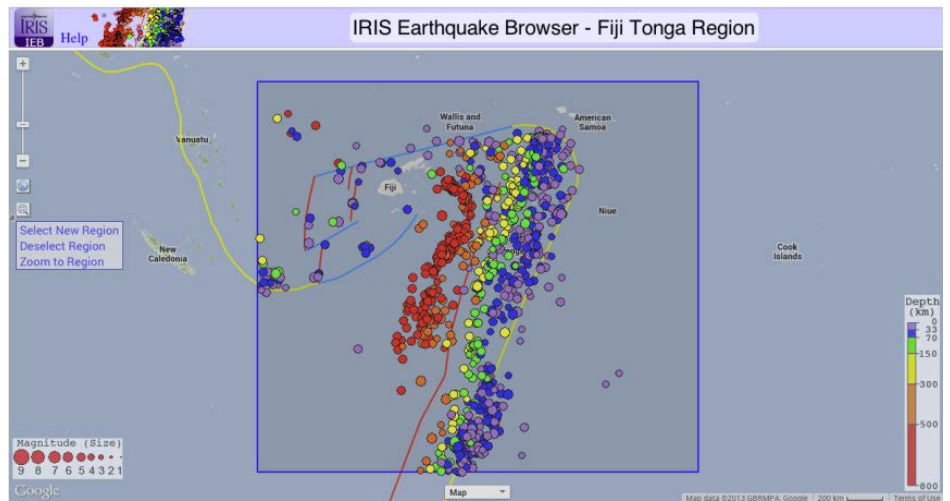
often a visualization of the seismic waves from that event passing through the array (like waves on a pond). If you 'friend' IRIS Education and Public Outreach on Facebook or sign up for the mailing list at http://norman.iris.washington.edu/mailman/listinfo/eno_quakes, you will get notification of when the presentation is ready for download. As with most IRIS resources, the Teachable Moments presentations are also available in Spanish.

There are many IRIS resources that display real-time earthquake data available through web browsers. A visually appealing global view of recent events is presented in the Seismic Monitor (<http://www.iris.edu/seismon/>), where clicking on different regions will bring up a separate display; for example North America or the Pacific Ocean. Links to further information on earthquake headlines, a list of earthquakes in the last 30 days, teachable moments, plate tectonics, the IRIS Earthquake Browser (IEB), and education is

provided along the bottom of this website. Clicking on any single event in the 30 day list will highlight that event in the IEB.

If you want a more customizable display of real-time and historic earthquakes, where you can select specific date ranges, magnitude ranges, depth ranges, or regions, try the newest version of the IEB (www.iris.edu/ieb). For each display chosen, you can also adjust the number of events shown to adjust to your visualization needs and download speed. There are pre-defined regions, like the Fiji Tonga region shown at right, or you can define your own region using your cursor.

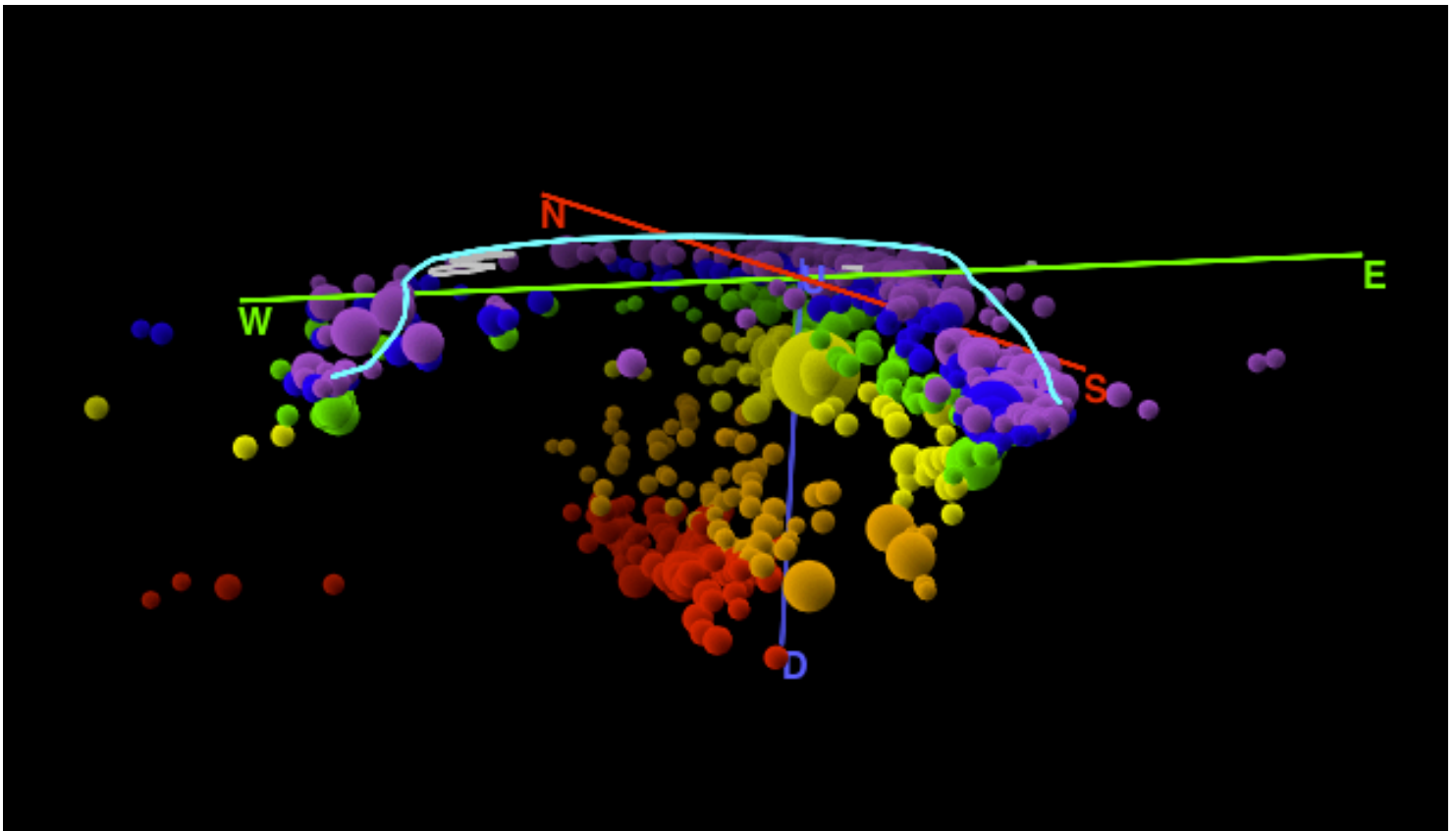
A major new feature of the IEB is the addition of a 3D viewer for any region displayed. The 3D view of the Fiji Tonga region is shown below, an oblique view looking to the northeast, clearly showing the Tonga subduction zone. As this can be done with any view, you can easily show the varieties of subduction angles, and the relationship to seismicity in class, or students can manipulate the view themselves in a lab exercise. You can also display the events shown in the region selected in table format, if you need more detailed, event-specific,

