

Activity 5 Homework – How erosion builds mountains

Name _____ Date _____

Scientists' Ideas about Mountains, Isostasy, and Erosion

Reading: "How Erosion Builds Mountains" by Nicholas Pinter and Mark Brandon, April 1997, *Scientific American*. Downloadable from <http://earth.geology.yale.edu/~markb/Eprints/Pinter&Brandon1997.pdf>

The study of isostasy (motionless, balanced floating) reveals that when a floating object loses mass, the object rises (floats higher) to restore the balance. (You can review this by playing with the isostasy simulator: <http://www.geo.cornell.edu/hawaii/220/PRI/isostasy.html>).

We also know that igneous intrusive and metamorphic rock types formed deep in Earth's crust. We use the term "uplift" to explain how these types of rock can now be found at the surface and as high mountains. Can erosion of mountains be likened to the melting and rising of icebergs?

What processes build mountains? How can isostasy explain how mountains grow? How can erosion of mountains factor into explaining mountain uplift?

Read about the ideas of two geologists whose research specializes in looking at answers to these questions in the *Scientific American* article "How Erosion Builds Mountains" by Nicholas Pinter and Mark Brandon. Then, answer the following questions:

1. By using the isostasy simulator (<http://www.geo.cornell.edu/hawaii/220/PRI/isostasy.html>), you can see that the proportion of an object exposed above the fluid it is floating in depends on the difference in density between the object and the fluid it floats in. Describe how the buoyant mountainous continental crust might be compared to this simulator analogy.

2. The article describes the dominant way that mountains are built from plate tectonics. Summarize (briefly!) some ways that mountains can form.

3. What are some examples of how climate affects erosion of mountains?

4. "Isostasy is the key mechanism that links a mountain's tectonic, or internal evolution to its geomorphic, or external development." In your own words, using the principle of isostasy, describe how erosion at the surface can cause uplift of mountains.

5. How do feedbacks between tectonics, erosion, and climate processes interplay to influence mountain building?

6. Evidence from the rock record suggests to scientists that during the past 40 million years there has been an unusual surge of tectonic activity and mountain building as well as global cooling. Did the surge of mountain building cause the global climate shift? Or did a climate shift itself produce uplift that looks like a surge in mountain building? Explain the rationale for each of these interpretations. Which cause and effect relationship do you align with? Why?
