Abstracts

Michael Murray and Michael Singer: "Spectral curves of non-integral hyperbolic monopoles." The twistor description of SU_n-monopoles on hyperbolic 3-space is developed and some consequences discussed. It is shown that in a precise sense, any appropriately decaying hyperbolic monopole is determined by its asymptotic values, and also that such monopoles determine and are determined by their spectral data (which reduces to a complex algebraic curve when $n = 2$). This paper provides the hyperbolic analogue of the work of Hitchin and others on euclidean monopoles and generalizes that of Atiyah and Braam-Austin on integral hyperbolic monopoles.

L.J.Mason: "The vacuum and Bach equations in terms of light cone cuts." Light cone cuts are the intersection of the light cones of space-time events with an initial data surface which is usually taken to be null infinity. These are determined by a "cut function," a function of the space-time coordinates and the sphere of generators of null infinity. The Bach equations and the conformal vacuum equations are shown to lead to a single scalar "main" equation on the cut function. In simplified cases, i.e., when the Weyl curvature is either small or self-dual, this equation can be integrated to give a simple scalar conformally invariant elliptic equation on the sphere of null directions. It has the remarkable property that the general solution of the Einstein vacuum equations in these cases can be derived from the solution to this auxiliary equation in two dimensions. Nevertheless, the main equation is still a necessary condition and it is conjectured that it is also sufficient to imply the Bach equations in general and supporting arguments are given. It is also shown how to extend the Kozameh-Newman framework to the case of light cone cuts of a spacelike Cauchy hypersurface. The analogous procedures for Yang-Mills are also discussed. A conformally invariant formalism for calculations on null infinity is described in an Appendix. This is used for all the calculations which are only described in brief form in the main text. *Copywrite 1995 American Institute of Physics.*

T.N.Bailey, M.G.Eastwood, A.R.Gover and L.J.Mason: "The Funk Transform as a Penrose Transform." The Funk transform is the integral transform from the space of smooth even functions on the unit sphere $S^2 \subset \mathbb{R}^3$ to itself defined by integration over great circles. One can regard this transform as a limit in a certain sense of the Penrose transform from $\mathbb{CP}_2$ to $\mathbb{CP}_2^*$. We exploit this viewpoint by developing a new proof of the bijectivity of the Funk transform which proceeds by considering the cohomology of a certain involutive (or formally integrable) structure on an intermediate space. This is the simplest example of what we hope will prove to be a general method of obtaining results in real integral geometry by means of complex holomorphic methods derived from the Penrose transform.