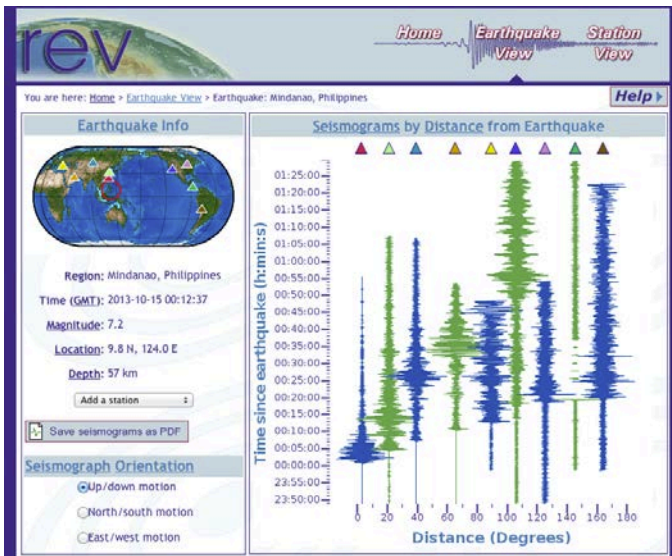


data for your teaching. It's worth noting that you can also use the IEB on your smartphone.

If you would like to view seismograms from selected seismographs in an easily obtainable and presentable format, please try the Rapid Earthquake Viewer (<http://rev.seis.sc.edu>). You can select from a list of recent events, and display a series of seismograms that are sorted by distance from the epicenter, such as the recent Mw 7.2 in the Philippines on 15 October 2013 shown at the top of the next page.

You can add additional seismograms and you can save the display as a PDF for convenient use in the classroom or in a lab.

