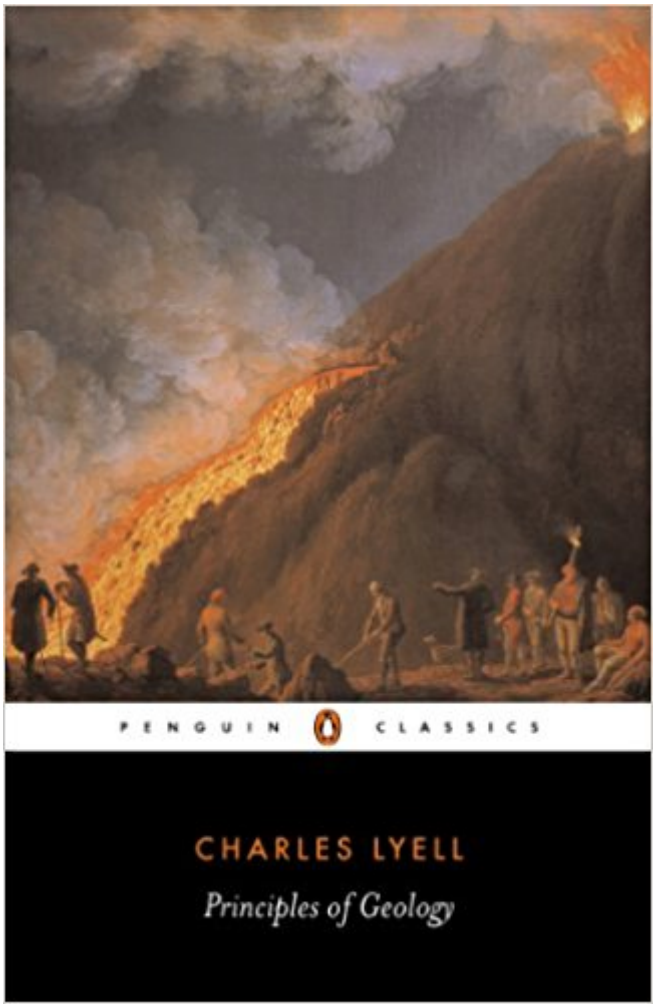
Principles Of Geology (Penguin Classics)



Synopsis

One of the key works in the nineteenth-century battle between science and ScriptureCharles Lyell's Principles of Geology (1830-33) sought to explain the geological state of the modern Earth by considering the long-term effects of observable natural phenomena. Written with clarity and a dazzling intellectual passion, it is both a seminal work of modern geology and a compelling precursor to Darwinism, exploring the evidence for radical changes in climate and geography across the ages and speculating on the progressive development of life. A profound influence on Darwin, Principles of Geology also captured the imagination of contemporaries such as Melville, Emerson, Tennyson and George Eliot, transforming science with its depiction of the powerful forces that shape the natural world.For more than seventy years, Penguin has been the leading publisher of classic literature in the English-speaking world. With more than 1,700Â titles, Penguin Classics represents a global bookshelf of the best works throughout history and across genres and disciplines. Readers trust theÂ series to provide authoritative texts enhanced by introductions and notes by distinguished scholars and contemporary authors, as well as up-to-dateÂ translations by award-winning translators.

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Customer Reviews

In 1832, Scottish geologist Charles Lyell published the second volume of his groundbreaking trilogy, which profoundly influenced Charles Darwin. Lyell examines the connections between the Earth's

changing crust and the many species of birds, insects, mammals and fish that live on it, their distribution, migrations and adaptation to changing habitats.

Sir Charles Lyell (1797-1875) was a British geologist most famous for his great geological opus: The Principles of Geology: Being an Attempt to Explain the Former Changes of the Earth's Surface, by Reference to Causes now in Operation (3 vols 1830-33).

