

systems and then chronicles the basic theory of hydrodynamic turbulence, or turbulence in fluid systems. It is mostly standard material, but Galtier adds fresh touches here and there, such as a novel derivation of the famous energy spectra found in turbulent systems—the first derivation of which was accomplished by Andrei Kolmogorov in 1941.

Spectral cascades, which describe the nonlinear flow of energy from large forcing scales to small dissipation scales, are introduced, and the dramatic differences between 2D and 3D spectral cascades are described. In a nutshell, in 3D the energy flows naturally to very small scales, but in 2D, a counterintuitive inverse cascade moves energy to larger scales. For subtle reasons, the large-scale turbulence in the atmosphere and in oceans behaves much like a peculiar 2D system, so inverse cascades are, in fact, crucially important in practice.

After presenting that material, Galtier introduces wave turbulence, which he discusses through a sequence of increasingly complex physical models. The models simulate capillary waves, which travel at the interface between two fluids, and the so-called inertial wave turbu-

lence, which is hydrodynamic turbulence in rapidly rotating containers. Interestingly, some of those systems exhibit inverse cascades as well.

Further applications include Alfvén waves relevant to incompressible magnetohydrodynamic systems, compressible plasma waves, and, finally, gravitational waves; a chapter on possible scenarios of the primordial universe discusses gravitational wave applications. The numerous exercises, integrated in the main text with solutions provided at the end of the book, are a welcome feature.

Like its two siblings, and despite the large amount of mathematics contained in it, *Physics of Wave Turbulence* is true to its name, so certain specific questions that may vex mathematicians are not addressed. I don't think that it a weakness of the new book, which is an excellent addition to the textbook literature on the subject. It simply means that a useful mathematical treatment of wave turbulence remains to be written.

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NEW BOOKS & MEDIA

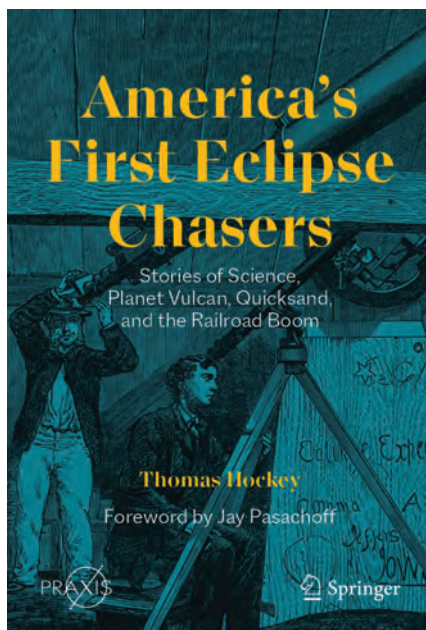
America's First Eclipse Chasers

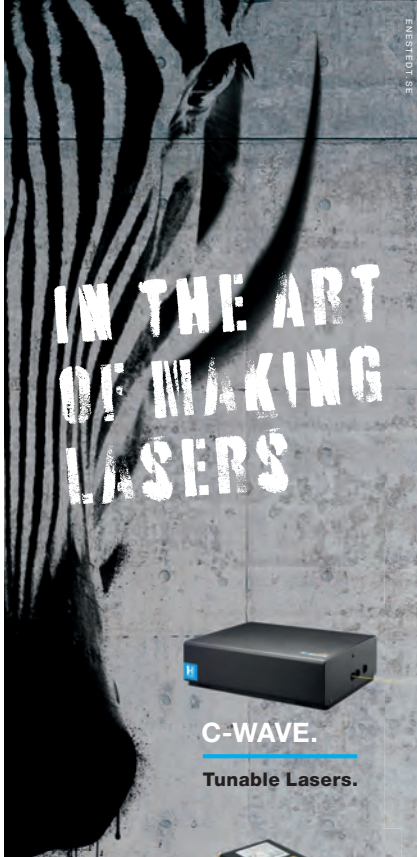
Stories of Science, Planet Vulcan, Quicksand, and the Railroad Boom

Thomas Hockey

Springer, 2023. \$37.99 (paper)

In advance of the next total solar eclipse, happening in April 2024, astronomer Thomas Hockey looks back at the first ever to occur over the continental US during the nation's history—that of 7 August 1869. That eclipse was notable in many ways, according to Hockey. First and foremost, it spawned the first large-scale astronomical expeditions in the US, which were aided in part by the number and portability of new astronomical instruments and the burgeoning US railway system. It also marked the first use of photography to capture scientifically useful images of the Sun. In *America's First Eclipse Chasers*, Hockey argues that the eclipse expeditions were the “biggest simultaneous scientific enterprise in the United States up to that time.”





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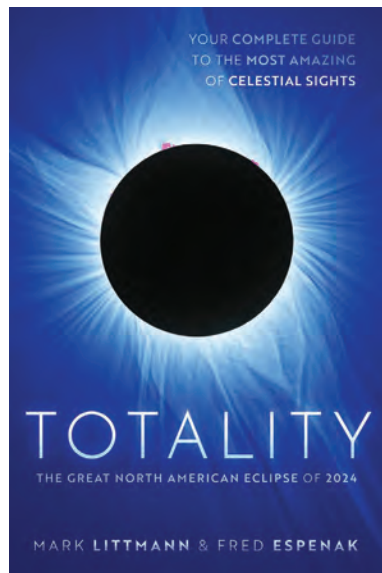
Totality

The Great North American Eclipse of 2024

Mark Littmann and Fred Espenak

Oxford U. Press, 2024. \$18.95 (paper)

In preparation for the April total solar eclipse, science writer Mark Littmann and astrophysicist Fred Espenak have produced this timely guide to what could be “the biggest outdoor spectator event in American history.”



Not only do they provide information and advice about viewing the eclipse on 8 April 2024, but they also discuss the different types of eclipses and the science behind them, eclipses throughout history, the experiences of early eclipse chasers, first-hand accounts of what it’s like to observe an eclipse, and guidelines for safely photographing the phenomenon. Illustrated with 220 photos, diagrams, tables, and maps, *Totality* is a handy reference for would-be eclipse chasers. —CC

Monarch

Legacy of Monsters

Chris Black and Matt Fraction, creators

Apple TV+, 2023



When *Godzilla* first reached the big screen in 1954, it was an uns subtle analogue for the destructive force of the atomic bomb and how difficult it would be to control. Set in the same universe as the 2014 film reboot, the new Apple TV+ series *Monarch: Legacy of Monsters* tackles a different message: After they discover a problem, how active should scientists be in fixing or controlling it? In the show, the organization Monarch, which was designed to investigate and protect civilians from giant monsters, evolves into something its founders didn’t expect: a passive observer to monster attacks. That message seems particularly timely given debates within the scientific community on how to tackle climate change. Fiction can be a good introduction into discussing real-world problems with students, and hopefully that will be *Monarch*’s legacy. —PKG 

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