Beneath our feet: a review of "Why Hell Stinks of Sulfur: Mythology and Geology of the Underworld", by Salomon Kroonenberg

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Salomon Kroonenberg
WHY HELL STINKS OF SULFUR
Mythology and Geology of the Underworld
£25
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Look upward on a clear moonless night, and you behold a universe of stars, myriad beacons from both long ago and far away. Look down, and you see your feet and the ground on which they stand, nothing more. What lies within the Earth, beneath the rocks, soils and seas that bound our everyday experience? To classical commentators the answer was clear: the kingdom of Hades, subterranean home of the dead and, later, the damned. Science’s account is different, but in its own way equally fantastic. We live atop slowly roiling layers of crust, mantle and core whose heat-driven dynamics shape landscapes and geography, perhaps even life itself. In *Why Hell Stinks of Sulfur*, Salomon Kroonenberg chronicles humanity’s journey from one mode of explanation to the other.

Kroonenberg begins in Jerusalem, from which both Jesus (according to the fourth century gospel of Nicodemus) and Mohammed (in the *Mi’raj*) descended into Hell. Combing through the Old City and nearby Ketef Hinnom, he searches for Jesus’ portal, but to no avail; candidate sites are both unconvincing and uninspiring. Disappointment similarly attends pilgrimages to Lake Averno, the “foul jaws of stinking Avernus” through which Aeneas entered the Underworld, and to western Greece, where the confluence of the Cocytus and Acheron rivers marks Odysseus’ gateway to Hell. Both sites actually exist -- a few clicks suffice to locate them on Google Maps -- but they prove to be placid waterways, better suited to weekend excursions than crossing the bar. As Arthur buffs who’ve trekked to Dozmary Pool can attest, the geography of myth morphs readily into mythical geography. The pleasure of joining Kroonenberg in his odyssey lies not in any fleeting glimpse of Hell, but rather in the finely wrought explanations of Mediterranean geology sprinkled throughout the text. Caves provided antiquity’s surest route into the Underworld, underground rivers its subterranean highways, and volcanic hot springs the evidence that Hell was hot and, indeed, stank of sulfur. Kroonenberg lucidly explains the origins of caves and karst, calderas and carbonates, but neither science nor epic takes us more than a few tens of meters into the Earth.

Descriptions of Hell improved dramatically with the Christian emphasis on punishment, and no account is more vivid than Dante’s. With Virgil as guide, Dante descends through nine circles of Hell, from the pleasant groves of Limbo, where Homer, Socrates, and other honorable but unbaptized figures wait out eternity, to deeper levels with torments so horrific that teenagers still love to read about them. To us, Dante’s subterranean geography seems obviously moral and not literal, but this would not have been evident to medieval and Renaissance readers. Indeed, in
1587, the Florentine Accademia invited the young Galileo to evaluate competing reconstructions of Hell. His precise calculations of the Underworld’s dimensions show nascent science in support of theology; only later would physics and mineralogy provide an alternative narrative.

Different ways of knowing commingle, as well, in Agricola’s magisterial 1556 *De re metallica*, generally considered the foundational text of mining. Throughout, Agricola mixes strikingly modern commentary on how to dig shafts and extract ore with warnings about demons likely to be encountered in the process. Demons notwithstanding, mines extended human exploration into the Earth – up to about 800 meters before the Industrial Age and now nearly 4000 m in the gold mines of South Africa. At this depth, hot and mind-numbingly humid, miners labor to a persistent cadence of small creaks euphemistically said to be singing rocks, but actually pressure bursts that continually (and occasionally, catastrophically) deform shaft walls. Hell, indeed.

The deepest rocks observed in place by humans, then, lie some 6,367 kilometers from the center of the Earth. How can we explore our planet’s greater volume? At this point, classical accounts fail us, but drilling helps a bit. Originally developed to extract petroleum from reservoirs up to a few kilometers deep, drilling for scientific purposes has recovered rock samples some twelve kilometers down. Fortunately, the Earth itself occasionally makes deeper materials available. For example, at plate tectonic boundaries, extraordinary features called ophiolites preserve slices of oceanic crust and upper mantle scraped off one plate onto another. Most famously observed in Cyprus, but spectacularly exposed, as well, in Oman and Newfoundland, ophiolites enable geologists to study rocks formed tens of kilometers below the Earth’s surface, and do so in a stroll. Still deeper samples can be transported to the surface by magmas generated deep within the mantle. Diamonds crystallize only at pressures and temperatures found more than 150 km within the Earth, but they adorn rings and pendants because molten rocks have brought them to us. Indeed, tiny inclusions within diamonds provide further glimpses of our planet’s interior – flecks of mantle incorporated as the gemstones formed. For the rest, scientists rely on physics, using earthquake waves to generate a tomographic view of the deep Earth, much as CAT scans illuminate our anatomy.

*Hell* requires patience on the part of the reader – Kroonenberg loves digression and only slowly reveals his narrative arc. But the rewards are substantial. Kroonenberg interleaves science, history and autobiography with a light touch, blending lively accounts of classical scholarship with superb descriptions of Earth’s interior and how geologists have come to know it. Virgil may no longer be available to accompany us through Hell, but Salomon Kroonenberg proves a witty and erudite guide for the 21st century.

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