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THE MAKING OF A MOUNTAIN

Journey to the Himalayas and discover what happens when continents collide
Fifty years ago, on May 29, 1953, mountain climbers Edmund Hillary and Tenzing Norgay became the first humans ever to scale the icy summit of Mount Everest (elevation 29,035 feet), the world's highest peak. Since then, more than 1,500 other adventurers have reached this pinnacle in the Himalayan mountain range, which sprawls 2,550 kilometers (1,600miles) along the border of India and Tibet. And at least 170 people have died while attempting the climb.

If a mountain is a landform standing 300 m (1,000 ft) above sea level, then Mount Everest is a towering giant. It stands 8.85 kilometers (5.5 mi) high--roughly the cruising altitude of a modern jet. But Everest isn't a lone giant: At least 30 Himalayan peaks soar 7.4 km (4.6 mi) high. And geologists say the entire mountain range is rising at a rate of about 5 millimeters (0.2 inches) a year--because the natural forces that thrust the mountains up 40 million years ago are still churning today.

That makes the Himalayas themselves almost as dynamic as the thrill-seekers who ascend them. Turn the page and check out the geologic action.

BUILDING THE HIMALAYAS

Mountain building--or orogenesis--occurs when Earth's crustal plates (see map, below) move. The Himalayas formed when plate movement drove the continent of India into southern Asia about 40 million years ago (MYA). Instead of grinding to a halt, India plowed on. The result: Earth's crust buckled and folded, the way metal crumples when two cars collide. Over millions of years, layers of warped rock evolved into mountains.

1 TECTONIC PLATES

Earth's crust, the planet's solid outer shell, rides on a rocky, partially molten layer, or mantle. Together, these two layers form the lithosphere. More than 100 km (62.1 mi) thick, the lithosphere is somewhat flexible like taffy, yet at the same time strong enough to form semi-rigid tectonic plates. About 15 of these thick slabs cover Earth's surface. Continents are embedded in the plates, which ride on the elastic mantle, jostling to and fro like rafts on a stormy sea.

2 HISTORY OF THE HIMALAYAS

CONTINENTAL COLLISION

Geologists believe a sea once separated the continental landmasses of India and Asia. Over 30 million years' time, India drifted north at a rate of 9 meters (29.5 feet) per century, until it struck the southern edge of Asia. The collision crumpled layers of rock into giant mountains.

60 Million Years Ago (MYA)

India strikes the Asian plate and keeps driving northward. This movement starts to close up the Tethys Sea. As the continental plates ram against each other, Earth's crust squeezes upward.

40 MYA

As the Indian plate drives under Asia, lightweight sedimentary rock (made of compressed dirt, sand, and silt) at the bottom of the Tethys Sea crumples into folds of all shapes and sizes.

20 MYA

The sea disappears. As India keeps squeezing beneath Asia, rocks scrape and buckle off India's crust, building up a folded mountain range, now called the Himalayas.

3 HIMALAYAS TODAY

Geologists say the Indian plate continues to squeeze northward under the Asian plate at a rate of 18 millimeters a year. As a result, the Himalayas--including Everest--are rising about 5 mm a year. The very tops of many Himalayan peaks consist of sedimentary rocks from the ancient Tethys Sea.

4 FOLDED MOUNTAINS

As continents collided, the oceanic crust forced itself under the less dense continental crust. It was flexible enough to buckle and fold instead of break. The crustal folds range from tiny wrinkles to formations miles high. Geologists use many terms to describe folded rock. Two main types: anticlines, arch-shape upward folds, and synclines, bowl-shape downward folds.

HANDS-ON SCIENCE

Mountain-Making

YOU NEED

- modeling clay in three colors
- construction paper (30 X 15 cm)
- roiling pin
- ruler

• butter knife

• a partner

TO DO

1. With each color clay, roll out two 0.5 centimeter-thick slabs. Make a total of six clay slabs, and trim each one into a 30 X 30-cm square.
2. Use ruler and knife to slice each square slab into a 30 X 15-cm rectangle.
3. Make two stacks of 6 slabs each; alternate colors. Gently press slabs together; each stack should be no more than 3-cm thick. Place each slab on a sheet of construction paper. These represent the Indian and Asian plates.
4. One partner should slide the "Indian Plate" slowly toward the "Asian Plate," which the other partner holds firmly in place. PREDICT: What will happen

when the plates meet?

