Park Science

There's Only One Grand Canyon

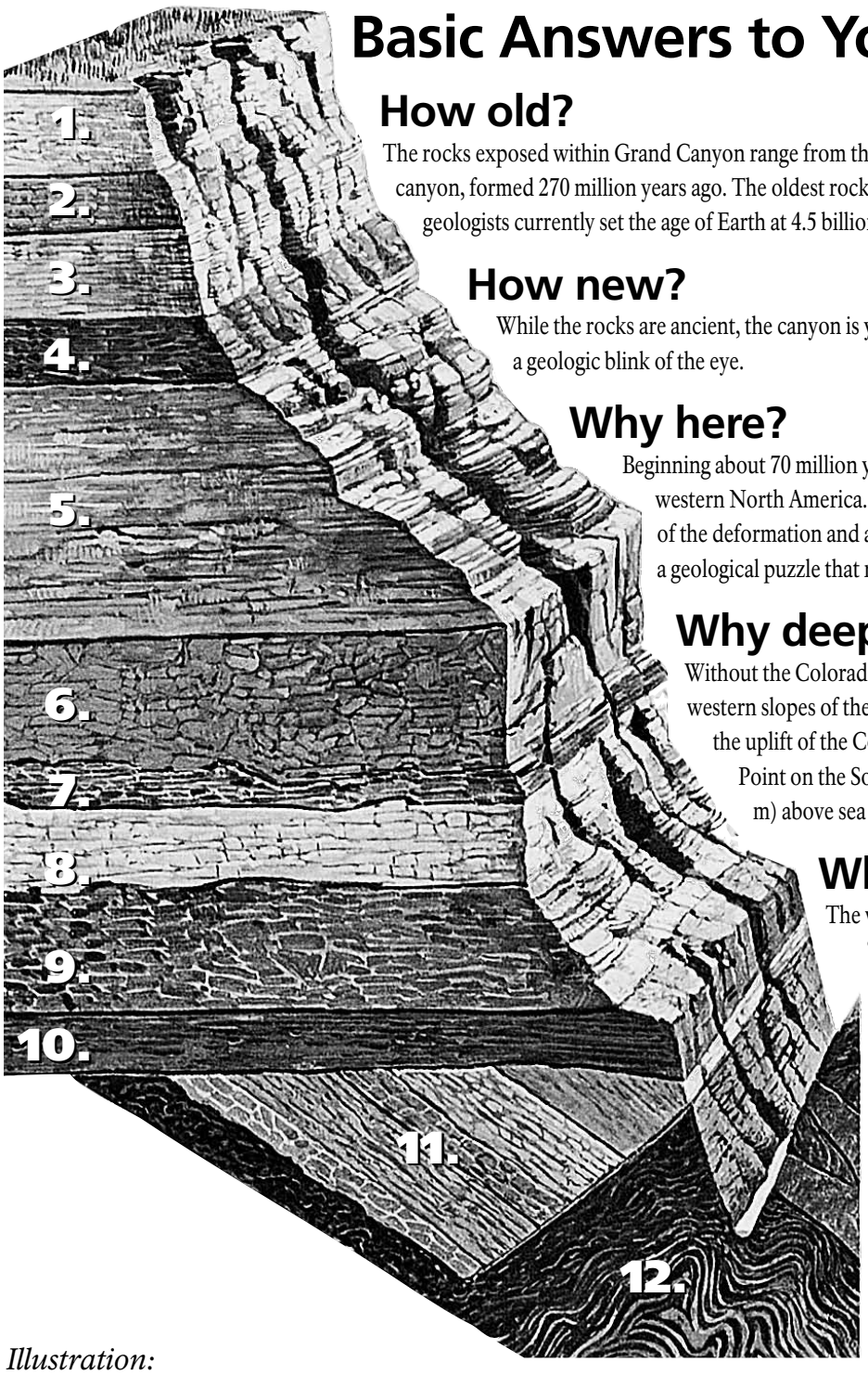

Illustration:

1. Kaibab Formation .....270 million years
2. Toroweap Formation .....273 million years
3. Coconino Sandstone .....275 million years
4. Hermit Formation .....280 million years
5. Supai Group .....315–285 million years
6. Redwall Limestone .....340 million years
7. Temple Butte Formation .....385 million years
8. Muav Limestone .....505 million years
9. Bright Angel Shale .....515 million years
10. Tapeats Sandstone .....525 million years
11. Grand Canyon Supergroup .....1.2 billion–740 million years
12. Vishnu basement rocks .....1.84–1.68 billion years

Basic Answers to Your Geologic Questions

How old?

The rocks exposed within Grand Canyon range from the fairly young to the fairly old (geologically speaking). Kaibab limestone, the caprock on the rims of the canyon, formed 270 million years ago. The oldest rocks within the Inner Gorge at the bottom of Grand Canyon date to 1.84 billion years ago. For comparison geologists currently set the age of Earth at 4.5 billion years.

How new?

While the rocks are ancient, the canyon is young. Geologists generally agree that canyon carving occurred over the last 5–6 million years—a geologic blink of the eye.

Why here?

Beginning about 70 million years ago, heat and pressure generated by two colliding tectonic plates induced mountain building in western North America. An area known as the Colorado Plateau was raised more than 10,000 feet (3,000 m), but was spared most of the deformation and alteration associated with the uplifting of strata. This high plateau, so critical to Grand Canyon's story, is a geological puzzle that researchers still seek to understand.

Why deep?

Without the Colorado River, a perennial river in a desert environment, Grand Canyon would not exist. Water draining off the western slopes of the southern Rocky Mountains carried sand and gravel, cutting down through the layers of rock. Without the uplift of the Colorado Plateau, there would not have been the thousands of feet of topography to sculpt. From Yavapai Point on the South Rim to the Colorado River is a change of 4,600 feet (1,400 m), yet the river still flows 2,450 feet (750 m) above sea level.

Why wide?

The width results from the rock layers collapsing around the river and its tributaries combined with the "headward erosion" of these side streams. Softer, weaker layers erode faster, undermining the harder, stronger layers above them. Without adequate support, the cliffs collapse. The relentless river carries this eroded material to the Gulf of California. Much of what is now southeastern California and southwestern Arizona is covered with material eroded from Grand Canyon.

Over its 277 river miles (446 km), the jagged Grand Canyon varies in width. Along the South Rim, it ranges between 8 and 16 miles (13–26 km) depending upon where you choose to measure.

Why Grand?

Often described as Earth's greatest geological showcase, the ensemble of stunning dimensions—the melding of depth, width, and length—sets Grand Canyon apart. Nowhere else features such a dazzling variety of colorful rock layers, impressive buttes, and shadowed side canyons. Grand Canyon is the canyon against which all other canyons are compared.

Want to know more?

The geologic story is rich in detail and mystery. Attending a free ranger program may move you from wonder to comprehension. Programs are described on pages 2–3.

Grand Canyon Association bookstores offer many geology related titles. Bookstore hours and locations are listed on page 3. To learn more about geology at Grand Canyon, take a look at:

- *Yardstick of Geologic Time*
- *Introduction to Grand Canyon Geology*, Greer Price
- *Carving Grand Canyon*, Wayne Raney
- *Grand Canyon: Solving Earth's Grandest Puzzle*, James Powell