Penguin Classics has done it again with this excellent edition of Charles Lyell's (1797-1875) pathbreaking study on geology. Of course, this is a book far more significant than just being an early treatise on geology. Written in three volumes between 1830 and 1833, it is not only a prime example of the ferment of 19th century science, but had a major impact on Darwin while he was making the Beagle voyage. As Jamet Browne recounts in "Voyaging," the first volume of her magnificant biography of Darwin, after reading Vol. I, Darwin had his entire outlook on empirical observations modified by Lyell's approach. Fundamentally, Lyell argued that geologic observation should be based on the assumption that physical causes now visibly at work (such as rivers, tides, volcanoes and earthquakes) are the same as those that existed in the past, and in the past they had the same degree of intensity as in the present. Like most of the Classics series, this one has a very helpful introduction, here written by James A. Secord in 1997. Secord explains beautifully how Lyell's scientific approach presented problems to followers of a biblical interpretation of geology predicated upon the "Mosaic flood." Lyell wanted to avoid combustion resulting from his approach, and so emphasized the positive features and benevolent aspects of current life. Ironically, since Lyell is seen as so influential on Darwin, he secretly rejected evolutonary theories, because he was repulsed by the idea of a world where only the fittest survive through vile competition. In fact, much of the second volume is aimed at refuting Lamarck. As Secord explains, it was not until Darwin's "Origin" appeared in 1859, that he began to accept evolutonary theory. Setting aside Darwin, Lyell's great achievement was to demonstrate that empirical science did not necessarily present a direct challenge to religious belief so the Victorians could be comfortable with its development. This rosy situation continued until Darwin published "the Origin" and fervent debate broke out between his supporters (e.g., Thomas Huxley) and the religious establishment.This edition has opted for including large and somewhat complete chunks of all three volumes rather than smaller excerpts. So here, within 450 pages or so, the reader has almost all of the significant portions of all three volumes, including the original illustrations. In addition, the edition contains most of Lyell's glossary of terms. Editor Second has added a section of helpful endnotes, and a unique"Bibliography of

Reviews" listing all the British reviews of Lyell’s treatise between 1830 1nd 1835. This should prove invaluable in assessing the impact of Lyell’s volumes on his contemporaries. A good index rounds out the volume, as does a great piece of cover art in the form of a 1774-5 painting of an eruption of Vesuvius. That all this material is available for a modest price only adds to the value of this edition.

as stated, just what i wanted

Son loves it.

Not for the faint-of-heart of the weak-of-spirit. This book is looong and boring, but it is worth it! The editors have left out a few chapters here and there, but not to worry, there is still PLENTY to read. This book is excellent to read at nighttime when you need to get tired so you can fall asleep. It took me about four years to read the entire book, but now I finally know a little tiny bit about Geology, and I also now have a better understanding of the history of the world.Principles of Geology rocked the world (pun intended). This book changed everything. Some of the most entertaining passages are those where Lyell defends against his detractors. Here is a good quote from Volume 1, Chapter 26: "When any one has ventured to presume that all former changes were simply the result of causes now in operation, they have invariably been called upon to explain every obscure phenomenon in geology, and if they failed, it was considered as conclusive against their assumption."Additionally, there is some very interesting discussion in the first volume (Chapters 6, 7, and 8) about climate, which provides a useful long-term context for thinking about the topic of climate change. This is one of the most influential books in the history of mankind. Darwin treasured his copy of Lyell’s Principles of Geology and brought it along with him on the famous Voyage of the H.M.S. Beagle.

Lyell’s contribution to science is most often reduced to a bullet point in a list titled "Influences on Darwin". In fact, Lyell stands as a bridge roughly halfway between Newton and Darwin. Call him, if you will, the missing link. But it seems a funny thing happens when you contribute to one of the greatest breakthroughs (evolution) in the history of thought: your work is only seen in relation to its intellectual cousin and, thus, much of the heart of your contribution is overlooked. This might even be expected, but what is a little more surprising is that even those Lyellian insights of major importance for Darwin never make it into the bullet point.* Lyell 1830: deep time, gradualism, ’present key to past’A variety of scientists, including Lyell’s (and Darwin’s) forerunner Hutton, were already discussing gradualist change over deep time spans, by the time Lyell came on the scene.