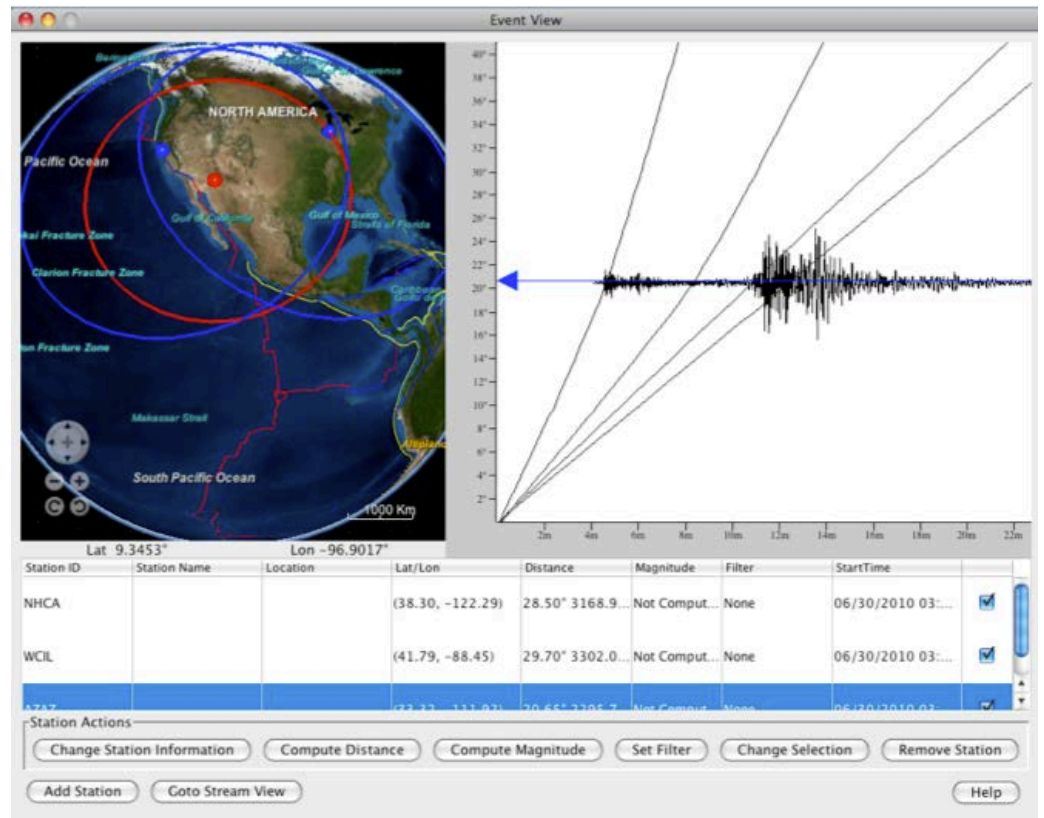




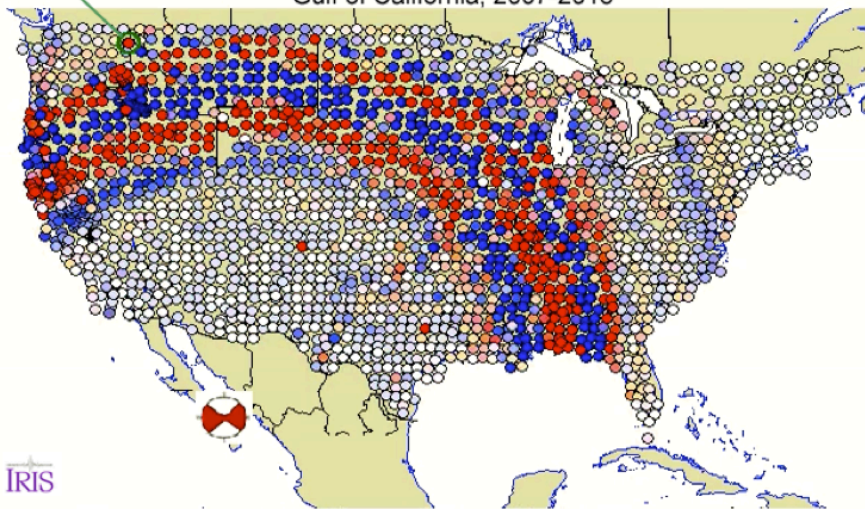
If you are interested in having a seismometer in your classroom or department for truly real-time data, IRIS plans to have AS1 seismometers available for distribution through the Seismographs In Schools (SIS) program (<http://www.iris.edu/hq/sis>). Recent problems with the supply of AS1's are being resolved, and the SIS program is being re-invigorated, so stay tuned. The TC1 (slinky) seismometer designed by Ted Channel is also available for use in the classroom.

If you are searching for resources to use in classes and presentations, there is a vast library of engaging and informative animations under the 'Educational Resources' link on the IRIS home page. There are short animations on earthquake hazards, plate tectonics, earth structure, earthquakes, and

If you would like access to truly real-time data, IRIS can provide a couple of options. If you do not own a seismometer, or cannot afford one, consider downloading jAmaseis. This is a free program that allows the user to display streaming data from up to 3 seismometers that send data to IRIS, and it has recently completed open-Beta testing and is scheduled for a full release soon. You can currently choose any professional seismometer in the world, as long as it streams data to IRIS, and will soon be able to select educational stations as well. You are able to extract specific events from the 24-hour display, and determine the magnitude and distance to the epicenter using those data (a distance calculation is shown at right).



volcanoes from a seismological viewpoint. These are also available on the [IRIS Education and Outreach YouTube channel](#). Particularly impressive is the library of wave visualizations that are made using the Transportable Array, which clearly illustrate the idea of seismic waves. A recently released 'super GMV' (Ground Motion Visualization) combines 6 earthquakes in the Gulf of California between 2007 and 2013 during various deployments of the Transportable Array that were of similar magnitude and focal mechanism, into a

