Cosmological constant can be considered as the on-shell value of a top form in gravitational theories. The top form is the field strength of a gauge field, and the theory enjoys a gauge symmetry. After reviewing the history of cosmological constant, I will show that cosmological constant in this context is the charge of global part of the gauge symmetry, and is conserved irrespective of the dynamics of the metric and other fields. In addition, I will introduce its conjugate chemical potential, and prove the generalized first law of thermodynamics which includes variation of cosmological constant as a conserved charge. At the end, I will discuss how our new term in the first law is related to the volume-pressure term.

This talk is based on the paper arXiv:1710.07904 in collaboration with Dmitry Chernyavsky.