

Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Director, Institute of Marine Sciences, UC Santa Cruz.

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Stories from Ancient Rocks



Table Mountain behind Cape Town in South Africa- The rocks don't forget their stories.

Traveling nearly around the world on a ship that averages about 15 miles an hour has made me acutely aware of how big the oceans are- really big. Although the continents are huge, we could squeeze them all into the Pacific Ocean and have a little room left over.

I've also come to realize how long four months is when you are on a ship. Someone once said that the only difference between being on a ship and being in prison is that you can't drown in prison. There is a little truth to that, but fortunately we have able to stop in a number of different countries and get off the ship to travel overland.

While the oceans are huge, they have been created and destroyed and have changed size and shape repeatedly throughout Earth history. The evidence for that is scattered across the sea floors of the world and also preserved in the rocks exposed on land. While the air and water are constantly in motion and forget where they have been and what they have experienced, the rocks don't forget their histories.

Between about 250 and 200 million years ago, roughly the time of Jurassic Park, the Earth's landmasses were distributed quite differently than they are today. There

was a large northern continent, known as Laurasia, which consisted of ancestral North America, Europe and Asia. Below the equator, South America, Africa, Australia, Antarctica and India, were combined in another very large southern landmass known as Gondwanaland.

In between the two was a large ocean called the Tethys Sea. The Mediterranean is a remnant of that ancient ocean. This ocean, like all oceans, was the site of sediment deposition. Zillions of microscopic planktonic organisms flourished in the surface waters over millions of years. When they died, their calcium carbonate shells sank to the floor of the Tethys Sea. Over time and with the increased pressure and temperature of burial, those calcium carbonate muds that accumulated on the seafloor were turned to limestones. In some places, they were metamorphosed into marbles.

As Africa pushed northward into Europe, those limestones and marbles were uplifted to become the Alps, including the marbles of Carrara that Michelangelo carved, as well as the limestone and marble of classical Greek temples and the Dalmatian coast.

Farther to the east, the summit of Mt. Everest at 29,000 feet above sea level consists of marine limestone from the ancient Tethys Sea pushed upward during India's collision with Asia about 50 million years ago. The limestone towers of Guilin in Southern China resulted from that same collision process.

Going back even further in time, about 550 million years ago, South America and Africa were separated by a pre-Atlantic sea, the Andamastor Ocean. Sediments deposited in that ancient ocean were uplifted to form the sandstones exposed today on top of Table Mountain, the iconic symbol of Cape Town, South Africa, when those two early continents collided before separating again 200 million years ago. The rocks don't forget their histories.