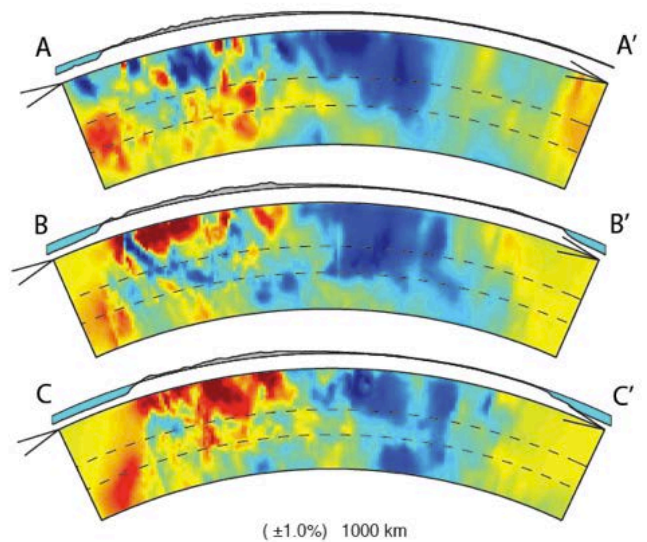
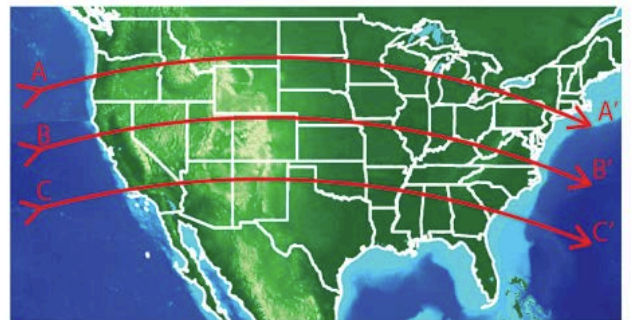


single animation. A portion of this Super-GMV is shown above, and is available at <http://www.iris.edu/dms/products/usarraygmv-super/>


For specific lesson plans, there is a new portal called 'InClass', where piloted lessons covering multiple topics for multiple class periods will be available. You will be able to select lessons based upon the content you want to cover and the length of time you have in class or lab. Although the first release is mostly for K-12, there will soon be 6 inquiry-based lessons for College level classes and labs on topics such as: the lithosphere-asthenosphere boundary, episodic-tremor-and-slip in Cascadia, icequakes in Greenland, earthquake hazards, and volcanic earthquakes. A lesson on hydraulic fracturing is in development.

If your training in seismology needs to be updated or improved, there is an excellent series of webinars authored by members of the IRIS community and other professionals from all aspects of the geoscience community. Some of the currently available webinars on seismology include: mantle dynamics, modeling the crust and mantle, volcano seismology, ocean-bottom seismology, seismic tomography, and seismic modeling of nuclear explosions. Currently archived non-seismological webinars include: teaching to maximize learning, communicating science with the media and general public, understanding the NSF system, and how to make better presentations. These, and others, are available for download and viewing at <http://www.iris.edu/hq/webinar/>. In addition to the webinars, there are a rotating set of short summaries of current seismological research on the IRIS homepage and "[Onesliders](#)" at the [Earthscope website](#).

The Transportable Array program of Earthscope is a network of 400 high-quality broadband seismographs that are being placed in temporary sites across the conterminous United States from west to east, and Alaska, that is in a regular grid pattern (as seen in the Super-GMV). It was started in 2004, and is currently mostly east of the Mississippi River, and is about to be deployed in Alaska. The dense spacing of this moving array has provided a significant resource for the mapping of the structure of the Earth's interior. Seismic tomographic studies of the west coast are identifying unexpected features, such as ghosts of old subducted lithosphere (shown in the figure below), regional mantle downwellings (lithospheric drips), and complexities



to the Yellowstone Hot Spot. More details can be found in the quarterly Earthscope publication [Insights](#) or the [bibliography of papers](#).

Oh, and by the way, I have just re-written my Seismology Lab for my 'Survey of Earth Science' and 'Physical Geology' labs, and there is not one circle drawn in either of them. 

Resources for Those Teaching Astronomy or Space Science

by Andrew Fraknoi
Foothill College

1. Talks by Noted Astronomers Now on YouTube

The Silicon Valley Astronomy Lectures, featuring astronomers giving nontechnical lectures on recent developments in astronomy, are now available on their own YouTube Channel, at:

<http://www.youtube.com/SVAstronomyLectures/>

The talks include:

- Sandra Faber on galaxy formation,
- Michael Brown on his discovery of Eris and the “demotion” of Pluto,
- Alex Filippenko and Leonard Susskind on black holes,
- Natalie Batalha on the latest discoveries from the Kepler mission,
- Frank Drake on his modern view of the Drake Equation,
- Gibor Basri on brown dwarfs and unattached planets,
- Anthony Aguirre on multiple universes, and
- Chris McKay updating the Cassini discoveries about Saturn's moon Titan.

The lectures are taped at Foothill College near San Francisco, and co-sponsored by NASA's Ames Research Center, the SETI Institute, and the Astronomical Society of the Pacific.

2. Resource Guide for Teaching about Extrasolar Planets

A new annotated guide to written, web, and audio-visual resources for teaching or learning about planets orbiting other stars is now available. Materials in the guide to this rapidly-changing branch of astronomy include video and audio files of lectures and interviews with leading scientists in the field, phone and tablet apps, a citizen-science web site, popular-level books and

articles, and more. Published by the NASA Astrophysics Education and Outreach Forum and the Astronomical Society of the Pacific, the guide can be found as a PDF file at:

<http://www.astrosociety.org/education/astronomy-resource-guides/the-search-for-planets-around-other-stars/>

3. Resource Guides on Music and on Apps

An annotated guide presenting 133 pieces of music inspired by astronomical ideas (organized into 22 topical categories, e.g. black holes, planets, etc.) is still available in *Astronomy Education Review* at:

http://aer.aas.org/resource/1/aerscz/v11/i1/p010303_s1?view=fulltext

Both classical and popular music are included.


