Impossible extinction: Natural catastrophes and the supremacy of the microbial world

by Charles S. Cockell

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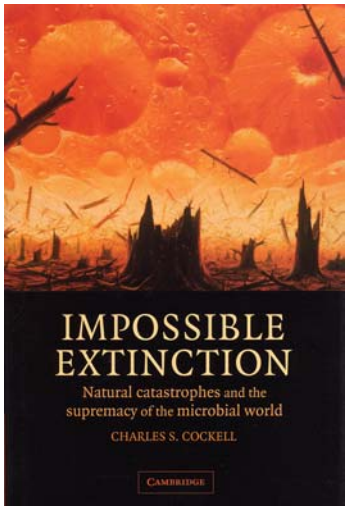

'What went wrong 600 million years ago? Why did microbes suddenly regress into large, lumbering, specialist animals prone to extinction?' This is an informative, serious yet humorous book written in a chatty, colloquial style. Charles Cockell is a microbiologist with the British Antarctic Survey and is also involved with NASA's Search for Extraterrestrial Intelligence Institute (SETI). He actively researches exobiology, life in the extremes and the human exploration of Mars. He is thus well suited to writing a summary overview of the changes experienced by the Earth during its cosmic journey around the Galaxy, and their effect on life.

The book hits home that, despite more recent 'advanced' species (including us!) having evolved, microbial life reigns supreme. Why is this? It is because microbial life is much simpler, smaller, more adaptable and faster to reproduce, often with simpler requirements for energy production, so is able to inhabit a correspondingly wider range of environments: hence the name 'extremophiles'. The environments include 70km high up in the Earth's atmosphere, near deep-sea (11km deep) vents at 113ºC, in Lake Vostok 3km beneath Antarctic ice, and even in solid rock 6km below Earth's surface. They often include conditions of very high or low temperatures, or high pressure, compared with conditions in which 'normal' life persists. Cockell writes, 'There is rarely a situation that is detrimental to all microbes.' Moreover, microbes often have the capacity to lay dormant for some thousands or even millions of years.

The relative effects on life of meteorite impacts and volcanic eruptions are intermingled and difficult to distinguish, so it is hard to show a direct causal link between environmental changes and extinction, even in the case of the two most celebrated extinction events: the end-Permian and the K–T. However, life on Earth is not merely at the mercy of the cosmos and some microbes may even benefit from volcanic and impact events.

We need to learn more about the effects of climatic change on present-day, let alone past, ecosystems. Human effects may be making an estimated 30,000 species extinct each year; in this current 'period of mass extinction' we will have destroyed 95% of species, an event comparable with the end-Permian extinction. Humans especially threaten large animals but human destruction/waste is good for microbes, which proliferate e.g. in landfill sites, so we sometimes use microbes to our advantage. Certain microbes can even deal with waste products from nuclear processes (and nuclear reactors may not even be a human invention as there is evidence for natural reactors deep below Earth's surface). But in degrading toxic compounds, microbes may produce worse toxins (e.g. methyl mercury) that threaten us.

Earth is not necessarily a unique environment – a be-all-and-end-all 'Goldilocks' planet. Many microbes are cosmotrophic – they could tolerate conditions on other planets or in space – so there is always the possibility of microbial life being exchanged between planets and, just possibly, even separate solar systems.

Cockell presents some interesting facts and terminology. A garden bucket of soil from half a kilometre below Earth's surface may contain more microbes than the number of stars in our Galaxy. He describes the Sun's 225-million-year voyage around the galactic centre as a 'Milk year'! Despite some very poorly reproduced photos, the odd terrible cliché and factual error (e.g. p.14, the Kuiper belt is no longer 'hypothetical'), I recommend reading this fascinating account of the status, importance and prevalence of the microbial world. Placing the human race in the wider life and cosmic perspectives helps alleviate the danger that we become too self-confident as a species (indeed many would argue that this is already the case), and this surely must be a good thing.

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Dr Edward Hanna studied planetary science, and now lectures and researches climate change at the University of Sheffield. He has a strong lifelong interest in astronomy.