Effective forces due to confined nearly critical fluctuations

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When macroscopic bodies are immersed into a medium exhibiting nearly critical fluctuations, long-ranged effective forces between them result. Such fluctuation-induced forces are akin to, though distinct from, the Casimir force between two grounded, perfectly conducting metallic plates caused by their influence on the quantum fluctuations of the electromagnetic field. A survey of current theories of such fluctuation-induced forces is given. Their achievements and limitations are discussed in the light of recent experimental results. The role of boundary conditions, their scale dependence, and the consequences of zero modes are explained along with the universal features of these fluctuation-induced forces and conditions under which they are attractive.