Twistor, Cohomology, Foundations of Physics

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Abstract: A twistorial framework for foundations of physics is outlined. In the framework, (1) spacetime is derived from twistorial constructions; (2) physical agents are described by elements of holomorphic sheaf cohomology groups defined on twistor space and appearing in spacetime as fields and particles, (2a) whose dynamics is encoded in the holomorphic structures and revealed through Penrose transforms, and (2b) whose scattering processes are describable by twistor diagrams or correlators of twistor operators; (3) the nonlinearity of fundamental interactions (gravity and non-abelian gauge interactions) is the manifestation of nonlinear self-interactions of twistor agents through the deformation of twistor space effected by the agents.

A consistent framework of quantum gravity is attainable within the twistor formalism because (1) gravity can be efficiently handled by the formalism and most importantly, (2) the formalism can be proven intrinsically quantal in nature, without the necessity of imposing a quantum postulate upon it externally through a quantization procedure, while the Planck constant and the whole quantum edifice built thereupon can be derived from it. Thus, the conflict between general relativity and quantum theory is dissolved rather than resolved because both theories can be derived from a new unified formalism, and the century-long debate concerning a consistent framework of quantum gravity is closed.

Many technical and conceptual details must be clarified and fixed before the formalism can be turned into a more practical research framework, but the foundational pillars of the framework provided by the formalism are rock solid.

Keywords: Twistor, Penrose Transformation, Cohomology, Quantum Gravity.