# THIS WEEK



# Awkward first dates

*Multiple dates for the anniversary of plate tectonics highlight the rolling nature of scientific discovery.*

This week, the Geological Society in London will mark the 50th anniversary of plate tectonics — the theory that describes the workings of Earth, how earthquakes strike, and why volcanoes happen. Or will it?

The timing of the anniversary is disputed. After all, this journal published its own 50th anniversary commemoration of plate tectonics 4 years ago (*Nature* **501,** 27–29; 2013). Columbia University's Lamont–Doherty Earth Observatory in New York celebrated last May. Confused? Blame the rolling nature of scientific discovery. Plate tectonics did not spring into existence fully formed, Athena-like, on a particular day in a particular year.

No doubt aware of this, the London conference, although billing itself as "Plate Tectonics at 50", pins next week more cautiously: as a commemoration of the "advent of the paradigm" — the arrival of the model of the theory.

Coming up with the modern theory of Earth involved sparks of insight from many different researchers, working in different laboratories on different continents. Most of the resulting papers were published in the 1960s, many of them in *Nature*.

In September 1963, Frederick Vine and Drummond Matthews described how stripes of changing magnetism on the sea floor represented the spreading of new oceanic crust away from the ridge where it was born (F. J. Vine and D. H. Matthews *Nature* **199,** 947–949; 1963). This was the crucial insight that nailed the concept of sea-floor spreading, which had been hinted at in the 1950s, when oceanic mapping by Marie Tharp and Bruce Heezen revealed a mountainous rift, and so this is the paper that *Nature* editors choose to commemorate in plate-tectonics anniversaries. Fast-forward four years, and Dan McKenzie and Robert Parker publish the first complete description of how crustal plates move around on the surface of the sphere (D. McKenzie and R. L. Parker *Nature* **216,** 1276–1280; 1967), the paper that the Geological Society is now celebrating.

Of course, Vine, Matthews, McKenzie and Parker were far from alone. In the 1960s, plate tectonics was such a fecund, fast-moving field that it involved several instances of simultaneous discovery. In early 1967, as McKenzie was developing his ideas of rigid-plate motions, he looked at a conference abstract by colleague Jason Morgan and decided not to attend the talk. As it turns out, Morgan veered from the text of his abstract and instead described ideas of plate motions that were eerily like McKenzie's. Later that year, McKenzie sent off his manuscript to *Nature* — and, when he realized that Morgan was about to publish similar ideas, he asked the journal to delay his own paper in order to give Morgan the credit. *Nature*'s editor, John Maddox, sent a telegram back saying that the issue had already been typeset, so there would be no delay. Who has not skipped an event, only to have that affect their careers for years to come?

But back to the question of anniversaries. Popular interpretations of scientific history are biased towards the single great discovery by a single great person — and they are more easily commemorated in an anniversary. But most discoveries are much more nuanced and communal. Charles Darwin would not have published his ideas of evolution by natural selection when he did, had he not been prompted into it by the similar thoughts of Alfred Russel Wallace. Albert Einstein relied on the work of friends and colleagues to develop his general theory of relativity.

Similar broad revolutions are unfolding today. Despite all the bitterness and infighting over who invented the CRISPR–Cas9 gene-editing technique, the fact remains that a large number of very bright scientists made enormous advances quickly by playing off one another. Just as in the heyday of plate tectonics, one gene-editing breakthrough inspired the next, until biologists were brimming with publications. Historians may one day bicker about which CRISPR paper to celebrate on the 50th anniversary of the technique, but science as a whole is much better off than it was before.

> ***"A number of very bright scientists made enormous advances quickly."***

And so, we could celebrate a 1963 publication on the magnetism of the sea floor, or a 1967 paper on the geometry of spherical rotations, or even the entirety of the dawning of plate tectonics. But when was that? Was it in 1912, when Alfred Wegener came up with the idea of continental drift? Or was it decades later, when his ideas were finally transformed into the concept we now know as tectonics? Much of that delay might trace to US researchers viciously opposing his ideas, as historian Naomi Oreskes described in *Plate Tectonics* (Westview Press, 2001). But after the slow start, Earth scientists in the 1960s were quick to embrace the data and theories that redrew almost every aspect of their field.

Such is the nature of discovery — incremental at times, fast-paced at others, occasionally derailing into pettiness. But it does nearly always move in the right direction. In these times of political uncertainty and global unrest, that is an accomplishment worth noting. ■

# Open science

*International mobility and collaboration are linked to stronger research.*

Some US biotechnology labs have responded to President Donald Trump's attempts to restrict immigration by releasing contrasting group photographs showing what less-open international borders would do to their workforces. A first image typically shows everyone who works in the lab. A second image includes only those who are permanent US residents, then just US citizens, and then only those who



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