

text & photos YD BAR-NESS

THE LANGUAGE OF THE LANDSCAPE

The rocks of India's terrain

ASIA, the largest landmass on our blue planet, strikes the geographer's imagination with a richness of landscapes and terrain. The world's tallest mountains, vast dry deserts and lush river deltas give colour and detail to the maps. Forming, literally, the foundation for the existence of nations, cities and people, the terrain of Asia determines fortunes and destinies.

The formal language of this terrain is geology. Like a diplomat travelling abroad, we can learn to understand the culture surrounding us by learning a few of the local words. With the proper vocabulary, we can build empathy with the people, and the landscape that surrounds us.

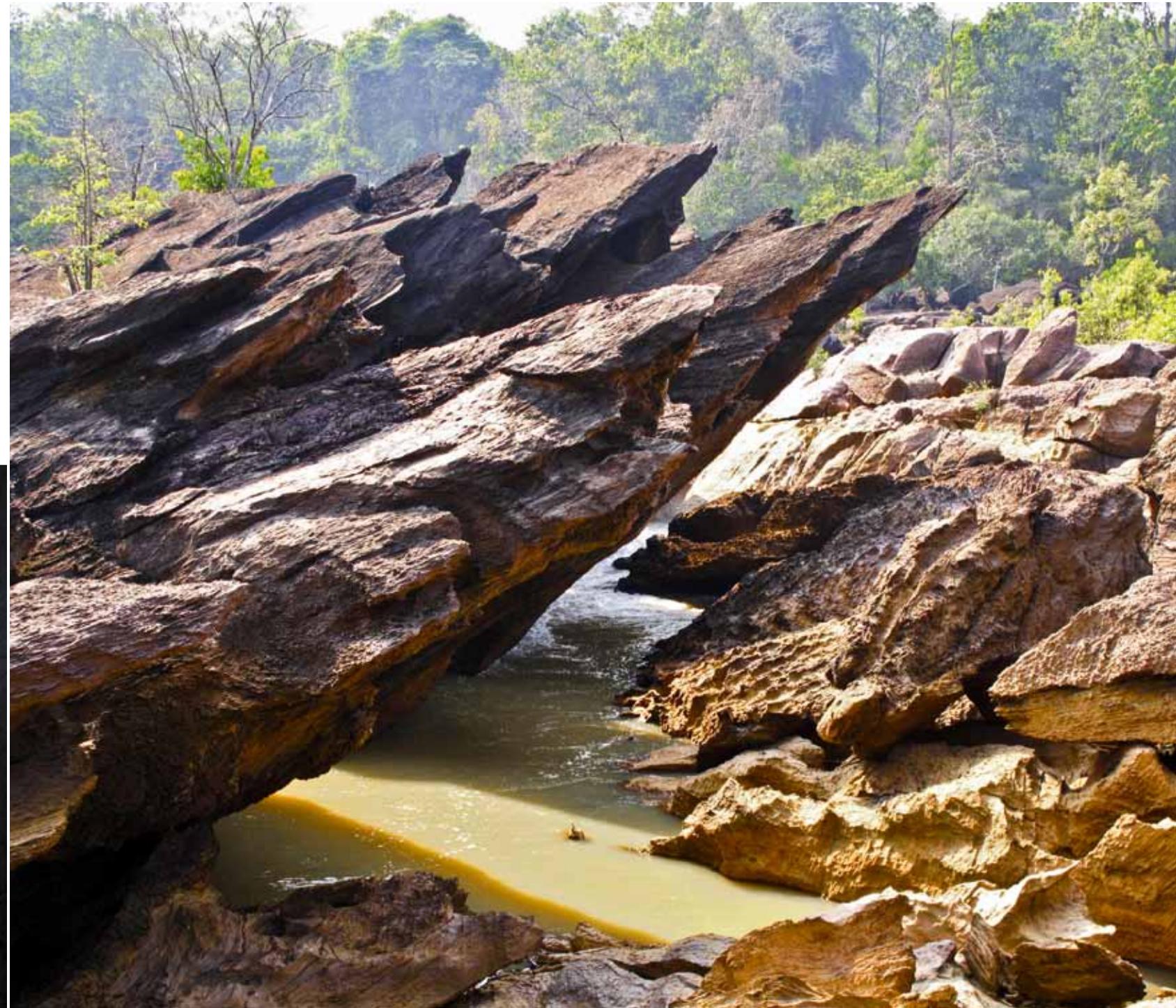
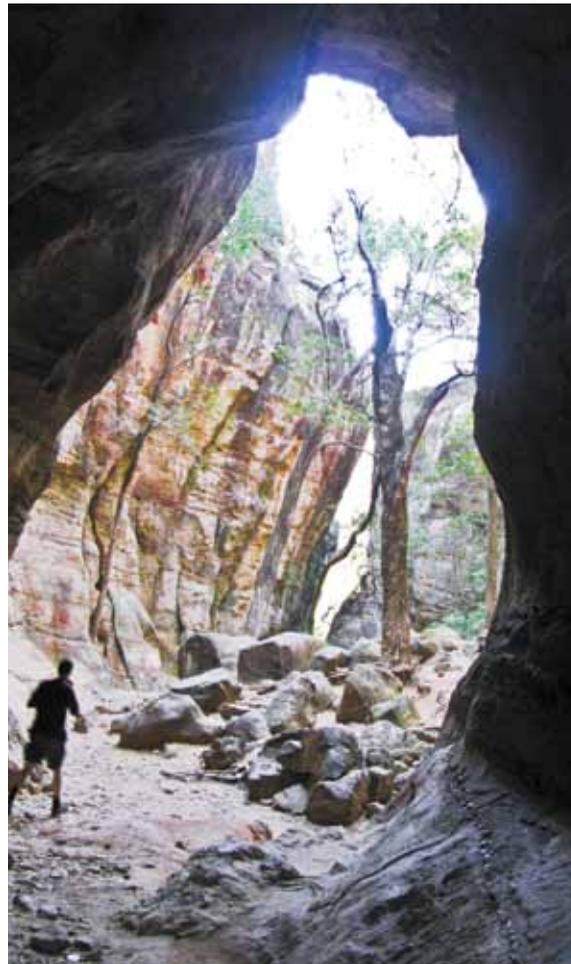
Let's learn a bit of this language of terrain, using pictures, maps and words of a diverse and varied area of Asia – India. This nation covers about a fortieth of the Earth's landmass, and encompasses a remarkable range of altitudes, climate and geologies. Using specific Indian landscape features as our teachers, we can learn about the ancient, ever-changing rocks of Planet Earth. Four rock types form dramatic scenery in India: basalt, granite, sandstone and limestone.

