Synthesis as the heart of New Materials Physics

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Humanity needs to find the materials that will ease is growing needs for reliable, renewable, clean, energy and/or will allow for greater insight into the mysteries of collective and, in some cases, emergent states. The design, discovery and growth of novel materials is heart of the research effort that will, hopefully address these needs. In this talk I will present a broad overview of New Materials Physics and describe how a practitioner can go from staring at the periodic table to deciding what “the next growth will be”. I will present and discuss the three basic motivations for making a growth: wanting a specific compound; wanting a specific ground state; searching for known and unknown unknowns. Materials discussed will span superconductors, quasicrystals, heavy fermions, fragile magnets, topological electronic systems, local moment magnets and a few lost puppies. The goal of this talk is to inspire and entertain, any resemblance to persons living or dead is coincidental.

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