

Cosmic necklaces of the early universe

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The spontaneous symmetry breaking of a scalar field has given us the current most complete theory of elementary particle physics, the Standard Model. Before particle physics, this very same idea had been used successfully in condensed matter physics. Even more, symmetry breaking in the early hot universe may have given rise to topological defects which include e.g. cosmic strings, magnetic monopoles and textures. These could be detected in cosmological measurements. Similar kinds of defects have already been observed in condensed matter systems.

I will give a brief introduction to the theory of symmetry breaking of classical scalar field theory and how this can be applied to $SU(2)$ symmetric scalar field theories. We will see that this application will first result in magnetic monopoles. After addition of a second field, symmetry breaking will produce string-like cosmic necklaces.

All this can be done without quantum field theory and no previous knowledge of field theories is necessary to grasp the subject. Technical details will be kept to minimum.