To understand some of the time scales frames involved, we will have to think back into impossibly distant eras. Astronomers and geologists have calculated Earth's age as approximately 4.5 billion years. To make these immense scales easier to understand, this time scale is represented as a 24-hour clock. If the Earth began at 00:00 midnight, and the present day is 11:59:59pm, then we can use the more familiar divisions of the daily time scale to represent the geological time scale.

India is a new arrival to Asia. The Indian Subcontinent is a piece of the ancient supercontinent of Gondwanaland. Named after the forest-dwelling Gond people of Eastern India, this now-divided land mass was formed from the fusion of India, Arabia, Antarctica, Australia, Africa and South America. This supercontinent existed from 510 to 180 million years ago, or, using the clock, 9:17–11:02pm. After the breakup of Gondwana, India drifted northwards only 50 million years ago (11:43pm), and collided into the main mass of Asia. From this tremendous impact, the Himalayas were uplifted. Below these mountains, in the Subcontinent, dramatic landscapes of four important rock types can be found.

► | The Kolab River runs between the Indian States of Odisha and Chhattisgarh, picturesquely dissolving the ancient seashell limestone

▼ | Entering the Reechgarh Canyon of the Satpura Mountains, Madhya Pradesh, India, where a plateau of layered sands has been carved by water and wind





▲ | Kotligad Peak provides a natural basaltic fortress in the Western Ghats of Maharashtra, India

Basalt is the stuff of the ocean floor, and granite is the stuff of continents. Basalt is dark and heavy relative to the lighter, brighter granite rocks. Basalt comes to the Earth's surface as hot, volcanic lava. If it cools slowly, it may form geometrical crystals. Vast regions of Siberia, northwestern North America, and Brazil are covered by basaltic flows. It has also been detected on other planets: the Moon, Mars and Venus.