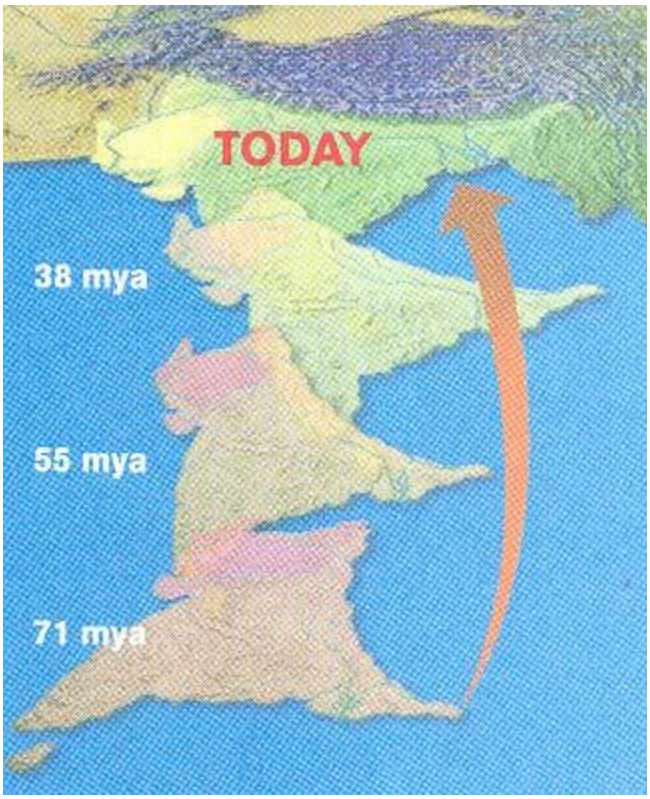
5. Keep gently but steadily pushing India into Asia, until the clay has crumpled. What kinds of folds have you made?

COMPARE your clay models to the "Types of Folds" diagram, at right.

