

Revival of Louis De Broglie's Double Solution as a Unified Fluid and Field Theory: Implications for Gauge Invariance, Non-Locality and Entanglement

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Abstract. Present paper postulates the existence of an energy-like dark matter (DM) fluid (or aether) formed by discrete DM entities that are the carriers of all energy and linear momentum in the universe; DM fluid obeys the Lorentz invariant homogeneous Klein-Gordon equation (HKGE) proposed by Louis de Broglie in 1927 as a basis for a quantum theory compatible with Einstein's general theory of relativity. A novel ingredient that was not available to De Broglie is the existence of new solutions discovered by us in the mid-1990s for the HKGE in spherical coordinates (r, θ, ϕ) , containing a background time-independent scalar field $B(r, \theta, \phi)$ and a time-distance entangled scalar field $E(Ct/r, \theta, \phi)$, the latter independent of time-distance transformations between coordinate systems in relative motion. De Broglie's dual solution arises from the permanent and inseparable interaction between the DM-fluid and a material object, which modifies in a single event both the motion of the material object and the flow of the DM-fluid. As in atmospheric pressure that generates forces pushing sail boats or holding together Magdeburg hemispheres, gradients of pressure in the DM-fluid lead to apparently different forces: gravity, electromagnetism, nuclear, chemical, van der Waals, and so on, thus fulfilling Einstein's dream for a unified fluid and field theory. Some implications for gauge invariance, non-locality and classical and quantum entanglement are briefly noted.