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Planck's radiation law: is a quantum-classical perspective possible? MICHELE MARROCCO, enea — Planck's radiation law provides the solution to the blackbody problem that marks the decline of classical physics and the rise of the quantum theory of the radiation field. Here, we venture to suggest the possibility that classical physics might be equally suitable to deal with the blackbody problem. A classical version of the Planck's radiation law seems to be achievable if we learn from the quantum-classical correspondence between classical Mie theory and quantum-mechanical wave scattering from spherical scatterers (partial wave analysis). This correspondence designs a procedure for countable energy levels of the radiation trapped within the blackbody treated within the multipole approach of classical electrodynamics (in place of the customary and problematic expansion in terms of plane waves that give rise to the ultraviolet catastrophe). In turn, introducing the Boltzmann discretization of energy levels, the tools of classical thermodynamics and statistical theory become available for the task. On the other hand, the final result depends on a free parameter whose physical units are those of an action. Tuning this parameter on the value given by the Planck constant makes the classical result agree with the canonical Planck's radiation law.

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