

## **The chemical imagination at work in very tight places**

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Diamond anvil cells now permit the study of matter under multimegabar (i.e. several hundred GPa) pressures. The properties of matter in this pressure regime differ drastically from those known at 1 atm. Just how different chemistry is at high pressure and the role that a chemical intuition for bonding and structure can have in understanding matter at high pressures will be explored in this lecture. I will discuss in detail an overlapping hierarchy of responses to increased density, consisting of (a) squeezing out van der Waals space (for molecular crystals); (b) increasing coordination; (c) decreasing the bond length of covalent bonds and the size of anions; and (d) an extreme regime of electrons moving off atoms and new modes of correlation. Examples of the startling chemistry and physics that emerge under such extreme conditions will alternate in this account with qualitative chemical ideas about the bonding involved.