I will show how, by using Crystallography, we can study materials which are of technological interest, and gain fundamental insights into why they exhibit their desired properties. Ultimately, our understanding of how structure is related to property in these systems will allow us to design better materials with improved functionality. Ferroelectrics, which exhibit a macroscopic polarisation, are an important class of these functional materials. The macroscopic polarisation state (+ / -) may for example be used as nanoscale storage bits in next generation memory devices. While it is broadly understood that the macroscopic polarisation in these materials arises from the microscopic off-centre displacements of atoms at the unit cell level, the precise mechanism by which this occurs is poorly understood. I will provide result that reveal hidden complexity in the mechanism that controls the macroscopic polarisation in the archetypal ‘proper’ ferroelectric Barium Titanate (BiTiO₃), and will discuss how this will affect how we model this material on the domain length scale (50 - 1000 nm). I will go on to show how unconventional ‘improper ferroelectric’ mechanisms may provide a more promising route for designing and engineering novel functional materials.