Lyell presented more empirical evidence than his predecessors -- an unabridged copy of ’Principles’ is a hefty package. You might never get through it unless you’re stuck on a sailing ship for three years. And, at least as importantly as the extensive cataloging of evidence, Lyell did a wonderful job at articulating the reasoning behind a different kind of science. Much of the discourse on Earth history before Hutton and Lyell was basically either Biblical literalism or unrestrained fancy: both kinds of "cosmogony" worked with an understanding that prehistoric Earth operated on "principles" very different from those at work presently. In consequence, anything went in making up stories about the past. Lyell argued that, instead, scientists needed to restrict themselves to testable hypotheses. Testability for Lyell was about observation, not experimentation, but the principle at work, as with experimentation, was that science had to be empirical.The historical science of Lyell actually required a philosophical point which Newton’s didn’t: that not only is everything we see now acting according to repeatable patterns, but anything we can suppose about former states falls under the same restrictions. This difference might seem trivial or even imaginary to a 21st-century perspective. But Newtonian physics was an accepted system within the 18th century, whereas gradualism in Earth history was not accepted until later. It could only have been the case that people accepted the universality of Newtonian laws across human experience without having also accepted that all material events, including the primordial past, could be explained by present conditions.Lyell titled his work after Newton’s ’Principia’ because his goal was to establish "general principles". But, unlike Newton, Lyell didn’t mean universal ... just general. This difference was what made it so important for Lyell to travel so very widely as he did -- the example he set is still indispensable in geological training, and is forcefully argued by Lyell early on in his book. He shows how several of his forerunners acquainted themselves only with their local geology and ended up formulating global models that proved ridiculous when tried out in any other country. Newton, on the other hand, could have studied optics everywhere or anywhere, and would have found the same results -- it is what makes physics so impressive, and also what made geology so difficult to get a handle on.Taking the particulars of geography seriously was essential for Darwin’s insight into evolution, and this outlook is forcefully put forth by Lyell. For example, Darwin noticed/argued that finches on the Galapagos were of a morphology and lifestyle someone might a priori have expected to be filled by different types of birds, but that the finches were modified descendants of the nearest mainland birds. Lyell, though he argued strongly *against* evolution in his book, did argue for what we would now call biogeography, a discipline (which has become) eminently evolutionary, and of which the Galapagos finches are prime examples.Furthermore, Lyell argues that geological inference is always mediated by the imperfect knowledge of investigators. He suggests, for

