



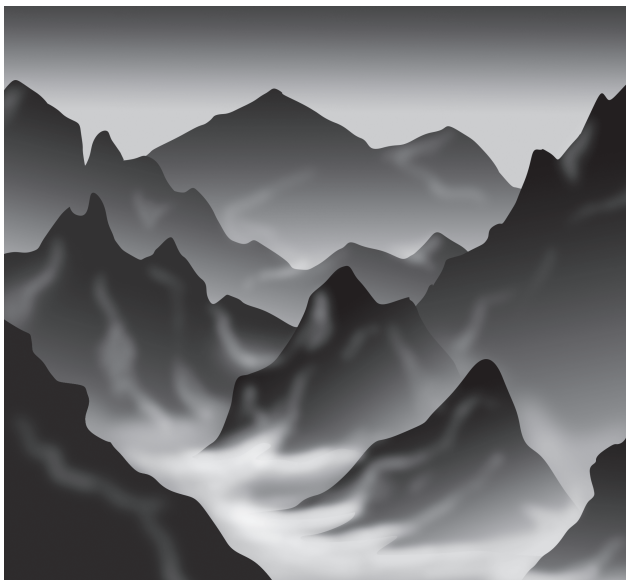
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Accursed Mountains

From Albanian, “Bjeshkët e Nemuna”; Serbo-Croatian, “Prokletije” (Accursed Mountains), a range of high, jagged mountains, also known as the Albanian Alps.

The Accursed Mountain chain stretches from northern Albania through Kosovo and Montenegro, with the highest peaks reaching more than 8,800 feet. The steep karst limestone topography features sharp crags, vertical rock faces, precipitous cliffs, caves, tremendous waterfalls, ice-clad pinnacles, and avalanches. Some deep valleys and yawning canyons descend more than 3,000 feet. The rugged, zigzagging massif is the result of the collision of the African and Eurasian tectonic

plates about 100 million years ago and later massive glacial activity in the Pleistocene epoch. Surprisingly, several glaciers are hidden in the mountains (four were only just discovered in 2010), along with numerous relict arctic plants from the last ice age. Vegetation is exceedingly rich, with more than 2,000 species of wild plants, including more than 100 medicinal herbs. Many animals long extinct in most of Europe still dwell in the Accursed Mountains: wolves, brown bears, otters, wildcats, lynxes, chamois, eagles, a newly discovered lizard, and venomous vipers. The last true wilderness of Europe, the inhospitable Accursed Mountains have never been fully explored.

Some of the valleys have been inhabited since the Stone Age, and some tiny villages trace their history back to the Middle Ages. In classical antiquity, the mountainous region was notorious for bandits; in modern times blood feuds among clans were rife. Early travelers remarked on the fairy-tale character of rustic stone villages and the awe-inspiring beauty of the Accursed Mountains. Of course, the high pastures and winding paths in the peaks were long known to local shepherds and villagers. Many of the old stories feature *vilas*, nymphs or fairies of the forests and mountains (*see* Ecodaimon). It was said that vilas especially loved to bathe in the medicinal waters of the high glacial lake Hridsko Jezero (Crag Lake) also called Liqeni i Zanave (Fairy Lake), hidden under steep cliffs at 6,400 feet.

Several stories account for the ominous name of the stark, forbidding mountains. According to one tale, the devil escaped from hell and formed the jagged peaks in one day's work. A Serbo-Croatian folktale tells how

three handsome brothers went hunting deep in the mountains to provide food after their father died. One day they came upon a vila, a lovely fairy. Enchanted by her beauty, the brothers fought violently among themselves over her. Tragically, all three brothers ended up dead. Their worried mother searched the mountains until she found her sons' bodies on a hill. She buried them there. The vila sadly explained to her what had happened. But the anguished mother cursed the fairy for the loss of her sons, and her wails of despair echoed from mountaintop to mountaintop.

Another legend relates that a woman and her children trekked into the mountains to escape enemies. In the blazing summer heat, they could find no water, and in despair the mother cursed the place. Some believe that the name originated with Slavic soldiers who once attempted to march over the trackless range into Albania. Others say the name arose because the Muslim Turks first invaded Albania by way of the mountains in the fourteenth century.

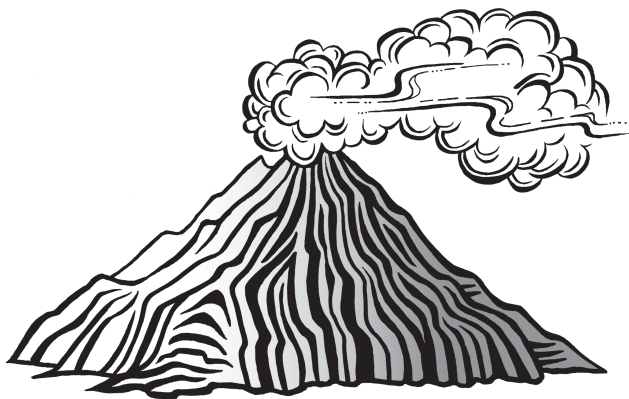
During the dictatorships after World War II, the natural barrier of the Accursed Mountains was fortified, set about with land mines, and patrolled, effectively isolating the stronghold of Albania from the rest of the world. The Accursed Mountains came to be called the "Forbidden Land." However, once a paranoid hermit nation of Europe, after 1992 Albania began to emerge from its fortress mindset. During the breakup of Yugoslavia in 1992–98, violent ethnic and religious strife boiled over among Muslims, Orthodox Christians, and Catholics. Finally, in 2013, Albania joined with Montenegro and Kosovo to plan a peaceful

cross-border 120-mile hiking trail called “Peaks of the Balkans.” Shepherds now guide and offer hospitality to travelers in the majestic and wild Accursed Mountains. Some route markers even transform the sinister name to “Blessed Mountains.”

