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Multicritical Black Holes

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The inclusion of thermodynamic pressure has been one of the major developments in black hole thermodynamics in recent years. By incorporating pressure, black holes are now known to exhibit behaviour corresponding to that seen in a broad variety of chemical systems, including liquid-gas type transitions, reentrant phase behaviour, polymer-like transitions, superfluid phase behaviour, and more. Consequently the subject has come to be known as Black Hole Chemistry. While black hole triple points —analogous to the ice-water-steam triple point —were discovered several years ago, only recently has it been shown that black holes can have multicritical points, in which four or more phases coalesce at a single temperature and pressure. This phenomenon —seen in colloids and polymers —can take place in Einstein gravity for multiply rotating black holes, as well as in charged black holes in non-linear electrodynamics, Lovelock gravity, and Generalized Quasitopological Gravity. I will describe how multicriticality arises in black holes and how the Gibbs Phase Rule governs such behaviour.

Keyword-1

Black Holes

Keyword-2

Thermodynamics

Keyword-3

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