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Gap Symmetry and Structure of Superconductors

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Message from the Guest Editor

Symmetry of the gap is the fundamental property of the superconducting state in a material. It is tightly related to the underlying mechanism of Cooper pairing, and, therefore, knowledge of the symmetry put severe constraints on the theories of superconductivity. Even more information can be gained from the particular structure of the gap. The latter term is used to designate the momentum-dependent variation of an order parameter within a given symmetry class. That is, gaps with the same symmetry may have very different structures, such as s+- and s++ states belonging to the same A1g representation in iron pnictides.

This Special Issue of *Symmetry* is devoted to theories and experiments that predict or reveal the gap symmetry and structure of superconductors. Special emphasis is put on the multiband systems with the unconventional order parameter. The scope includes theories of conventional and exotic mechanisms of pairing, and experimental techniques sensitive to the gap symmetry and structure, e.g., penetration depth, thermal conductivity, ARPES, Andreev spectroscopy, inelastic neutron scattering, quasiparticle interference, and Josephson junctions.

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Message from the Editor-in-Chief

Symmetry is ultimately the most important concept in natural sciences. It is not surprising then that very basic and fundamental research achievements are related to symmetry. For instance, the Nobel Prize in Physics 1979 (Glashow, Salam, Weinberg) was received for a unified symmetry description of electromagnetic and weak interactions, while the Nobel Prize in Physics 2008 (Nambu, Kobayashi, Maskawa) was received for the discovery of the mechanism of spontaneous breaking of symmetry, including CP symmetry. Our journal is named *Symmetry* and it manifests its fundamental role in nature.

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