Budj Bim

Pronounced judge jim, “high head,” in Dhauwurd Wurrung, the dialect of the Gunditjmara Aboriginal people; a dormant volcano in the Newer Volcanoes Province, southwest Victoria, southern Australia; also known as Mount Eccles.

In the Gunditjmara people’s “Dreamtime” story, the Great Creator dispatched four giant creator-helpers to form the land of Australia. Three of the giant beings went north and east. But Budj Bim remained in the ancestral homeland of the Gunditjmara people. There Budj Bim transformed into a violently erupting volcano, spitting liquid fire from between his *tung att* (teeth), while the trees and the land itself “danced.” Today Budj Bim stands as a cone 584 feet high, surrounded by other volcanic craters. The brow of the mountain represents Budj Bim’s forehead, the sharp basalt scoria rocks are the giant’s teeth, and the lava flows are his blood, which poured over the land. Budj Bim assigned the weeping she-oak (*Casuarina*) trees, whose whispering voices can be heard in the wind, to be the guardian spirits of the landscape. The tree’s hardwood is excellent for fuel, boomerangs, clubs, and shields. The lava flows created a fertile complex of wetlands, which supported the hunting, fishing, and eel-farming lifestyle of the Gunditjmara people for at least 40,000 years. By 6,600 years ago, they



were living in lakeside settlements with houses made of basalt and wood. They engineered sophisticated eel and fish traps using basalt lava rocks. The complex of fishing traps makes up one of the earliest known aquaculture farming systems on Earth.

Scientific analysis by argon gas dating determines when molten rock solidified. The argon “clock” shows that Budj Bim erupted a little over 36,000 years ago. Archaeologists discovered a stone axe under the volcanic ash. The find confirms that tool-using humans could have witnessed the eruption from a safe distance; survivors recorded the event in the story told by the Gunditjmara people who have lived continuously in the region of Australia’s youngest volcanoes. This means that the oral legend about Budj Bim volcano may have been told and retold for more than 36,000 years, many millennia longer than, for example, the Klamath Indian mythic account of the creation of Crater Lake in

Oregon (*see* Longevity of Orality). Scholars believe that Aboriginal tales conveying perceptive observations and understanding of natural evidence are some of the most ancient geomyths in the world, helping scientists to understand seismic, volcanic, and other geological events in Australia's remote past (*see* Geomyth).

Cameroon Death Lake
Lake Nyos in Cameroon, Central Africa; deadly carbon dioxide gas suddenly burst forth in 1986, creating a toxic cloud that killed nearly 1,800 people, 3,000 cattle, and countless domestic and wild animals, birds, amphibians, reptiles, and insects.

In Cameroon, there are two types of lakes. Good lakes have plenty of fish, have easy access for fishing and bathing, and provide water supplies. Bad lakes, believed to be inhabited by powerful spirits, are difficult to get to, have no fish, often change color, and are associated with death and destruction. Lake Nyos, an extremely deep lake in the volcanic highlands of northwest Cameroon, was in the second category. Notably, in the local Mmen language, *nyos* means “good,” a euphemistic way of appeasing the lake.

The round maar, or crater lake, covers only half a square mile, but it is 682 feet deep. It was formed just 400 years ago by a violent volcanic explosion of lava and water. The deep crater of the volcano now filled with water sits atop the still-active magma column of molten rock. This magma chamber beneath the lake charges the maar with millions of tons of carbon dioxide (CO₂), which seeps up through fissures in the lake floor. The water of the deep lake is stratified, with

a shallow layer of fresh rainwater occupying the upper 150 feet. As the columns of CO₂ bubbles rise, they dissolve in the cold, deep layer of water under very high pressure, a continual process for centuries. But over time the water becomes supersaturated with CO₂ and the lake becomes more and more unstable, creating a hidden ticking time bomb should anything cause the deep, cold, densely saturated water to suddenly rush up to the warmer, low-pressure layer of the lake. Sooner or later, the upwelling water and escaping gas will produce a limnic eruption, the violent explosion of tons of carbon dioxide and water into the air. Picture shaking a bottle of carbonated champagne before popping the cork, but on a catastrophic, geological scale.

Cameroonian myths tell of lakes that suddenly shift location, rise, sink, or explode. Mindful of bad-spirited lakes, even though the soil near the lake is rich and fertile, the most long-standing ethnic groups in the area have always built their houses on high ground well away from Lake Nyos. In contrast, since the 1940s newcomers have settled around the shores and valleys near the lake.

One oral tradition about Lake Nyos describes how people long ago attempted to cross the dry lake bed between the high, contorted rock formations of the maar's volcanic rim. Suddenly the waters surged back and everyone drowned. People say the voices of the drowned ghosts can be heard between two rocky crags. Could the story contain a collective memory of the original eruption of the volcano, only 400 years ago?

Another legend explains how in the distant past, the nefarious Lake Nyos was formed from the decomposing

body of a Kom chief whose people had been tricked and murdered by the Bamessi tribe. To take revenge on the Bamessi and save his surviving people, the Kom chief decided to hang himself. The chief warned the Kom people not to disturb his body and not to try to fish in the lake that his bodily fluids would create. Instead, the Kom should wait until the lake formed and then, on the day the Bamessi traditionally set aside for fishing, the Kom should secretly move away to another land. On Fishing Day, the Bamessi went to the mysterious new lake to fish. All of a sudden the lake exploded, killing the Bamessi, whose bodies sank to the depths.