An annotated overview of 98 astronomy applications for smart phones and tablets has also been published in *Astronomy Education Review* and features brief descriptions and direct URLs:

<http://dx.doi.org/10.3847/AER2011036> (click on the PDF version under the author's name for the easiest format for links.) The listing includes a variety of apps for displaying and explaining the sky above you (some using the GPS function in your device); a series of astronomical clocks, calculators, and calendars; sky catalogs and observing planners; planet atlases and globes; citizens science tools and image displays; a directory of astronomy clubs in the U.S.; and even a graphic simulator for making galaxies collide. A number of the apps are free, and others cost just a dollar or two. A brief list of articles featuring astronomy app reviews is also included.

4. A Video about Interesting Studies of College Astronomy Teaching

At this summer's Astronomical Society of the Pacific meeting, Douglas Duncan (U. of Colorado) and Alex Rudolph (Cal State Pomona) were part of a plenary session answering such questions as: What do learning surveys tell us about the best teaching practices? Are students really the multitaskers they profess to be? Does student addiction to electronic devices and their in-class use impact learning outcomes? See the tape at:

<http://www.youtube.com/watch?v=DR7pqOjg154>

Happy star-gazing! 

President's Column

by **Merry Wilson**

Scottsdale Community College



Geo2YC is celebrating its second anniversary as a division of NAGT! As a fledgling organization, we've gained rapid momentum and have had a year of great success and progress.

I would like to take a moment to thank Lynsey LeMay, as she joins the ranks of 2YC past presidents. Her support and leadership over the last year have helped to increase the vitality and visibility of our flourishing Division. I value her service and am grateful for her continued guidance. I would also like to give a shout out to Ben Wolfe, our incoming Vice-President. I look forward to working with Ben to continue the vision of the 2YC. I would also like to thank Callan Bentley, who indefatigably continues to produce our outstanding newsletter, highlighting the amazing work being done by and for our colleagues.

A month ago at the Annual GSA Conference in Denver, I marveled at the increased participation and presence of our 2YC faculty. Our Division cosponsored a short course, as well as several topical and poster sessions. The enrollment in the short course, Helping Students Succeed in Geoscience Courses at Two-Year Colleges, recorded the second largest turnout for any short course during GSA. This was amazing, not only because the room was nearly impossible to find, but also due to the large

numbers of new participants. I've attended many short courses and workshops in the past where I was the lone representative from a community college, and I would be thrilled when there were three or four of us present. As I sat in that room and watched Bob Blodgett and Eric Baer try to fit more tables in for our ever-increasing numbers, I was reminded me of the Field of Dreams – "If you build it, they will come."

Of course, we are all individuals, with varying needs and resources, and I think it would be very naïve to think that we can offer a one-size-fits all model for our community. But, my hope is that we are opening the lines of communication, providing an intellectual home, so that we can continue to grow and support our members and colleagues at large. As we move into the New Year, and ideas or issues come to mind that you, as an individual, feel we might pursue together, please do not hesitate to contact me. I look forward to talking with you.

Merry.wilson@scottsdalecc.edu



Bringing down the hammer:

the question of outdoor ethics

by **Becca Walker, Joshua Villalobos, Pete Berquist, and Callan Bentley**

Mt. San Antonio College, El Paso Community College, Thomas Nelson Community College, and Northern Virginia Community College

Until recently, I didn't give much thought to how problematic outcrop abuse can be in the context of geology field trips. When training introductory students in outcrop analysis, I emphasized the importance of obtaining fresh faces of hand samples, but the only hammer instruction provided was to emphasize the importance of eye protection. However, when I saw one of my students going to town on some columnar joints in the Mojave and started to notice graffiti at some of my favorite field sites, it occurred to me that I need to do a better job talking to my students about outcrop destruction.

