

QUESTIONS, CONFIDENCE, AND WANDERLUST Jean Brierley award talk 3/03/20

Thank you for your kind words, Julie and thank you Catherine Overson for keeping me on track for my Brierley award responsibilities and for organizing this lunch. Good afternoon Provost Jones, colleagues, Brierley award alumni, and guests.

As a teacher I want to capture student imagination and creativity while imparting the information and skills Earth scientists need to understand their observations. To do this I use methods that helped me learn and follow advice from colleagues and students. These methods are summarized in the first part of this talk (Questions). At the same time I try to bolster Confidence, which is the second part of the talk. My father took us on trips, near and far, to teach us about nature, history, and other cultures. He called it wanderlust, and this is the third section of this talk.

Questions

In graduate school professors answered questions with questions until I figured out the answer to my own question. They taught using what was handy for an "easel" (e.g. blackboard, napkin, paper) and asking questions. Equations were solved initially "on the back of an envelope". They taught us to think and use our heads before obtaining further data. Dr. Robert P. Sharp taught one of my favorite courses called Geomorphology seminar which was all field trips; we students were the instructors.

While these teaching methods take time, they promote active learning. Rather than look up everything on a smart phone or computer, I show students how they can use their heads, knowledge, and experience first.

Taking time to listen to student questions is an integral part of my teaching and advising. I learned this early in my career from a student who said that just because I was rushing from a meeting I should not be in such a hurry in class. Professor Franz Anderson in our department told me that taking time to present a topic thoroughly is more important than covering a myriad of topics.

Confidence

My first job was as a field assistant for Dr. Helen Foster of the U.S. Geological Survey. I learned by a combination of correcting my mistakes, watching Helen, and listening; now I use what she taught me in the field and pass it on to students. While working in Alaska Helen had me traversing alone long before I thought possible. She was right; my confidence to take on further challenges increased.

Nevertheless, I was petrified to teach my first course at UNH. The chairman, Herb Tischler, made it easier that first semester by having me teach with Cecil Schneer. Cecil started the class by saying he was sure to make mistakes and the class was responsible for pointing them out and making corrections. To help students remember the geologic time scale, he put a statement on the bottom of the syllabus about Camels who Often Sat Down Carefully ... I still remember a student evaluation from that first class: "Don't be so nervous, we won't hurt you."

Eventually I was confident enough to use the teaching methods I learned in grad school. Students are sometimes afraid to answer questions, but I tell them dare to be right, or as a recent CEPS brochure says: "Don't fool yourself into thinking you can't". When a student said he was able to do a lab he thought he couldn't do, I knew I was doing something right.

Geology jargon can be overwhelming, so I try to break down words. Hornfels is as hard as a son-of-a-gun metamorphic rock; migmatite is a mixed up rock with igneous-like and metamorphic-like parts.

Perhaps you have been asked to teach a subject you didn't understand very well. One of the subjects I teach, crystallography, was hard for me in school, and I took the easier of two crystallography courses (*n.b.* advise students to take challenging courses; they might end up teaching the subject). Crystallography remained hard for me until I team taught mineralogy with Wally Bothner, 1993 Jean Brierley award alumnus. Wally teaches with analogies (often food), and I

learned to use boxes and examples of symmetry all around us. Let's try it.

Teddy bears, for example, have mirror plane symmetry as does this podium, kites, buildings, and the Super Cub we flew in the Alaskan bush. Teddy does not have rotational symmetry, but look at the windows or the printed announcement at your place setting. Both have two-fold rotational axes/mirror.

To test that you understand the principles of symmetry, look at the chocolate distributed. How does the symmetry vary compared to the window?

Wanderlust

Recently I read a book about Alexander von Humboldt who is said to have satisfied his wanderlust in 1799 by going to South America and collecting data on plants, climate, and volcanoes. He recorded the plants at different elevations in the Andes; some of them reminded him of plants in Austria, and he eventually made a map showing the distribution of vegetation zones across the globe.

In geology we encourage this same type of wanderlust by taking students to the field. This photo shows ESCI400 students on a field trip to the Rye Fm. at Newcastle, NH. They are asking questions such as: Why does the black rock vary in grain size? What are the clasts within the black rock and where did they come from? In a subsequent class Professor Johnson will ask the students to interpret the deformation of the white rock (Rye Fm.)

In 1994 with help from the Brierley award to Wally Bothner, we took students to the Grand Canyon and started our department's summer trips for students. Like Dr. Sharp we ask students to be the teachers. In this photo Taylor Hodgen was our glacial geologist. Taylor's undergraduate research was on magma mixing in the Belknaps; perhaps his interest in magma mixing came from this stop at a landslide in Yosemite.

On this same trip (2013) we studied the clasts in a conglomerate on Pt. Reyes, CA. Later during the trip we will see if the clasts in the conglomerate could have come from a volcanic rock which is now south and on the other side of the San Andreas fault zone.

Ian Honsberger is the lad to the far left in the picture. Ian's PhD (2015) was on the petrology of mafic and ultramafic rocks in Stockbridge, VT. His wanderlust has taken him to the Canadian Geological Survey where he is studying gold deposits in Newfoundland. I am pleased that Ian is in the audience today.

Joel Johnson and I took our students to Newfoundland in 2017. Finally I saw what some of the rocks in Vermont looked like before they were metamorphosed. The young lady in the red hat at this locality is Haley Currie, presently an Earth Science teacher in Salem, NH who is here today. Haley's enthusiasm for teaching is inspiring. Another young lady with Salem, NH ties here today is Corinne Disenhof. After graduating Corinne worked in California; then her wanderlust brought her back to UNH for an engineering degree.

Another locality we saw in Newfoundland reminded me of the Rye Formation on the Isles of Shoals, or perhaps it is like the Massabesic Gneiss Complex. Tim Fagan can perhaps help us decide. Tim is a professor in Japan where he and his students study meteorites.

The book about von Humboldt states that the scientists and writers influenced by him include Darwin and Thoreau. With this in mind, as undergraduate advisors we can advise students to take courses that combine science and the humanities and that meet the Discovery requirements.

While I'm on GenEd, I want to register my opposition to the proposal to eliminate a requirement in the Discovery program of a science with a lab. Lab is where students make observations, ask questions, and solve problems. Lab is discovery.

I conclude that our responsibility as teachers is to ask questions, build confidence, and promote wanderlust. THANK YOU