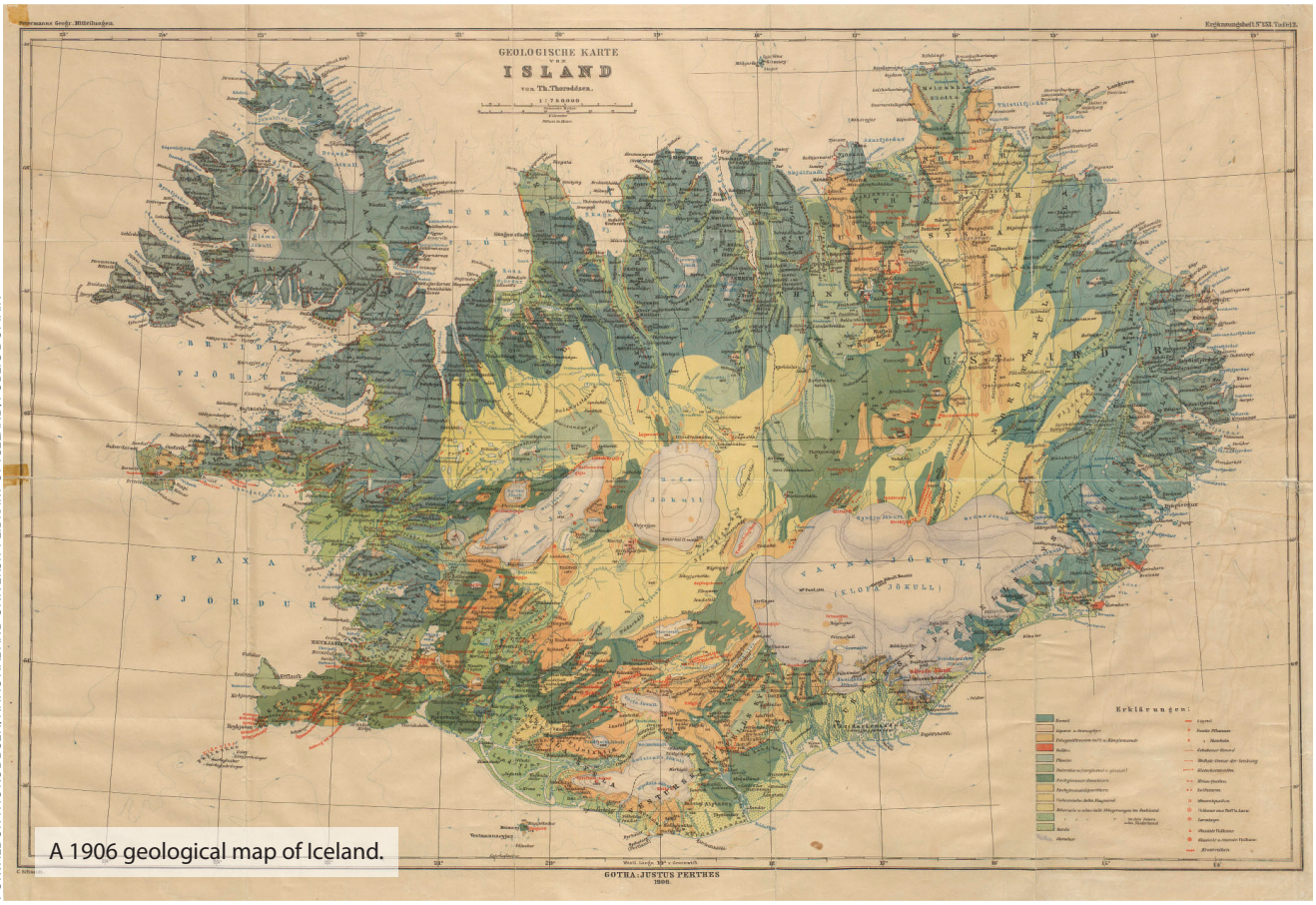

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A 1906 geological map of Iceland.

