

## The unique role of twistors in TGD

### 1. Background.

- (a) Twistor Grassmannian approach has led to a breakthrough in  $\mathcal{N} = 4$  SUSY relies on 4-D conformal invariance having Yangian extension
- (b) The basic problem in twistorialization of general relativity the empty Minkowski space  $M^4$  is the only space-time with Minkowski signature of metric allowing twistor space is solved in TGD. allows twistor space
- (c)  $CP_2$  is the only 4-D compact space with Euclidian signature of metric allowing twistor space with Kähler structure and identifiable as the flag manifold  $SU(3)/U(1) \times U(1)$  parametrizing the choices of color quantization axes so that  $M^4 \times CP_2$  is completely unique.

### 2. Twistor approach to TGD is motivated by

- (a) Twistor Grassmann approach which has led to breakthrough in  $\mathcal{N} = 4$  SUSY and relies on 4-D conformal invariance having Yangian extension.
- (b) the unique twistorial properties of  $M^4 \times CP_2$ .

### 3. Twistor approach is motivated also by the facts that of if fundamental fermions are massless and if bosons emerge as pairs of wormhole contacts consisting of fermion-anti-fermion pairs and then

- (a) residue integration over virtual momenta reduces generalized Feynman diagrams with fermion lines to diagrams with on mass shell fermions having non-physical helicities and propagator replaced with its inverse.
- (b) there are good hopes about BCFW type recursion formulas for stringy variants of twistorial amplitudes using twistor Grassmannian.

### 4. Twistor approach suggests that the replacement of point-like particles with partonic 2-surfaces implies the existence of an extension of 2-D superconformal symmetry to infinite-dimensional 4-D symmetry having Yangian extension.

### 5. Twistor approach requires stringy version of twistorialization because induced spinor fields are localized to 2-D string world sheets and partonic 2-surfaces by well-definedness of em charge for spinor modes. Stringy twistorialization allows to resolve the old problem due to the fact that stringy fermionic propagator carries fermion number in TGD and achieve manifest UV and IR finiteness.