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New State of Fermionic Matter MIRON AMUSIA, Racah Institute of Physics, The Hebrew University, VASILY SHAGINYAN, Konstantinov's Institute of Nuclear Physics — In many Fermi systems and compounds at zero temperature a phase transition happens that leads to a quite specific state called fermion condensation. As a signal of such a fermion condensation quantum phase transition serves unlimited increase of the effective mass of quasiparticles that determines the excitation spectrum and creates flat bands [1]. We have theoretically carried out a systematic study of the phase diagrams of strongly correlated heavy-fermion compounds, including heavy-fermion metals, high temperature superconductors, insulators with strongly correlated quantum spin liquid, quasicrystals, and two dimensional Fermi systems (like ^3He), and have demonstrated that these diagrams have universal features. The obtained results are in good agreement with experimental facts. We have shown that the data collected on these very different heavy-fermion compounds have a universal scaling behavior. Thus, the quantum critical physics of different heavy-fermion compounds is universal. This uniform behavior, allows us to view it as the new state of matter.

[1] M. Ya. Amusia et al, *Theory of Heavy-Fermion Compounds*, Springer Series in Solid-State Sciences **182**, (2014).

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