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### **Exploring electron-phonon interactions in superconductors<sup>1</sup>**

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Superconductors can be roughly assigned to two classes. The first class contains materials in which the electronic pairing induced by electron-phonon interactions is the fundamental mechanism giving rise to the superconductivity. The BCS theory, together with its extensions, explains the properties of these superconductors extremely well. The second class is all other superconductors including the cuprate, Fe based, and heavy Fermion superconductors. Again, electronic pairing appears to be evident, but there is no consensus on the correct underlying theory of the superconducting mechanism at this time. I will discuss calculations for materials in the former class and describe the progress made in explaining and predicting their superconducting properties. I will emphasize calculations of the transition temperature and discuss some suggestions for raising the maximum transition temperature for materials in this class.

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