

2021 Jacques Solvay International Chair in Physics Inaugural Lecture



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A brief history of cold atoms

A laser beam can heat, burn, or even destroy ... but also allows to reach the lowest temperatures ever measured. The cooling of matter by light is undoubtedly one of the most paradoxical applications of the laser. It makes it possible to considerably reduce the disordered motion of particles in a gas and to achieve a near perfect order: the temperatures obtained are a billion times lower than the usual ones!

This inaugural lecture will present the general ideas at the basis of this unexpected use of laser light. It will also describe a few perspectives among the numerous research avenues opened by cold atoms. One emblematic example concerns the measurement of time: modern clocks, our "time keepers" which use atoms as pendulums, are all the more accurate when the atomic motion is reduced. The cooling of gases by light has thus allowed a spectacular improvement of the clock precision, which finds applications e.g. in navigation, positioning by satellite, or geodesy.

In this lecture, I will also explain why these assemblies of cold atoms constitute a "quantum matter" with fascinating properties, radically different from usual fluids. Then, the following lectures will be devoted to a more detailed investigation of some facets of this quantum matter, from the exploration of systems in reduced dimension to the notion of scale invariance and solitonic matter waves.

Tuesday 25 January 2022 at 4:00 P.M.

COFFEE AND TEA WILL BE SERVED AT 3:45 P.M. AND DRINKS AT 5:00 P.M IN FRONT OF THE SOLVAY ROOM

The inaugural lecture will be followed by 3 lectures on

Thursday 27 January at 2:00 P.M.

From Bose-Einstein condensation to Kosterlitz-Thouless physics

Tuesday 1 February at 2:00 P.M.

Controlling atomic interactions: Scale invariance tested in the laboratory

Thursday 3 February at 2:00 P.M.

A droplet of spin-1 atoms: the simplest many-body system