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From the liquid drop model for nuclei to the ionization conjecture for atoms

The liquid drop model is an isoperimetric problem with a competing non-local term. It was originally introduced in the nuclear physics literature in 1930 and has received a lot of attention recently as an interesting problem in the calculus of variations. We discuss some new results and open problems. We show how the insights from this problem allowed us to prove the ionization conjecture in a certain model for an atom in density functional theory.