

GEOSCIENCE'S VOCABULARY MAKES EARTH MORE HUMAN

Rasoul Sorkhabi

Ancient civilizations and tribal people often respected Earth as the mother and the sky as the father of life. Much of the language of geology comes from similar myths: “Gaia” — the root for “geo” — is a Greek name for Goddess Earth.

In the late 18th century, James Hutton, a (if not the) father of modern geology, embraced this anthropomorphizing viewpoint, describing Earth as a “super-organism” or an “organized body.” Hutton was also a farmer who cared about soil fertility and a non-practicing physician who wrote his doctoral thesis on the circulation of blood in the “microcosm” — that is, the human body. James Lovelock most recently revived the metaphor of Earth as a planet-scale organism in his Gaia hypothesis.

In some environmental literature, water is regarded Earth’s blood, soil is Earth’s placenta and tropical forests are Earth’s lungs. As Earth warms, the planet is “weeping” — polar ice caps and mountain glaciers are melting, sea level is rising, floods and hurricanes are becoming more frequent or more powerful.

Whatever the philosophical debates about a living versus an inanimate Earth, a considerable number of geoscience words describe Earth’s features and processes in terms of the human body or human behaviors. Over the next few months, EARTH will look at some of these terms.



Illustration by Setsuko Yoshida

GEOMORPHOLOGY AND PHYSICAL GEOGRAPHY

- Mountains have their “birth” and “death;” they may be “young” or “old.”
- Mountains, like sea levels, the sun and civilizations, rise and fall.
- Mountains have “feet” (which is what the French word “piedmont” means) and “foothills.”
- In the early 20th century, William Morris Davis divided the entire cycle of river erosion into three stages: “youth, maturity and old age,” which is still a textbook description of how rivers shape the landscape.
 - Rivers have “headwaters” (where they begin), “mouths” (where they end), and throats, called “gorges.”
 - In a geological process called river piracy, a river is “captured” by (that is: diverted into) the channel of another river.
 - Rivers also “meander” along a landscape, or can appear “braided” or “straight,” like human hair.
 - Like a combatant army, the sea may retreat (regression), advance (transgression) or even occupy the land (marine conditions) for millions of years until tectonic forces uplift the land or climatic cooling pushes back the sea.
 - Glaciers have toes called “snouts.”



STRUCTURAL GEOLOGY AND TECTONICS

- In classical geo-literature, Earth’s smooth “skin” (crust) was deformed by “wrinkles” (folded mountains) — although this is an outdated notion.
- Strike-slip faults may be left-handed (“sinistral”) or right-handed (“dextral”) depending on whether they move to the left or to the right of the observer.
- Dip-slip faults have “hanging walls” (the portion above the fault plane) and “foot walls” (below the fault plane). Both terms were derived from miners’ jargon in the 18th century.
- Faults take “steps,” jumping to new locations nearby and continuing to propagate.
- Folds have “limbs” joined at the fold, or “hinge.”
- A “recumbent” fold is so-named because it is “lying down.”
- Volcanoes have “necks,” and can “blow their tops” as humans are described to do when angry.
- Rift valleys have “shoulders.”

GEOCHEMISTRY AND MINERALOGY

- Radioactive isotopes have “parents,” “daughters” and “half-lives.”
- Hydrothermal solutions flow through rock fractures and form mineral “veins.”
- Hematite, which means “blood-like” in Greek, is a mineral that shares a common element with our blood: iron.
- Minerals display varying degrees of (poor to perfect) “cleavage,” (much to the amusement of many Geo 101 students).
- Each crystal has several “faces” (flat sides).
- Some crystals grow in “twins” in the same crystal lattice.

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GEOSCIENCE VOCABULARY MAKES EARTH RIGHT AT HOME

Rasoul Sorkhabi

The language of geoscience often reflects our planet as a furnished home with a fine architecture for its inhabitants, including everything from “tables,” like the wide mesas in the American Southwest, to the magma “chambers” that sit below volcanoes like Kilauea, to the geochronologic “clocks” used to date Earth’s past events.

