Quantum entropy

Marlan Scully

Baylor University, Waco, TX 76704 USA
Princeton University, Princeton, NJ 08544 USA
Texas A&M University, College Station, TX 77843, USA

The entropy concept is both a useful engineering tool and a philosopher's lodestone. We will review the way that Planck was led to the quantum of action by studying the entropy of thermal light and Einstein was led to the photon concept following Planck's studies. A century later we are still fascinated by (quantum) thermodynamics; For example, the quantum heat engine [1] and the entropy of laser light [2,3] will be discussed. Application of these ideas to a Bose condensate (a.k.a. atom laser) [4] will also be presented.

[1] Scovil Schulz-DuBois, PRL, 1955: "The Maser as a Heat Engine"

[2] M. Scully and W. Lamb, PRL, 1965: "The Quantum Theory of the Laser"

[3] M. Scully, T.B.P.: "The Entropy of Laser Light"

[4] M. Scully, PRL, 1999: "The Quantum Theory of a Bose Condensate"