An anachronistic new textbook

Known for his seminal works on statistical mechanics, beta decay, and slow neutrons, Enrico Fermi was already a towering figure in 20th-century physics by the time he emigrated to the US in 1939. He entered the annals of world history in 1942 when he directed the construction of the first experimental nuclear reactor, Chicago Pile-1. But it is far less known—and was previously unknown to me—that the protean Fermi not only was a pioneering nuclear physicist but also had a deep interest in the less glamorous field of geophysics.

The context and content of the physicist's curiosity about Earth science is the central theme of *Unearthing Fermi's Geophysics*, an informative and lucid book by two professors emeriti of physics, Gino Segrè and John Stack. Many readers of Physics Today will be familiar with Segrè's books on the history of physics, which include the prize-winning 2007 *Faust in Copenhagen: A Struggle for the Soul of Physics* and a 2016 biography of Fermi coauthored with Bettina Hoerlin, *The Pope of Physics: Enrico Fermi and the Birth of the Atomic Age*. Segrè's coauthor, John Stack—a particle physicist at the University of Illinois at Urbana-Champaign—is a theorist with extensive teaching experience.

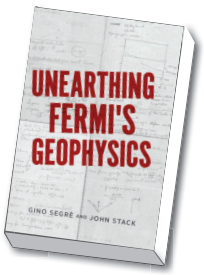
Although Fermi never published any papers on geophysics, he taught a course on the subject at Columbia University during his first few years in the US. In *Unearthing Fermi's Geophysics*, the two authors use his handwritten lecture notes to develop a complete textbook on introductory geophysics in the way that Fermi might have done had he written one at the time. To do so, they also use another source: Fermi's notes from the Sixth Washington Conference on Theoretical Physics, held in 1940, which focused on the physics of Earth's interior.

The authors sensibly endeavored to write a textbook that faithfully reflects what was known about Earth physics around 1940. But as they admit, they couldn't resist expanding on several of the topics discussed by Fermi and adding a few new ones of their own. Indeed, throughout the book there are references to much later literature and modern data, which makes perfect sense from a pedagogical point of view but is problematic from a historical perspective.

Unearthing Fermi's Geophysics

Gino Segrè and John Stack

U. Chicago Press, 2022. $35.00



Readers may find it unclear which parts of the book come from the authors and which ones are by Fermi.

Fortunately, inquisitive readers can freely consult Fermi's authentic notes online at the University of Chicago Press's website. If they do so, they will discover that very little of the Segrè–Stack book is actually based on Fermi's notes, which mostly consist of formulas, tables, and numerical data. Moreover, the notes also contain references that were left out for some reason, presumably because Segrè and Stack believed they would be irrelevant for modern readers. For example, at one point in the lecture notes, Fermi refers to the geologist and physicist John Joly, who in 1909 tried to explain Earth's heat budget with a cyclic theory in which radioactive decay continually increases and decreases. Joly's long-forgotten theory was apparently of some interest to Fermi, but it is not mentioned in the book.

As Segrè and Stack point out, the topics Fermi chose to cover in his lectures on geophysics were somewhat idiosyncratic. They differ not only from those presented in modern textbooks and lectures but, more importantly, from the content covered in most geology books published in Fermi's day. For example, his lectures did not cover orogeny—namely, mountain formation—a topic of great interest to physical geologists both then and now.

But the authors make no attempt to place Fermi's lectures in the context of 1940s geophysics. How representative were his lectures of contemporary mainstream geophysics? Readers are left guessing. It would have been interesting if the authors had compared Fermi's physics-oriented view of geophysics with more geology-oriented views of the field, such as the one articulated by the geologist Arthur Holmes in his classic 1944 textbook *Principles of Physical Geology*.

Despite its shortcomings, at least from a historian of science's perspective, *Unearthing Fermi's Geophysics* is a welcome contribution to the literature on Fermi and 20th-century geophysics. First, it opens a window into Fermi's surprising interest in and broad knowledge of a completely different field than the ones upon which his fame rests. Second, Segrè and Stack have produced a concise and excellent textbook on classical geophysics as the subject stood around 1940.