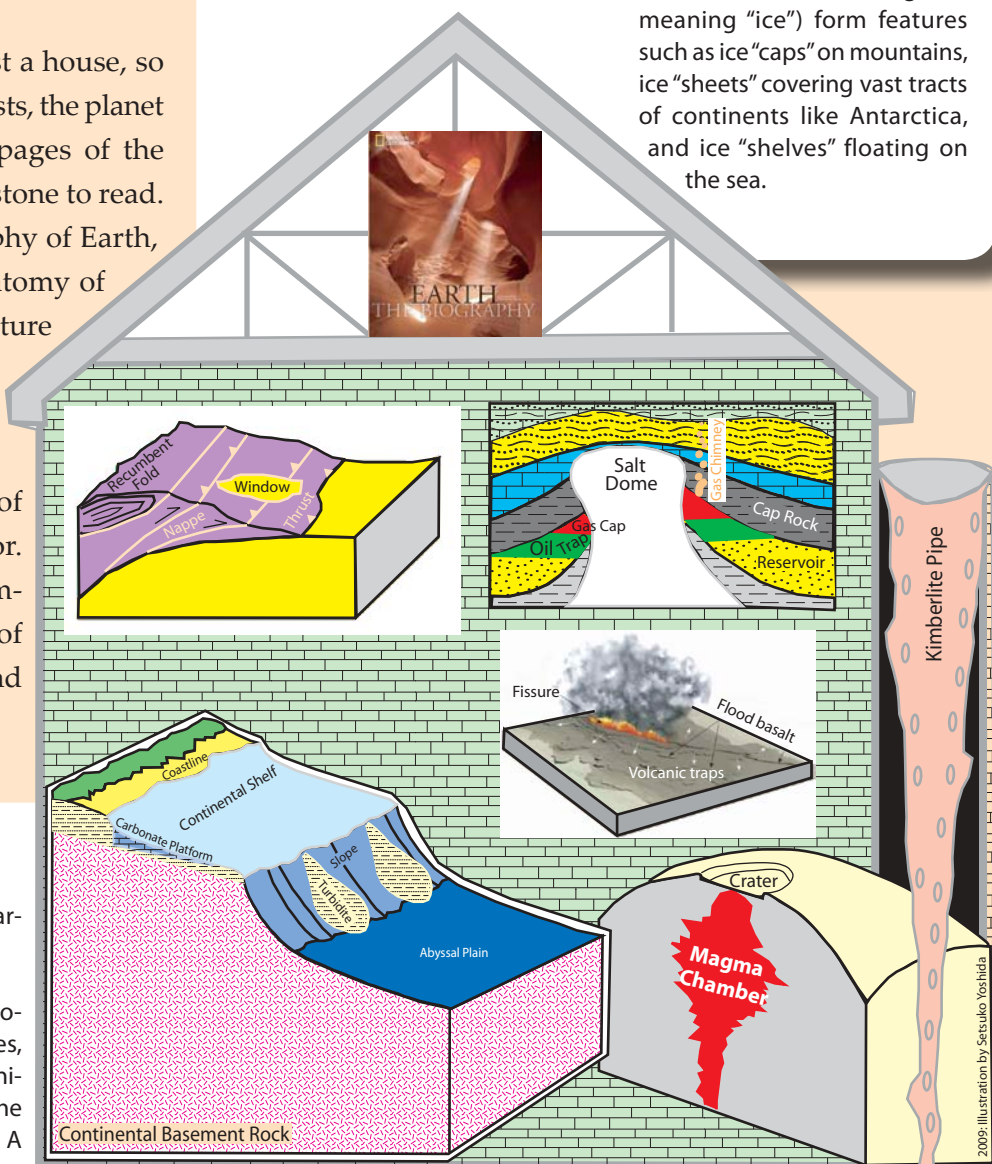
A home without books is just a house, so the saying goes. To earth scientists, the planet is filled with literature: The pages of the Book of Nature are written in stone to read. We can read about the biography of Earth, the evolution of rocks, the anatomy of mountain belts and the architecture of sedimentary basins.

Last month, EARTH looked at how geoscience terms describe the planet in terms of the human body and behavior. Next month, EARTH will examine the fantastical language of lightning and other weather and space phenomena.

GEOMORPHOLOGY

- “Plateaus” are large “tablelands.” Smaller tablelands are called “mesas” (especially in the American Southwest) — a Spanish word for “table.”
- “Butte,” an isolated hill rising steeply in a plain, is derived from the Latin “bottis,” a cask of wine.

- The Spanish word for a volcanic “caldera” comes from the Latin “caldarium,” a hot bath.
- “Crater” means a “mixing bowl” in Latin.
- “Water table” is the depth at which underground rocks are saturated with water.
- Glaciers (from the French “glace,” meaning “ice”) form features such as ice “caps” on mountains, ice “sheets” covering vast tracts of continents like Antarctica, and ice “shelves” floating on the sea.



PETROLEUM GEOLOGY

- Sedimentary basins are hydrocarbon “kitchens.”
- During the early days of the petroleum industry in the United States, the courts decided that oil, like animals, belong to the land (and to the landowner) where it is trapped. A petroleum “trap” is a three-dimensional closure of “reservoir” rock beneath an impermeable “cap” rock. Within the trap, we may find only oil, only gas or both of them together with a “gas cap” on top of the oil.

Sometimes the cap rock is breached and large volumes of the gas escape upward in the sedimentary basin, displaying “gas chimneys” on seismic images.

2009 Illustration by Setsuko Yoshida

Illustration by Setsuko Yoshida © 2009

STRUCTURAL GEOLOGY AND TECTONICS

- Tectonic “plates,” carbonate “platforms” and high “plateaus” all share the Greek root “platys,” meaning “flat” (or “plat” in French). The highest continental plateau, Tibet, is renowned as the “Roof of the World.”

- European geologists call the large thrust and fold structures of the Alps “nappe” (French) or “decke” (German), both of which mean tablecloth. (The word “napkin” is derived from nappe.) A similar English word is “thrust sheet.” The younger

rocks underlying a nappe may be exposed by uplift or erosion and thus provide a “window” (“fenster” in German).

