A Most Improbable Journey: A Big History of Our Planet and Ourselves.
WALTER ALVAREZ. New York, NY: W.W. Norton and Company, 2016.
256 pp. $26.95 (hardcover).

A number of books are now available that give the reader a grand narrative of our universe from the Big Bang to our own immediate present, so what can yet another "big history" book contribute to that field? For Walter Alvarez, the geologist who identified the asteroid impact responsible for the demise of the dinosaurs, the answer is, naturally enough, in telling big history with planet Earth as the star of the show.

For Alvarez, imparting an abundance of information is less important than sharing an abundance of enthusiasm. Geology is a slow process, and a narrative that went into excessive detail could unintentionally convince the general reader that nothing important is happening. For example, Robert M. Hazen's worthy book, *The Story of Earth* (2012), tells our planet's history in rich detail, but presumes a reader already willing to engage in such detail. Alvarez makes no such presumption; if anything, he presumes the opposite. Elsewhere Alvarez has written that geology can seem "arcane" and "foreign" to most people, seeming "of little use in everyday life." This is where his skill and experience as an educator are apparent; he knows that it is enough at the beginning simply to generate excitement and interest.

Alvarez begins with a quick account of cosmic history, from the Big Bang to the birth of planet Earth, but in a chatty and almost cursory fashion. He is well aware that this story has already been told in detail by authors specializing in astrophysics, such as Eric Chaisson and Steven Weinberg, and wisely does not attempt to repeat that kind of narrative. He gently nudges Edwin Hubble aside and instead gives attention to one of the less celebrated players, Milton Humason, "a boy who dropped out of school at age 14 to drive a team of mules and had no further formal education" (p. 24) Humason's biography may be a digression, but it is a digression with a purpose: Alvarez wants to keep us entertained. He understands that the expansion of the universe may seem remote and abstract to many readers, but the human interest in the story of a high school dropout becoming Hubble's scientific partner has broad appeal. By sharing Humason's personal journey from mule skinner to janitor to scientist, Alvarez gently draws readers of varied backgrounds into his cosmic story. By the time Alvarez arrives at the birth of planet Earth, the reader may not have all the facts about the early universe, but is certainly well prepared to appreciate the next chapter in the tale.

That next chapter, "Gifts From the Earth," focuses on the processes that make material resources useful to humans. The unique strength of Alvarez's book is that it places geology in the foreground of the story, all the while making it clear that the dynamic processes of our planet have an ongoing impact on the human story. This is a worthy accomplishment, as many people have difficulty appreciating the story of non-living rock, and are inclined to view planet formation as simply setting the stage for the appearance of life. Not so in Alvarez's narrative, which consistently keeps geological history relevant to the modern world. Preferring one good example to a sprawling catalog, Alvarez devotes most of this chapter to telling the story of the element silicon, from sandy beaches, to the first stone tools, to stained glass for cathedral windows, and to the computer chips that enable almost every aspect of modern human life.

This chapter, and the three that follow, make up the core of the book, focusing in turn on Earth's major geographic features: continents and oceans; mountain ranges; and ancient rivers. Alvarez moves in close on exciting details such as the earthquake that destroyed Lisbon in 1755, then contextualizes those details in the larger perspective of plate tectonics. He introduces familiar names and events such as the voyages of Columbus, giving the reader a reference point, and then makes the familiar fresh and new by telling the tale from a geologist's point of view.

This talent for introducing a geological

interpretation truly shines in the seventh chapter, "Your Personal Record of Life History." Instead of referring to the strata of rocks, Alvarez uses the physical evidence of our own human bodies to recount Earth history. While much of the book follows a loose chronology, sliding backwards and forwards in time as suits the topic of the moment, this chapter follows a linear path through time, identifying in proper order the geological periods in which various parts of our anatomy evolved. More than anywhere else in this book, he makes use of the jargon of his profession ("Hadean," "Archean," "Proterozoic"), but instead of being obtuse and intimidating, the terms become personal and meaningful.

Although the book is broadly organized into four chronological regimes – Cosmos, Earth, Life, & Humanity – Alvarez makes it clear he is not worried about following a strict timeline. His introduction plainly states, "Although there is a continuity from chapter to chapter, feel free to read them in any order that interests you." In that spirit of fueling the reader's curiosity, Alvarez's concluding chapter is not really a conclusion at all, but rather a reminder to reflect on the grand story of our planet, and experience some awe and wonder. The chapter title is a question, "What Was the Chance of All This Happening?", followed by another question in the final sub-section heading, "How Improbable Are We?". Alvarez gives some numbers and figures on probability, but again without expecting the reader to engage in technical details. He considers it a success to be able to raise the questions, to invite the reader's curiosity.

The book is short and the pacing is brisk. Alvarez provides just enough detail with each example to create excitement, and then moves quickly to something new, well before the reader has a chance to lose interest. The loose structure and lively pacing are comparable to the very best television documentaries on the natural world, stimulating interest and leaving the audience ready for more. This is not a "dumbing-down" of the material, however. Quite the contrary, Alvarez loves the facts of the natural world and imparts them with accuracy. But he knows that this is not a textbook, and portions out the hard data accordingly. His introduction declares that he seeks to leave the reader "with a delight in a whole series of fascinating stories" and "new questions," and in that he certainly succeeds.

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