But even though the book was inspired by Fermi's lecture notes, its 17 self-contained chapters—which cover such topics as liquid-drop physics and atmospheric plasma—substantially deviate from the notes. Nevertheless, *Unearthing Fermi's Geophysics* will be appreciated by not only historians of geophysics but also teachers of physics because of its clarity and pedagogical style.

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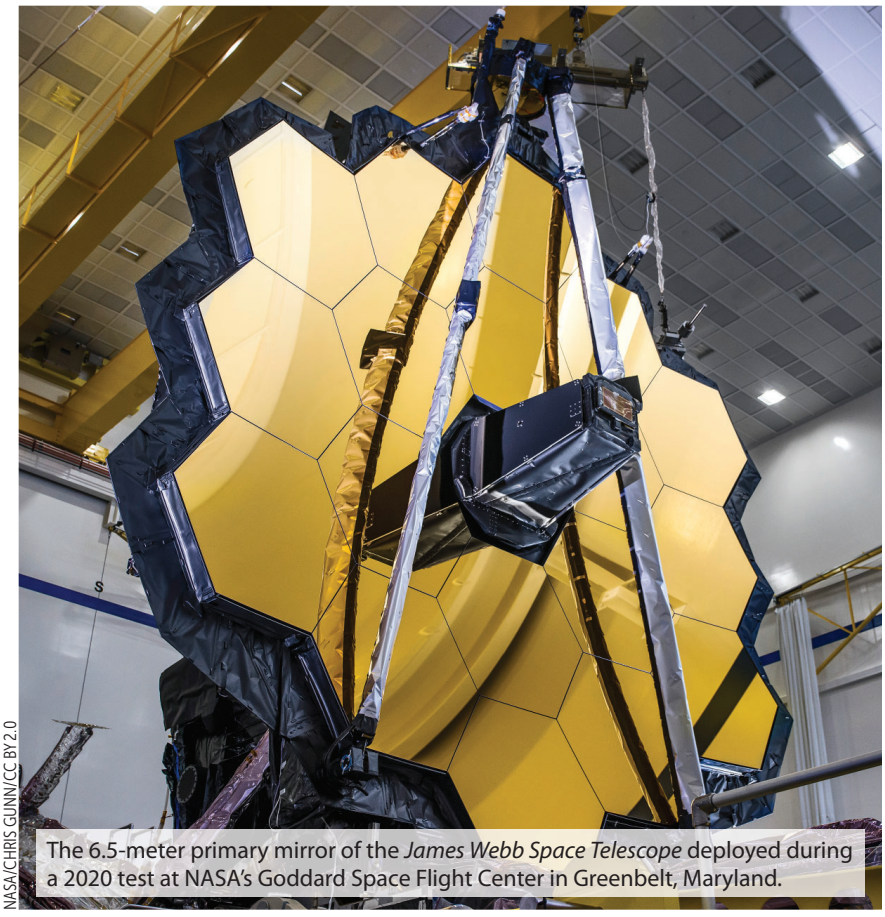
An introductory astronomy textbook for majors



NASA/CHRIS GUNN/CC BY 2.0

The 6.5-meter primary mirror of the *James Webb Space Telescope* deployed during a 2020 test at NASA's Goddard Space Flight Center in Greenbelt, Maryland.

Most astronomy departments offer two introductory courses: one for majors and one for nonmajors. Stan Owocki's new textbook, *Fundamentals of Astrophysics*, is designed to accompany the former. A professor at the University of Delaware, Owocki is well known for his research in the field of stellar astrophysics and has extensive experience teaching undergraduate courses. He intends his new book to fill in the gap between textbooks for nonscience majors and upper-level astrophysics textbooks. But does it succeed?

I'll get to the point: I really like *Fundamentals of Astrophysics*. Will you? I think it depends on what purpose you think a textbook serves. Is it meant to be a tome that you'll refer to for an entire career or a readable book that might need to leave out some rigor in the name of clarity? In other words, should a textbook include every possible topic or equation you might want to cover so you can pick and choose which sections to assign? Or should the book remain simpler and be supplemented by classroom instruction?

Fundamentals of Astrophysics falls firmly in the simple and concise, but readable, category, which I believe is a good thing.