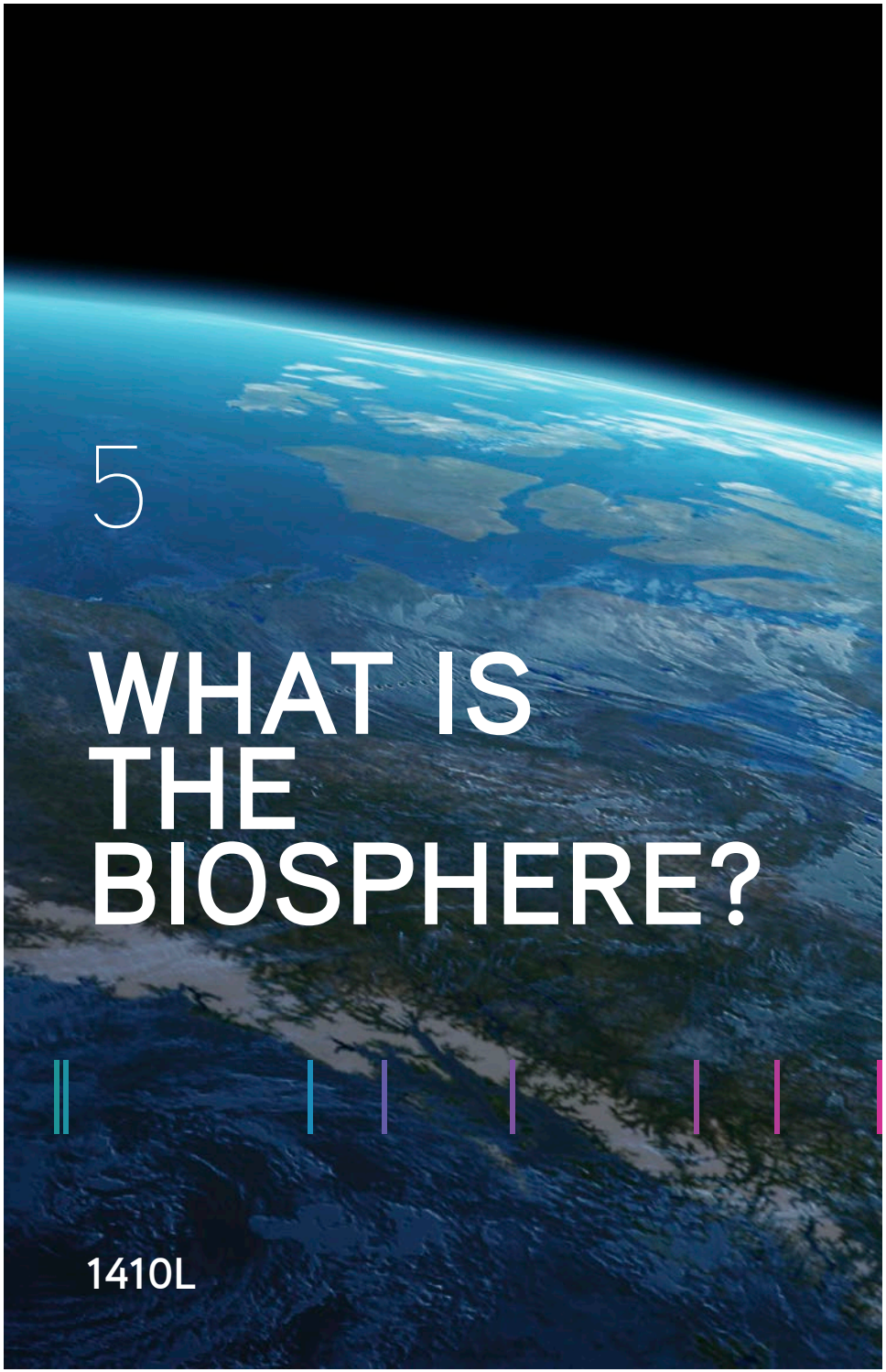

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WHAT IS THE BIOSPHERE?

