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leading
undergraduates
to the edge
of science

Dr. Joe Allen
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West Virginia Higher Education Policy Commission



WV EP SCOR

JOE ALLEN:

Leading undergrads to the **EDGE OF SCIENCE**

Joe Allen knows a lot about earthquakes and the faults where they originate. The 14-year professor of geology and chair of the Division of Natural Sciences at Concord University even serendipitously discovered a previously unknown fault.

Over the years, Dr. Allen has led some 75 students and 75 professional geologists on study trips to the Rocky Mountain region where two ancient earthquake faults are exposed, showing a rare visible record of temblors that occurred 1.4 billion years ago.

Yet it's not what Dr. Allen knows that he believes is important to pass on to his students. It's what he and other geologists don't know that he wants his students to learn.

Whether it's a five-week trip with students to a remote Colorado fault zone, an afternoon class trip to an outcrop near Concord's southern West Virginia campus, or detailed analysis in the Electron Microprobe Laboratory, Joe Allen wants his students to see "the edge of science," that place where mankind's existing knowledge ends and the answers to questions are "we don't know."

And thanks to the efforts of Dr. Allen, his colleagues and West Virginia's EPSCoR (Experimental Program to Stimulate Competitive Research) program, more students have the opportunity to approach that edge.

Since joining Concord as the lone geology faculty in 1998, Dr. Allen has helped institute an Environmental Geosciences undergraduate degree program, one of only three geology programs in the state. With awards from the National Science Foundation, the American Chemical Society's Petroleum Research Fund and the W. Va. Research Trust Fund, Concord's Natural Sciences Division has assembled a respectable collection of analytical equipment to provide opportunities for students to conduct research.

"Undergraduate research tends to open up students' eyes a lot," Dr. Allen says. "They see the scientific process a lot more. That sense of discovery is with them."

Among the student research opportunities is a trip to Colorado to map and study pseudotachylyte systems along the Homestake and Grizzly Creek shear zones.

Pseudotachylyte (pronounced sudo-tacky-lite) is frictionally melted rock that appears as thin veins showing the exact location where an earthquake occurred a billion-plus years before. The rock facings liquefied from heat and friction during the quake, then cooled and re-solidified within minutes, casting in stone a visual recording to be studied years later.

The Colorado faults are significant because through millions of years of uplift and erosion, these recordings are now exposed on the earth's surface and visible for study. Otherwise, "earthquake archaeologists" like Dr. Allen could only infer what occurs during a quake at the shear zone in Earth's middle crust some 10 miles beneath the surface.

Studying this fault behavior is important in Appalachia because faults also impact the migration of economically recoverable reserves of petroleum, natural gas, and other mineral deposits.

But it's not just the geology of a fault or the properties of ancient rock that's important for Dr. Allen's students to see.

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Portrait photography, John Sibold; Field photograph by J.L. Allen

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Dr. Joe Allen explains the one-centimeter thick black vein in rock from the Homestake shear zone in the Colorado Rockies is a visual record of an earthquake from 1.4 billion years ago. The rock was nine miles deep at the time of the quake, but came to the surface through uplifting of the Rocky Mountains within the past 70 million years.

about the division of science and research

The West Virginia Higher Education Policy Commission's Division of Science and Research directs the National Science Foundation's Experimental Program to Stimulate Competitive Research (EPSCoR) in West Virginia. The division also coordinates scientific research grants to academic institutions and conducts outreach activities to broaden the public's understanding of science, technology, engineering and mathematics (STEM) disciplines. For more information, visit www.wvresearch.org.

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