

## Geology 101 explorations with weathering and geologic time

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### Description of Assignment

First, make dishes equally dirty and design and conduct experiments to evaluate which type of weathering analogy would best aid in cleaning the dishes.

Then compare experimentally determined weathering rates for food with weathering rates for rocks by calculating the time necessary to weather selected objects

#### WHY DO IT?

- Explore the analogy between doing the dishes and weathering/erosion
  - Simple, apt analogy
  - Relates to everyday chore
  - Continual reminder - think about geology after every meal
- Practice conducting experiments
  - Use control and multiple variables
  - Semi-quantitative
  - Discussion and interpretation
- Calculate erosion rates and relate personal experience to geologic time
  - Highlights slow rock weathering rates compared to rates for food
  - Quantitative

### What they did

#### ■ Dirty the dishes

- At least 4 dishes (1 control, 3 experimental)
- Area and depth of dirt measured



The dreaded enchilada pan (Katie Petrie)



A meal designed to be hard to clean (Chris Hennings)



Baked BBQ sauce in Pyrex pans (Teddy Salutos)



Burnt eggs in non-teflon pans (Siri Wutolia)

#### ■ Determine methods

- At least 3 different methods
- All methods should be analogy for geologic process



I'm stumped on a geologic analogy for soap. Any ideas?

#### ■ Do the dishes!

- Experiments are run and timed



Abrasion on an enchilada pan (Katie Petrie)



Carbonic acid in cola used to simulate acid rain (Rusty Graeff)



Abrasion on stove drip pans (Michael Giuliani)



Egg pan after soaking in whiskey (Siri Wutolia)

Between iterations of freeze-thaw cycles (Katie Petrie)



Abrasion from running water (Kaimanu Chin-Hidano)

#### ■ Determine the winner

- Compare aerial percentage

Abrasion (scrubbing, left) vs. hydration + abrasion (right) (Teddy Salutos)



Clockwise from top left: control, abrasion (scrubber), freeze-thaw, acid soak (lemon juice) (Laura Hoff)

### Geologic Time

#### ■ Calculate empirical weathering rate

- For most effective technique, calculate loss in thickness; divide by time (mm/min)
- Calculate time req'd to weather mound of food the size of the geology building (50m)
- Calculate time req'd to weather mound of food the depth of the Grand Canyon (1600m)

#### ■ Calculate weathering of rocks

- Same calculations using weathering rates on marble tombstones in Montana (0.027 mm/yr\*)

### Write up

- Describe methods, analogies, inaccuracies
- Discuss calculations; problems with assumptions (there are many)

### Interesting observations

Non-salted Cream of Wheat erodes more easily than salted  
 Canadian whiskey, Pepsi are effective but leave residue  
 Freeze-thaw is the consistently least effective method

### Tips and tricks

Give students a required subject for E-mail submission  
 Limit write-ups to two pages (not including photos)  
 Request photos of experiments, students

\*Data from: Roberts, Sheila 2000, Reinforcing quantitative skills with applied research on tombstone-weathering rates, Journal of Geoscience education, vol. 48, pg 469-473