



Bulletin

of the Eastern Section of the National Association of Geoscience Teachers

Volume 67, Issue 2: Spring 2017

ROCKD

Filter checkins

Sort by Date added

Ron Schott
September 03, 2011
Near Boundary Waters Canoe Area Wilderne...
Soudan Iron Formation...

Shanan Peters
May 20, 2008
Near Superior National Forest, MN
Gunflint Iron Formation...

Paul Richard
April 16, 2017
Near Prescott National Forest, AZ
Copper Basin View from Sierra Prieta M...



Rockd: Geology at Your Fingertips in a Mobile World

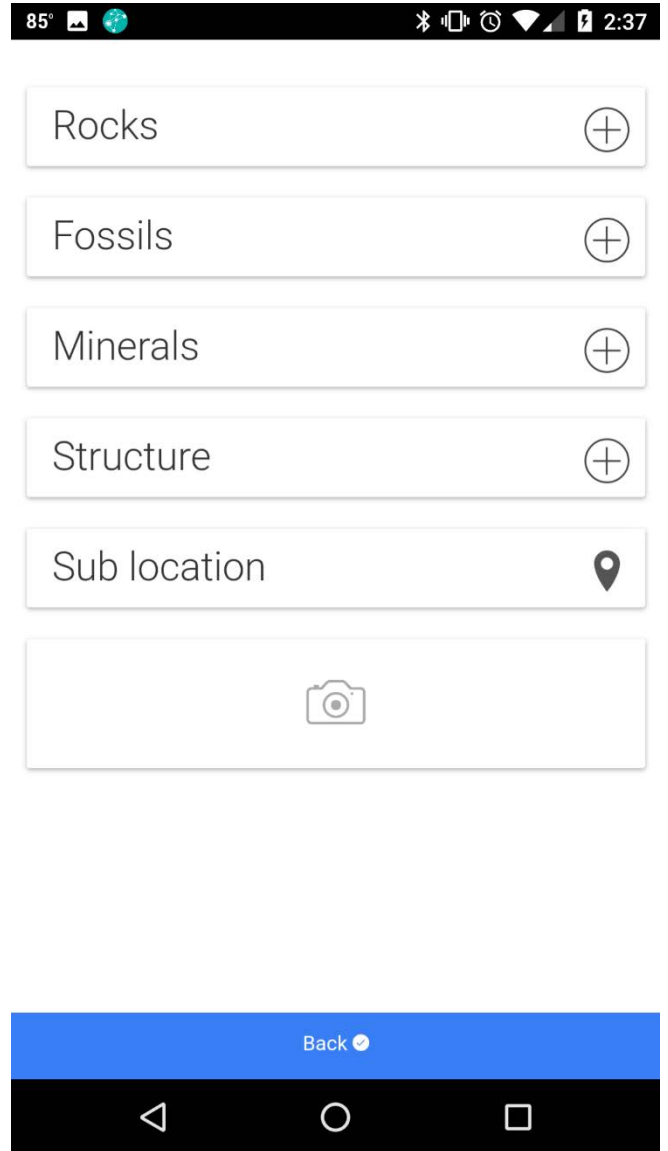
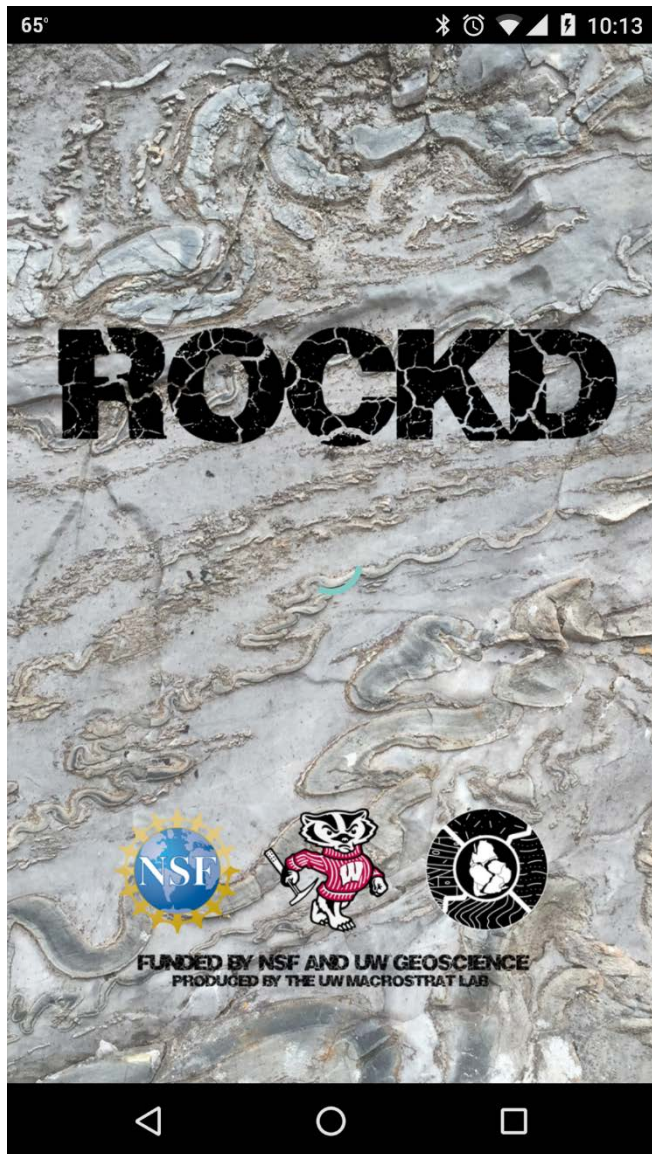
by Ron Schott
GigaGeology.org

Have you ever been travelling and come upon an outcrop or roadcut and wondered what formation it belongs to, what its geological age is, or what's been published about it? Or maybe you're driving through an area that you're unfamiliar with and you'd like to know if there's anything geologically

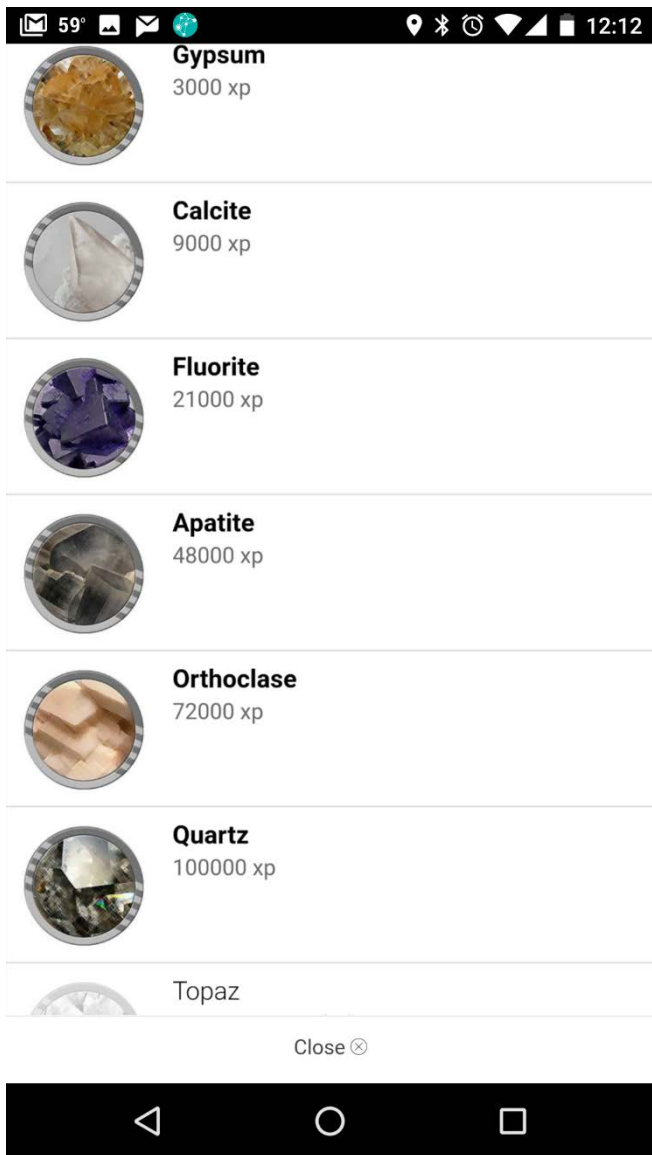
interesting to see nearby. Unfortunately your paper guidebooks and maps are back at home or in the office. If only there was an app for that... Well, now there is!