In central India, the landscape of plateaus and cliffs known as the Deccan is the result of a cataclysmic volcanic flooding 65 million years ago (11:39pm). On the west coast, this mass of rock falls away to the ocean in a series of stepped cliffs. Attached to these cliffs, sharp mountain towers can be found. In India, the staircases providing access to a river's edge are known as ghats, and therefore this escarpment of basalt walls and sharp spires is known as the Western Ghats.

“Basalt is dark and heavy relative to the lighter, brighter granite rocks. Basalt comes to the Earth's surface as hot, volcanic lava.”

In the centre of Maharashtra State, east of Mumbai, a unique landscape feature exists at Lonar. Here, a perfectly circular crater has been formed by a meteor strike, only 50,000 years ago (11:59:24pm). While there are other meteor craters on Earth, this is the only one to occur on a basaltic lava flow. Standing on the rim, above the saline waters of the crater lake, it is impossible to imagine the energy of the impact that transformed the landscape.

Granite is one of the major materials of the continents, which float above the oceanic basalt. It is often found as rounded domes, which flake off into layers in the manner of an onion skin. One can imagine these bubbles of molten rock slowly ascending from the depths of the Earth, and the finer details of granite terrain as the damage done to the bubble by weather, water and gravity.

Some of southern India's most spectacular terrain, such as the rocky hills of Hampi, is granitic. These are some of the oldest exposed rocks on Earth, almost 2.5 billion years of age (10:40am) – far older than the Deccan basalts or the supercontinent of Gondwana. Over these countless years, the granite has broken apart into picturesque boulders, which tempt the photographer and rock climber alike.

Unlike these two major components of the planet, limestone and sandstone are the accumulated deposits of materials settling on the ocean floor. Limestone is a zoological rock, made of calcium from seashells and corals. As these organisms die, their corpses collect on the ocean floor. Over time, weight and pressure fuse these bodies into solid rock.

► | Hampi represents the substance that is one of the major materials of the continents

“Granite is one of the major materials of the continents, which float above the oceanic basalt. It is often found as rounded domes, which flake off into layers in the manner of an onion skin.”



► | The Satpura Mountains of Madhya Pradesh, India, are formed of uplifted sandstone shaped by wind and water

The forces of the restless Earth can uplift the ocean floor, and the sea level has risen and fallen over geological time. The summit of Earth's highest point, Mount Everest is oceanic limestone lifted far into the sky. Much of southeastern Asia is limestone, including the wondrous scenery of Thailand and Vietnam. In India, limestone can be found in pockets in the Himalaya, the Meghalayan Plateau and along the eastern seaboard. Limestone has a very peculiar and magical characteristic – it is slowly dissolved by water. Rainfall and rivers can create intricate, mysterious cavern systems and gorges. The famous caves of Meghalaya are found in limestone around 60 million years old (11:40pm)

Sandstone is the collection of offshore sands, especially from the flows of rivers. These grains of sand, with time and pressure, can be fused into rock and uplifted above sea level. Sandstone is sometimes layered, with the changes in sand composition over time showing as different rock strata. At the very centre of India, the Satpura Mountains are formed of sandstone deposits approximately 250 million years of age (10:40pm).

These four rock types, in all their surprising variety and infinite shapes, are the most basic vocabulary by which we can understand and describe the colossal landmass of Asia. These words, put together into unique stories and landscapes, form the fundamental pieces of our planet's language. As you explore Asia, by foot, train, elephant or atlas, you'll now have begun to learn the words you need to read the story of the continent. **AG**

YD Bar-Ness a conservation ecologist based in Fremantle, Western Australia. He is on a long-term quest searching for the Kalpavriksh, the Wish-Fulfilling Tree of ancient Indian myth. He hasn't found it yet, but will make sure to tell you when he does. As a scientist, he specialises in climbing trees to explore the canopy biodiversity, and as a conservationist, he seeks to use geography and photography to create environmental education materials.

