

# Dualities and intertheoretic relations

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## Abstract

This is the first of two papers concerned with the philosophical significance of dualities as applied in recent fundamental physics. The general idea is that, for its peculiarity, this 'new' ingredient in theory construction can open unexpected perspectives in the current philosophical reflection on contemporary physics. In particular, today's physical dualities represent an unusual type of intertheory relation, the meaning of which deserves to be investigated. The aim is to show how discussing this point brings into play, at the same time, what is intended by a 'theory' and in which sense dualities are to be considered 'symmetries' (if they are). This paper is introductory and focusses on the first form of duality explicitly applied in twentieth century physics, that is electromagnetic duality as discussed in Dirac's theory of magnetic poles (1931, 1948). The extension of electromagnetic duality in the context of quantum field theory and string theory is explored in a forthcoming companion paper.

**Keywords:** Physical dualities, electromagnetic duality, symmetry, intertheoretic relations, Dirac's theory of magnetic poles

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