> MOVE OVER GEOLOGY, IT'S TIME FOR GEOPHYSICS TO TAKE CENTRE STAGE ON THE RED PLANET

FROM THE EDITOR'S DESK:

Farewell Oppy, hello InSight

In February 2019, we said our goodbyes to the Mars rover Opportunity, as NASA scientists officially closed the mission. The rover, known affectionately as Oppy, fell silent in June 2018 when its solar panels were engulfed during a giant dust storm. There was hope that winds might remove the dust, freeing the panels to the Sun's rays and injecting Oppy with life. Alas, the storm season came and went and while NASA sent signal after signal, none was returned. Oppy was declared "dead".

But what a life. That little rover, sent to Mars in 2004 was meant to be operational for just 90 days. She lasted more than 14 years! Oppy's mission was essentially a geological one and with the discovery of sedimentary rocks and hematite spheres, Oppy confirmed the existence of past surface water on our celestial neighbour.

With the success of Oppy, it strikes me that geologists have been incredibly lucky in the roving exploration of Mars. The 1997 Pathfinder mission, which was planned to last a month but stretched to three, confirmed the idea of catastrophic flooding in Ares Vallis, while 2012's Curiosity, a mission initially set at two years and now extended indefinitely, has imaged some stunning streambed deposits in Gale Crater.

Geophysicists have had somewhat worse luck with the rovers. In 1976, the Viking landers touched down on Mars armed with the first seismometers to reach the Red Planet. Sadly, the seismometer on Viking 1 failed to unlock, while that on Viking 2 isn't in direct contact with the martian surface, meaning it's been impossible to confirm whether seismic data record true marsquakes or simply martian winds. 20 years later, Russia's Mars 96 mission, which included a seismometer, failed to break Earth's orbit.

With the successful arrival of a seismometer aboard the lander InSight (Interior Exploration using Seismic Investigations, Geodesy and Heat Transport) in November 2018, geophysicists' luck might be about to change.

Seismologists have mapped our own planet's internal organs by monitoring seismic wave propagation, meaning that our once simplistic view of core, mantle and crust has evolved to one of great intricacy—an inner solid and outer liquid core, a complexly structured and convecting mantle and so much more (see page 10).

With InSight, the aim is to apply the same geophysical techniques to map the martian interior, using waves generated by marsquakes and meteorite impacts. InSight won't allow us to map the martian mantle in anything like the detail we can for Earth. Accurate reconstructions rely on seismic data recorded at multiple stations, and there are tens of thousands of seismometers spread across our planet. InSight has just one. But, this humble, lone station could still revolutionise our understanding of planetary evolution and ESA-Roscosmos' ExoMars 2020 lander will soon increase Mars' seismometer haul.

Geophysical data are key for understanding a planet. Now that seismology is set to have its turn on Mars, we may begin to understand why the terrestrial planets, which formed at similar times, had such different destinies, and why a planet that once had a magnetic field and free-flowing surface water became barren and listless.

The InSight lander placed its seismometer onto Mars on December 19 2018 (image credit: NASA/JPL-Caltech)

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