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Título:

The Thomas Program and the Canonical Proper-time Theory

Resumen:

In a seminal paper, L. H. Thomas suggested that a many-particle relativistic dynamics can be constructed provided that we give up the assumption of invariant world-lines. In the first part of this paper, we show that, using only retarded potentials, a completely consistent action-at-a-distance classical electrodynamics can be constructed, which provides the correct dissipative force (back reaction) in the equations of motion.

In particular, this means that we can account for radiation reaction without the Lorentz-Dirac equation, self-energy (divergence), advanced potentials or any assumptions about the structure of the source. What is more interesting is that the Bakamjian and Thomas [2] program is a special case and, the calculations could have been completed by them, had they considered the problem. The general theory provides a new invariance group which is related to the Lorentz group by a scale transformation. This theory also provides a natural (and unique) definition of simultaneity for all observers, completing Thomas’ program. As an unexpected side benefit, the theory is noninvariant under time reversal.