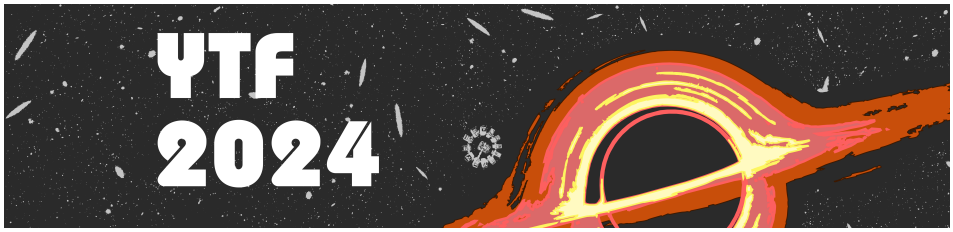

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The Double Copy: A Duality for Particles and Gravity

Thursday, 19 December 2024 09:40 (30 minutes)

An open problem in theoretical physics is to combine all four of the fundamental forces of nature into one single theory. Problematically, gravity has proven difficult to reconcile with the other forces. Recently, relationships between scattering amplitudes (the quantity related to the probability for an interaction to occur between two or more particles) in non-abelian gauge theories (such as the theory of quarks and gluons) and theories of quantum gravity have led to the discovery of a relation known as the double copy. First observed in string theory, the double copy relates scattering amplitudes in quantum gravity to their counterparts for those in non-abelian gauge theories. This property has been extended to relate solutions in classical electromagnetism with those in general relativity, via a theory known as the classical double copy. As a tool, the double copy has been invaluable for deriving results in gravity, that otherwise would be harder or impossible to do from first principles.

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