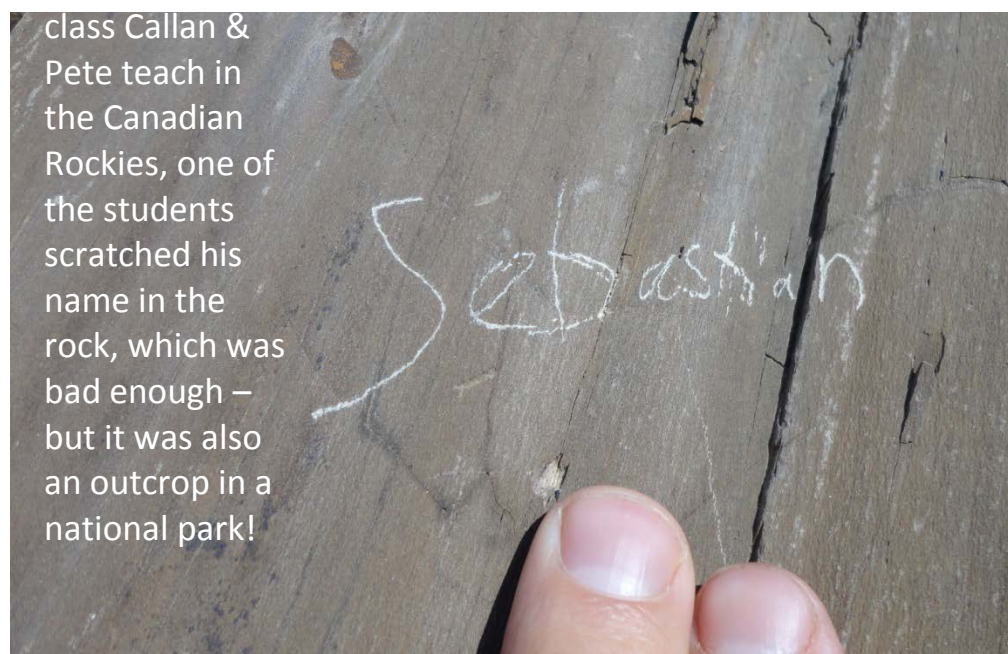
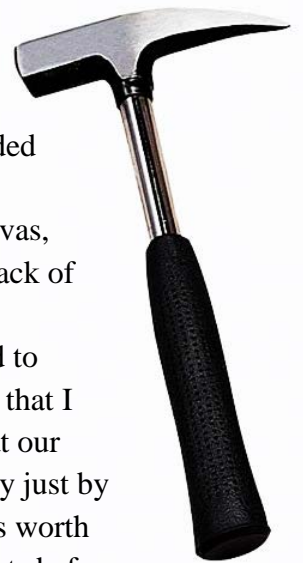
Field trips are especially beneficial for visual and kinesthetic learners, and I'm certainly not advocating taking away students' opportunity to physically interact with outcrops in the field. Most,

if not all, of the outcrop abuse I've witnessed on field trips (climbing on nonwelded tuffs, disturbing sedimentary structures, hammering pillow lavas, etc.) isn't malicious, it's just a lack of thought and understanding.

Geoscientists are so accustomed to thinking on geologic timescales that I think we mistakenly assume that our students have the same mentality just by being in our class. However, it's worth taking the time to remind students before they approach an outcrop that it only takes a few seconds to destroy a geologic feature that has taken potentially millions of years to form.

But students are not the only one to blame for this unintentional "vandalism". Professors and academics are also too often to blame for a lack of understanding beyond what we see with our professional eyes or goals. Formations and outcrops of significant local and national importance to the geoscience community are often collected, sampled, or tested to the point that some spots are so disturbed that it can be said that "professional vandalism" has taken place. Over collecting of fossils, hand samples, paleo-cores, and other forms of physical data, that often are taken in areas where special permission has been granted, are now

permanent examples to future visitors of our desire for knowledge, understanding, or the perfect classroom sample! But once we leave the field we rarely think of who will be there tomorrow or the next day and how the lack of that sample or the alteration of a site will affect the understanding or wonder of the site. Often times when taking students in the field I find myself explaining (or avoiding) the dozens of pale-cores scattered over an



class Callan & Pete teach in the Canadian Rockies, one of the students scratched his name in the rock, which was bad enough – but it was also an outcrop in a national park!

area of only a few cubic meters right on the trail or an overly collected pegmatite seam by countless enthusiast, or stumble upon spray-painted markers to identify key site or field trip stops and I wonder if my students think if being a geologist give you the right to modify the landscape or collect anything or anywhere you want?

Student-to-instructor ratios make monitoring and enforcing outcrop stewardship really challenging.

Field trips often involve hikes where the group is dispersed, so unless we insist that the entire group stays together, we can't see how all of our students are interacting with the outcrops. In addition, once students are aware of locations, they may later return to these sites on their own and/or share the location with others. In addition to teaching the geology of the outcrop, we should also emphasize the importance of responsible use and preservation, encouraging our students to become stewards of these sites, too. These examples highlight the importance of talking to our students early and often about outcrop protocol during field trips.

For the time being, I've started hanging onto the rock hammers on field trips and instructing students one-on-one about appropriate sampling, but this isn't a solution to the problem. Although it will require some class time (and in turn, some minimal sacrifice of course content), I think that the community needs to consider explicitly incorporating outcrop ethics into our curricula and developing strategies to get our students to buy into the importance of collecting ethics, proper sampling techniques, and outcrop preservation. We are already familiar with "outcrop-etiquette" being

imposed on us, for example, while studying in National Parks that enforce strict collecting regulations. I suspect would all agree that a pillow-basalt outside the park has just as much right to exist as a similar outcrop within the park, so perhaps we can reinforce not just the rule, but the rationale of these rules to all outcrops. I would like to be more confident that after they leave my class, none of my students are going to make national

headlines for ruining classic geologic sites.