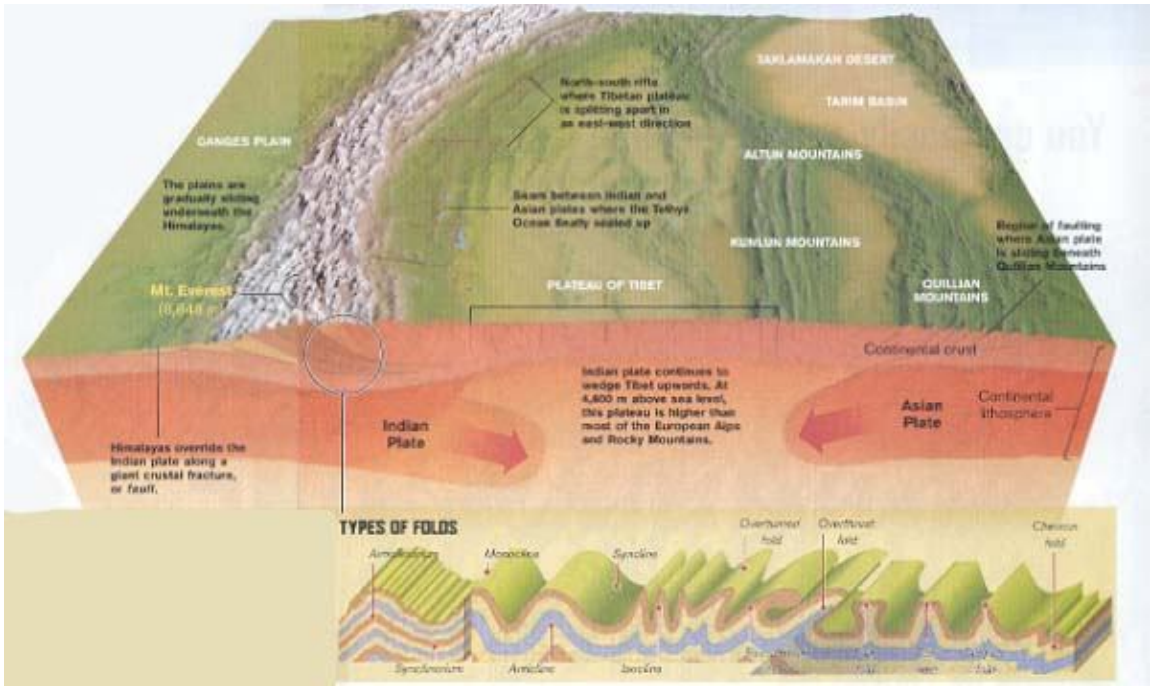
THINK ABOUT IT

What might happen if your continental-plate models were made of dry lasagna noodles instead of clay?

