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Studies on Symmetry in Theoretical Physics: The Universal Validity of Curie's Principle and Noether's Theorem

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Curie's 1894 celebrated paper on symmetries has been examined by a previous paper through both its doubly negated propositions of intuitionist logic and its kind of theoretical organization; which was forced by the author to appear as an axiomatic-deductive one; instead it is a problem-based one because it presents ad absurdum arguments and applies to the conclusion of such arguments the principle of sufficient reason. No surprise if an accurate definition of what may be extracted from the paper as a "Curie's principle"is a difficult problem. A specific paper was devoted to reduce its possible versions to a minimum number.
In present communication the question of the possible universal validity of the commonly called Curie's principle is examined. Some Roberts's counter-examples concerning the symmetry of time-reversal are discussed. One may insert this principle as either an axiom within a deductive-axiomatic organization or a methodological principle within a problem-based organization. In both cases a universal validity is denied.
Before Curie's paper, it was Lazare Carnot that as first introduced symmetry in a physical theory. Also in this case the theoretical organization is based on a problem; both the ad absurdum proofs and the application of the principle of sufficient reason are recognized in some crucial steps of L. Carnot's algebraic technique. Then the logical structure of this technique is compared with the logical structure of Noether's theorem determining in non-constructive mathematical way all symmetries of a physical system. Noether's mathematical steps corresponding to Carnot's mathematical crucial steps are recognized. This fact proves that also Noether's general representation of symmetries in theoretical Physics preserves the characteristic features of a problem-based theoretical organization. Hence, the true universality of the symmetry principle is constituted not by the range of a principle stated in words but by the above mathematical steps of the symmetry technique.

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