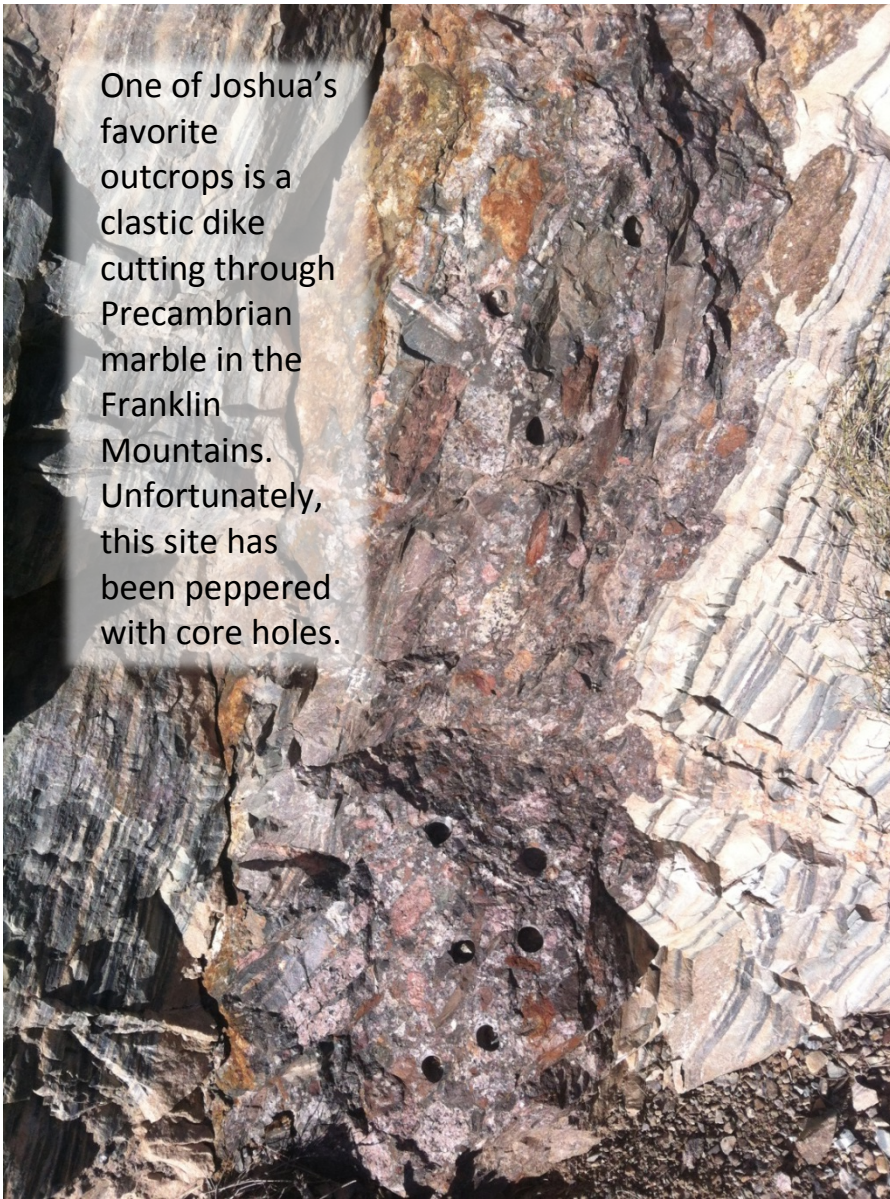


When Becca takes students to Mormon Rocks Recreation Area, they have a tough time identifying rocks that have been painted over!

So what as professors, students, and enthusiast to do in the field to set examples for our future and current geoscience protégés? Here are some ideas....

Teach the Ethic, Use the Rule – I know I have been guilty of complaining about State and National Park rules that prohibit sample collection, but in the grand scheme of things, I think we can agree to the principle behind those rules: resources should be protected for the enjoyment and education of all. Rather than grudgingly remind students to leave their hammers in the van, perhaps reinforce the rationale behind the rule. If this outcrop was interesting enough for us to travel to see, then we should leave it in a state so that others can learn and appreciate it, too.

One of Joshua's favorite outcrops is a clastic dike cutting through Precambrian marble in the Franklin Mountains. Unfortunately, this site has been peppered with core holes.



cobbles at an elevation of ~300 feet above sea-level. Impressed with the perfect rounding of the cobbles, park visitors had removed all the cobbles that documented rounding by wave-action during a period of higher sea-level. Aside of the loss of the aesthetic stones, we also lost the direct evidence of ancient sea-level. Now the only vestige of intellectual value of this outcrop comes from the historical accounts and pictures of mounds of rounded cobbles. This example stood out to me because I realized I often reconciled my removal of handsamples as justified as collected “in the name of Science” and thus I was immune from any ethical considerations. Certainly it is valuable to sample in sensitive places, but in general, we can make other decisions. As LNT preaches, leave the place the way you found it so that others can have the same experience of discovery, insight, and appreciation.

Incorporate conversations of ethics while at the outcrop, in transit to the field, or within assignments. Certainly you can think of examples on your own

Follow Leave No Trace Outdoor Ethics – I’ll admit it, I drank the LNT kool-aide, but it was an unexpected conversion for me. After spending years making geologic maps, traipsing across private property lines and choosing traverses based on expected outcrop exposure, I received LNT principles as a barrier to getting my job done efficiently and effectively. However, after spending several seasons in one of the nation’s most heavily and densely visited National Parks, I saw firsthand the impact of repeated missteps and stolen stones. Perhaps the most poignant example came from a sea-cave carved out during Pleistocene glaciation. Although a small and subtle feature only 10-feet wide and equally deep, the cave preserved rounded

of an outcrop that has been defaced. Share your experiences with your students and encourage them to think about what does “responsible use” mean and look like. Take advantage of the trip to the outcrop or the ride home to facilitate group or one-

on-one discussions. Fold ethics into assignments, asking students to articulate their thoughts on ethical behavior. Address it head on. Following in the words of the controversial Smokey Bear, “if not you, who?”



