



## **How Pebbles Break: An Experimental Study of the Breakdown of River Rocks by Transport**

**Sophie Bodek (COL 2018)**

**Advisors: Alain Plante and Douglas Jerolmack**

I spent this summer working in the Penn Sediment Dynamics Laboratory under the mentorship of Dr. Alain Plante and Dr. Douglas Jerolmack. The research project I participated in looked at the breakdown of rocks under both high and low energy transport. By examining a rock-like material under both types of transport, we observed two types of breakdown— chipping and fragmentation. The goal of the project was to empirically determine a boundary between the two breakdown regimes.

In order to simulate the transport of river rocks, I created cement particles in cubical molds that were then rotated in a large metal drum. I was able to form strong particles by mixing cement with a higher ratio of cement mix and similarly, I created weak particles by mixing cement with a higher ratio of sand. The tumbling of strong particles in the metal drum simulated low-energy chipping, similar to pebbles transported by a stream. Like pebbles in a stream, the strong particles became rounded as only small pieces of the particle chipped off. The tumbling of weak particles in the metal drum simulated high-energy fragmentation, like rocks experiencing transport by a landslide or flood. Much larger pieces broke off the weak particles, creating a rough and jagged shape. Both the strong and weak particles were regularly massed and photographed during the tumbling portion of the experiment. Once the particles were finished tumbling, I ran the photographs through an ImageJ program that found circularity, aspect ratio, and other parameters that were used to analyze how transport effects the different particles.

From my experiences this summer, I learned about the research process as a whole and more specifically about the field of geomorphology. My mentors allowed me to choose a specific research project that intrigued me and to follow that project from start to conclusion. The project started with a question: what makes chipping different from fragmentation? From that question, I read various papers about other relevant research on similar topics. Then, I started in the laboratory just trying out different ideas, seeing what worked and how I could create an experimental procedure. Once I had developed a procedure, I continued for much of the summer with data collecting and some data analysis. Although the summer is drawing to a close, the project is still far from over. I have amassed

hundreds of photographs that need to be more closely analyzed in order to better understand the two types of breakdown and the boundary between them. Fortunately, the experience left me with a deeper interest in geomorphology and I am looking forward to working in the Sediment Dynamics Lab into the fall term and even further into the future.