



Cooking, Fishing and Jogging through Phase Space: A Practical Guide to Discovering and Understanding New Materials

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SALA DE GRADOS

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The design, discovery, characterization and control of novel materials is perhaps the most important research area for humanity as it moves into the 21st century. A myriad of societal problems concerning energy, clean water and air, and medicine all need to be solved by the discovery of new compounds with dramatically improved, or even new, properties. The search for such materials requires a blending of skills and mindsets that, traditionally, have been segregated into different academic disciplines: physics, chemistry, metallurgy, materials science. In this colloquium I will outline the basic philosophy and techniques that we use to search for novel materials. These include a combination of intuition, experience, compulsive optimism and a desire to share discovery [1].

In the second half of the lecture, the specific case of superconductivity will be used as an example of one such search. Over the past couple of decades a growing sense of where and even how to search for new superconductors has been developing, with the recent discoveries of MgB₂ and the FeAs based materials providing, at least for me, clear guidance [2].

Be sure to come early to participate in the warm-up exercise

[1] Paul C. Canfield, *Rep. Prog. Phys.* **83** [2020] 016501.

[2] Paul C. Canfield, *Nature Materials* **10** [2011] 259.