Complex metallic alloys present unique challenges and opportunities in surface science, both for preparation of clean surfaces and for epitaxial studies.

Studies of three Ag-In-RE(100) (RE=Yb,Gd,Tb) approximants illustrate a variety of surface behaviours when prepared in ultra-high-vacuum conditions [1] from flat surfaces to multiple faceting; I will discuss the origin these behaviours in terms of surface atomic bonding.

In recent work, we demonstrated that C_{60} molecules adsorbed on this surface at room temperature form a Fibonacci square grid – the first physical manifestation of a prediction made in 2002 by Lifshitz [2]. In this case the C_{60} molecules bond preferentially to Mn atoms in the surface layer, which are arranged in the Fibonacci square grid geometry [2].

In a further study, the adsorption of Pb atoms on the 3-fold surface of the icosahedral Ag-In-Yb quasicrystal proceeds in an unusual way; instead of layer-by-layer growth as was observed on the five-fold surface [3], the atoms form quasicrystalline Pb nanoclusters by mimicking the structure of the underlying substrate. I will discuss whether this is long-sought evidence for “cluster stability” in quasicrystals.