example, that sea creatures or subterranean gnomes would come to very different and possibly even better geological conclusions than we surface dwellers do. It is, after all, very difficult to see almost anything of the earth's inner workings, stranded out here as we are on an opaque raft of regolith. Again consider Newtonian science: it is perspective-free. Some study systems are simpler and cleaner, but none "in principle" should fail to evince the universal laws. This isn't a question of objective vs. subjective reality; Lyell was not suggesting scientific inferences were subjective or incommensurable. But he was pointing out that, in geological investigations, our reasoning can proceed on a basis of only partial knowledge. Though this is a weakness inescapable in our human existence, if we at least keep it in mind, it can be a moderated weakness.Reasoning from partials and particulars is difficult. These conditions do not admit, at least reliably, the possibility of using deductive reasoning to fuel your inference. Lyell thus argued for two major tools in scientific reasoning. The first was analogy. Where a local peculiarity, such as a roadcut or canyon, revealed the inner structure of, say, a volcano, the information gleaned from that instance should be judiciously applied to other instances of pertinent similarities. It is necessary to see first-hand much of the world to get an intuition and fact-base for what kinds of similarities and what kinds of differences are prevalent. The second tool was imagination. Yes, Lyell uses this word quite explicitly (see chapter 5 especially). Lyell is not unsophisticated in his treatment of imagination, either. He distinguishes between its use in art and in science; and he further distinguishes between scientists constructing hypotheses and scientists simply trying to envision facts such as vast timespans. Imagination in necessary because we are looking at only a patchy smattering of the total facts, and we must fill in the gaps where deduction won't show us what *must have* happened. It is in this mindset that the tentativeness of scientific knowledge looms much more seriously than it does in physics. Whereas Newton prided his method on requiring him to "feign no hypotheses," Lyellian explanation depends on a modified claim: to take only the observable as a basis for hypothesis.*Curiously, a superficial reader who somehow hadn't been primed by two centuries of commentary allying Lyell with Darwin might well suppose Lyell is anti-Darwinian. For one thing, on the nature of time Lyell seems to lean toward a perpetual-motion clockwork world, perhaps infinitely old, not an evolving world with a past very different from its present and future. For another thing, Lyell argued strongly *against* the evolvability of species. It was a huge surprise, as I read along through the book, marveling at Lyell's aggressive and innovative advance of scientific reasoning, to see his reasoning fall apart catastrophically when in the later pages he dashes himself against the topic of evolution. It's easy, today, to suppose that opponents of evolution are stodgy and ignorant, but Lyell is a sympathetic case of how mindshattering natural selection is. Evolution before Darwin

was pretty unscientific anyhow: no mechanism made it plausible or even evaluatable. Once Darwin was ready to put his own idea forward, Lyell was relatively open-minded and supportive, though he hardly embraced Darwin unreservedly.But although Lyell didn't summit Darwin's mountain, Lyell articulated and advanced many of the most fundamental conceptual tools Darwin used in his ascent. In my personal experience, it has struck me that the people who have the easiest time thinking about evolution are at ease with their imaginations, and that, in converse, people who keep their imaginations at bay make little sense of evolution. This phenomenon is not widely discussed, presumably because imagination still has little prestige among scientists and is jealously withheld from the evaluations of science by humanities thinkers. In my opinion, Lyell's book offers answers to both scientists and humanists -- answers that require not dropping the basis of the objections, but of better understanding the new place for imagination Lyell meant to establish. In any event, Lyell's treatment of other major ideas -- biogeography, particulars instead of universals, reasoning by analogy, and reasoning from perspective-dependent partial knowledge -- all constitute conceptual adjustments to the Newtonian way of thinking that allowed Darwin to go even farther in making sense of nature.*The meaning of "hypothesis" in Newton's usage is widely contested, and is probably not very similar to how we use the term today. Newton was speaking of metaphysics and the occult. His point was that his work focused on formalizing, by putting in mathematical terms, material interactions. This is different from saying what, you know, "really causes" something, so to speak. That the gravitational constant is so-and-so can be true and useful knowledge even in the absence of a statement about "why" it is what it is, or how bodies interact gravitationally when they don't appear to be touching eachother. Or so some argue. In any event, the pertinent difference between Newton and Lyell is that the former needed no reason for what is true everywhere and always (Newton was very theological) whereas Lyell needed instances to suggest mechanisms transferable to other instances.----------A note on the Penguin edited paperback version:The editorial introduction is interesting and well written. The editing of the content almost wholly consists in removing some of Lyell's copious empirical examples, which are not going to be missed by contemporary readers since they won't be reading the book to learn geology per se. Any omitted material is noted and briefly summarized, further ameliorating any potential sense of loss. The only excised material I wish had been left in was from Lyell's opening discussion of previous geologists. Much of this is retained by the editor, but what he says about Steno is not, and I would have liked to see these comments. However, this was not a big loss. I have only one major complaint: the page margins are tiny! Maybe small margins were used to cut down on page count for such a long book, but it made it very difficult to take notes in the book.

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