Anthropologist Eugenia Shanklin's analysis of the details in this legend, and her discussions with Kom people (1989), led her to conclude that the geomyth arose after a real natural disaster centuries ago. She notes that lakes only form during heavy rains and that traditional Fishing Days fall in the rainy season, suggesting that the lake exploded during the rainy season. Cameroon is subject to very heavy rainfalls. Turbulence in Lake Nyos changes the color from clear blue to mud-brown or reddish from iron sediments.

In 1983, the prominent tribal leader in the Nyos region, known as the Lake Chief, died. Before his death, he expressed his last wish. Two versions of his request, recounted by tribesmen, differ slightly in the details. In one, he told his kinspeople to select his best, fattest cow to be given to the tribe's secret Kwifon society for sacrifice. In the fuller version, he commanded them to drive his best, fattest cows over the sheer cliffs above Lake Nyos as a sacrifice to the spirit of the lake, Mami Wata, the goddess of life-giving and death-dealing

waters. It is plausible that the Lake Chief knew the story of the exploding lake and hoped that sacrifices to Mami Wata might forestall another catastrophe. But the chief's kinsmen failed to honor his request. Arguing among themselves, they decided to keep his best cow and sacrificed a skinny cow instead. No cows were driven over the cliff into the lake, but some recalled that a week after the Lake Chief's death, his finest cows were seen walking in single file toward the lake.

It rained hard on August 21, 1986, the beginning of the rainy season. That evening, as people cooked meals and prepared for bed, something caused the entire lake to erupt, releasing a massive 1.6 million tons of CO₂. As scientists reconstruct the event, an immense foaming fountain of gas and water shot 260 feet in the air. As the water cascaded down, it washed out cornfields and flattened banana and fig trees. Survivors only noticed a distant rumbling. An expanding cloud of deadly gas rose more than 300 feet above the lake and was silently propelled about 45 miles per hour down the populated valleys radiating from the lake, instantly suffocating nearly every living thing in its path as far as 15 miles away. In Nyos town, only four of the 1,200 inhabitants survived. Those few villagers who miraculously lived were rendered unconscious. They awoke the next morning to a horrific scene, surrounded by the corpses of family, friends, and livestock. People living at higher elevations escaped the toxic cloud. When they came down to the villages, they were shocked by the surreal sight and eerie silence of the unthinkable disaster. No houses were destroyed, nothing was burned, just silent death everywhere. There were no flies on the

dead people and animals—even insects had succumbed to the invisible stealth killer. About 1,746 people died, along with thousands of cattle, sheep, goats, chickens, dogs, and untold birds, antelope, and other wildlife.

Among the survivors, many remembered the Lake Chief's last wish and attributed the catastrophe to the wrath of his departed spirit. Some suspected a secret government weapons test, or a bomb planted in a plot to mine diamonds under the lake, while others heard tales of old witches turning into savannah buffalo and plunging into the lake. Scientists, for their part, were hard-pressed to pinpoint the cause of the disaster. They understood the dangerous stratification of the deep maar, the exponential feedback cycle of the plumes of CO₂ bubbles, and the consequences of the sudden upwelling of cold CO₂-laden water from the bottom layer to the top, where the pressure of the gas exceeds that of the water. But what caused the turbulence that suddenly reversed the layers? What triggered the massive quantities of gas-rich water to explode at the surface of Lake Nyos? Some propose seismic tremors sent waves that forced the deep water upward. Could strong winds perturb the layers? Perhaps there were explosions of steam from the volcano at the bottom? Some hypothesized that an underwater landslide displaced the deep water. This had happened at another maar about 50 miles away. Lake Monoun exploded and released carbon dioxide gas that killed 37 people on August 15, 1984, a year after the Lake Chief's death. Scientists at Lake Monoun found evidence of a large landslide that had occurred the night before, stirring up the gas-rich bottom layer. But no evidence of a landslide was found at Lake Nyos.

Another theory is that very heavy rainfall after serious drought violently sloshed the waters of Lake Nyos. During drought and heat, much of the top layer of the lake evaporates, reducing the amount of water that served to seal the bubbling, gas-rich lower layer. The shallowness of the warm top layer would be vulnerable to mixing, as colder, heavy rain fell, driving the shallow water down and the deep water up. A driving rain indeed occurred on August 21. The Kom legend of the exploding lake during the rainy season comes to mind. Whatever the trigger was, to prevent recurrence of the calamity, degassing facilities were installed at Lakes Monoun and Nyos to remove the continual buildup of carbon dioxide gas.

Cantre'r Gwaelod

A legendary sunken kingdom (also called the Lowland Hundred), said to lie in Cardigan Bay in western Wales.

The earliest written mention of the fabled kingdom of Cantre'r Gwaelod is the Welsh poem "The Drowning of the Land of Gwyddno" in the early thirteenth-century *Black Book of Carmarthen*, a collection of verses from AD 800 to 1200. Cantre'r Gwaelod was ruled by King Gwyddno. The Maes Gwyddno ("Plain of Gwyddno") was an area of low-lying, fertile land, said to be nearly 800 square miles, extending about 20 miles west of the present-day coast. The kingdom was fortified by a series of dikes with floodgates that had to be closed at high tide and opened at low tide to drain the land. In medieval accounts, Seithenyn (Seithennin), either a prince or the king's servant, was responsible for the floodgates. One night as the tide rose, Seithenyn,

drunk on mead, forgot to close the sluices. The ocean surged in and swallowed Maes Gwyddno. Welsh folklore says Cantre’r Gwaelod’s sunken church bells toll ominously when danger is nigh.

