AGPhil 8: Classical Electrodynamics

Time: Friday 17:30–18:30 Location: SPA SR22

AGPhil 8.1 Fri 17:30 SPA SR22

The Elimination of Fields in Classical Physics — •Mario Hubert — University of Lausanne, Switzerland

Newtonian Mechanics was originally formulated as an action-at-a-distance theory. With the advent of electrodynamics in the 19th century, the ontology of physics was enriched by a further entity apart from matter and forces: the electromagnetic field. The idea of fields was then used to make Newton's gravitational theory spatiotemporally local by the introduction of the gravitational field. However, I want to show that classical fields pose philosophical as well as physical problems that encourage to state that they are not entities in space-time. As a result, I want to point out that classical physics only requires substances and properties in the ontology.

AGPhil 8.2 Fri 18:00 SPA SR22

The radiation arrow of time is not a statistical arrow — •Wolfgang Pietsch[1] and Mathias Frisch[2] — [1]TU München, Germany — [2]University of Maryland, College Park, USA

We comment on the debate concerning the radiation arrow of time in classical electrodynamics starting with the Ritz-Einstein debate at the beginning of the 20th century up to more modern considerations involving among others Earman, Rohrlich, and Frisch. We first identify and distinguish several asymmetries, which have often been confused: between retarded and advanced fields, retarded and advanced potentials, converging and diverging fields, converging and diverging potentials, converging and diverging electromagnetic waves. Furthermore, a crucial issue regards whether we consider point or extended charges as sources. Some, but by no means all of these asymmetries can be shown to coincide. Various reasons are discussed for a non-statistical asymmetry concerning the way potentials or fields are generated by point charges or point charge elements. Most importantly, the main classical derivations of the radiation reaction either presuppose retarded solutions and would yield wrong results using advanced solutions or at least presuppose an asymmetric role for retarded and advanced potentials. The usual counterarguments are shown to employ other notions of symmetry that are compatible with the described non-statistical asymmetry, which by the way was already identified a century ago by Walther Ritz.