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Dirac's Theory of Physical Vacuum: Continuation of Bose's Logical Errors TEMUZ Z. KALANOV, Home of Physical Problems, Pisatelskaya 6a, 700200 Tashkent, Uzbekistan — The critical analysis of Dirac's theory of physical vacuum is proposed. The purpose of the analysis is to prove that the foundations of Dirac's theory include Bose's logical errors. The proof is based on the following statements: (a) a material object has physical states, and physical states are the inseparable characteristics of a material object and belong only to a material object; (b) the problem of physical meaning of the formalism of secondary quantization can be solved only by means of the correct quantum-statistical description of the subsystem "photon gas" representing the inseparable part of the system "molecule + photon gas + thermostat." The main result of the analysis is as follows: both the "phase cell" and the "state of photon gas" are defined by not photons with energy $h\nu_{nm}$, but substance: namely, the expression $|E_n - E_m|$, $n \neq m$ where E_n and E_m are the energy levels of the molecule emitting and absorbing photons. The general conclusion: since it is supposed in Bose's method and Dirac's theory that both the "phase cell" and the "state of photon gas" are defined by photons with energy $h\nu_{nm}$, both Bose "empty phase cell" and Dirac "vacuum state of photon gas" are not a characteristic of material object, have no physical meaning and, hence, represent logical error.

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