Many other medieval Welsh traditions describe Gwyddno’s castle and harbor. Several fifteenth-century genealogies claim descent from Gwyddno’s son Elffin, and the name “Gwyddno” is preserved in place-names. The exact location of Cantre’r Gwaelod is uncertain. Over the centuries the legend became conflated with other tales of drowned cities in Wales and with similar fables of Lyonesse in Cornwall and Ville d’Ys in Brittany in northwest France.

Beginning at the end of the last ice age, about 8,000–10,000 years ago, people in Ireland and Wales experienced rising sea levels from melting ice that eventually covered the land bridge connecting the two countries. Cardigan Bay of western Wales was once a landmass. *The Mabinogion*, a collection of the oldest Welsh prose stories, was compiled in 1350–1410. Some of the legendary and historical narratives date back to 1050–1200. One of the accounts describes the king of Britain leading his army from Wales to Ireland across a landscape with two rivers and a narrow, shallow strait that could be waded across. The story states, “Later the sea spread out when it flooded the kingdoms.” Settlements on the coasts would have been flooded as the sea advanced. In the sixth century, the British monk Gildas wrote that Wales was besieged by two enemies, barbarians from inland and the sea eating away the coast. As the ocean levels inexorably rose, some communities would have sought to defend their land by constructing earthen

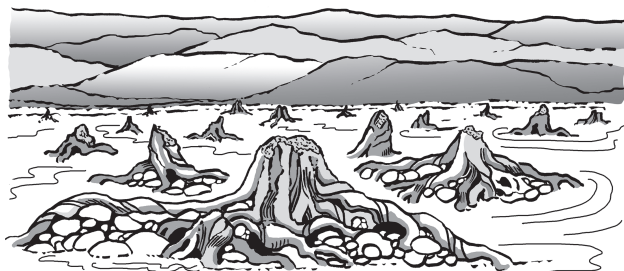
dikes and stone walls to resist inundation. It was inevitable that the sea would ultimately overwhelm any dikes or floodgates in low-lying lands. The ancient memories of those natural flooding disasters were kept alive in legendary narratives that blamed careless individuals like Seithenyn.

Is there any evidence for the existence of Cantre'r Gwaelod or other drowned Welsh cities? In 1846, geographer Samuel Lewis mentioned that when the tide is out in Cardigan Bay, some stone ruins called *Caer Wyddno* ("Fortress of Gwyddno") could be seen, and people found Latin inscriptions and ancient Roman coins. Lewis also remarked on the series of parallel shingle reefs of clay, gravel, and rocks conspicuous at low tide in the bay, identified as ancient dikes that once protected Cantre'r Gwaelod. The largest and longest ridge is called *Sarn Badrig* (Saint Patrick) Causeway. The causeways are not human made, however. They are glacial moraines deposited by retreating glaciers at the end of the last ice age. Over time, underwater ruins of a drowned town would likely be undermined and scoured by waves and covered by tons of mud washing into the sea from deforested hills in Wales. The shoreline of Wales continues to erode even today.

In some versions of the legend, Cantre'r Gwaelod was made up of two islands. The earliest known map of Great Britain was made in about 1370 (the Gough Map, in the Bodleian Library, Oxford). The map is geographically accurate in the contours of the English coastline generally, but it shows Cardigan Bay filled in, with two small islands just off the straight coast, between the Ystwyth and Dyfi Rivers. The lost islands no longer

exist in Cardigan Bay. Indeed, they had disappeared from maps by 1550. In 2022, geographer Simon Haslett and linguist David Willis surveyed the topographical, historical, and geomorphological implications of the Gough Map. Notably, their findings include the buildup of peat bogs and mires, and at least three submerged forests from about 5,000 years ago on the Cardigan coast between the Ystwyth and Dyfi Rivers. The two lost islands were likely to have been made up of loose Pleistocene deposits subject to erosion by surf and weather. Haslett and Willis conclude that the islands were remnants of a larger lowland that once occupied Cardigan Bay, and that the lowland was inhabited until the fifth and sixth centuries. The tale of the sudden inundation of Cantre’r Gwaelod appears to be a folk memory that compresses the relentless drowning of the coast into a single night.

Further evidence is the submerged forest on the beach at Ynyslas, a village at the mouth of the Dyfi River, which has been associated with the drowned land of Maes Gwyddno. The petrified stumps of birch, oak, pine, willow, and hazel trees were part of a large forest



that was inundated about 5,000 years ago, preserved by the acidic, anaerobic conditions of the peat soil. The large stumps and roots are visible at low tide. A series of severe storms in 2010, 2014, and 2019 permanently eroded the shore and seabed, uncovering even more tree stumps of the old forest. The storms also revealed burned stones, human footprints in hardened peat, evidence of coppiced trees (traditional forest management), and the remains of an ancient wooden walkway.

Dzud “Devourer,” in Mongolian and Kazakh; catastrophic weather conditions that kill vast numbers of livestock on the steppes.

Nomads have herded sheep, goats, yaks, horses, cattle, and camels for thousands of years on the steppes of Central Asia. The traditional pastoral lifestyle depends on a delicate environmental balance of enough grass, water, and shelter for the animals to thrive and persevere in a harsh climate and rugged terrain. Drought, wildfire, and extreme winters with blizzards, deep snow and ice, and deadly cold temperatures periodically threaten the nomads’ flocks and livelihoods. Difficult to prepare for and daunting to survive, severe weather in semiarid Mongolia, where temperatures and precipitation swing wildly, makes life precarious.

