Building precise molecular architectures to maximise f-element properties

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The complexity and richness of synthetic f-element chemistry has attracted increasing attention in recent years. This interest is stimulated jointly by scientific curiosity of a relatively unexplored field and the myriad applications that these elements have found in diverse areas such as organic synthesis, materials science and nuclear fuel cycles.¹ Our research focuses on stabilising f-element complexes with unusual coordination geometries and/or oxidation states, which can provide enhanced reactivity and unique physical properties.¹ We mainly utilise bulky bis(silyl)amides and cyclopentadienyls as supporting ligands to stabilise these unusual f-element motifs. Here we will present some recent highlights of this work, such as the first near-linear f-element complexes (1),² the first measurements of actinide covalency by pulsed EPR spectroscopy on the Th(III) complex (2)³ and the first isolated f-block metallocenium cations (3), which provided record magnetic hysteresis temperatures for the dysprosium analogue in 2017.⁴

References:
1. (a) Lanthanide and Actinide Chemistry, S. Cotton, John Wiley & Sons Ltd, 2005.