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WHAT IS THE BIOSPHERE?

By Big History Project

The history of a word

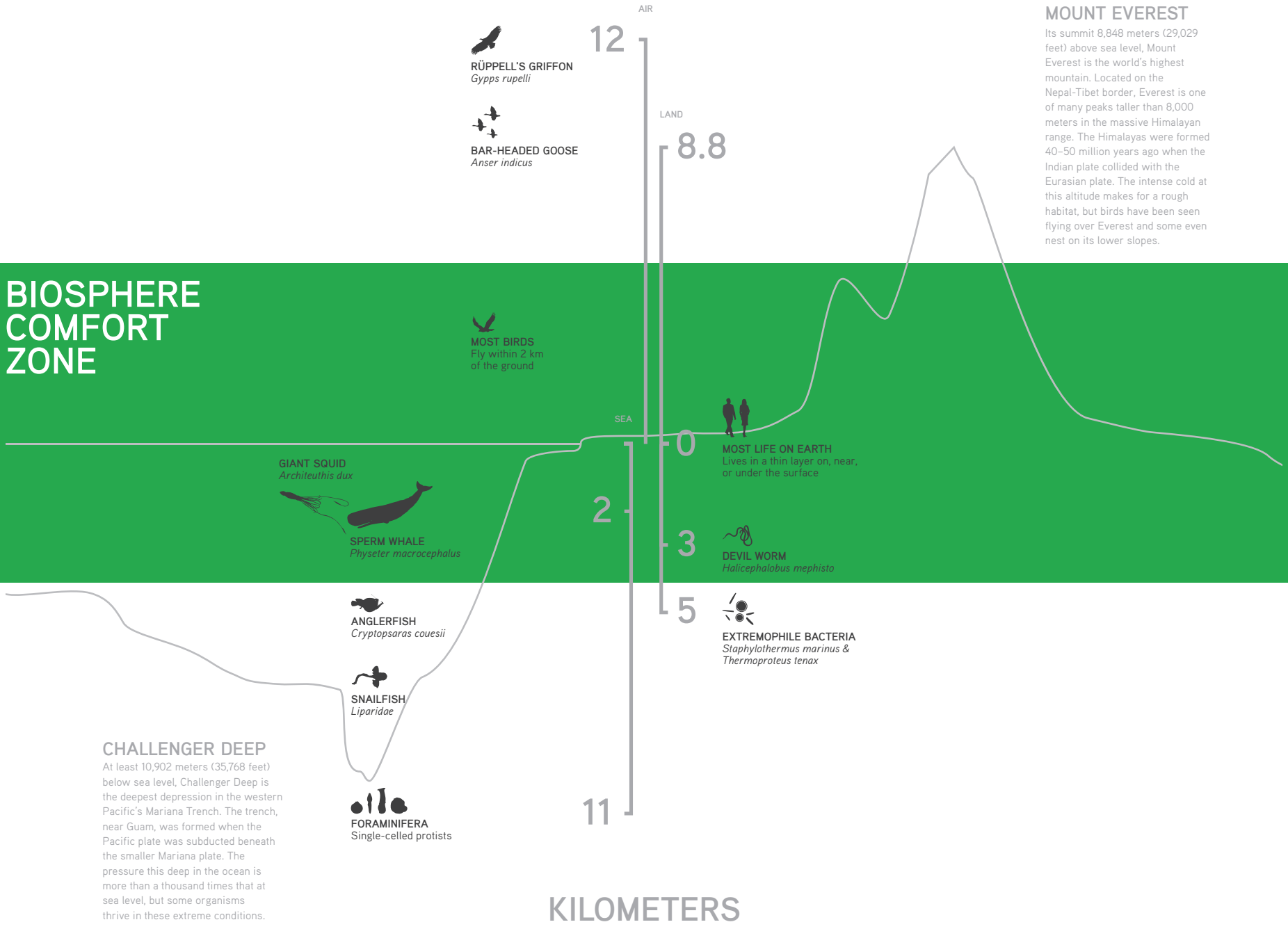
Sometimes the history of a word can tell us a lot about what the word means. The study of words even has its own name: etymology. Often, a closer look at a word unfolds into another story, one that may connect to other people and other scientific studies.

