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Jonathan Holland* (jehsma@rit.edu), School of Mathematical Sciences, 2330 Thomas Gosnell Hall, 85 Lomb Memorial Drive, Rochester, NY 14623. *Null geodesics and the universal Teichmüller space*. Preliminary report.

This talk will present some new results on null geodesics in a four-dimensional space-time. The main theorem is that it is possible to associate to a null geodesic in space-time a path in the universal Teichmüller space. This is proved using Penrose limits: there is a unique pp-wave space-time that osculates to the infinitesimal neighborhood of any null geodesic. Finally, the five-dimensional space of null geodesics \mathcal{N} is examined using local twistor transport. There is a natural contact structure on \mathcal{N} : the contact distribution around a given null geodesic is the set of null geodesics that are infinitesimally abreast. The Lagrangian subspaces of the contact distribution correspond to the solutions of the Sachs equations, which govern the null geodesic deviation in space-time. The space of these Lagrangian subspaces is a three-dimensional conformal anti-de Sitter space, with metric $\delta\rho^2 - \delta\sigma\delta\bar{\sigma}$ in the Sachs parameters ρ and σ . The original null geodesic naturally embeds into a timelike curve in anti-de Sitter space, with its natural projective structure. (Received September 22, 2015)