

Titles and abstracts

Maciej Dunajski:

Title: **A twistor approach to toric gravitational instantons**

Mike Eastwood:

Title: **Killing 2-tensors**

Abstract: Very much akin to solving the twistor equation via local twistor transport, it is well known that Killing fields can be realised as the parallel sections of a suitable vector bundle with connection. The same is true for Killing 2-tensors but what is not so clear is how these bundles may be aligned so as to accommodate the natural quadratic map from Killing fields to Killing 2-tensors. I shall explain how this can be done and some of its consequences. This is joint work with Thomas Leistner.

Rod Gover:

Using tractors and to solve Killing type equations and yield (super)integrable systems.

Abstract: The Killing equation and its generalisations for Killing tensors are important for the study of symmetry, structure deformations, and for yielding integrable solutions of Hamilton-Jacobi and Laplacian equations. These Killing equations arise in some differential complexes known as BGG complexes. Understanding this is one of the key steps to a new approach to constructing collections of solutions to these equations that we outline in this talk. The interaction of the prolonged system with scale is managed by tractors and yields the desired solutions. These then provide first integrals for equations such as the geodesic equation, other Hamilton-Jacobi equations and for Schrodinger operators equations. The overall story demonstrates a beautiful interaction of mechanics, geometry, and algebra.

This is joint work with Simon Goodwin, Thomas Leistner, and Jonathan Kress

Roger Penrose

Title: **Bi-twistor theory, for general curved space-times.**

Abstract: Whereas in a general conformally flat space-time the conformally invariant twistor equation can be used (at least locally) to provide a definition of a twistor, this equation fails to have non-zero solutions in a general conformally curved space-time M . However, the weak twistor equation (acting on

a single-unprimed-indexed quantity ω , where all remaining unprimed indices are contracted with ω s) yields a corresponding single primed-indexed quantity η . When the corresponding (complex conjugate) process applied to η leads back to ω , the pair defines a general null geodesic in M .

Atul Sharma

Title: **The Giants of Twistor Theory**

Abstract: The finiteness of the entropy of a black hole suggests that quantum gravity in a bounded region contains a finite number of degrees of freedom. We study a toy model of this statement by applying the holographic principle to twistor string theory and obtaining a twistorial stringy exclusion principle.

George Sparling

Title: **Reflecting on twistor theory from the past to the future**

Abstract: I will discuss the basics of twistor theory as I understand them, emphasizing that, a priori, twistor theory is a quantum theory and in that light, I will present recent work that aims to mesh quantum theory, twistor geometry and spacetime, joint work of my colleague Jonathan Holland and myself.