

hagen social circle itself (Bohr and Werner Heisenberg never really agreed on anything).

That creates a sense of a genuinely open field: All the modern interpretations are on something of an equal footing. There is not really a reigning champion that needs to be dethroned. Instead, the approaches can demonstrate their strengths and weaknesses on their own

terms. Bohr's ideas are not necessarily the point of departure.

That said, having so many plausible contenders in one place, each presented so forcefully, can be somewhat dizzying. But it surely reinforces the initial premise of the volume: that the interpretation of quantum mechanics is a live field, one with rich opportunities for innovation and creative thinking. It also emphasizes

the strange nature of quantum theory, which is remarkably productive despite seeming unstable and fractured. Its mysteries are clearly not going to be resolved in the near future, which makes this handbook a launching point for future work rather than a summary of past efforts.

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The famous step pyramid at the center of Chich'en Itza (background) was dedicated to the feathered serpent deity (foreground).

Understanding the Mayans on their own terms

The works of Mayan astronomers have long been an object of popular fascination. Their impressive feats include a base-20 system for calculating large numbers, which included the number zero and negative quantities; a 365-day calendar system based on an accurate measurement of the solar year that the Mayans diligently corrected on a 52-year cycle; and another 260-day calendar created for ritual and divination purposes. They used the two calendars to create their famous long count, a system that numbered every day from some remote, mythical origin date. All those achievements were made before 900 CE, when Mayan civilization in major towns collapsed.

As Gerardo Aldana y Villalobos, a his-

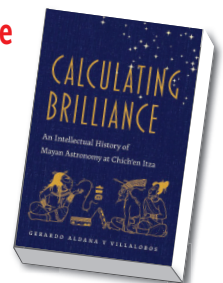
torian of science, details in his new book, *Calculating Brilliance: An Intellectual History of Mayan Astronomy at Chich'en Itza*, Western scholars long focused their attention on those intricate Mayan calendar systems because they aimed to determine how the Mayan system corresponded with the Western calendar. That type of Eurocentrism in Mayan studies, he argues, has led to a flawed understanding of Mayan astronomy that removes it from its cultural context.

In *Calculating Brilliance*, Aldana aims to rectify that situation by outlining the history of our understanding of Mayan astronomy and presenting a daring conclusion of his own: that a female astronomer named K'uk'ul Ek' Tuiyilaj who worked in

Calculating Brilliance
An Intellectual History
of Mayan Astronomy at
Chich'en Itza

Gerardo Aldana y Villalobos

U. Arizona Press, 2022.
\$75.00



the city of Chich'en Itza likely obtained data relating to Venus's orbital trajectory.

As Aldana details, the looting and dispersion of Mayan documents following the Spanish conquest of Mesoamerica delayed the systematic study of Mayan science and society for centuries. It was only at the end of the 19th century that the German librarian Ernst Förstemann made a foundational contribution to the understanding of Mayan culture by deciphering part of the Dresden Codex, possibly the most significant collection of Mayan hieroglyphic texts. Förstemann was able to unravel the Mayan number

system and tried to decode a portion of the codex that contained what appeared to be records of appearances of Venus—which is now known as the Venus table.

The 20th century saw many breakthroughs in the study of Mayan astronomy, including a better appreciation of the relationship between Mayan architecture, inscriptions, and astronomical observations. During that time, however, few scholars attempted to decipher Mayan hieroglyphic writings and inscriptions, which prevented them from analyzing astronomy in the context of broader Mayan society. It was only in the second half of the 20th century that the Russian American archaeologist Tatiana Proskouriakoff decoded the hieroglyphs and revealed what the inscriptions on Mayan monuments tell us about historical events.

That was when Aldana, who teaches at the University of California, Santa Barbara, entered the field. He began working on Mayan astronomy during his doctoral studies at Harvard University under Owen Gingerich. At that time, he also began engaging with historical and

archaeological work on Mayan history and archaeology. In *Calculating Brilliance*, Aldana connects the Dresden Codex's Venus table—which is now more fully understood because of Proskouriakoff's work deciphering the hieroglyphs—with the inscriptions on Chich'en Itza's buildings, where a mural prominently depicts K'uk'ul Ek' Tuyilaj.

