



Discovering new minerals in the deep Earth (EMU medal lecture)

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Mineral composition of the deep interior of the Earth is still not well known, and therefore the search for new high-pressure forms of minerals is a fruitful field for discovery. Recent years have brought many of such discoveries, and in this talk I shall focus primarily of the following aspects:

1. The discovery of the post-perovskite phase of MgSiO_3 [1,2] and its implications for the Earth's D" layer.
2. Prediction of a new family of MgSiO_3 polymorphs related to post-perovskite [3]. These minerals can be stabilized by temperature and impurities and have actually been observed (Tschauner, pers. comm.).
3. The existence of native iron in the lower mantle, discovered experimentally [4] and rationalized by calculations [5].
4. The novel methodology for systematic prediction of stable crystal structures [6]. This method is capable of producing stable structures given only the chemical formula and P, T - conditions of interest. I shall discuss its applications to finding major carbon-bearing phases in the Earth [7,8], to studies of possible core-forming minerals [9] and to planetary materials.

References

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