Contribution ID: **4** Type: **not specified**

# Gravitating magnetic monopole via the spontaneous symmetry breaking of pure R^2 gravity

*Saturday, 1 June 2019 09:30 (15 minutes)*

The pure $R^2$ gravity is equivalent to Einstein gravity with cosmological constant and a massless scalar field and it further possesses the so-called restricted Weyl symmetry which is a symmetry larger than scale symmetry. To incorporate matter, we consider a restricted Weyl invariant action composed of pure $R^2$ gravity, SU(2) Yang-Mills fields and a non-minimally coupled massless Higgs field (a triplet of scalars). When the restricted Weyl symmetry is spontaneously broken, it is equivalent to an Einstein-Yang-Mills-Higgs (EYMH) action with a cosmological constant and a massive Higgs non-minimally coupled to gravity i.e. via a term $\xi R|\Phi|^2$. When the restricted Weyl symmetry is not spontaneously broken, linearization about Minkowski space-time does not yield gravitons in the original R^2 gravity and hence it does not gravitate. However, we show that in the broken gauge sector of our theory, where the Higgs field acquires a non-zero vacuum expectation value, Minkowski space-time is a viable gravitating background solution. We then obtain numerically gravitating magnetic monopole solutions for non-zero coupling constant $\xi = 1/6$ in three different backgrounds: Minkowski, anti-de Sitter (AdS) and de Sitter (dS), all of which are realized in our restricted Weyl invariant theory.

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**Session Classification:** Talks