Matisse-Axe 5 « Extreme Conditions » Day

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Pressure causes extraordinary changes in the properties of matter by bringing the atoms closer and closer to each other. It can turn the air we breathe into beautiful dark red oxygen crystal and make a semi-conducting polymer out of nitrogen. Indeed most matter exists under extreme conditions, so it is clear that we can fully understand the natural world only with knowledge of the fundamental physical and chemical forces at play at high pressures.

Hydrogen is the most abundant element in the universe, and the intrinsic quantum nature of the H_2 molecule endows it with the most fascinating behaviour of any materi al at extreme conditions. This exotic behaviour, and the great interest it inspires in those working in fields as diverse as planetary interiors and superconductivity, has ensured that the study of hydrogen has been both extensive and very high-profile, despite the huge experimental problems it poses. As a result, this endeavor has been perhaps the principal driver in high-pressure research for the last 25 years shaping scientific agendas and challenges.

In my presentation, I will demonstrate the remarkable progress recently achieved in our understanding of the hydrogen phase diagram in a wide pressure and temperature range.