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Null surfaces and contact geometry

We will start with a survey of the null surface formulation of the Einstein field equations of gravitation, which has been developed over many years by Newman and his collaborators. We will then show how this makes it possible to rediscover the isomorphism between three-dimensional conformal Lorentzian geometry and the contact geometry of third order ordinary differential equations, first brought to light by Cartan and Chern. We will also show that four-dimensional conformal Lorentzian geometry corresponds to the contact geometry of a class of overdetermined system of second-order pdes in two independent variables.