- “Duplex” thrust structures are bounded at the bottom and top by a “sole” and a “roof” thrust.
- Rotational faults are also called “scissor” faults.

- “Fence” diagrams show the lateral distribution of rock formations, and “rose” diagrams

illustrate the direction of fractures and faults.

- Stable continental blocks of Precambrian age were termed “shields” by the Austrian geologist Eduard Suess in 1888.

- Ocean “floors” spread at mid-oceanic “ridges” and subduct at “trenches.”

- Continents have “basement” rocks and continental “shelves” upon which “beds” of sedimentary rocks are piled.

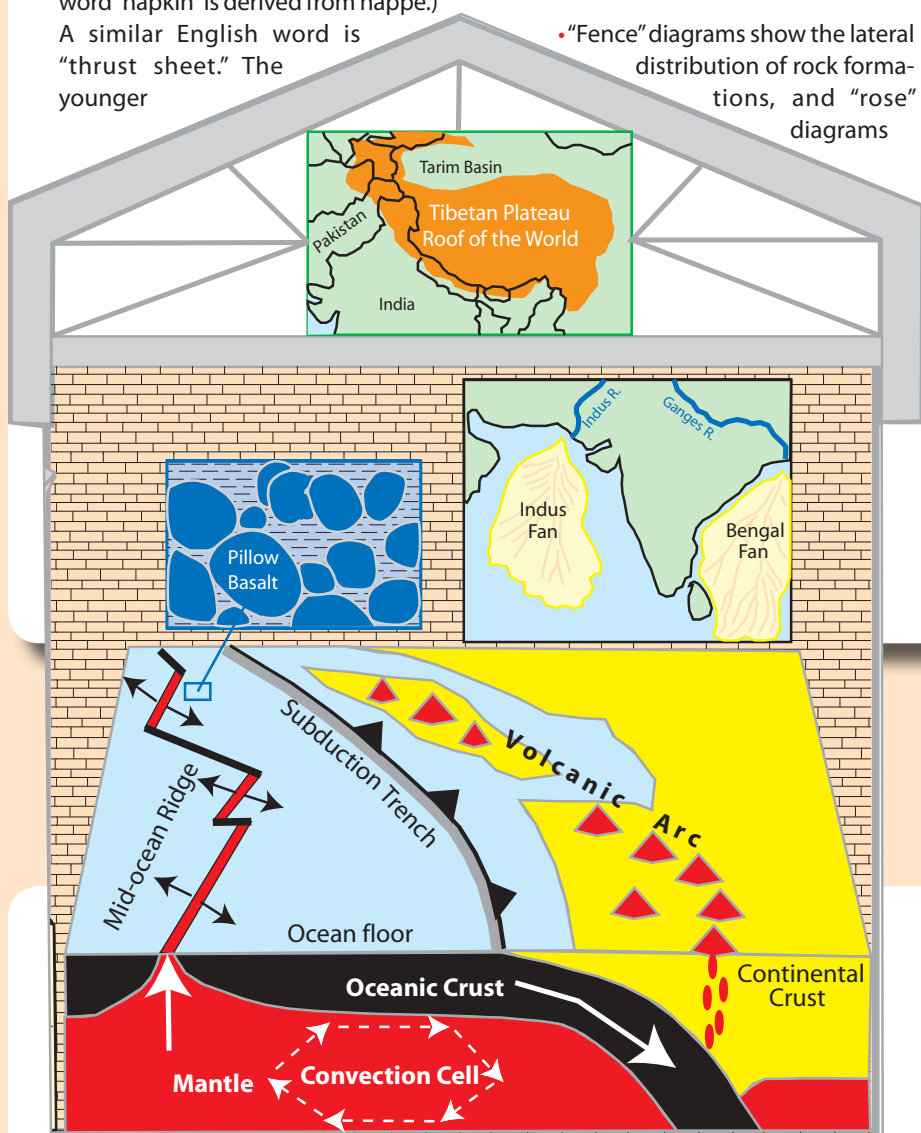
- Deeper in Earth, there are convection “cells,” magma “chambers,” volcanic “vents,” kimberlite “pipes” and ore “bodies.”

- Outpouring of volcanic rocks beneath the sea produces “pillow” lava.

- Wide volcanic activity on continents produces “flood basalts” or “traps” like the Deccan Traps of India. The word “traps” derives from the German word “treppe” for “stairs” because of the stair-like feature of these rocks covering the land.

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- Earth has “basins” of various types: oceanic, tectonic, sedimentary, drainage and groundwater basins, for example. “Basin” is derived from the Latin “bacchinon” — a circular vessel for holding water.



SEDIMENTOLOGY

- Soil is formed from the weathering of “bedrock.”
- “Cementation” is one of the processes that transforms loose sediments into sedimentary rocks.

- Within sedimentary basins, we may find salt “domes,” alluvial “fans” and sand “channels.”

- A characteristic sedimentary bed used for stratigraphic correlation is called the “key” bed.

- Oceans are chemical “sinks” for many elements.