Washington, USA). Therefore, examination of the reported breakdown by other experiments and computations is important.

Laboratory experiments and computations show that post-perovskite exhibits greater seismic anisotropy than perovskite. The anisotropy in the core/mantle boundary region might be caused by flow in the lowermost mantle, driven by thermal or compositional heterogeneities, that produces anisotropic fabric in post-perovskite (Sanne Cottaar, University of Cambridge, UK; James Wookey, University of Bristol, UK). However, the texture of deep mantle minerals is sensitive to a range of parameters and may evolve during the post-perovskite phase transition (Sebastien Merkel, Université Lille, France; David Dobson, University College London, UK). So, interpretations of deep-mantle anisotropy appear to be very complex.

Not all of the work presented at the meeting pointed towards increased compositional heterogeneity for the lowermost mantle. It is debated whether the large low-shear-wave-velocity provinces observed beneath the Pacific Ocean and Africa represent compositional or thermal anomalies compared with the surrounding mantle. Some geodynamical and seismological models now suggest that they could be purely thermal anomalies, with distinct chemical compositions not required to explain the seismic data (Saskia Goes, Imperial College London, UK; Arwen Deuss, University of Cambridge, UK). However, seismic discontinuities are observed within the large low-shear-wave-velocity provinces and if these are caused by the post-perovskite phase transition, these provinces may contain chemical heterogeneities (Thorne Lay, University of California, USA).

The ppv@10 meeting[2] highlighted that the post-perovskite transition has provided a successful framework for evaluating and interpreting seismic observations of the lowermost mantle. A decade of intense investigation has unveiled previously unknown mineralogical changes, unexpected details in seismic structures and complex sensitivity of the post-perovskite transition to chemical and mineralogical changes in the core/mantle boundary region. Incorporating a suite of important processes, such as mantle melting, electronic spin transitions in iron-rich minerals, phase transitions and compositional variations into one integrative framework for the lower mantle remains a challenge for geophysicists over the coming decade. ❐

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CARBON SEQUESTRATION

Tiny potential

Up to ten quadrillion ants are estimated to live on Earth. These insects exist on every continent except Antarctica. Their relentless invasion of human dwellings is mostly viewed with frustration. Nevertheless, ants and their activities also benefit humans in a variety of ways. For example, in China, southeast Asia and Australia, weaver ants are used for pest control on fruit farms. In South Africa, black ants gather the tiny rooibos seeds used to make herbal tea and store them in their nests, where they can be harvested easily. And in South America, army ants are used as surgical sutures. The ants are encouraged to bite into the skin so that their powerful mandibles lock the wound closed. The body of the ant is then cut off and discarded, leaving the ant's head as a make-shift stitch.

It now seems that ants might help mitigate climate change, too. Silicate weathering processes — under discussion as one form of carbon sequestration from the atmosphere — were found to be particularly efficient inside the nests of ants. Over a 25-year period, Ronald Dorn monitored the breakdown of grains of basaltic rock that he had placed at a depth of about 50 cm within ants' nests in parts of Arizona and Texas, USA (*Geology* http://dx.doi.org/10.1130/G35825.1; 2014). His experiments showed that these basalt grains were broken down 50 to 300 times faster than similar grains placed in isolated patches of bare ground, over the same time period.


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The samples retrieved from the ants' nests also showed a gradual build-up of calcium carbonate, implying that mineral weathering and reactions involving atmospheric carbon dioxide had probably taken place: when silicate minerals break down, carbon dioxide in the atmosphere reacts with the minerals to create calcium carbonate rocks. This process strips carbon from the atmosphere, and locks it into rocks.

It is unclear precisely how the ants speed up the weathering process that converts silicate minerals and carbon dioxide into carbonate rocks. The ant's role in this conversion might come from some digestive or excretion process. However, given the sheer mass of ant colonies that exist on Earth, improved understanding of the interactions between ants and silicate minerals could provide insights on how to accelerate the consumption of atmospheric carbon dioxide.

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