

## ASTRONOMY

# An all-American eclipse

Jay Pasachoff enjoys four books heralding this summer's US total solar eclipse.

On 21 August 2017, the United States will experience its first all-American total solar eclipse. The path of totality's full shadow — some 100 kilometres wide — will for the first time make landfall only in the United States, passing over the homes of 12 million people in 14 states, from Oregon to the Carolinas. Heliophysicists and umbraphiles from around the world are preparing for it, along with Department of Transportation officials. The former are still pondering the results of the 1999 eclipse, whose path crossed Europe from Cornwall to Romania and beyond, and of total eclipses since. The latter are doing their best to ensure that millions of drivers get safely into and out of the path.

The fuss is understandable. A total solar eclipse is the most stupendous sight in nature: the abruptly darkening sky; Baily's beads, glints of sunlight shining through lunar valleys; the dazzling diamond-ring effect; the spiky, pearly solar corona. Then, a couple of minutes later, the whole show in reverse. Equally compelling is the knowledge that you are witnessing a syzygy, an alignment of Earth, Moon and Sun that darkens the sky by an additional factor of 10,000 in the last minute alone. Now, four books all anticipate the coming celestial event in different ways.

In *American Eclipse*, journalist David Baron harks back to the total eclipse visible in the United States in July 1878. (I read this book in draft and provided a blurb.) A group of eminent scientists, including astronomer Henry Draper and his wife, Anna (see S. Nelson *Nature* 539, 491–492; 2016), travelled to Rawlins, Wyoming, to witness it. But, as Baron relates, 31-year-old whizz-kid inventor Thomas Edison gained the lion's share of publicity, even though he was just tagging along. Edison brought one of his devices, a tasimeter, to measure minute shifts in heat from the Sun's corona during the eclipse. He was unprepared for the strength of the signal, however, and his instrument's needle pinned at its maximum reading. It wasn't until around 1940 that physicists Walter Grotrian, Bengt Edlén and Hannes Alfvén found the solar corona to have a temperature of at least 1 million °C. Had the tasimeter worked, the



The progress of an eclipse seen from Australia in 2012.

scattering of sunlight that we see as the inner corona would have misleadingly given Edison the Sun's surface temperature, 6,000 °C.

Baron's stories are good ones, well told. The pioneering US astronomer Maria Mitchell — the first professor hired at Vassar College in Poughkeepsie, New York — took a group of alumnae, although they weren't offered free rail travel like their male counterparts. Astronomer and inventor Samuel Pierpont Langley, meteorologist Cleveland Abbe and solar spectroscopist-astronomer Charles Young also witnessed the eclipse. Nine years before, Young had co-discovered the green line in the spectrum of the corona that proved key in understanding coronal temperature; in the 1940s, it was found to come from iron gas so hot that many of its atoms have lost half their electrons.

The history of eclipses is global and long. Astronomer and science historian Anthony

**American Eclipse: A Nation's Epic Race to Catch the Shadow of the Moon and Win the Glory of the World**

DAVID BARON  
*Liveright: 2017.*

**In the Shadow of the Moon: The Science, Magic, and Mystery of Solar Eclipses**

ANTHONY AVENI  
*Yale University Press: 2017.*

**Eclipse: Journeys to the Dark Side of the Moon**

FRANK CLOSE  
*Oxford University Press: 2017.*

**Mask of the Sun: The Science, History, and Forgotten Lore of Eclipses**

JOHN DVORAK  
*Pegasus: 2017.*

Aveni's *In the Shadow of the Moon* mines observations from five millennia. We learn about eclipses in ancient Babylonia, such as those recorded on a tablet fragment from 280 BC. Aveni analyses the story that the Greek philosopher Thales of Miletus predicted the eclipse of 28 May 585 BC, which supposedly halted a battle between the Lydians and Medes; he is sceptical of links between these ancient dates and actual eclipses.

He also delves into total eclipses seen in the United States, such as New York City's in 1925: people sat on roofs along the Hudson River to mark the shadow's lower edge on 96th Street,

and the 'diamond-ring effect' was mentioned in the US media for the first time. Aveni concludes that neither rainbows, comets, meteors nor the aurora borealis surpass "the transient, exquisite beauty" of a total solar eclipse.

Particle physicist Frank Close tells more-personal stories in *Eclipse*. In 1954, aged eight, Close viewed a partial solar eclipse; it inspired him to become a scientist. Although clouds all but foiled Close's attempt to see the totality from Cornwall in 1999, he managed to catch subsequent events from Zambia, Libya, Tahiti and, in 2013, a ship off the west coast of Africa. As he notes, "Like druids, who gather to greet equinoxes at Stonehenge, I had joined an international cult whose members worship the death and rebirth of the sun at moveable Meccas, about half a dozen times every decade". Although he weaves in a modicum of history and science, this is essentially a travel book. ▶

▶ Like Close, astronomer John Dvorak hopscoches through eclipses in *Mask of the Sun*, but this is science history rather than anecdote. The quotes he interweaves reveal the extraordinary pull the events have had on the human imagination. The writer Virginia Woolf, for instance, who had witnessed the 1927 total solar eclipse in the north of England, wrote of it in her essay ‘The sun and the fish’ the following year: “Show me the eclipse, we say to the eye; let us see that strange spectacle again.”

