

Plenary Talk

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The Laser and fundamental quantum science — ●SERGE HAROCHE — Laboratoire Kastler Brossel, Collège de France, Paris, France

Among all the inventions born of quantum physics, the laser occupies an essential place, both for the rich history of discoveries that led to its birth, and for the role it plays today in fundamental and applied research. This history began at the time of the old quantum theory with Einstein's discovery of stimulated emission in 1916 and Stern's discovery of the spatial quantization of the atomic angular momentum in 1922. Nuclear magnetic resonance (1945), optical pumping (1952), atomic clocks and the maser (1954) followed, leading in 1960 to the

invention of the laser.

This extraordinary light source plays an essential role in many modern technologies. It has also opened up fields of research in blue sky science that could not have been imagined at the time of its birth. We owe to it the cooling and trapping of atoms, the study of quantum gases of bosons and fermions, the discovery of gravitational waves and the manipulation of individual quantum particles, which has led to current research into quantum simulation and quantum computing. The laser may also provide answers to fundamental questions about the link between quantum physics and gravitation, or about the nature of the hypothetical dark matter. The history of the laser is a vivid illustration of the close link between fundamental research and technology