Mongolians have a word for the natural disasters unique to winter on the steppes: *dzud*. In the past, one expected a dzud about every 8–12 years, but Mongolia has become drier over the past century, and overgrazing, deforestation, urbanization, and mining also degrade the environment. Weather records reported



15 dzuds in 1700–1800; 31 in 1800–1900; and 43 in 1900–2000. Four consecutive dzuds—lethally cold winters during drought—occurred in the decade 2000–2010. The impact was catastrophic: more than 20 million livestock perished by starvation and freezing, and as many as 40,000 herders were impoverished in 2002 alone, forced to move to cities to try to earn a living.

Mongolian folk wisdom describes the following types of dzud:

- *Khuiten* (cold) dzud, several days of wind-driven blizzards and extremely frigid temperatures that can plunge to 58 degrees below zero Fahrenheit. Entire flocks can freeze overnight.
- *Tumer* (iron) dzud, a brief warm spell in winter melts snow, followed by subzero temperatures that freeze the melted snow into an impenetrable ice crust, which prevents grazing.
- *Khar* (black) dzud, harsh cold but lack of snow, depriving grasses of water in spring.

- *Tsagaan* (white) dzud, the most feared dzud, causing the most deaths, as very deep snow prevents animals from reaching grass and keeps herders from bringing fodder. Then, when the deep snow thaws in spring, grasslands are flooded into mud.
- *Khavsarsan* dzud, also dreaded, when two kinds of dzud combine—deep snowfall and freezing temperatures. The Kazakh nomads’ proverb, “Dzud has seven relatives,” refers to summer drought, grass drying up, early severe winter, deep snow, winter rain or snowmelt, ice crust, and blizzard.

In the past, Mongolian herders looked for traditional signs of dzud: wind and rain patterns, the appearance of the moon, marmots and other animals hibernating early, and other signals. To prepare, they would cull weak animals, fatten the flocks by migrating to lush grasslands, and store up extra hay and fodder. To rotate pastures and ensure water sources, herding families followed traditional agreed-upon migration patterns (*otor*) of their ancestors, by taking turns in pasturelands. In the old days, the nomads believed that performing epic poems and songs along with special rituals would please the spirits of their ancestors and nature, ward off evil spirits, and defend against dreaded dzud. Accordingly, when the nomads set up their *gers* (yurts) and readied their flocks for the coming winter, the people would gather to hear bards recite certain epic poems and folktales, accompanied by music. These special songs with the power to guard against dzud were only sung between October and March. Performances in summer were thought to offend the spirits and summon severe thunderstorms and lightning.

E **codaimon**

Mythical spirits of the natural environment, such as rain gods, spring nymphs, river and ocean deities, flower goddesses, mountain daimons, forest sprites, desert djinn, and glacier demons; a term coined in 2009 by Cindy Glendenon, a scholar of water lore (see Hydromythology).

Nature spirits abound in folklore, fairy tales, myths, and legends around the world. Earthly and atmospheric daimons (distinguished from celestial divinities) can rule an all-encompassing realm, such as the Underworld, the world under the sea, mountain ranges, or the skies. Poseidon, for example, was the Greek god of the sea, responsible for earthquakes and tsunamis, and Gaia was the goddess of the earth (*see* Gaia Hypothesis). Some ecodaimons are site-specific, dwelling in a certain body of water, special terrain, a particular forest glade, waterfall, cave, unique rock formation, island, desert, and other natural features of the landscape. Collectively, the spirits and minor gods of local places (ecodaimons) and the major gods of large natural domains (ecodeities) make up the assemblage of spirits and gods and goddesses who watch over and defend the ecological environment of the earth. Notably, ecodaimons can be capricious, benign, or dangerous, and sometimes all three; therefore, humans do well to bestow veneration and respect. Consider Pan, Greek god of the wilds, the goatlike, flute-playing faun of wooded groves, glens, and mountains associated with flocks, shepherds, and nymphs. Pan was worshipped in caves and natural grottoes. Usually peaceful, Pan could wreak violent revenge when spurned, and his shout could inspire *panic* (frantic fear) among flocks and humans. Another

example of dread classical ecodaimons were Charybdis and Scylla, monsters embodying the powerful sea currents and rocky coast in the Strait of Messina, Sicily (*see* Whirlpool). Ecodaimons often figure in fantasy fiction; examples include the Ents, tree-folk in J.R.R. Tolkien's *Lord of the Rings* (1954–55), and the Psamméad (sand fairy) in E. Nesbit's *Five Children and It* (1902).

Ancient Roman soldiers took the idea of ecodaimons to heart wherever they traveled in the empire. They made sure to offer dedications in far-flung lands to the *genius loci*, “Spirit of the Place,” whoever that might be.

See also Accursed Mountains; Fech Fech; Tsangpo River Chasm.

Eternal Fires

Perpetual flames issuing from fissures in the ground.

Descriptions of mysteriously burning lakes, fiery fountains, and flames issuing from caverns and openings in the ground have captured attention since ancient times. One of the earliest examples is the Greek myth of the Chimera, a fire-breathing monster that lived in a cave on the side of a mountain in ancient Lycia. The Roman natural historian Pliny identified the Chimera's cave as a place where flames emerge from the ground near the ancient town of Olympos in Lycia (southwest Turkey). The place is now called Yanartas (Turkish, “Flaming Rock”). The mountainside has vents in the rocks that have continually emitted burning methane gas for more than 2,500 years. In ancient times, the fires could be seen by ships at sea at night, and sailors relied on them for navigation. Today hikers visit the ruins of the ancient temple and marvel at the

Chimera's fiery breath. The flames are especially spectacular in the dark.

