Paper Number: 1695

A FIELD-BASED METHOD FOR TEACHING UNIFORMITARIAN PRINCIPLES USING TRACKWAY RECONSTRUCTIONS

Garcia, W. J.[1]

[1] Department of Geography and Earth Science, University of North Carolina Charlotte, wjgarcia@uncc.edu

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Numerous studies have demonstrated that students perform better and have increased learning outcomes in courses that promote active learning by means of inquiry-based activities and research experiences [1-3]. For many of the natural sciences, authentic learning experiences require students to actively participate in fieldwork. Consensus among geology instructors is that fieldwork is an essential component in the training of future geologists [4]. However, many university-level geology courses do not contain field-based experiences at the introductory-level. The design of field-based learning activities in higher education is greatly facilitated by the use of one's campus as a laboratory, students benefit from a strong sense of place and ownership when their own campus is part of the lesson. One specific difficulty with developing active, direct learning experiences in field-based disciplines is that many campuses are urban environments lacking appropriate natural space within which to conduct field studies.

At UNCC we have developed an on-campus, field-oriented exercise in which students are taught uniformitarian principles using reconstructed fossil trackways made in concrete. The first trackway has two sets of tracks, a modern human and a dog. These tracks were formed by a faculty member walking across the drying concrete. The second trackway is a reconstruction of the hominid tracks at Laetoli, Tanzania. The last set is a reconstruction of a section of sauropod dinosaur tracks from the Paluxy River in Texas, USA. During the exercise students are introduced to a formula developed by Alexander [5] for calculating walking and running velocity from trackways. This formula requires some information about the track maker that is often not available, such as the maker's hip height. Students record their own straight line walking and jogging speeds along a measured course and then calculate their speed using Alexander's formula [5]. This process demonstrates to the students that the formula produces accurate measures of velocity. Students then apply the formula to calculate the velocity of the first pair of tracks within the concrete. Since the velocity of these track makers is known to the instructor students can compare their calculations to a past situation with a known answer. This provides a true experimental test of the principle of uniformitarianism. Students then apply the formula to the reconstructed Laetoli and Paluxy trackways. Students are required to make estimates of the hip heights of the track makers to use in their calculations. Once each student has completed their calculations we discuss the differences between results and how uncertainty about the track makers can lead to these differences and the implications this has for reconstructing past behaviors.

This exercise does not require the construction of replica trackways from concrete and can be conducted in a parking lot or small open space with minimal resources. Prior to the construction of the trackways on the UNCC campus this exercise was successfully conducted with trackways drawn on long sheet of butcher paper and rolls of paper designed for large format printers.

References:

[1] Geier, R et al. (2008). Journal of Research in Science Teaching 45: 922-939.
[2] Michael, J (2006) Advances in Physiological Education 30:159-167.
[3] Oliver, R (2007) Innovations in education and teaching international 44: 3-15.
[4] Petrovic, H. L. et al. (2014) GSA Today 24:4-10.
[5] Alexander, R. M (1976). Nature 261:129-130.