

Editor's desk



This issue of *Preview* features the second part of John Stanley's fascinating account of the development of optically pumped magnetometer systems in Australia, and their application throughout the world. In this part John describes diversification in the applications of optically pumped magnetometers and the development of SAM and SAMSON.

We only have room for one feature in this issue because the Associate Editors have pulled out all stops for the New

Year. Three of their columns could be considered mini-features! You will be able to read and enjoy a consideration of earthquake magnitudes (*Education matters*), the identification and characterisation of aquifers in saline environments (*Environmental geophysics*), and the value of integrating the interpretation of structural, geochemical and petrophysical analyses to gain new insights into the Mount Isa Eastern Succession (*Mineral geophysics*). David Denham has also sent in a comprehensive report from Canberra (*Canberra observed*) and allows us to hope that the writing is on the wall for a recovery in the oil industry. Mick Micenko and Guy Holmes, for their part, continue to titillate our imaginations with their respective columns on seismic attributes and digital twins!

Turning to rather more serious matters, readers may not be aware that the five-year contract between the ASEG and CSIRO Publishing for the production of *Preview* and *Exploration Geophysics* expires at the end of this calendar year (*Exploration Geophysics* Volume 48 and

Preview Issue 191). The end of this contract could be the end of an era as I understand that, over the next 6 months, the ASEG Federal Executive will be considering whether one or both publications should continue in their current form (or migrate to another form), and whether one or both publications should continue to be produced by the same publisher or move to a different publisher/service provider. Particular consideration will be given to whether both publications should move to a digital format, and a flipbook format (for ease of use on a smart phone or tablets) is one of the formats being considered.

If you would like to find out what is on the table, and to add your views to the discussion – as a reader, contributor or advertiser – please contact one of the joint Chairs of the Publication Committee, Greg Street or Lisa Vella, at publications@aseg.org.au. Your views are important because neither publication, in any form, will survive without you!

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Breaking news: Swarm suggests accelerating jet stream in the Earth's liquid outer core

An explanation for two lobe-like fluctuations in the secular variation of the Earth's magnetic field in the northern hemisphere, mostly under Alaska and Siberia, has been provided by 'Swarm', the constellation of three identical satellites launched in 2013 by the European Space Agency (ESA). As well as highly accurate magnetometers, each satellite has E-field measurement capability.

As reported in the 7 January 2017 issue of *New Scientist*, thanks to these new highly detailed observations these fluctuations can be explained by a 'jet-stream' at the molten core–inner core boundary, 420 km wide. It is moving westward at 40–45 km per year, which is three times as fast as the typical speeds of molten iron in the outer core. For reasons yet unexplained, it appears to be speeding up.

The ability of Swarm to make such measurements at the outer core/inner core boundary, 3000 km deep, comes from its ability to strip away gradients across the three measurement positions due, for example, from the ionosphere and the crust, thereby producing the highest resolution data. Studies of this kind can also help us to learn more about the core itself and its influence on the magnetic field.

The *New Scientist* article suggests that the jet stream is due to two parallel vertical cylinders of rotating molten iron tangential to the solid inner core. Where they meet the solid core they squeeze molten iron into a jet stream. The basis for the above conclusions is given in a paper by Livermore et al. titled 'An accelerating high-latitude jet in Earth's core' and published online in *Nature Geoscience* on 19 December 2016.

More on Swarm is available at the ESA website http://www.esa.int/Our_Activities/Observing_the_Earth/Swarm. The Swarm mission is dedicated to study of the Earth's magnetic field.

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