Another legendary flame is the Api Abadi (Indonesian, "Eternal Flame") of Mrapen, in central Java, sacred to Buddhists and Muslims. The natural gas flowing from rocks near Manggarmus village was ignited sometime before the fifteenth century. The flames were fabled to have forged the heirloom *kris*, the ceremonial dagger of the Demak Sultanate, the first Muslim kingdom in Java, founded in 1475. The Javanese kris, with its wavy blade and Damascus steel-like forged layers of metals, was more than a weapon. The daggers were spiritual talismans of power, imbued with magic, and they even possessed unique personalities. They were often featured in folktales about Javanese and Indonesian heroes.

Flammable crude oil and gases well up in sand, seep from bedrock, and create cascading fountains of fire in Near Eastern and other oil-producing lands. Petrochemical flames burn underwater, and water only intensifies the fire. Naphtha, the highly volatile, vaporous, or gaseous liquid that exudes from oil deposits in the Near East, is an extremely flammable light fraction of petroleum. Flowing fire that behaved like water but could not be extinguished with any liquid was a mystifying phenomenon held in awe by Babylonians, Persians, Jews, and other ancient peoples. Worshippers built temples at places where natural petroleum ("rock oil") and volatile gases burned perpetually. Ancient Mesopotamian texts show that spontaneously burning lakes and fountains of fire were revered from earliest times. As early as the sixth century BC, for example, Zoroastrians

and Persians venerated fire in several places where fiery oil wells blazed continuously, such as the Pillars of Fire near Baku, Azerbaijan. Notably, Medea, the powerful sorceress of ancient Greek myth, was associated with the region of Baku and Persia (ancient Iran), where flammable petroleum deposits and wells exuding gas and naphtha are common. Medea was said to control the secrets of unquenchable liquid fire, and she used it to kill her rival for the affections of the hero Jason of the Argonauts fame. Since antiquity, Azerbaijan was known as *Odlar Yurdu* (Azeri, “Land of Fire”) for its natural occurrences of flaming mud pools, burning hillsides, and eruptions of jets of flames in the Caspian Sea. At *Atashgah* (Persian, “Throne of Fire”) near Baku in the sixteenth century, Zoroastrian, Hindu, and Sikh fire worshippers built a temple complex around seven fountains of shooting flames. The temple was abandoned in 1883 when petroleum plants were installed to tap the gas field below.

In Iraq, near Kirkuk, people worshipped a naphtha fountain called *Baba Gurgur* (Kurdish, “Father of Flames”), continuously burning since 600 BC. Located in one of the largest oil fields in the world, *Baba Gurgur* was tapped in 1927 to become the first modern oil well. Some scholars suggest that *Baba Gurgur* was the fiery furnace into which the neo-Babylonian king *Nebuchadnezzar* (650–562 BC) cast the young Jewish men *Shadrach*, *Meshach*, and *Abednego*, according to the Old Testament tale in *Daniel 3*. *Baba Gurgur* may also be the place where, in 331 BC, the Babylonians showed *Alexander the Great* a cleft in the earth where fire flowed out in a continuous stream. According to

Alexander's biographer Plutarch, the Babylonians used flaming naphtha to illuminate their streets at night. The biblical Apocrypha describes how, in the fifth century BC, Nehemiah, a Jewish official in Susa under Persian rule, brought a thick combustible substance from Babylon called *nephtar*, to kindle an exceedingly bright and clear flame at the altar in Jerusalem.

Mesopotamian cultures exploited the surface pools of petroleum for lamps and torches, magical fire rituals, punishment of criminals, and making much-feared incendiary weapons that resembled flaming honey or glue, which clung to siege machines and immolated enemy soldiers. Roman writers struggled to describe the horror of the strange Persian burning "mud" collected from oil pools and poured on besieging armies. In the Byzantine era, distilled naphtha was mixed with sulfur and quicklime to invent the terrifying weapon called Greek Fire. The exact formula is lost, but in the twentieth century, the dreadful weapon napalm was concocted with similar substances.

In Rome in about 38 BC, people marveled when a fountain of oil (*fons olei*) suddenly gushed from the earth under the Taberna Meritoria, a hospice for veterans of the Roman army. The oil flowed for one day and one night into the Tiber River. Later, the legend arose that the oil predicted the birth of Jesus. The hallowed spot became a meeting place for the first Christians in Rome. Emperor Alexander Severus permitted the Christians to replace the old soldiers' home with a small chapel in about AD 220. The chapel was rebuilt on a large scale in AD 340, as the Basilica of Santa Maria

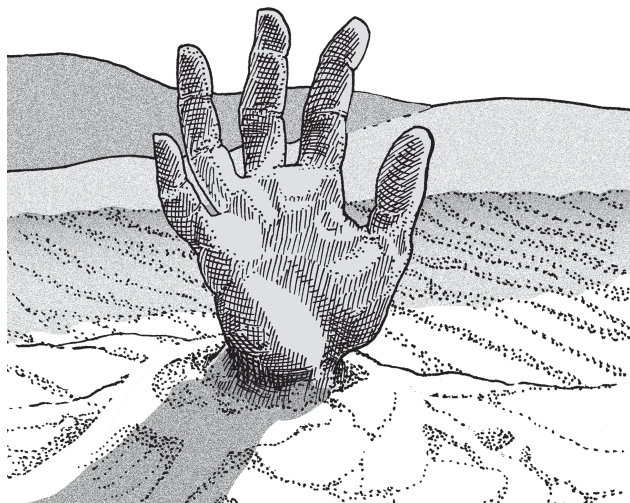
in the district of Trastevere, one of the oldest churches in Rome. Today the “exact” spot where the fons olei gushed from the ground is marked next to the steps up to the altar, and a thirteenth-century mosaic by Pietro Cavallini shows the old soldiers’ home with the stream of oil flowing into the Tiber. The scientific explanation of the temporary oil flow is unknown. Oil—usually in its vegetable form—was used for anointing the holy and the royal. The miraculous appearance of a fountain of oil in Rome was taken as a prodigy by Christians.