Rockd is a relatively new app for mobile devices (phones and tablets, iOS and Android; Figure 1) developed at the University of Wisconsin Macrostrat Lab (Shanan Peters, principal investigator & John Czaplewski, lead developer). Rockd helps you: 1) understand what's published about the geology around you, and 2) share your geologic observations and photos with fellow

Rockd users via Checkins. (If the first part of that sounds a little bit like the Flyover Country app, it's because they both draw data from UW Macrostrat databases.) Checkins can be recorded by the app even if you're out in the middle of nowhere without a hint of a cell signal or WiFi, and synced later once you have returned to an area with good connectivity. There is also a website interface <https://rockd.org/explore> that currently allows one to explore the Macrostrat geologic maps and view Rockd Checkins by anyone who has shared theirs publicly (Figure 2). (Data entry is not currently enabled from the web interface, though that capability is on the product's development roadmap.)

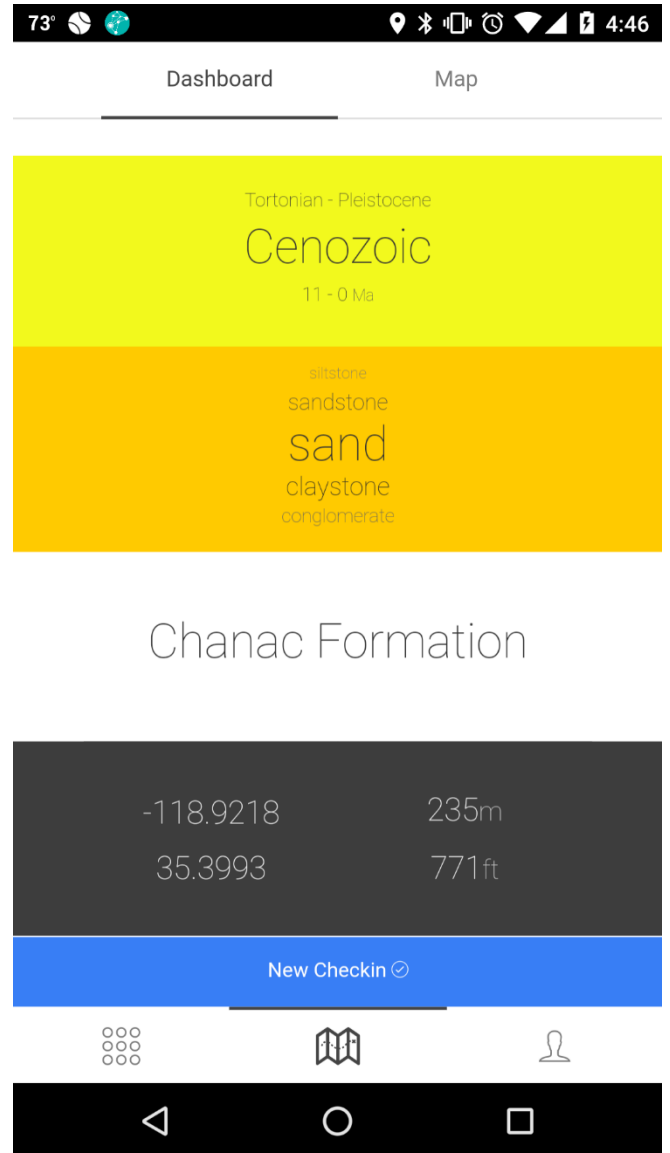


To learn about the rocks at your location Rockd has a Dashboard (Figure 3) that shows the app's best guess for the geologic unit where you are. You can also go to the Map view to see an interactive geologic map of the area around you, along with the locations of Checkins made by Rockd app users (Figure 4). Tapping on this interactive geologic map brings up a description of the unit at the location you tapped as well as a list of geographically relevant publications. New geologic maps are continually being added to the Macrostrat database, so the information that app delivers is constantly improving.



What makes Rockd really interesting and fun, and adds new, valuable information to the scientific knowledge base, is that it empowers you to make and share observations thru Checkins. Recent Checkins from you and other Rockd users can be found in the Activity Feed (Figure 5). Individual Checkins can also be viewed by clicking on a Checkin location pin in the Map view. A new Checkin can be initiated from either the Dashboard or Map views. It may reflect your current location (if you're on a field trip, for instance) or a location that you've previously visited. Each Checkin has a title, a star rating, a photo, geolocation (latitude and longitude), and a date (Figure 6). Checkins can be either public or private. In addition to this basic information, a Checkin may include any number of observations. Observations record information about the rocks (e.g., unit name, mapped unit, age, lithologies, and notes), fossils, minerals, structure, sub-locations, and/or additional photos (Figure 7).

Experience Points (XP; Figure 8) are awarded for the amount and completeness of observations, and users level up the Mohs Hardness scale

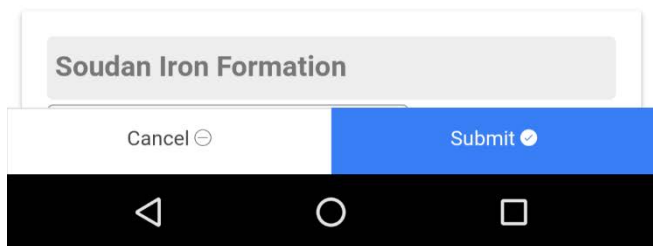
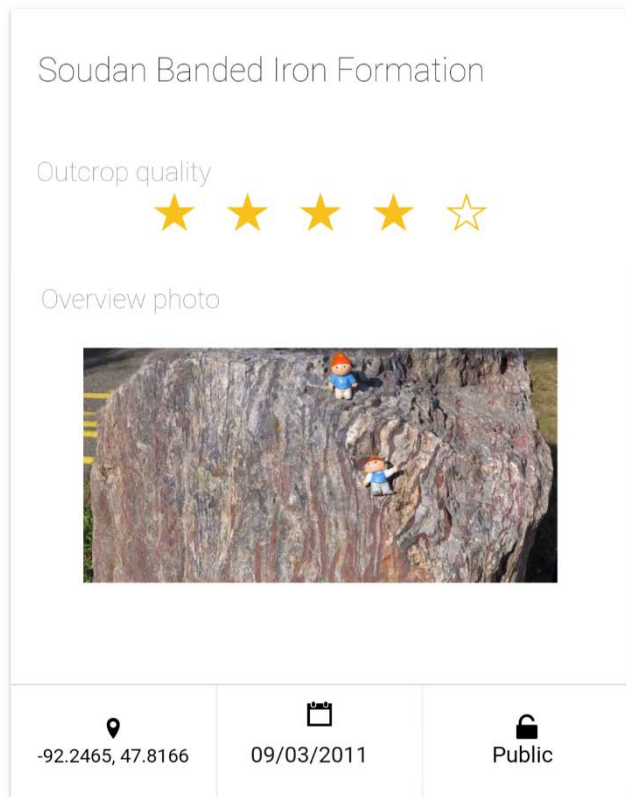


(Figure 9) as a reward for contributing their data. Why do you want to earn XP? Well, we all know that “the geologist who sees the most rocks wins!” But seriously, the gaming aspect of XP makes contributing more fun, and can be a motivating factor to get people to stick with the app. The app also records a GeoTime summary (Figure 10) which is not currently tied to scoring, but reflects another way to measure your progress.

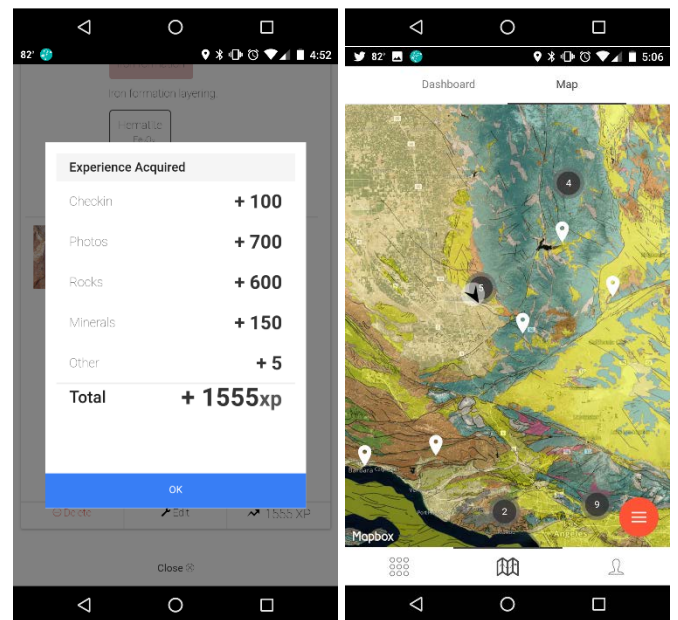
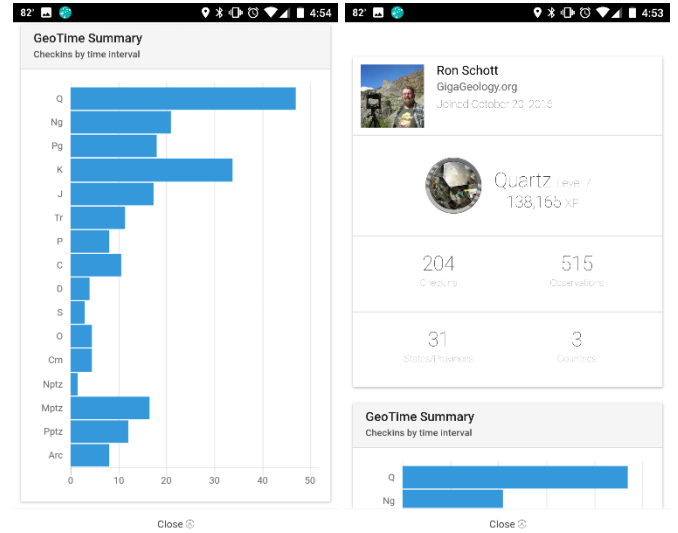
There are a few areas where the app could be improved. The geologic maps don't always register perfectly with the underlying satellite maps. Geologic map detail also varies considerably, though this is being addressed by the addition of new maps on a regular basis. In a few instances,