Following the work of Anthony Aveni, who in the 1980s suggested that the observations for the Dresden Codex's Venus table were made in a structure at Chich'en Itza called the Caracol, Aldana argues that K'uk'ul Ek' Tuyilaj likely made corrections to the table to account for data she and other astronomers had collected on the planet's orbital trajectory. Those corrections were intended to cope with the small difference between Venus's 584-day orbit and what we call the synodic period of Venus. That allowed her to predict how morning appearances of Venus would coincide with certain dates from the 260-day divinatory calendar.

But unlike prior scholars, Aldana isn't interested in assessing the accuracy of

Mayan astronomy according to contemporary Western standards. Using historical and anthropological records, he aims to illuminate the role astronomy played in Mayan society. As he emphasizes, K'uk'ul Ek' Tuyilaj's discoveries not only helped build calendars but were integral to ceremonial and ritual events. Aldana also notes that the Mayans mastered the Venus table around the same time that the feathered serpent, a god worshipped by other Mesoamerican societies, became a popular deity for Mayans to revere. That may have led the Mayans to identify the serpent with Venus.

Unfortunately, the print version of the book suffers from poor-quality images, which look much better in the digital version. Nevertheless, *Calculating Brilliance* is a tribute to humanity's cultural diversity. The book marks a milestone in our understanding of Mayan astronomy and culture by illustrating how they were inherently intertwined.

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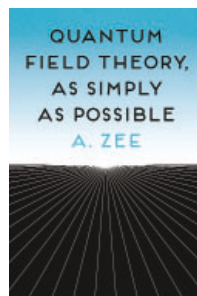
NEW BOOKS & MEDIA

Quantum Field Theory, as Simply as Possible

A. Zee

Princeton U. Press, 2023. \$39.95

Countless books aim to explain quantum mechanics to a lay audience, but few authors have attempted to present a popular introduction to quantum field theory, the mathematical framework linking quantum mechanics with special relativity. A. Zee, a well-known author of several textbooks and popular-science works, attempts to fill that gap in this new book. But as he freely admits, it isn't for the faint of heart: Be prepared to see a fair share of summation symbols, path integrals, and Greek letters. If readers are willing to put in a bit of work, they will be rewarded. Zee's witty, insightful writing and engaging historical anecdotes make the book a pleasure to read. —RD



Astrotopia

The Dangerous Religion of the Corporate Space Race

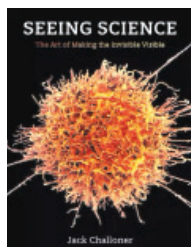
Mary-Jane Rubenstein

U. Chicago Press, 2022.
\$24.00

In *Astrotopia*, the philosopher Mary-Jane Rubenstein argues that the 21st-century private space race being carried out by Elon Musk, Jeff Bezos, Richard Branson, and others has become a "mythological project" analogous to the type of "imperial Christianity" that was used by Europeans to colonize more than half the planet. Discussing the era of private competition in space, known as NewSpace, she argues that we need to act now to prevent it from being rapaciously exploited by capitalists. Yet perhaps the most provocative portion of the book looks toward the past: Rubenstein convincingly demonstrates that NASA and US politicians used Christian imperialist language to justify the Apollo missions. In other words, it's no coincidence that the *Apollo 8* crew read from the book of Genesis while orbiting the Moon on Christmas Eve 1968.



—RD **PT**



Seeing Science

The Art of Making the Invisible Visible

Jack Challoner

MIT Press, 2022. \$34.95 (paper)

In this new coffee-table book, the science writer Jack Challoner has collected and annotated more than 200 images—historical and contemporary—of phenomena like neurons, animal locomotion, and the Sun's photosphere. But

Seeing Science isn't just a collection of beautiful pictures. Challoner also aims to answer a question that many laypeople often wonder about: How do scientists produce images of objects or phenomena they can't see with the naked eye? To do so, he intersperses the text with explanations of how such technologies as scanning electron microscopes and space telescopes have enabled researchers to image seemingly unseeable things. The result is a compelling collection. —RD