



## Theory Seminar

### **“ (Why) Is Helicity Lorentz-Invariant? Part 2: Thermodynamics and Field Theory”**

Massless particle states of integer or half-integer "helicity" can, in general, mix under Lorentz boosts (like massive particle polarizations). This possibility, historically known as "continuous spin" particles (CSPs), is neither well understood theoretically nor obviously well constrained by experiment. This talk is a continuation of the introduction to CSPs given in Part 1 on Monday. We will examine the physical consequences of the "helicity correspondence" in which simple CSP amplitudes approach scalar, electromagnetic, or gravitational amplitudes in a high-energy limit. In particular, we elaborate on the thermodynamics of matter coupled to CSPs at high temperatures and related observational constraints. We also present a gauge field theory description of CSPs, and comment on some puzzles regarding how this theory is related to the scattering amplitudes discussed previously.



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