I've noted that units on the original geologic maps were not always accurately transferred to the interactive map, resulting in mismatched units, however I'm quite satisfied that the development team has rectified these errors quickly when documented. In fact, I've also found the development team to be receptive to other suggestions for improving the app, as well, which is quite commendable. Moreover, though I haven't been able to take advantage of this yet myself, my understanding it that the crowdsourced geologic data that's being procured by Rockd will eventually be available for use by other projects via an API.

together a tutorial video walking thru the process: <https://youtu.be/4STfSZ6dcGU>



The Rockd app is a free download from the Apple App Store or the Google Play Store. Keep an eye on Rockd.org or follow the app on Twitter @RockdApp for updates and developments. If you need a little help making your first Checkin I've put



- Figures:
- Rockd Startup Screen (Cracked word ROCKD)
- Rockd.org/explore (Global geologic map with Checkins; most recent Checkins in view on left sidebar)
- Dashboard (Horizontal bars with Age, Rock type(s), Formation Name, current locality data)
- Macrostrat Geologic Map (expanded to show southern Sierras region)
- Activity Feed (with the grid highlighted at bottom left and Checkins by me and Shanan Peters)
- Checkin Basic Elements (Soudan BIF 4 stars)
- Observation elements (Rocks, Fossils, Minerals, etc.)
- Experience Points (Checkin Summary with 1555XP)
- Scoring Summary (Mine, Level Quartz 138165 XP) and Mohs Scale Levels (with XP requirements)
- GeoTime Summary (bar graph)



Chemical Inputs and Outputs at Subduction Zones: A Lesson Review

by Russell Kohrs

Lord Fairfax Community College

With an ever-increasing focus on providing students with inquiry-based and data-intensive labs, even in introductory Geoscience courses, the pressure is on to find alternatives to some of the more traditional activities while keeping to the spirit of the content. One content area where this can be particularly challenging is igneous geochemistry. Certainly, a good hearty focus on igneous rock identification and a thorough study of Bowen's Reaction Series are still vital, but would it not be great if there were a way to tie these two concepts directly to volcanism and plate tectonics while asking students to use data analysis, spreadsheet, and GIS skills?

Karin Block (2009) has provided just such an activity. In her lesson "Chemical Inputs and Outputs at Subduction Zones", students are required to apply the following skills:

- Retrieving data from databases;
- Identifying data that is necessary for an investigation;
- Obtaining a raw .txt file and importing it into a text editor or spreadsheet;
- Importing data into a third-party program for analysis (MGDS, 2013).

Students are introduced to an extensive set of geochemical databases, EarthChem (2015), housed by Lamont-Doherty Earth Observatory. Certainly, working with such archival professional databases is a skill-stretcher for the typical introductory Geoscience student, but the directions in the activity are clear and guide the students toward the successful retrieval of real geochemical data that they can successfully use to address some key questions:

- How does silica content vary between divergent and convergent volcanics?

- Is it possible to see trends in the presence of major ions predicted in Bowen's Reaction Series when examining geochemical data retrieved from different tectonic zones?
- How do strontium and neodymium isotopic ratios vary between volcanics of different tectonic sources and how can we use this information when examining ancient igneous rocks?
- Are there significant major ion differences between tectonic environments?
- How can these new insights help us understand the mineral compositions of different igneous rocks?

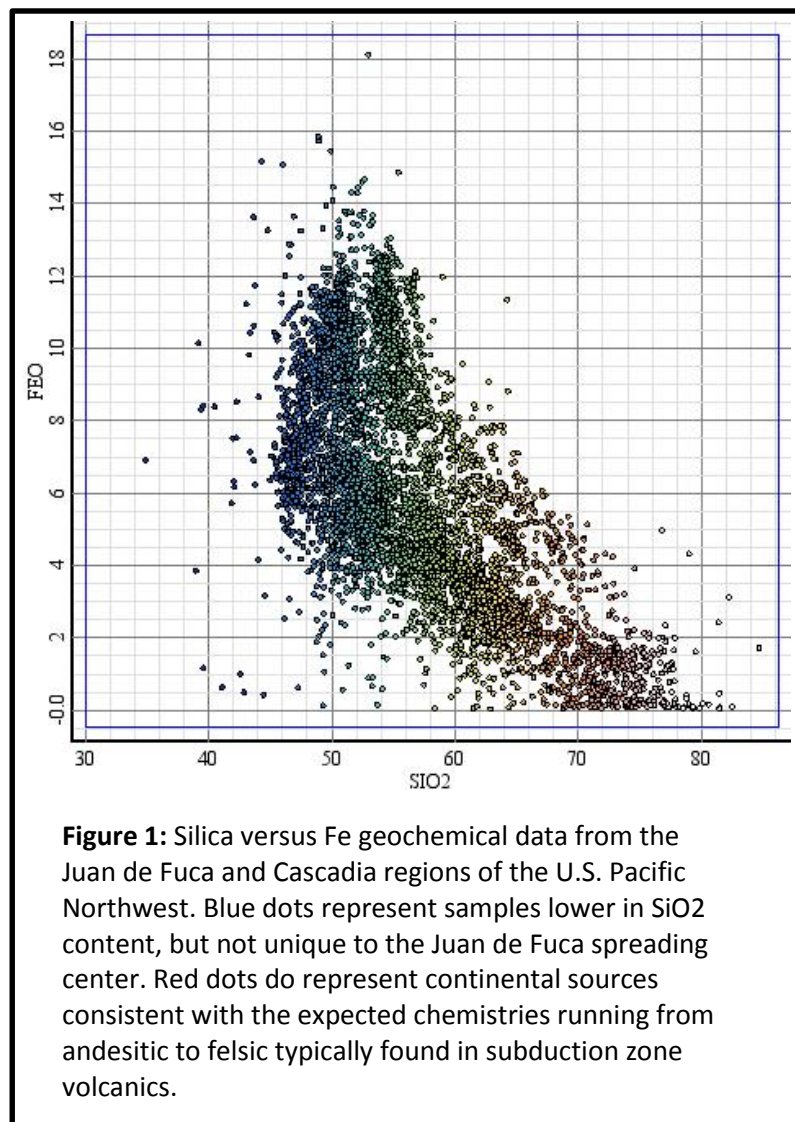


Figure 1: Silica versus Fe geochemical data from the Juan de Fuca and Cascadia regions of the U.S. Pacific Northwest. Blue dots represent samples lower in SiO₂ content, but not unique to the Juan de Fuca spreading center. Red dots do represent continental sources consistent with the expected chemistries running from andesitic to felsic typically found in subduction zone volcanics.

Data are downloaded as a .txt file, but can also be downloaded directly as an Excel file. There are plenty of places where an instructor can guide students toward slightly different avenues, beginning with the blueprint created by Block (2009). During the activity, students import their data into GeoMapApp, a free download provided by

the Marine Geoscience Data System that will, in the case of this activity, allow students to plot the data's geographic extent, symbolize among any number of variables within the dataset, and create scatterplots of two variables to look for trends and address hypotheses. These charts are high-quality and can easily be input into a document. See Figure 1 below. This makes the creation of attractive and professional student lab reports easy and allows them to focus on getting their formatting and discussion correct rather than struggling over the creation of graphs.

While the lab activity was written a few years ago and instructors should make an effort to update and

include the construction of Harker Diagrams, TAS diagrams, and more. And, because the data is both bountiful and freely available, it provides not only the basic functionality described in the lab activity considered here, but also in mining it to answer much more complex research questions for mentored student research or class projects. Finally, the importation of this data into the GeoMapApp program places it in geographic context and provides yet another opportunity for students to practice with a simple Geographic Information System. To be able to examine igneous geochemistry spatially is a powerful way to synthesize and connect the content with plate tectonics.