It’s a rich chronicle. Dvorak notes, for instance, how in 1684 Increase Mather, the president of Harvard College in Cambridge, Massachusetts, delayed the graduation ceremony by ten days so that faculty members and students could reach Martha’s Vineyard off the state’s south coast to see a total eclipse. (Mather, a Puritan minister, was less enlightened about the Salem witch trials less than a decade later, refusing to condemn them.) We see how astronomer Edmond Halley predicted the eclipse that crossed England in 1715, and gathered public observations to improve prediction of the 1724 event that traversed the country to Europe. And we are reminded of the part an eclipse played in Albert Einstein’s rise to prominence. In his 1916 elaboration of his general theory of relativity, Einstein had predicted a deviation in the positions of stars near the Sun during an eclipse; three years later, English astronomer Arthur Eddington successfully measured it.

Along with other recent studies — such as astronomer Tyler Nordgren’s fine *Sun Moon Earth* (Basic, 2016) and Mark Littmann and Fred Espenak’s excellent and thorough *Totality* (Oxford, 2017) — these books should enrich the understanding of anyone interested in eclipses. They provide a worthy shelf-full for those gearing up for the big US event in August. (I will be viewing it — on my 34th total-solar-eclipse expedition — near the path’s US start in Salem, Oregon.) And I hope they convince many others to view it live. If you’re not in the zone of totality, just remember to wake up early enough to dodge the traffic jams. ■

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## MUSEUMS

# The life and times of a curiosity-monger

Henry Nicholls revels in a biography of Enlightenment collector and Royal Society president Hans Sloane.

What do bloodletting, slavery, journal editing and a silver penis protector have in common? The eighteenth-century physician, collector and president of the Royal Society Hans Sloane.

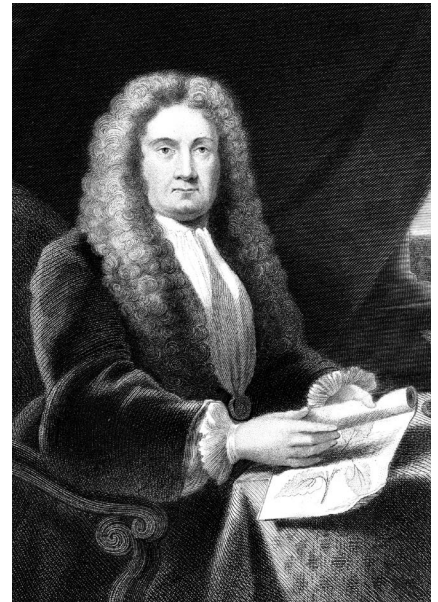
In *Collecting the World*, historian James Delbourgo charts Sloane’s rags-to-riches transformation, from his birth in 1660 into a family of domestic servants in the north of Ireland, to his death in 1753 as one of the most influential figures in England. Sloane became medic to the rich and famous and used his personal wealth to amass the most celebrated cabinet of curiosities of the age.

Despite his celebrity in life, Sloane has managed to slip almost into obscurity: his name lives on mostly in a handful of street and place names, such as London’s Sloane Square. And he remains a shadowy figure in Delbourgo’s book. There is little about what he looked like, or about his family life — perhaps because his archives are full of letters to, rather than from, him. But Delbourgo sheds magnificent light on Sloane’s larger world, providing great insight into the evolution of Britain’s early scientific and global ambitions.

At the age of 16, Sloane survived a “violent haemorrhage”, a formative experience from which he emerged with intense ambition. Moving from Ulster to London in 1679 to study medicine, he developed a talent for self-advancement. He exploited the close-knit Anglo-Irish diaspora to cultivate a connection with chemist and fellow of the Royal Society Robert Boyle, and was introduced to philosopher John Locke, naturalist John Ray and physician Thomas Sydenham. Within a decade, Sloane had emerged as a prominent London doctor, and in 1687 he travelled to Jamaica as physician to the island’s new governor, the Duke of Albemarle.

Sloane’s timing couldn’t have been better: he arrived as the island and its sugar plantations were beginning to assume a pivotal role in Britain’s empire. Delbourgo does not shy away from the savagery of the slavery from which the colonists profited — violence and oppression that don’t seem to have worried Sloane. Indeed, Sloane’s description of public tortures and

**Collecting the World: The Life and Curiosity of Hans Sloane**  
JAMES DELBOURGO  
*Allen Lane: 2017.*



Hans Sloane founded the British Museum.

executions is “eerily dispassionate”.

When not attending the duke, plantation owners or their slaves, Sloane indulged his dream of universal knowledge. This resulted in his natural history of the region: a lavish folio published in two volumes (in 1707 and 1725), filled with hundreds of detailed, life-sized engravings of local plants, animals and curios. The work set a new standard for scientific illustration, from which botanists such as Carl Linnaeus would benefit. Sloane distributed copies like calling cards, spreading his work and fame.

There seems no limit to Sloane’s curiosity, although he was scathing about witchcraft and magic, and paid special attention to anything that could be transformed into a commodity. Natural history, for him, was “a speculative exercise in scouring the globe for things that might seem odd or trivial ... but which could ultimately triumph in the discovery of prized new resources and goods”, writes Delbourgo. Sloane’s account of the West Indian manatee (*Trichechus manatus*) is a perfect example of what Delbourgo calls “total commercial cataloguing”. The creatures were “reckon’d extraordinary food”; their cured flesh could last “without corruption ... never turning rancid”; the skeletons, ground to a

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