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Mathematical structures and features of quantum resource theories

A common theme in Chemistry, Thermodynamics, and Information Theory is how one type of resource – be it chemicals, heat baths, or communication channels – can be used to produce another. These processes of conversion and their applications are studied under the general heading of "resource theories". While resource theories use a wide range of sophisticated and apparently unrelated mathematical techniques, there is also an emerging general mathematical framework which seems to underpin all of them. In this talk, I will give an overview on the mathematical techniques and structure of quantum resource theories, with examples from resource theories of entanglement, asymmetry, quantum coherence, and quantum thermodynamics. I will end with several open problems.