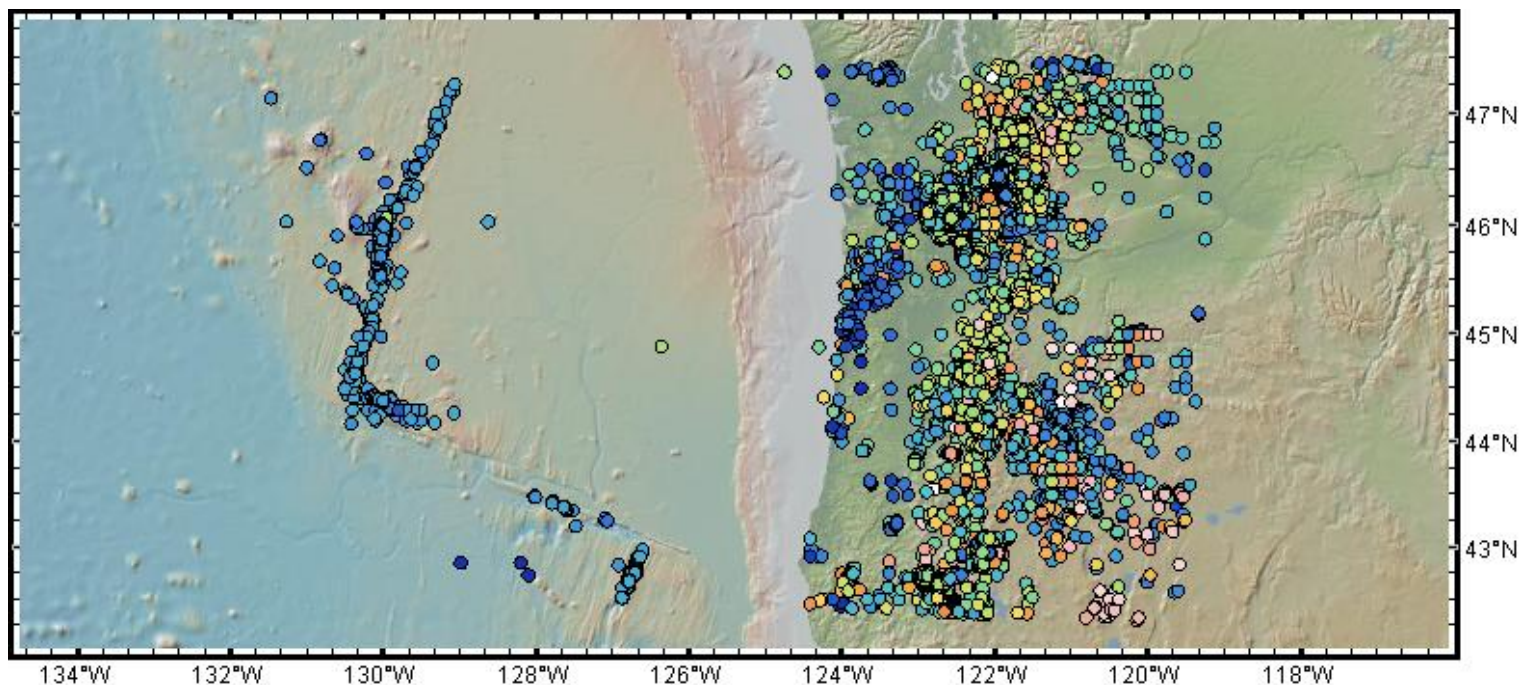


Figure 2: From GeoMapApp, the geographic distribution of the data examined for part 2 of the lab by Block (2009), colored by silica content. Students should be able to make a clear distinction between the geochemistry of divergent and convergent boundaries.

address any dated elements of the lab activity, it remains that this activity powerfully offers educators opportunities to address a wide variety of content related to igneous geochemistry and plate tectonics with even their introductory Geoscience students. The work is not only enlightening and rigorous, but quite enjoyable and satisfying as, though the data can be messy, clear trends are visible with just a few clicks. If applied with the proper preparation, students should find this activity very helpful for both understanding igneous geochemistry more fully and for data analysis skill development. There are also fabulous opportunities for extension activities using Earthchem data. These

References

- Block, Karin (2009). Chemical inputs and outputs at subduction zones. Science Education Resource Center (SERC). <http://serc.carleton.edu/17649>.
- Earthchem (2015). Earthchem. Interdisciplinary Earth Data Alliance. Lamont-Doherty Earth Observatory. <http://www.earthchem.org>.
- MGDS (Marine Geoscience Data System) (2009). GeoMapApp. <http://www.geomapapp.org/>



A simple demonstration to help explain viscosity of lava

by Steve Lindberg

University of Pittsburgh at Johnstown

During the fall 2016 semester I had the opportunity to teach a new course for the first time. “*Earthquakes and Volcanoes*”; a 3 credit non-lab introductory class was designed to complement our Physical Geology course and provide students with a deeper understanding of the processes responsible for earthquakes and volcanic activity on the Earth. I placed a great deal of emphasis on the principles of plate tectonics and how the active, evolving surface features we see on Earth are the result of interactions between the Earth’s lithospheric plates. Within the unit on volcanic eruptions the students were presented with a large collection of rock samples that resulted from various types of lavas.

At one point during the class I showed several short videos of erupting volcanoes and the lava flowing downslope and across the ground. We discussed the variations such as “aa” and “pahoehoe” along with compositional variations including basaltic, andesitic, and rhyolitic lavas. The viscosity of a substance (lava) can be defined as its consistency and resistance to flow. The viscosity of lava is controlled by three factors; the temperature, gas content and composition. In terms of composition the silica content is the most important in determining viscosity. The bonding together of Silicon-Oxygen tetrahedron within the lava create increasing friction and as a result the viscosity of the lava increases. The basic characteristics of lava viscosity and silica content can be summarized in this table below:

Silica Content	Type Of Lava	Viscosity
~50%	Mafic, Basalt	Low
~60%	Intermediate, Andesite	Medium
~70%	Felsic, Rhyolite	High

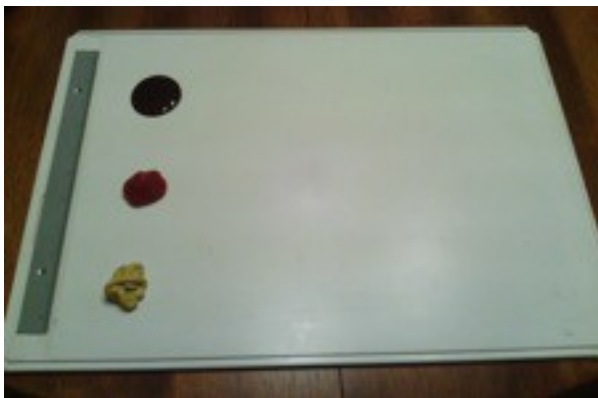
During the class discussion I used the term viscosity several times and after a few moments several hands went up asking for a further explanation of that term.

As I scanned the class and saw the facial expressions I immediately realized a further explanation, and demonstration of viscosity was needed. Knowing that necessity is the mother of invention; I immediately gave the class a brief 5 minute break while I ran down the hall to retrieve from my office a small bottle of cooking oil (which I keep for oil-water density demonstrations) and a 100 ml beaker that would return to the classroom partly filled with water. I gathered the students around one of the classroom tables and poured the water out along with a small amount of the oil. Lifting the table upwards slightly from one end we observed the rate at which both of the fluids moved downslope along the table. For the moment, this demonstration seemed sufficient; but I wanted to go one step better. That evening at home I prepared a somewhat more detailed demonstration. Using a small plastic drafting board I experimented with a variety of items that were on-hand within the kitchen. I wanted to use readily available food substances that were highly visible, environmentally friendly, easy to clean up and familiar to the students. My final selections included Tomato Ketchup, Chocolate Syrup and Brown Mustard. From each container I squeezed approximately 50 cc of each onto the board and then lifted the edge to an incline of about 45 degrees. The results were quite effective in demonstrating the varying degrees of viscosity in substances. Here are a few photos of my results:

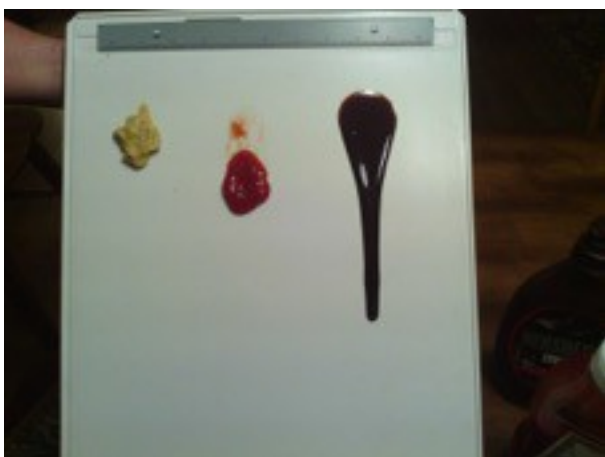
Small plastic drafting board with selected “lavas:”



Board with 50 cc of each lava:



Resulting downslope flow of lava at 45 degree angle after 30 seconds:



I repeated this procedure during the next class session; the student response was extremely positive and I could immediately see their increased level of comprehension about the concept of viscosity. My questioning of them included ranking the substances in terms of silica content and classifying the types of lava each represented. This simple demonstration has many additional applications that could be expanded into a more in depth hands on lab activity. Changing the slope, the characteristics of the surface, varying the temperature and amount of the substances and increasing the number of “lavas” tested for viscosity opens up many options for this teaching activity.



