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Huygens Analogy Between Propagation of Light Waves in Ether and Sound Waves in Air SIAVASH SOHRAB, Northwestern University — According to a scale-invariant model of Boltzmann statistical mechanics[1] speed of light is identified as root-mean-square speed of photons in physical space identified as a compressible tachyon fluid, Planck compressible ether, that is de Broglie hidden thermostat or Casimir vacuum. In accordance with perceptions of Huygens[2], propagation of light waves in ether is found to be analogous to that of sound waves in air with the ratio of *longitudinal* to *transverse* velocities given as $c_l/c_t = \sqrt{3}$. Photons are considered to have *helical trajectories* due to their periodic (axial, angular, radial) motions along cylindrical "*strings*" with three *simultaneously independent* coordinates $(z, \theta, r)$and by Boltzmann equipartition principle, have Wien[1] velocities $(v_{wz} = c/\sqrt{3}\,,\, v_{w\theta} = c/\sqrt{3}\,,\, v_{wr} = c/\sqrt{3}\,)$ leading to photon atomic internal energy $\hat{u} = m_o c^2 = 3kT$ and atomic enthalpy $\hat{h} = \hat{u} + p\hat{v} = mc^2 = 4kT$ hence Hasenöhrl $\gamma = 4/3$ factor in $m = (4/3)m_o$ (S. H. Sohrab, *APS Bulletin, April*2017). With atomic potential energy $p\hat{v} = \hat{u}/3$ and ideal gas law $p = \rho RT$, speed of light waves $c = \sqrt{3kT/m_o} = \sqrt{3kT'/2m_o}$ in photon gas or Casimir vacuum is in close agreement with Laplace formula $c = \sqrt{\gamma RT'}$ for speed of sound waves in ideal gas[3]. [1] Sohrab, S. H., *ASME J. Energy Resources Technology* **138**: 1-12 (2016). [2] Huygens, C., *Treatise on Light*, p.14, Dover, 1912. [3] Krout, K. A., and Sohrab, S. H., *Int. J. Thermo*dynamics **19**: 29-34 (2016).

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