# Review of: "Mass Creation via the Phase Transition of the Higgs Field"

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In this paper, the authors examined the Higgs potential (or Ginzburg-Landau free energy) using catastrophe theory. The parameter dependence of the Higgs potential is investigated in detail and classified based on catastrophe theory. I have several comments on the paper.

Although the paper presents interesting results on the Higgs potential, its meaning in physics is not clear. The authors consider the potential of a one-component real field \phi. This is, for example, the free energy of the Ising model with two local minima \phi= \phi_0 and -\phi_0. The negative expectation value means that the magnetization is in the opposite direction compared to the positive one, and the two local minima are equivalent. It is not clear why the negative value state is regarded as unphysical. At the critical temperature, one of the two states is chosen, and the ordered state is realized with spontaneous symmetry breaking. I think that it is necessary to discuss the relevance or meaning of the present theory for statistical models such as the Ising model.

In the Landau theory (or Higgs model), a multi-component or complex field \phi is considered with continuous symmetry in most cases, for example, the Heisenberg model, superconductivity, and the Higgs model in a gauge theory, where the local minima exist at the bottom of the wine bottle. Thus, the theory in the paper deals with only exceptional models in the theory of phase transitions. A discussion should be added on this point.