Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **2659** Type: **Invited Speaker / Conférencier(ère) invité(e)**

Coulombic contribution to angular momentum flux in general relativity

Monday 3 June 2019 13:15 (30 minutes)

The flux of angular momentum in electromagnetism cannot be expressed entirely in terms of the field's radiative degrees of freedom. Its expression also involves Coulombic pieces of the field, in the form of a charge aspect q(theta,phi), a function of polar angles whose integral gives the total charge of the system. Guided by the strong analogy between radiative processes in electromagnetism and gravitation, we ask whether the flux of angular momentum in general relativity might also involve Coulombic pieces of the gravitational field. Further, we ask whether such terms might have been missed in the past by specializing the flux to sources of gravitational waves that are at rest with respect to the frame in which the flux is evaluated. To answer these questions we bring together the Landau-Lifshitz formulation of the Einstein field equations, which provides specific definitions for angular momentum and its associated flux, and the Bondi formalism, which provides a systematic expansion of the metric of an asymptotically flat spacetime in inverse powers of the distance away from the matter distribution. We obtain a new expression for the flux of angular momentum, which is not restricted to sources of gravitational waves at rest nor to periodic sources. We show that our new expression is equivalent to the standard formula used in the literature when these restrictions are put in place. We find that contrary to expectations based on the analogy between electromagnetism and gravitation, the flux of angular momentum in general relativity can be expressed entirely in terms of the field's radiative degrees of freedom. In contrast to electromagnetism, no Coulombic information is required to calculate the flux of angular momentum in general relativity.

Author: Prof. POISSON, Eric

Co-author: Dr BONGA, Beatrice (Perimeter Institute)

Presenter: Prof. POISSON, Eric

Session Classification: M2-8 General Relativity I (DTP) | Relativité générale I (DPT)

Track Classification: Theoretical Physics / Physique théorique (DTP-DPT)