While Zoroastrians and Persians revered fire and ever-burning pools of flames in their petroleum-rich lands, Christians more often saw the fiery imagery as satanic. The natural phenomenon was taken to represent the everlasting flames of hell. In the Christian vision of eternal damnation, sinners would be punished by being thrown into the Lake of Fire. In the New Testament book of Mark, for example, Jesus refers to hell as “the fire that shall never be quenched.” The concept of the wicked cast into a lake of fire and brimstone (sulfur) to be tormented forever also appears five times in the book of Revelation. The ominous imagery originated in the Near East, where mysterious flames issued from fissures under the earth.

Modern petroleum geologists are interested in the geomythological accounts of spontaneous fountains of flames and perpetually burning fires. Knowing that an oil or gas seep was active thousands of years ago in specific locations helps scientists trace the history, extent, and rate of the earth’s hydrocarbon degassing into the atmosphere.

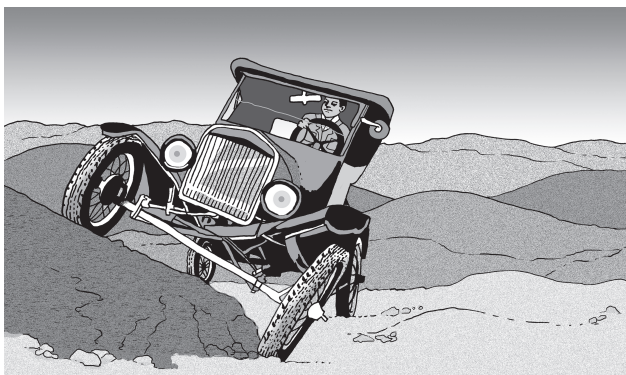
Fech Fech
Arabic term for “dry quicksand,” fine powdery dust that looks like solid sand but behaves like quicksand, posing grave danger to travelers in deserts (see also Quicksand).

Reports of desert travelers and whole caravans being swallowed instantly in *fech fech*, “dry quicksand,” were long dismissed as folklore. Scientists ridiculed the memorable desert scene in *Lawrence of Arabia*, the 1962 film based on T. E. Lawrence’s *Seven Pillars of Wisdom* (1926), in which the young Bedouin sinks in a pit of dry sand in the Sinai desert. In 2004, however, researchers in fluid dynamics replicated *fech fech* in a laboratory by blowing air through finely powdered sand granules. When they dropped a weighted Ping-Pong ball into



the dust, they were surprised that it disappeared instantaneously, confirming that reports of *fech fech* are credible, though its mechanics are still not perfectly understood.

Pockets of very fine clay, limestone dust, or shale silt under a thin, brittle crust are hidden sand traps that can suddenly collapse, engulfing camels, travelers, and vehicles. Under the deceptive crust, the dust has extremely low particle cohesion, providing little traction. Areas of *fech fech* formed over eons from dry mud and pulverized sediments of ancient lakes or rivers. As sand scientist Mathieu Lapôtre explains, when windblown, the dust is suspended in the air for extended periods and then settles very slowly, resulting in deposits much less compacted than sand. *Fech fech* is impossible to detect. Since the 1920s, beginning with Model T Fords, desert jeeps and trucks have been equipped with wide, very low-pressure tires to create more surface area and distribute weight.



In western Egypt, *fech fech* is common in the Qattara Depression, 436 feet below sea level and covering more than 7,500 square miles. Millennia of salt weathering—salts chemically breaking down the sediments of ancient lake beds—and perpetual abrasive wind erosion have created a vast basin of deep powdered sand, salt pans, windblown sand dunes, and fragile crusts over sticky mud or dry silt.

West of the Qattara Depression near the Libyan border is an *erg*, an ocean of sand with no vegetation, known as the Great Sand Sea. In this erg lies the Siwa Oasis, with date palms and olive trees watered by natural springs. In the late seventh century BC, the Oracle of Zeus-Ammon was established at Siwa Oasis. Travelers who ventured to the oracle in antiquity marveled at the seashells and marine fossils from the Miocene epoch that paved the desert floor, vestiges of the prehistoric lakes. Like the Qattara basin, the Great Sand Sea has prime conditions for *fech fech* and dust storms.

In 332 BC, Alexander the Great made the long journey, nearly 400 miles from Alexandria, Egypt, to Siwa to consult the oracle. He and his men knew that two centuries earlier, in 524 BC, an army led by Cambyses II of Persia had disappeared on the way to Siwa (*see* Sandstorms). Ancient historians reported that besides the lack of water, the 100-mile trek across the Qattara Depression posed the double danger of “deep, soft sands”—*fech fech*—and sandstorms blasted by the south wind. Alexander’s band and their guide became lost in the featureless dunes. Luckily, they were rescued by a pair of ravens who led the band to Siwa Oasis (*see* Geosmin).

