

Spontaneous Symmetry Breaking: From Condensed Matter Systems to Particle Physics

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Abstract

Spontaneous symmetry breaking is behind most phase transitions in Condensed Matter Systems and plays a predominant role in the Standard Model of Particle Physics. It is also believed to be of importance in the history of the early Universe.

These lectures will be divided in two parts: First we will deal with the phenomenon of spontaneous symmetry breaking in Condensed Matter Physics. We will treat topics such as Ferromagnets, Superfluidity, Superconductivity, Liquid Crystals and Bose-Einstein Condensates. Some of these subjects will be treated in details using the language of field theory.

The second part of this course will be devoted to the study of spontaneous symmetry breaking in Particle Physics. This will lead us to the Higgs boson. This part makes a direct contact with the lectures of Michel Rausch de Traubenberg.

Finally, if time permits, we will establish some link between spontaneous symmetry breaking and the formation of topological defects.

The lectures will take place at IPHC, 23 rue du Loess, 67037 Strasbourg, in Amphitheatre Grunwald, Bâtiment 25. The dates are: 21st, 22nd, 26th, 27th (**from 16h00 to 18h00**), 28th of May (**from 14h00 to 16h00**) and on the 29th of May (**from 10h00 to 12h00 to be confirmed**).

References

- 1) Patterns of Symmetry Breaking (Nato Science Series II:), Editors: Henryk Arodz, Jacek Dziarmaga and Wojciech Hubert Zurek, Springer (2003).
- 2) Basic Notions of Condensed Matter Physics, P. W. Anderson, Westview (1997).