

### **Abstract:**

We tested to see whether the Earth was made of granite by comparing the density of a granite block to the density of the Earth. By using different measuring tools including a balance beam and caliper, we determined the density of the granite. After determining the density of the Earth, using the  $D=M/V$  equation and some predetermined measurements, we were able to compare the densities. Our results show a difference in the densities between the Earth and granite block, suggesting that the Earth is not solely made of granite.

### **Data:**

We measured the mass and dimensions of a granite block to determine the volume and the density of it. We used the mass and radius of the Earth to compute its volume and density.

	<b>Earth</b>	<b>Granite</b>
Mass (grams)	$6 \times 10^{27}$	1307.5
Dimensions (meters)	Radius: $6.4 \times 10^6$	$0.0768 \times 0.0621 \times 0.1047$
Volume (cubic meters)	$1.1 \times 10^{21}$	$4.99 \times 10^{-4}$
<b>Density (grams / cubic meter)</b>	<b><math>5.5 \times 10^6</math></b>	<b><math>2.6 \times 10^6</math></b>

We computed the density of the Earth using the formula  $D = M/V$  and found it to be  $5.5 \times 10^6 \text{ g/m}^3$  ( $D = 6 \times 10^{27} \text{ g} / 1.1 \times 10^{21} \text{ m}^3$ ). The volume of the Earth was determined by the volume of a sphere,  $V = 4 \pi / 3 r^3$ . From the data shown, we found the density of the Earth and granite is  $5.5 \times 10^6 \pm 0.10 \text{ g/m}^3$  and  $2.6 \times 10^6 \pm 0.10 \text{ g/m}^3$ , respectively.

### **Analysis:**

In determining the density of granite, some sources of uncertainty may have occurred. The granite was not a perfect rectangle, and its height, length, and width were not consistent throughout the block. We measured the dimensions with several tools including the meter stick, ruler, and calipers and found the calipers to be the most reliable. So we found several measurements and averaged them together. We are confident of the granite's density to  $\pm 0.10 \text{ cm}$ . The uncertainty of the granite's measurements accounts for the uncertainty of its density. There may also be an inaccuracy in the mass measurement because we were only able to measure to 0.1 gram. The uncertainty may have been minimized with our finding of an average of the four repeated measurements of the granite block.

### **Conclusion:**

The finding of the Earth's density compared to the density of granite is important to our understanding of the make-up of the Earth. The comparison shows that the Earth is not solely made of granite and may contain less dense matter. The density of granite is 47% of the Earth's density; therefore the Earth is not solely made of granite. By using various measuring tools, we have suggested more precise ways of measuring length.

**Contributions:**

- Paul and Jill both measured the mass of the granite block and then together calculated the volume and density of the Earth.
- Wendy and Keith worked together to find the dimensions of the granite. They used multiple methods and tools to find the most accurate results that they can in order to calculate the volume of the block.
- Carrie was our recorder, and she kept track of all measurements and converted units when necessary.
- We all worked together to make final calculations, compare the densities, analyze our data, and write the lab report.