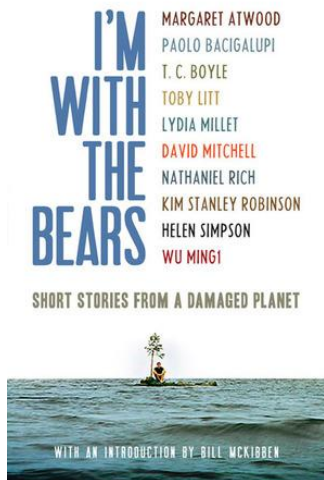
Cli-Fi @ 2y: Learning Geoscience through Climate-Change Fiction

by Steve Winters and Elizabeth Trobaugh
Holyoke Community College

Responding to the challenges of teaching geoscience in the liberal arts setting, we have developed an interdisciplinary course that fulfills both lab science and English graduation requirements. At Holyoke (Massachusetts) Community College, we team-teach a course called “Cli-Fi: Stories and Science of the Coming Climate Apocalypse.” “Cli-fi” refers to climate-change fiction, a now-popular subgenre of science fiction. Our course combines introductory literature and composition with first-year physical geology (including laboratory and field exercises). With interdisciplinary/thematic content and a seminar-style learning environment, our course attracts a variety of students -- science majors, English majors, environmentalists, science fiction fans, etc. We read Paolo Bacigalupi’s cli-fi novel *The Windup Girl* and shorter works from recently published anthologies. Standard college-level geology texts and excerpts from science magazines and journals complement our literary readings. To help students focus on climate change issues and themes, we use a “climate-change stress index” that we have developed to tabulate and categorize climate change impacts. For each story we read, students locate and describe several features of the climate-changed world, such as adaptation/mitigation, breakdown in civilization/social order, climate imbalance/disorder, extinction, illness/disease, and resource scarcity. For the final project, students write their own original cli-fi stories using the storytelling techniques and the climate change science they have learned and researched. Our students present their projects at an end-of-semester cli-fi/science mini-conference on campus.

Learning in Communities at Holyoke Community College

Holyoke Community College (HCC) has a well-established history of interdisciplinary learning. For over 30 years, our college has supported and promoted learning communities, courses that integrate two disciplines united by a shared theme. Two professors from different divisions combine their curricula and join in one classroom to deliver a course that invites students to actively participate in a community of learning where the professors, too, are learning each other's disciplines alongside the students. Our course fulfills three graduation requirements for the largest degree program HCC offers, the Liberal Arts and Sciences Associates Degree: college composition II, a lab science, and integrative learning. While also teaching the principles of good writing, research, and using supporting evidence, our course provides students with a first-year geology curriculum, including labs and field exercises. Labs and field trips offer particularly rich climate-science learning

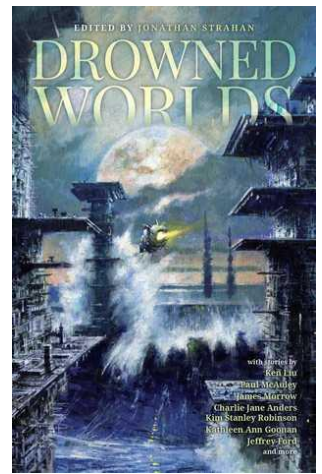


What is Cli-Fi?

Cli-fi is a term coined by climate change blogger and activist Daniel Bloom to describe an emergent sub-genre of science fiction. Modelled after the assonance of sci-fi, cli-fi refers to a body of literary fiction that is responding to anthropogenic global climate change. As cli-fi novelist Claire Vaye Watkins says, cli-fi brings the imagination to the problem-solving equation. We use literature to ignite students' sense of wonder and curiosity. Some believe that literature, in fact, can play a role in galvanizing people's attention and interest in the changes occurring across the globe. Some even believe that climate-change fiction – i.e., “cli-fi” – can motivate people to take action to protect the

opportunities: trips to a local natural history museum and dinosaur trackways to study species extinctions face-to-face; visits to a local community garden to assist rain-garden installation and other green-infrastructures to conserve and enhance our threatened water supplies.

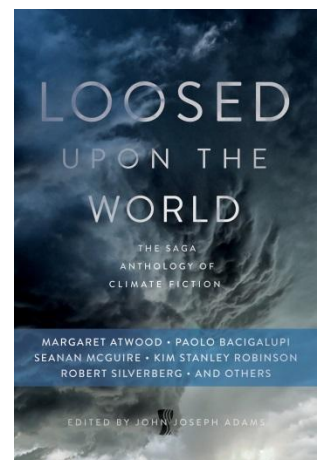
planet. For example, articles in *The Atlantic*, *The New York Times* and the Natural Resources Defense Council magazine *On Earth* have all recently suggested that cli-fi is capturing a growing awareness and concern about environmental degradation, and these works of fiction and imagination are pushing people to care.



Some popular cli-fi novels include *The Year of the Flood* ([Margaret Atwood](#)); *Science in the Capital Trilogy* and (just out) *New York 2140* (Kim Stanley Robinson); *The Windup Girl* and *The Water Knife* (Paolo Bacigalupi). [Some of the best cli-fi](#) storytelling takes the form of short fiction. Some anthologies we've used are *I'm With the Bears* (edited by Mark Martin, Verso); *Drowned Worlds* (edited by Jonathan Strahan, Solaris); and *Loosed Upon the World* (edited by John Joseph Adams, Saga).

It All Begins with a Story ... and the Climate-Change Stress Index

For our course, we have developed a tool we call the Climate-Change Stress Index (CCSI) to help students identify the evidence of climate-change impacts in the fictional setting of each story. This stress-index technique helps us use cli-fi's settings, plots, and characters not just as jumping off points for general discussion but as windows through which students get an integrated view of science and fiction in one lesson. For example, when reading *The Windup Girl*, students notice that resource scarcity, specifically the scarcity of fossil fuels, not only propels the plot but also leads to technological regression: in the world Bacigalupi has created, machines run on animal and human power, rather than on electricity or fossil fuel. This adaptation has the benefit of reducing carbon emissions in a runaway greenhouse atmosphere, but it also places a premium on



calories in a climate-changed world of extinctions and agricultural plagues. Identifying real climate science in a literary text motivates students to take the projected outcomes of climate change fiction seriously and to engage critical thinking and research skills to assess a story’s verisimilitude. The CCSI marks the beginning of the students’ critical analysis of the climate fiction and acts as a window through which students can get an integrated and in-depth view of fiction and science in one lesson. The CCSI lists nine climate-change impacts on society and on the natural world:

- Adaptation/mitigation
- Breakdown in infrastructure
- Breakdown in civilization/social order
- Climate imbalance/disorder
- Ecosystem imbalance – flora and fauna
- Illness/disease
- Positive/negative feedbacks
- Regression (psychosocial, biological, technological, etc.)
- Resource scarcity

For example, with student contributions, the CCSI for Robert Silverberg’s “Hot Sky” (from *Loosed*), looks like the example on pages 12 and 13.

Science-story Intersects

Once CCSI impacts have been tabulated, students are ready to dig deeper into the text using a technique we call story-science intersections: a series of probing and/or leading science questions that critically explore the science that underlies the narrative. Intersects also provide a model for the final cli-fi science project.

Intersects are essentially fact-finding/fact-checking activities that ask believability questions:

- *What is the science, if any, that underlies the fiction?*
- *Is the science used in a believable way?*
- *Does the story seem plausible?*
- *Does the story have verisimilitude?*

For example, following a reading of Paolo Bacigalupi’s story “The People of Sand and Slag,” (<http://windupstories.com/books/pump-six-and-other-stories/people-of-sand-and-slag/>), we ask

students to dig deeper into the following story excerpts:

Excerpt from “The People of Sand and Slag”

We ate sand for dinner. Outside the security bunker, the mining robots tumbled back and forth, ripping deeper into the earth, turning it into a mush of tailings and acid rock that they left in exposed ponds when they hit the water table, or piled into thousand-foot mountains of waste soil. It was comforting to hear those machines cruising back and forth all day. Just you and the bots and the profits, and if nothing got bombed while you were on duty, there was always a nice bonus.

After dinner we sat around and sharpened Lisa’s skin, implanting blades along her limbs so that she was a like a razor in all directions . . .

Lisa laughed and took a spoonful of tailings. “We can eat anything. We’re the top of the food chain.”

“Weird how it [the dog] can’t eat us.”

“You’ve probably got more mercury and lead running through your blood than any pre-weeviltech animal ever could have had.”

“That’s bad?”

“Used to be poison.”

“Weird.”