Deserts with *fech fech*-type conditions also exist in western China. The vast Gobi and Taklamakan Deserts extend more than 2,000 miles across north-central China and Mongolia to the Tien Shan and Altai Mountains of Xinjiang. Chinese travelers especially feared traversing the sinister terrain from Dunhuang, Gansu, westward to Xinjiang with its unpredictable deep sands, salt marshes, and quicksands of the Moheyan Moraine (also *Sha-he*, “River of Sand”). Passage required navigating an utterly barren terrain across the Tarim and Lop Nur Basins and the Taklamakan-Gobi Deserts, baking hot in summer, bitterly cold in winter. Now completely desiccated, Lop Nur was once a salt lake, 100 miles long, where villages flourished from 1800 BC to about AD 800. After the lake dried up, the Lop Nur Basin was intermittently marshy in the past; petrified skeletons of tamarisk and poplar trees mark the ancient lagoons. The desert floor is covered by fossil shells and yardangs, bizarrely shaped wind-eroded rocks, given names like “Town of the Dragon” and “White Dragon Mounds” in ancient Chinese texts. In many places, the powdery silt is deceptively covered with a thin salt crust: typical *fech fech* conditions.

To the Chinese, the Gobi’s immense ocean of suddenly shifting, constantly flowing dunes and deep pits of soft, dry sand was known as *Liusha-he*, “Flowing Sand River or Quicksand River” (“river” is poetic for “sea”). Stone steles inscribed with Chinese characters warned of 800 quicksand circles and 3,000 “weak water” holes. Many died attempting to cross *Liusha-he*, beset by thirst, sandstorms, mirages, and ethereal voices. The Chinese Buddhist monk Fa-Hsien recorded his travels

from Nanking to India in about AD 400. About to begin crossing the desert, he wrote, “Travelers who encounter the desert’s hot winds and its many evil demons perish to a man. Not a bird or animal to be seen and nothing marks the way but the dry bones of the dead left upon the sand.” Marco Polo crossed the Gobi and Taklamakan Deserts in about 1280. He wrote, “It is a well-known fact that this desert is the abode of many evil spirits.” These spirits lead travelers “to their destruction with the most extraordinary illusions,” which Marco Polo described as visual and auditory, such as “visions and sounds of large armies approaching.”

The Chinese believed Liusha-he was haunted by a terrifying sand demon or ogre called Shensha shen, “Spirit of the Deep Sands” (*see* Ecodaimon). His appearance is gruesome. A bloodthirsty cannibal, he wears a necklace of the skulls of nine Buddhist pilgrims who had tried to traverse Liusha-he. The desert spirit’s first appearance in writing is in a seventh-century account of



the travels of the Buddhist monk Xuanzang, who set out across Liusha-he to obtain scriptures from India. The sand demon appeared when Xuanzang was near death from thirst. In a twelfth-century version of the Chinese novel *Journey to the West*, the demon threatens Xuanzang but finally agrees to help the monk safely cross over the dangerous sea of sand on a magical golden bridge.

I asked sand expert Mathieu Lapôtre whether *fech* *fech* conditions might exist on Mars. “Absolutely,” he replied. Mars has deep layers of dust that settled after being airborne in the planet’s horrendous dust storms. In fact, in 2009, NASA’s Mars Exploration Rover *Spirit* was traveling over solid-looking ground when it got trapped in layers of soft sand over sulfate salts. NASA’s engineers failed to maneuver *Spirit* out of the trap, and the brave little rover died in the Martian equivalent of *fech* *fech*.

Fimbulwinter

“Mighty or terrible winter,” also Fimbulvetr, described in Norse legends.

In the Old Norse and Icelandic narrative poems collected in *The Poetic Edda*, the unending winter, *Fimbulwinter*, is described in terse verses:

A winter will come called Fimbulwinter.
Snow will drift from all directions.
There will be great frosts and biting winds.
The sun will be obscured.
There will be three of these winters
and no intervening summers.

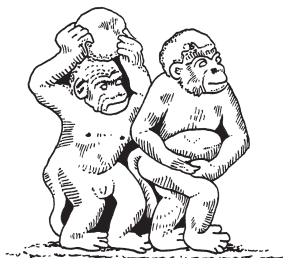
In the myth, the terrible winters will usher in an apocalypse of fire and ice and cosmic battles pitting Odin, Thor, Freya, and other Norse gods and goddesses against Fenrir, the Great Wolf, and Jörmungandr, the vast, venomous Earth Dragon. It is the fate of the gods to be destroyed in Ragnarök, the “twilight of the gods,” at the end of the world. According to scholars who study the *Edda*, it was composed in the ninth or tenth

century AD, drawing on much older Scandinavian and Icelandic oral traditions.

The scenario of extreme cold, blizzards, and persistent winter in northern lands lasting for three years could arise from storytellers' imaginations (*see* Ymir). But geomythologists wonder whether the Old Norse story of Fimbulwinter has some basis in folk memories of severely disrupted seasons. In fact, a "volcanic winter" occurred across Europe in the sixth and seventh centuries AD, with exceptionally frigid temperatures and darkened skies, bringing crop failures, livestock deaths, and starvation (*see also* Dzud). Scientific evidence shows that a series of tremendous volcanic eruptions spewed millions of tons of ash into the earth's atmosphere, blocking out the sun and moon and causing unusually cold temperatures. Ancient accounts around the world described the traumatic results of what is known as the Late Antique Little Ice Age of AD 536–660. Roman historians reported that the sun's light was feeble with no warmth. No shadows were cast even at midday. The seasons were perturbed and the people suffered drought and frost, poor harvests, and famine. Other accounts say snow fell in summer in China and thick, dry fogs covered the Middle East. Irish chronicles recorded deadly "failures of bread." There were widespread crop failures.

Some archaeologists speculate that hoards of buried gold treasures from that time period in Scandinavia could have been related to fears of Ragnarök. Analysis of tree rings confirms the dates of the catastrophe, the most severe and longest-lasting climate-cooling episode in the past 2,000 years. Bipolar ice core samples from

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