The word biosphere was first used by English-Austrian geologist Eduard Suess (1831 — 1914) more than a hundred years ago in a four-volume work entitled *The Face of the Earth* (1885 — 1908). Suess is also credited with being the first person to propose the existence of the supercontinent Gondwanaland and the ancient Tethys Ocean, based upon his work studying fossils in the Alps and his knowledge of the fossils of *Glossopteris* ferns that were found on several different continents.

At the time, no one knew about plate tectonics. German meteorologist Alfred Wegener didn't put forth his theory on continental drift until 1912, a couple of years before Suess died, and the best explanation Suess could offer for the presence of marine fossils in the mountains was that the waters of the Tethys Ocean had flooded the whole Earth, not that the continents had actually drifted apart and changed. This is a great example of how limited evidence can sometimes lead scientists to settle on incorrect conclusions. It also demonstrates how the work of one person can build on that of others, collectively leading to new discoveries about the world around us.

Suess combined bio, meaning "life," and sphere, referencing the Earth's rounded surface, to express the portion of the Earth that supported life. He invented the word because he felt it was important to try to understand life as a whole rather than singling out particular organisms. He wrote in *The Face of the Earth*:

> The plant, whose deep roots plunge into the soil to feed, and which at the same time rises into the air to breathe, is a good illustration of organic life in the region of interaction between the upper sphere and the lithosphere, and on the surface of continents it is possible to single out an independent biosphere.