Intersects from “The People of Sand and Slag”:

Text: “We ate sand for dinner.”

Example questions:

- *How is it possible any living thing could “eat” sand or rock? Have you heard of lichens?*

Text: “Outside the security bunker, the mining robots tumbled back and forth, ripping deeper into the earth, turning it into a mush of tailings and acid rock that they left in exposed ponds when they hit the water table or piled into thousand-foot mountains of waste soil. ”

Example questions:

- *Where does the acid come from?*
- *Can you describe the geochemistry of the tailings ponds?*
- *How would you describe the “waste soil”? Is it a soil at all? How is the presence of acid related to absence of normal vegetation?*
- *How are the soils of “The People of Sand*

*and Slag” similar to the soils on the Moon?
On Mars?*

Intersects from “The People of Sand and Slag”:
Text: “We can eat anything. We’re the top of the
food chain.”

Example question:

- *But if you can eat anything, aren’t you on
the bottom of the food chain?*

Text: “You’ve probably got more mercury and lead
running through your blood than any pre-weeviltech
animal ever could have had.”

“That’s bad?”

“Used to be poison.”

“Weird.”

Example questions:

- *What’s “weeviltech”? (A central concept in
Bacigalupi’s imagined world. We generally
define it as genetically modified organisms
or cellular organelles designed to catalyze
and metabolize inorganic, otherwise
poisonous foodstuffs such as native metals
and minerals.)*
- *What other (real!) organisms may also have
adapted weeviltech-like metabolisms?*
- *In what way do extremophiles have their
own version of weeviltech?*
- *Where on Earth today or in the geologic
past have we seen organisms that possess a
kind of weeviltech referred to in “The
People of Sand and Slag”?*

The Cli-fi Final Short-Story Project and End-of-Semester Celebration

“An imaginary garden with real toads in it.”

– Marianne Moore

“Cli-fi is where art meets science, where data meets
emotions, and where science meets art, too.” –

Daniel Bloom

As the culmination of the semester, we ask students
to write their own cli-fi short stories. We encourage
them to explore any of the ideas, themes, settings,
climate/Earth science concepts that have come up in
class or that they’ve generated in their imagination.
While climate change often brings visions of
dystopian settings and situations, we have also read


stories that offer more hopeful visions of problem-
solving and adaptation. In their stories, we want
students to explore how humans might adapt to a
new environment, a new reality. On the final day of
the semester, we celebrate each student’s final cli-fi
science project and short story with a reception,
including refreshments and invited guests (faculty,
former cli-fi students, and administrators). Our
students never fail to amaze us with the stories they
create out of science and imagination.

Summary/conclusion

We are fortunate at HCC to have a tradition of
innovative, interdisciplinary learning that has
allowed us to develop a rich climate-science
curriculum centered on the popular literary sub-
genre of cli-fi. It is our belief that the best science
and technology are always creative, and cli-fi helps
add the imagination to the geoscientist’s toolkit.

Our curriculum combines the techniques of critical
thinking and textual analysis from the sciences and
the humanities. The fictional settings and scenarios
of cli-fi expand the imagination and show
geoscience principles in a fictional context, inviting
students to confront the role of humanity in a
climate-changed world and perhaps inspiring
students to learn more about how humanity might
cultivate a more cooperative relationship with the
Earth.

Works Cited

- Adams, Joseph, editor. *Loosed Upon the World:
the Saga Anthology of Climate Fiction*. Saga
Press, 2015.
- Bacigalupi, Paolo. “The People of Sand and Slag.”
Windupstories, 15 Apr. 2017,
[windupstories.com/books/pump-six-and-
other-stories/people-of-sand-and-slag/](http://windupstories.com/books/pump-six-and-other-stories/people-of-sand-and-slag/).
- Bacigalupi, Paolo. *The Windup Girl*. Night Shade
Books, 2015.
- Martin, Mark, editor. *I’m With the Bears: Short
Stories from a Damaged Planet*. Verso, 2011.
- Silverberg, Robert. “Hot Sky.” *Loosed Upon the
World: the Saga Anthology of Climate Fiction*,
edited by Joseph Adams, Saga Press, 2015,
pp. 203-228.
- Strahan, Jonathan, editor. *Drowned Worlds: Tales
from the Anthropocene and Beyond*. Solaris,
2016. 

Instructions: Please contribute one factor (an example and a brief quote with page number). Find passages that illustrate the following themes and features of the climate-changed world:

Stress factor/impact	Example from the text -- record a brief quote, with page number, and bullet point observation(s).	Contributor (put your initials here)
Adaptation/mitigation	<p>Robert Silverberg writes, "The shot of screen he'd taken at dawn still simmered like liquid gold in his arteries. He could almost feel it as it made its slow journey outwards to his capillaries and went trickling cozily into his skin, where it would carry out the daily refurbishing of the body armor that shielded him against ozone crackle and the demon eye of the sun" (203).</p> <ul style="list-style-type: none"> This shows how humans had to create a new method of protecting themselves against the sun's UV rays. 	KS
Breakdown in infrastructure	<p>The narrator writes, "The berg was due to go to San Francisco, which was in a bad way for water just now. The whole west coast was. There hadn't been any rain along the Pacific seaboard in ten months" (205).</p> <ul style="list-style-type: none"> Community water supplies or stocks were very low. Large west-coast cities were desperate for fresh water. 	SW
Breakdown in civilization/social order	<p>When Carter thinks to himself, "The idea of dropping everything to deal with the problems of some strange ship didn't sit well with him. He wasn't paid to help other captains out, especially Kyocera-Merck captains. Samurai Industries wasn't fond of K-M these days. Something about Gobi reclamation contract, industrial espionage, some crap like that. Besides, he had a berg to deal with. He didn't need any other distractions just now" (208).</p> <ul style="list-style-type: none"> Where he had to choose between the difficult decision of helping out Calamari Maru or finishing his job to deliver this berg that was melting at a quick rate. 	AA
	<p>Carter says, "Who had asked for any of this, the heavy green sky, the fiery air, the daily need for Screen, the million frantic improvisations that made continued life on Earth possible? Not us. Our great-great-grandparents had, maybe, but not us. Only there not here to know what it's like, and we are" (219).</p> <ul style="list-style-type: none"> This passage shows how the world's climate has drastically changed over time and also what was necessary in order to adjust to the warming of the Earth. 	JEC
Climate imbalance/disorder	<p>The narrator writes, "Rennet was maintenance/operations, a husky, broad-shouldered little kid out of the mid-west dust-bowl" (207).</p> <ul style="list-style-type: none"> The North American Mid-West in 2133 is suffering a dust-bowl environment reminiscent of the 1930's 	EB

Ecosystem imbalance – flora and fauna	<p>The narrator writes. “The heart of the ship was a vast tank, a huge squid-peeling factory occupying the whole mid-deck” (211).</p> <ul style="list-style-type: none"> • The author is implying that all other top predators are gone – leaving only squid. 	SW
Illness and disease	<p>Silverberg writes, “It was midmorning. The shot of Screen he’d taken still simmered like gold in his arteries” (203).</p> <ul style="list-style-type: none"> • UV radiation is so intense in this climate changed world of 2133, humans must inject sun screen intravenously. 	SW
Positive/negative feedbacks	<p>Silverberg writes, “It was a cock-eyed place to be trawling for icebergs. But the albedo readings said there was a berg somewhere around there, and so the <i>Tonopah Maru</i> was there too” (203).</p> <ul style="list-style-type: none"> • One would not expect high albedo readings in the middle of the ocean. Low albedos would indicate ice melting conditions (a negative feedback). 	SW
Regression (social, technological, etc.)	<p>Silverberg writes, “This was open territory, pretty much a lawless zone where old-fashioned piracy was making a terrific comeback” (207).</p> <ul style="list-style-type: none"> • This passage clearly shows regression in the fact that they say they are going to bring piracy back which we all know was practiced very long ago. 	AK
Resource scarcity	<p>The narrator says, “With the one-time farming heartland of North America and temperate Europe now worthless desert, and the world dependent on the thin, rocky soil of northern Canada and Siberia for its crops, harvesting the sea was essential” (212).</p> <ul style="list-style-type: none"> • It’s clarifying that the U.S. can no longer harvest for itself, so the ocean is their only real bet for survival. 	JC
	<p>Silverberg writes, “Carter said, ‘Start getting the word around. That berg’s down here, south-southwest. We get it in grapple tomorrow, we can be in San Francisco with it by a week from Tuesday.’</p> <p>‘It didn’t melt between Antarctica and here, it’s not gonna melt between here and Frisco. Get a move on, man. We don’t want LA coming in and hitting it first’” (205).</p> <ul style="list-style-type: none"> • This passage emphasizes the need for icebergs to humans, particularly in San Francisco. Along with the fact that it’s a competition to the possession of them against neighboring cities. 	EB

