



HAL
open science

How particles acquire their spin: a Higgs-like mechanism

Patrick Cassam-Chenai

► **To cite this version:**

Patrick Cassam-Chenai. How particles acquire their spin: a Higgs-like mechanism. 2012. hal-00874939

HAL Id: hal-00874939

<https://hal.univ-cotedazur.fr/hal-00874939>

Preprint submitted on 19 Oct 2013

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

How particles acquire their spin: a Higgs-like mechanism

P. Cassam-Chenaï

Univ. Nice Sophia Antipolis, CNRS, LJAD, UMR 7351, 06100 Nice, France.

cassam@unice.fr

Abstract

It seems more and more legitimate to think that elementary particles acquire their mass by interacting with the quantum fields of other particles [1,2]. In the same way as “elementary” entities should be massless, i.e. should transform under translations as the trivial representation, one would expect them to be spinless i.e. to transform trivially under rotations. However, a large number of the known particles considered as elementary are not spinless.

The origin of spin is still a debated question in modern physics. It is usually considered as a consequence of the existence of internal degrees of freedom, a somewhat paradoxical property for allegedly elementary particles. In this article we suggest a different interpretation, reminiscent of the Higgs mechanism line of thought: A particle acquire its spin by coupling to a field defined over space-time. The idea is very similar to that put forward by Berry and Robbins [3,4] to explain Pauli spin statistics. However, our proposal stems from a different perspective.

In conclusion, we suggest that spin is not a fundamental property of elementary particles, but the result of their coupling with particles yet to be discovered, and that, if these particles were massive they could be related to the “dark matter” problem.

References

- [1] The CMS collaboration, *Physics Letters B* **716**, 1 (2012).
- [2] The ATLAS collaboration, *Physics Letters B* **716**, 30 (2012).

[3] M. V. Berry, J. M. Robbins, Proc. R. Soc. Lond. **A 453**, 1771 (1997).

[4] M. V. Berry, J. M. Robbins, J. Phys. A: Math. Gen. **33**, L207 (2000).