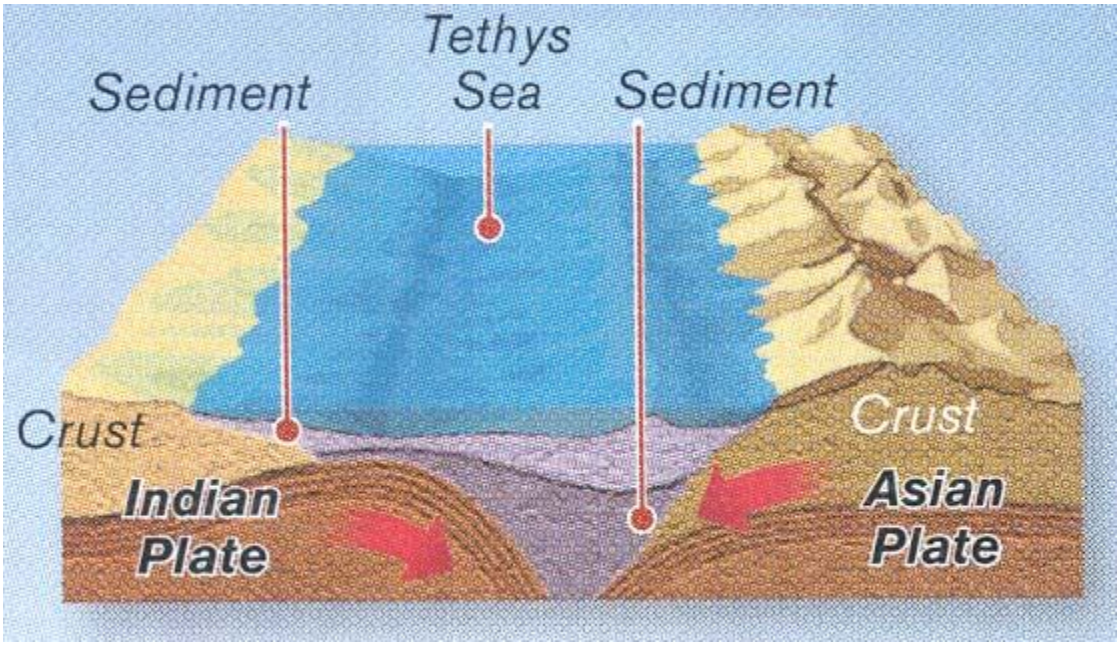
TECTONIC PLATES



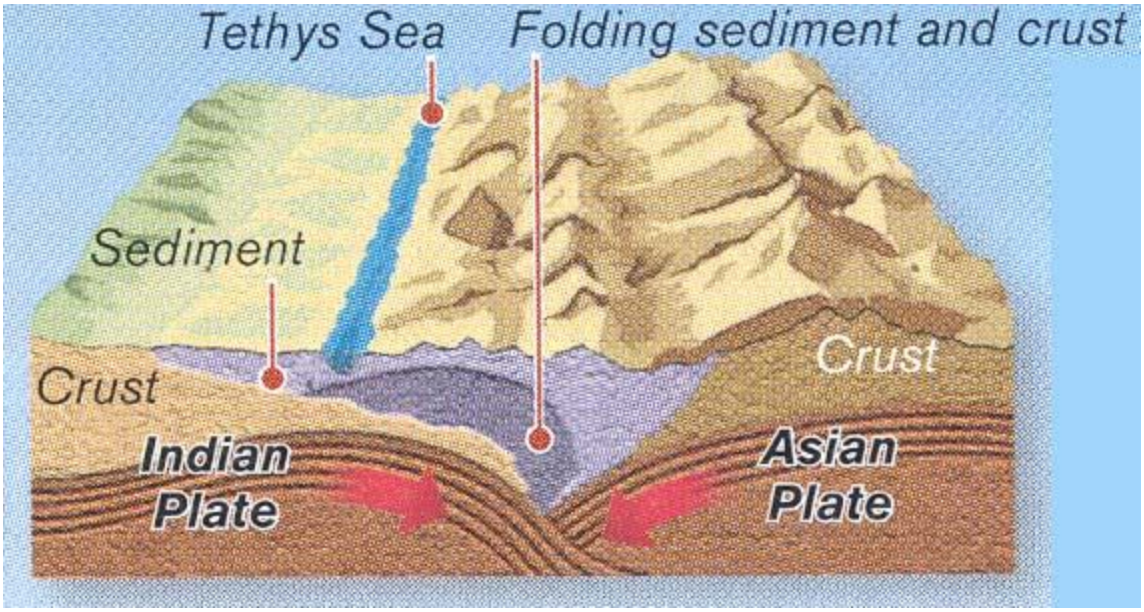
CONTINENTAL COLLISION



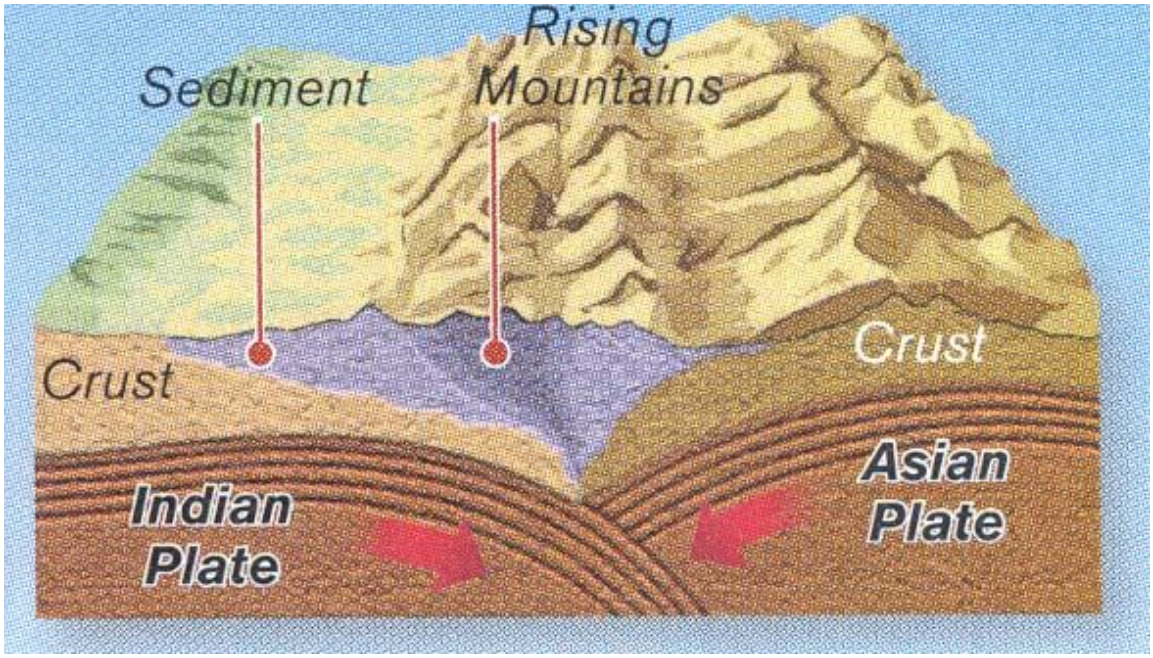
HIMALAYAS TODAY and FOLDED MOUNTAINS



HIMALAYAS 60 Million Years Ago (MYA)



HIMALAYAS 40 MYA



HIMALAYAS 20 MYA

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By Kim Y. Masibay
