

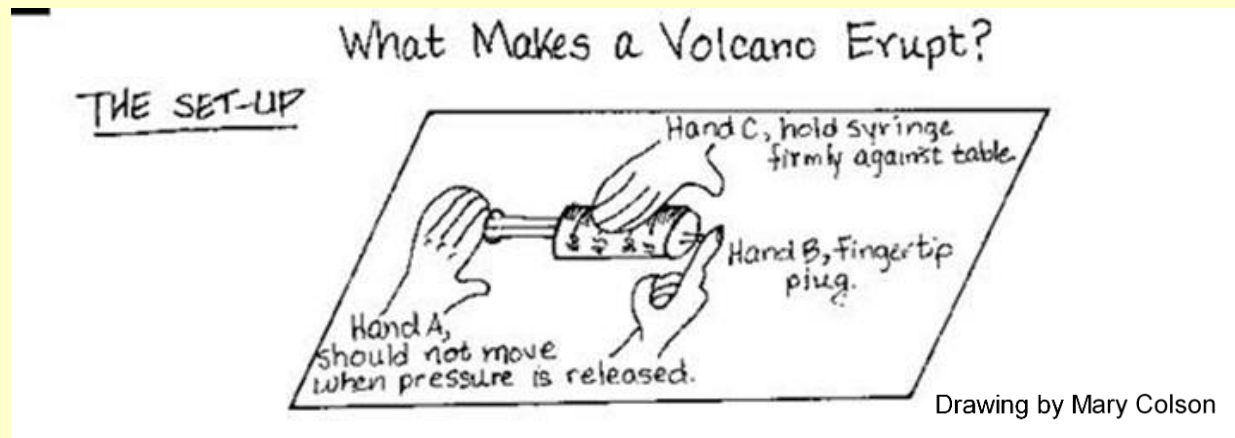
Stories of the Present
How Does it Work?—Volcanos and Geysers with Syringes Lab
Earth Science Essentials-Advanced
by Russ Colson

Volcanos

The baking soda and vinegar volcano is, for many young students, a memorable demonstration of how expanding gases can drive lava from a volcano. Here is an inquiry activity to expand that demonstration into an experiment that encourages a student to figure out how a volcanic eruption works. How is a baking soda volcano like a real volcano and where does a real volcano get its oomph?

This activity is modified from "Spirit of the Volcano" by Russ and Mary Colson, published in the Journal of Geoscience Education, November 2000.

Your goal is to measure, quantitatively, how gas in a magma chamber affects energy of an eruption. You will do this by measuring how far water squirts from your 60cc syringe, given a fixed starting pressure, as a function of how much air is in the syringe.



Trials:

Trial 1: fill the syringe $\frac{3}{4}$ full of water (45cc)

Trial 2: fill the syringe $\frac{3}{4}$ full of water (45cc) plus some air (15cc)

Trial 3: After looking at your results, decide on a third experiment that will give you important information

For each trial, compress the plunger in the syringe with hand A, keeping pressure equal for each experiment. Release hand B finger, keeping other hands stationary. Measure how far the liquid shoots.

Some things to consider:

- Repeat all measurements at least 3 times. Report your results neatly and clearly!

- Figure out a way to control the pressure in the syringe so that you have the same initial pressure for each different experiment.
- Notice that there are two different ways to measure how far the water shoots: The continuous stream and the discontinuous stream. Measure and record both and include in a data table. Note that data tables should include all measurements, not only the final average.

The Analysis

- Which trial shot water the farthest? Why do you think this was?
- What is the dependent variable (the response variable)?
- What is the independent variable (the causative variable)?
- What are the constants in your experiment (the variables whose values you hold constant)
- How are these experiments like a real volcano?
- How are these experiments like a baking soda and vinegar volcano?

Geysers

Following a recipe that someone else has provided you is very little like doing real science. Real science happens when you invent the recipe.

Design an experiment to measure the pressure at which water boils at room temperature. Your materials are a weight scale, a piece of string, your 60cc syringe, a balloon (to protect your finger), a ruler, a bucket with a handle, and plenty of sand. You do not need to do this experiment—only design it.

Your grade will depend on your report of the following (listed in order of decreasing emphasis):

- 1) inclusion of all important steps in your experimental plan
- 2) experimental design to make all needed measurements
- 3) calculations needed to get the boiling pressure from your measurements