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QCD thermodynamics with magnetic fields and Landau levels

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QCD with strong electromagnetic fields is relevant for heavy-ion collisions, the early universe and strongly magnetized neutron stars. Amenable to lattice simulations, its thermodynamics shows some unexpected features like inverse magnetic catalysis. I review our numerical results and show that many effects can be understood – at least qualitatively – by (otherwise free) fermions in magnetic fields. In the second part of my talk I discuss how the corresponding Landau level picture can be transferred from two to four dimensions and to what extent physical observables are dominated by the lowest Landau level.

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