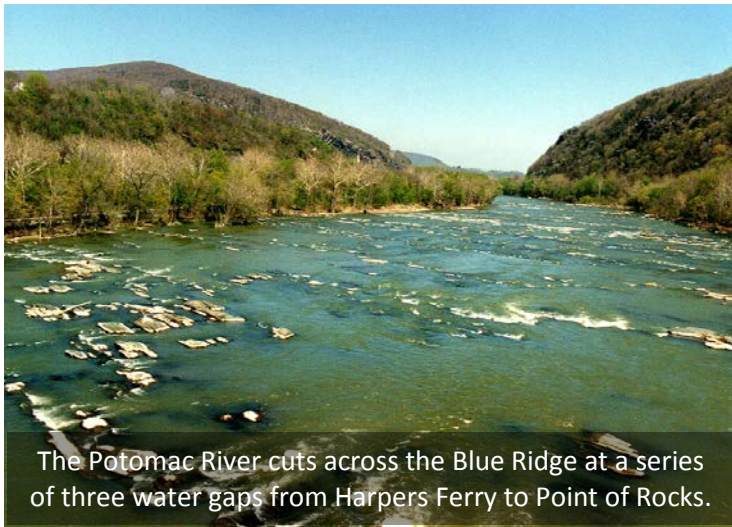
Skip to (Don't Trip Over) The Fall Line in Maryland in 2017!

by **Dave Ludwikoski**

Community College of Baltimore County

NAGT-ES Vice President and Conference Host

As the home of NASA Goddard Space Flight Center, the Space Telescope Science Institute, the world famous Calvert Cliffs, and spanning five geographic provinces from the Appalachian Plateau to the Coastal Plain, Maryland is at the heart of an area rich in geologic history and science exploration. And sitting on the midpoint, or "Fall Line" of the area lies the Baltimore metropolitan area, whose human history has been shaped by its geology.



The Potomac River cuts across the Blue Ridge at a series of three water gaps from Harpers Ferry to Point of Rocks.

The Community College of Baltimore County (CCBC) is the largest community college in the state of Maryland, comprising five campuses and two extension centers, and serving over 60,000 credit and non-credit students annually for 60 years. Our conference headquarters will be on the oldest and largest CCBC campus, in Catonsville, MD (800 S. Rolling Road - located on the southwest side of Baltimore, just outside the Baltimore Beltway) which has undergone some significant building construction and renovation in recent years. The newest building to be completed is our new Mathematics and Science Hall (MASH), which was dedicated in August, 2015.

Conference Events Overview

Our meeting will begin on Thursday evening at CCBC Mathematics and Science Hall, 800 S. Rolling Road, Catonsville, MD 21228, with light refreshments followed by a planetarium show. The Benjamin Banneker planetarium is one of the new highlights of the building, and houses a new Spitz SciDome XD digital projector.

Friday morning will involve presentations and round table discussions of ideas among participants that choose to share their "best practices" in teaching in the nearby lecture halls.

Friday afternoon will involve a local field trip to some nearby interesting geological sites, led by our own Martin Schmidt.

Friday evening, as always will be our infamous GeoAuction at the nearby Holiday Inn Express & Suites, our host hotel for the conference.

Saturday is field trip day. There are 2 choices, with details listed in the Agenda section.

Option #1: "The Blue Ridge of Maryland and Nearby Areas." with Martin Schmidt.

Option #2: "Goin' South to Comb the Beaches and Cliffs of Calvert." with Dave Ludwikoski.

Saturday evening will involve our annual Eastern Section Awards Dinner banquet at CCBC with Lucy Edwards from USGS as our guest speaker.

Sunday morning is our annual Eastern Section business meeting, held at a nearby restaurant, where breakfast will be on your own.

Come to Maryland for Variety!

Maryland spans the 5 major provinces that characterize the central Appalachians. The Baltimore area includes the Coastal Plain and 5 different terranes of the Piedmont. CCBC is on a hill on Coastal Plain sediments (Patuxent Fm) but down the hill is surrounded by Piedmont amphibolites (Mt Washington Fm - and the building stones came from nearby quarries!) which were island arc intrusives - so it's right in the Fall Zone.

Less than a mile SE are metamorphosed island arc volcanic rocks of the Chopawamsic Terrane, and 3 miles to the NW are the folded interfingerings of the Precambrian-based Baltimore Terrane. The Coastal Plain sediments on the western side of the Chesapeake Bay have been uplifted enough to create relief - and cliffs along the shore exposing their fossils - while the sediments east of the Bay show much less relief. As they say, "Mountains to the Sea" - there's lots to explore.



Fossil-bearing strata at Calvert Cliffs

Other Nearby Attractions include:

Maryland Science Center – A neat museum with lots of hands-on displays, including a good dinosaur exhibit, planetarium, and observatory in down Baltimore. www.mdsci.org

National Aquarium – walk through exhibits on a variety of marine environments. <https://aqua.org/>

Benjamin Banneker Historical Park, Oella MD – Interesting museum and outdoor exhibits on the site of property owned by a free black scientist who published an almanac, helped to plot the boundaries of Washington, D.C., and was a friend of Thomas Jefferson.

<http://www.baltimorecountymd.gov/Agencies/recreation/countyparks/mostpopular/banneker/>

Soldiers Delight Natural Environmental Area - A serpentine area preserved for its special plants and its abandoned chromite mines, once the largest source of chromite in the world.

<http://dnr.maryland.gov/publiclands/Pages/central/soldiersdelight.aspx>.

Conference Agenda

Thursday, June 8:

3:00 pm – 5:30 pm Conference Registration at CCBC Mathematics and Science building, 800 S. Rolling Road, Catonsville, MD 21228. Dinner on your own this evening.

7:00 pm – 8:00 pm Light refreshments followed by host Dave Ludwikoski presenting a planetarium show on "The Great American Solar Eclipse: August 21, 2017", followed by the award-winning full dome movie "Solar Superstorms." The show will be at the Benjamin Banneker Planetarium, CCBC Mathematics and Science Hall.

Friday, June 9:

8:00 am – 9:00 am Conference check-in and registration at CCBC Mathematics and Science building. Breakfast available on your own or at the Holiday Inn.

9:00 am – 12:00 pm Presentations and Round Table Discussions: "Best Practices in Teaching."

12:00 pm – 1:00 pm Box lunches provided prior to afternoon field trip.

1:00 pm – 5:00 pm Local Geology Tour – **Vans leave from CCBC Lot 2 near Mathematics and Science Hall.** Our afternoon field trip will take us to nearby Patapsco Valley State Park, where the Patapsco River cuts an excellent cross-section through the Maryland Piedmont. We plan to visit three sites: First, a site with a base of Rodinia rock (the famous Baltimore Gneiss) and its overlay of now-metamorphosed sediments that illustrate the contrasting landforms created in adjacent rocks of varying resistance. Second, if arrangements with the park go as planned, walk across the fault between continental rocks and early Paleozoic island arc rocks, to see their significant differences. And third, take a scenic walk to see multiple pegmatite dikes and small waterfalls in those island arc rocks. Be prepared for a little

hiking as these aren't roadcut visits, but just hills, not mountains. In the park we'll be collecting photos, not rocks.

5:00 pm – 7:00 pm Dinner on your own.

7:00 pm – 9:30 pm Holiday Inn Express - Geo-auction, with desserts and other sweets.

Saturday, June 10:

8:30 am – 5:00 pm Field Trips – Box Lunches are provided! **Vans leave from CCBC Lot 2 near Mathematics and Science Hall.**

Option #1: “The Blue Ridge of Maryland and Nearby Areas.” with Martin Schmidt.

This trip visits the multiple ridges of the Maryland Blue Ridge, and even a bit into the Valley & Ridge. We'll start with views from Catocin Mountain in the east and cross the valley in the center of the Blue Ridge province to see the (now-meta)basalt emplaced when Rodinia rifted apart. We hope to visit a small but well-decorated cave at the eastern edge of the Valley & Ridge. Then we'll head up to a fine viewpoint on the western side of the Blue Ridge which is South Mountain, at the first monument built to honor George Washington, now along the Appalachian Trail. We'll come down for a visit to get the lay of the land around Harpers Ferry, WV, and head back across the Blue Ridge to visit Sugarloaf Mountain, a scenic quartzite monadnock in the Piedmont. There may be other stops depending on time available. The trip involves some walking but nothing difficult; rock collecting is limited since we're often in parks.



Tension gashes in the Sugarloaf Mountain Quartzite

Option #2: “Goin’ South to Comb the Beaches and Cliffs of Calvert.” with Dave Ludwikoski.

Special Guests: **Stephen Godfrey**,
Curator of Paleontology, *Calvert Marine Museum*,
Solomons, MD
Lucy Edwards,
Research Geologist, *USGS*, Reston, VA

Tentative plans at the moment involve first traveling to the Calvert Marine Museum in Solomons, MD, where we will meet the staff and tour the museum, especially the fantastic exhibit on the marine life of the Miocene Epoch (including sharks). Then we will get an exclusive “behind the scenes” tour of the museum’s collections. Next, we will visit several sites along the bay and learn about the paleontological and stratigraphic importance of the units present, along with opportunities to collect. The sites we visit will be tide dependent, so water-proof boots or waders may be a good idea along with sample bags.