Some photo highlights of the annual Geo2YC division meeting at GSA in Denver:



2013 President Lynsey LeMay updated meeting attendees with the various accomplishments of the Geo2YC Division over the course of the previous year.



2013 Past-president David Voorhees presented 2013 President Lynsey LeMay with a plaque commemorating her successful year helping the Geo2YC Division.



The Geo2YC role in GSA's OTF program


by **Suzanne Traub-Metlay**

Western Governors University

Geo2YC contributed \$125 toward support of a Two-Year College student participating in GSA's inaugural On to the Future (OTF) program during the 125th Anniversary meeting of the Geological Society of America in Denver, CO, during the last week of October 2013. OTF made it possible for undergraduate students from diverse backgrounds including low-income to attend their 1st GSA annual meeting. Only one student participating in OTF 2013 is currently enrolled in a 2YC – Jake Heil, Front Range Community College, Longmont, CO.

Of 89 students who completed GSA's pre-meeting survey, 31 students noted a 2YC background. Of these, 19 students earned their Associate's Degrees before majoring in geology or a related field at a four-year college or university. Fifteen students took a geosciences course at a community college, successfully leading them to their current career paths.

To meet travel, lodging, meal, and registration expenses, roughly \$500 was required per student so Geo2YC funds were bundled with other donations to make each student's participation possible. The GSA Foundation targeted at least \$50,000 in donations to support OTF's 1st year. Special events were held each day during the Annual Meeting so that OTF students could network with potential employers, seek funding opportunities, and explore avenues for future research.

According to GSA, undergraduate and graduate students comprise nearly 1/3 of GSA membership and are its fastest growing sector. Membership diversity is a critical strategic priority for many professional organizations and the GSA Diversity Committee worked very hard to successfully launch this OTF initiative. NAGT and Geo2YC are pleased to help bring underrepresented students, especially those with 2YC experience, to GSA and other conferences where they gain professional presentation skills and the confidence that comes with personal connections among the larger geosciences community. 

Outstanding Adjunct Faculty Award

by **Kaatje Kraft and Alison Beauregard**

Mesa Community College and Northwest Florida State College

We are proud to announce the Winter 2013 awardee of the Outstanding Adjunct Faculty awardee for the Geo2YC division of NAGT. Christopher Khourey, dedicated adjunct faculty at Northern Virginia Community College.

Chris was nominated by Callan Bentley, and he writes,

"Chris Khourey has been a dependable, innovative member of the adjunct faculty in geology at Northern Virginia Community College for most of the time I've been there - at least five years. During that time, Chris has taught at two different NOVA campuses, Alexandria and Annandale. In these two places,

Chris has mastered teaching both our introductory level courses, Physical and Historical Geology. His approach to methodical lectures, the sharing of detailed lecture notes, and involved labs is deeply appreciated by his students. He puts in extra time, uncompensated in any way, tutoring his students in our "Science Learning Center." This is unusual, and commendable. In addition, he has developed brand new 1-credit field courses focused on exploring the geological story behind two iconic mountains in our region, Stony Man



Chris Khourey

(Shenandoah National Park, Virginia), and Sugarloaf (near Comus, Maryland - the "only mountain in the Piedmont").

Last summer, Chris joined my own field class, a four-credit Regional Field Geology of the Northern Rocky Mountains. He audited the class for professional development, and collected samples, photos, and ideas that he now employs in his classes at NOVA. This sort of initiative and dedication to self-improvement impresses me deeply. Chris is a man of sterling character and commitment to his students. I have found him to be utterly dependable, professional in demeanor, and thoughtful and considerate to a degree I hadn't thought possible. It's an honor to have him as a colleague."

Congratulations to Chris from all of us at the executive council of Geo2yc. Our programs wouldn't be what they are without our part-time faculty and we're glad to be able to recognize Chris in the amazing efforts he has contributed toward his department. We are pleased to award Chris with an honorary membership to the Geo2yc division of NAGT for 2014 and he will be in the pool to be our annual outstanding adjunct faculty awardee to be announced at GSA 2014 which includes a professional development award sponsored by Pearson publishing.

If you know of one of your adjunct faculty who deserves recognition (self-nominations are also welcomed), please nominate them at:

http://nagt.org/nagt/divisions/2yc/oafa_nomination.html



MAIL TO

National Association of Geoscience Teachers

P.O. Box 1897, Lawrence, KS 66044, U.S.A.

The membership year runs from
January through December.

NAGT Membership Application / Renewal

ONLINE MEMBERSHIP SERVICES ARE AVAILABLE AT: www.nagt.org

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 Check One: ☐ College Faculty at _____
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APPLICATION TYPE ☐ New Applicant ☐ Renewal

Regular, domestic membership

(JGE online only and *In The Trenches* in print) ☐ \$45

Signature of NAGT member: _____

School: _____

I want printed copies of *JGE* mailed to me ☐ \$35

Membership in NAGT's Geo2YC Division ☐ \$7

TOTAL \$ _____

FOUNDATIONS is edited by Callan Bentley,
Northern Virginia Community College. Please get in
touch with your feedback: cbentley@nvcc.edu