

Mountain Building

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Type of Project: Hands-on exhibit

Target museum: SciTech

Target audience: Children 10-14

Big Idea: Mountain ranges are the result of uplift of rock when two continental plates collide; the point of contact between the plate boundaries is called a convergent margin. When two plates collide, one plate is pushed (subducted) underneath the other plate. The nature of the convergent margin depends on the type of crust present, namely whether the plates carry continental crust or oceanic crust. Because oceanic crust is heavier than continental crust and rides lower in the asthenosphere, a plate composed primarily of oceanic crust will be subducted underneath one carrying continental crust. Such a collision may result in mountain building due to accretion of some oceanic crust onto the continent and associated volcanism. However, mountain building is much more dramatic if both plates carry continental crust. Even though one plate will be thrust underneath the other, the compression of the buoyant continental crust riding on each plate results in this material being pushed upwards as the plates collide. This latter type of mountain building is called collisional orogeny.

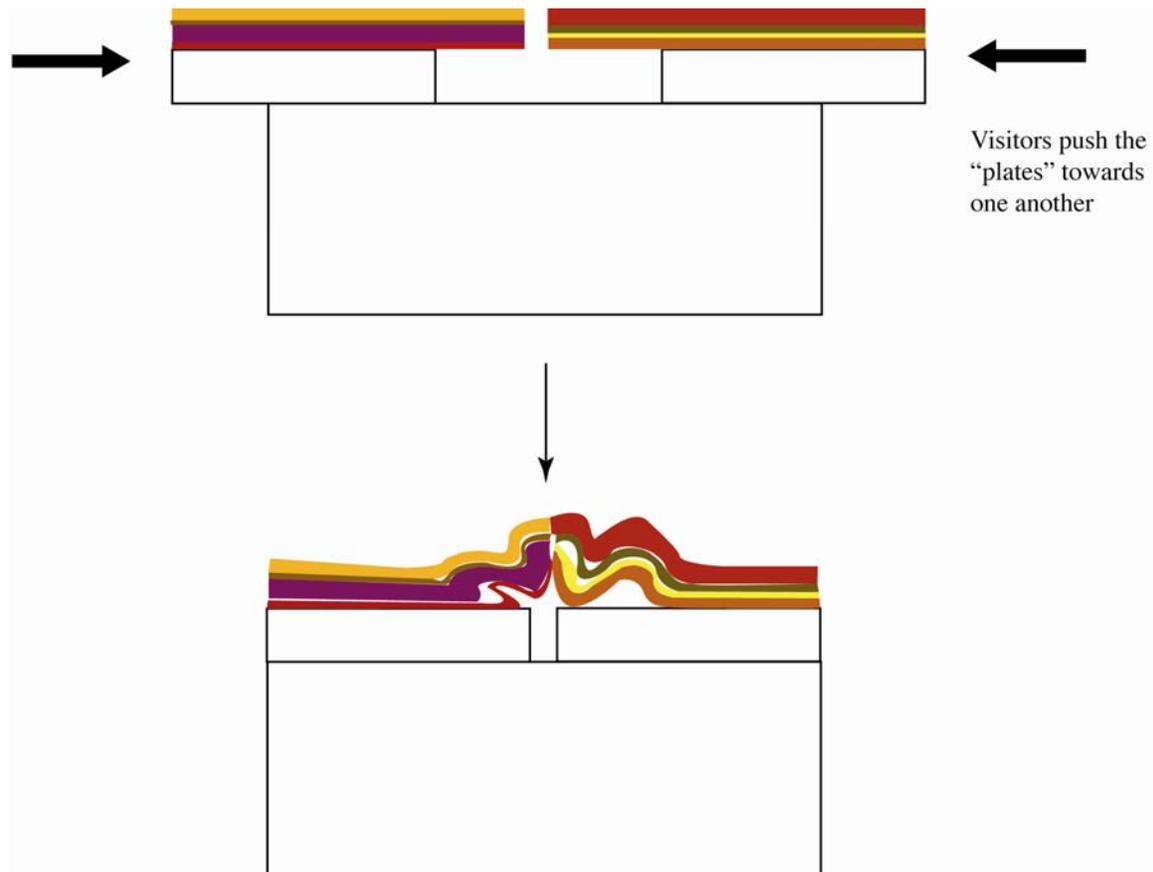
Because this concept is abstract, it is more suitable for older children. This is particularly true because the target museum is located in the Midwest so children may not have exposure to mountains aside from images seen on television and film or in books and magazines. For older children, however, familiarity with plate tectonics and the larger geologic forms or events that result (mountains, volcanoes, earthquakes) is fundamental to understanding the structure of the earth and to the understanding that the earth has a long evolving history even if those changes cannot always be seen on a day-to-day scale.

Exhibit description: Exhibits which attempt to demonstrate plate tectonics often show the separation of continental plates at mid ocean ridges (divergent plate boundaries). The ocean floor is simulated by two conveyor belts which can be rotated away from one another. The subduction zone (a convergent margin) is shown where the conveyor belt folds underneath the return to the mid-ocean ridge. While this is a fairly straight-forward representation of what's going on, it's rather boring and the results of these processes cannot be seen by students, unless subsequent explanation regarding earthquakes and volcanoes associated with subduction zones is incorporated.

I propose to demonstrate a collision at a convergent margin, using the Himalayas as a model. The collision of India into Asia with concurrent uplift of these mountains is relatively recent in geologic history; this is why they are so tall. This also means that erosion has not altered them as significantly as older mountain ranges around the world. While visitors to the target museum may not be able to visit the Himalayas themselves, they are familiar with them as a geologic/geographic features, particularly because of Mt. Everest.

Nova has a decent animation: <http://www.pbs.org/wgbh/nova/everest/earth/shock.html>

The exhibit will consist of moving two “continental plates” together so that they deform into mountain-like forms and then relaxed into the starting mode again when pressure is no longer being applied (see figure below). A candidate material for such layers is flexible foam. The layers should be mounted such that they are secured to the platform and also confined from folding outward. Pressure is applied by visitors on either side of the platforms (each visitor moves one of the “continental plates”). The exhibit should be accompanied by photographs of mountains.



Evaluation I: Assess assumptions of proposal:

The first stage of evaluation may be accomplished by a simple survey of visitors to the target museum. In particular, children should be asked the following questions:

- (1) How big are mountains? (after all, visitors to this museum live in the Midwest...)
- (2) Have you ever wondered how mountains are formed?
- (3) Have you heard of Mt. Everest before? Do you know where Mt. Everest is or why it is famous?