7:00 pm – 9:00 pm Eastern Section Awards
Dinner Banquet in Atrium, Mathematics and Science Hall, CCBC.

Speaker: Lucy Edwards, United States Geological Survey Research Geologist,
“Buried surprises: A paleontologist tells tales of the Chesapeake Bay impact crater.” Talk to be presented in MASH 032 (next to planetarium and adjacent to Atrium).

Sunday, June 11:

9:00 am – 11:00 am Eastern Section business meeting. Breakfast will be available on your own at the meeting which will be held at a restaurant near the hotel.

Hotel/Housing Information:

It is the responsibility of the conference attendees to arrange for their hotel rooms or other housing. Conference lodging is NOT included in your registration fees.

The Conference Hotel will be the Holiday Inn Express & Suites where a block of rooms have been reserved: **Holiday Inn Express & Suites: 5701**

Baltimore National Pike, Catonsville, MD 21228; this is about 10 minutes from the CCBC campus. **Phone: 443-251-2000.** This location has both single and double rooms reserved for the conference attendees. This hotel has been completely renovated recently and is an excellent deal for the price! **We need as many people as possible to reserve rooms here in order to get the group rate.** Please be sure to mention that you are in the National Association of Geoscience Teachers group. Single and double hotel rooms have been reserved at a cost of \$104 per night plus taxes and will be held only until May 15. **This date is firm from the hotel, so DON'T PROCRASTINATE!! After that, the room rate goes up to the regular rate! The rate includes breakfast.**

Another hotel in walking distance of the HIE includes a Quality Inn, 5801 Baltimore National Pike. Also a short drive away (one exit north) are a Hampton Inn, 1810 Belmont Avenue, and another Quality Inn, 1806 Belmont Avenue, as well as others.



On Friday evening the GeoAuction will be held at the Holiday Inn. On Saturday the banquet will be at CCBC MASH atrium and the field trips on Friday and Saturday will leave from nearby Lot 2 at CCBC.

Hotel Directions: Take I-695 to Exit 15A (US 40 East toward Baltimore) and stay in the right lane. The hotel is on the right at the southwest corner of Ingleside Road. If you pass a Walgreens and a Kentucky Fried Chicken, you've gone too far!



The Setters Schist, a garnet-bearing metasedimentary rock in the Maryland Piedmont.

Directions to CCBC from the hotel: Turn right out of hotel parking lot onto Ingleside. Follow Ingleside approximately 2 miles, crossing under I-695, as well crossing as Edmondson and Frederick roads. At Frederick Road, Ingleside becomes Bloomsbury Avenue. **(Lots of good restaurants here!)** Go straight. After approximately another mile, Bloomsbury dead ends into S. Rolling Road at Catonsville High School. Turn left, and then in about .25 mi turn right at the campus entrance (Campus Drive – look for the electronic sign).

Once on campus: Go down and then up to the hill and bear right at the fork. The MASH building is the 3rd building on the left across from the Center For The Arts building. Park either in Lot 2 (on left just before MASH building) or in Lot 3 (behind Arts building). The Banneker planetarium is the curved part of the building on the right as you face the building. You have arrived!

Directions to CCBC from I-695: Use Exit 12B from I-695 (Wilkins Avenue West). Follow Wilkins Avenue west about .4 miles and bear right onto Valley Road as you approach its traffic light. Follow Valley Road (narrow but scenic) through one stop sign, then, at the first traffic light (which is Rolling Road), Valley Road becomes Campus Drive. Continue straight across Rolling Road, enter the campus, and follow the on-campus directions above.

Campus Map is available at this link:

<[http://www.cbcemd.edu/~media/CCBC/About%20CCBC/CCBC%20Locations/PDFs/Full Size map catonsville.ashx?la=en](http://www.cbcemd.edu/~media/CCBC/About%20CCBC/CCBC%20Locations/PDFs/Full%20Size%20map%20catonsville.ashx?la=en)> or go to

<<http://www.cbcemd.edu/>> and find the map under the Campus Life & Activities tab.



Registration Form

National Association of Geoscience Teachers Eastern Section Conference and Field Trips

June 8-11, 2017, Catonsville, MD

Each participant must submit a registration form. Lodging accommodations are the responsibility of the registrant. Pre-registration for the conference deadline and the **firm** hotel cut-off date is **May 15, 2017**.

Registration questions? Please contact Dave at dludwikoski@cbeemd.edu.

Please fill in the form below and indicate your registration preferences. **Please register early!**

Make a check for the total registration fee payable to **David J. Ludwikoski** and send it along with this form to: David J. Ludwikoski, 1020 Marksworth Road, Catonsville, MD 21228.

OR Register Online at: <https://nagt2017easternconference.eventbrite.com>

Name _____

Affiliation: _____

E-mail: _____

Mailing Address: _____

Cell phone: _____ Home phone: _____

OESTA Award Winners from Spring 2016 meeting attend Free! Please indicate this on your registration information.

Please circle the appropriate selection(s) below:

Full Conference Registration (includes Saturday field trip but not Saturday Banquet)

NAGT member	\$60
(after May 15, 2017)	\$70
Spouse/Significant Other	\$40
Student	\$40
Non-member	\$70
(after May 15, 2017)	\$85

Check if you are a 2016 OEST Awardee: _____

Friday- Only Registration

NAGT member	\$45
Student	\$35
Non-member	\$50

Saturday- Only Registration

NAGT member	\$45
Student	\$35
Non-member	\$50

Saturday Awards Banquet and

Keynote Speaker - all \$30

(no charge for 2016 OESTA winners & one guest)

Add Field Trip Fee (Please circle) \$6 or \$20

Total Fee Enclosed: _____

Sunday Business meeting held at nearby

restaurant. Breakfast available.

Please circle: I will attend business meeting yes no

Please indicate any dietary restrictions here: _____

Saturday Field Trip Choice (choose one):

_____ Blue Ridge with Martin Schmidt
(Add \$20 admission fee to registration)

_____ Calvert Cliffs & Marine Museum tour
(Add \$6 admission fee to registration)

Friday Box Lunch Sandwich (choose one):

_____ Roast Beef and Cheddar on Ciabatta

_____ Grilled Chicken Breast on Focaccia

_____ Roasted Veggie on Multigrain

Saturday Box Lunch Sandwich (choose one):

_____ Spicy Italian Baguette

_____ Turkey and Sharp Cheddar

_____ Hummus, Avocado & Roasted Veggie Wrap



PRESENTATION PROPOSAL FORM
NAGT-Eastern Section 2017 Annual Meeting

Submission Deadline: May 15, 2017

Presentations will be scheduled for **45-minute blocks**. Double sessions will be accommodated only as space and time permits. As many presentations as possible will be accommodated.

Return completed form to: David J. Ludwikoski, 1020 Marksworth Road, Catonsville, MD 21228

You may also submit proposals electronically at dludwikoski@cbbcmd.edu.

Poster displays are also welcome and should use this same proposal form.

Name: _____

Email: _____

Affiliation: _____

Address: _____

Phone: _____ Fax: _____

Presentation Title: _____

Description (max. 100 words): _____

Presentation equipment needed: (all rooms have projectors, computer, laptop drop and sound)

Other facilities needed? (subject to availability) _____

Check one: Poster presentation _____ Oral Presentation _____

EASTERN SECTION NAGT

Officers

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Monroeville, PA 15146; (H) 724-989-4190; (W) 412-
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Vice-President: Dave Ludwikoski, Community College
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Publicity Chairperson: Vacant; volunteers welcome.

NAGT Geo2YC Division Representative: Rich
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Award Chairperson

All awards currently handled by Steve Lindberg; 814-
539-7723(H); email <minerlight@atlanticbb.net>.

Awards listing:

- Distinguished Service Award
- John Moss Award
- Outstanding Earth Science Teacher Award
- Ralph Digman Award
- James O'Connor Memorial Geology Field
Course Scholarship

Eastern Section NAGT web site addresses:

<<http://sites.google.com/site/nagtes>>

or just <www.nagtes.org>.

State Councilors' years of office are in brackets;
terms begin and end at the spring section meeting.

State Councilors

Delaware

Lawrence Matson, Dept of Natural Resources &
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Rich Gottfried; contact info in Geo2YC Representative
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[15-18].

Michael Passow, 296 Central Ave., Englewood NJ
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Don Duggan-Haas, Paleontological Research
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<dugganhaas@museumoftheearth.org> [13-16].

Ontario

No Councilors at present; volunteers welcome.

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[13-16].

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Angela A. McKeen, St. Mary's Catholic School,
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Deb Hemler; contact info in 2nd Vice President listing
above [15-18].