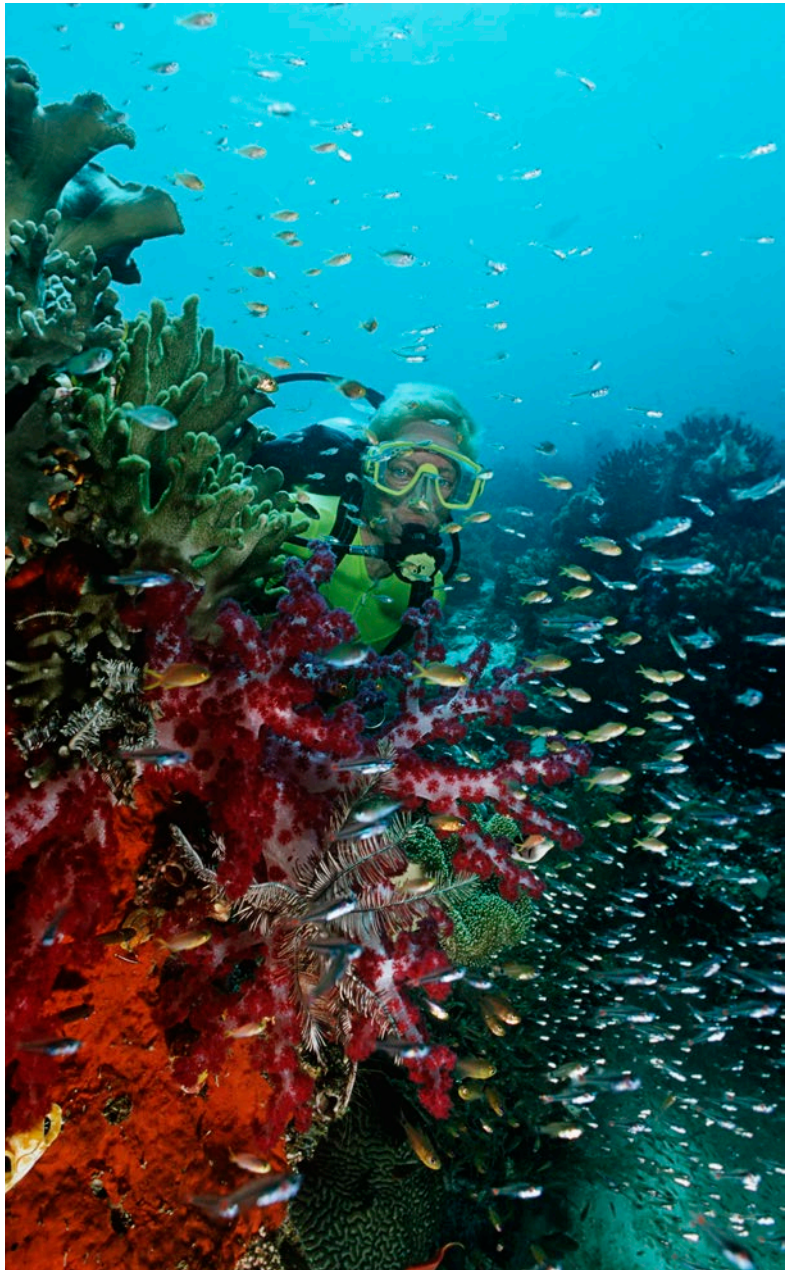
BIOSPHERE COMFORT ZONE

MOUNT EVEREST

Its summit 8,848 meters (29,029 feet) above sea level, Mount Everest is the world's highest mountain. Located on the Nepal-Tibet border, Everest is one of many peaks taller than 8,000 meters in the massive Himalayan range. The Himalayas were formed 40–50 million years ago when the Indian plate collided with the Eurasian plate. The intense cold at this altitude makes for a rough habitat, but birds have been seen flying over Everest and some even nest on its lower slopes.

CHALLENGER DEEP

At least 10,902 meters (35,768 feet) below sea level, Challenger Deep is the deepest depression in the western Pacific's Mariana Trench. The trench, near Guam, was formed when the Pacific plate was subducted beneath the smaller Mariana plate. The pressure this deep in the ocean is more than a thousand times that at sea level, but some organisms thrive in these extreme conditions.



As our knowledge of life on the planet evolves, we've come to use the word biosphere as a way of explaining the entire intertwined network of life on Earth. This concept combines an understanding of geology, knowledge of the distinct layers that make up the Earth and its atmosphere, and an awareness of the biodiversity surrounding us. We can think of the biosphere as the habitat, or home, for all life on our planet, in all its forms, and with all its intricate biological and geological relationships.

Biosphere = the network of all life on Earth

Worlds within worlds

The biosphere is incredibly small — just a thin layer around a medium-size planet. But it's also incredibly large, when you consider all of the different living things and our planet's vast expanses of water and land. As with most things that seem large and encompassing, it's possible to break down the biosphere and to use other words to describe specific environments or habitats.

These smaller areas are called "ecosystems," and they are characterized by particular geologic or climatic features that accommodate certain forms of life. Oceans, jungles, and mountain ranges can be ecosystems, but even more specific places can be their own ecosystems. Think of a cave, a river or river valley, a coral reef, a city, or the "vent communities" that surround black smokers on the ocean floor. Altitude, latitude, longitude, climate, soils, and terrain can all contribute to the distinct features of an ecosystem — the Earth's geologic processes have produced a multitude of diverse environments. The biosphere boasts incredible diversity and, even in extreme environmental conditions, astounding examples of life's flexibility and determination.

Every organism — from baboons to bacteria — has a specialized way to make a living as it vies for resources and energy and reproduces within its own environment. Examining these individual ecosystems, using biology and geology, reveals the many complex relationships between life and the planet we all share.

Image credits

Earth from space
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An 1869 lithograph of Eduard Suess by Josef Kriehuber, public domain

Illustration of the biosphere
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Scuba diver looking at coral reef
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