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Two Invariance Principles for Scientific Laws

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By a 'scientific law' we mean an equation in which the variables are physical quantities measured by ratio scales, such as mass, length, (absolute) temperature or time duration. The first invariance principle, called 'meaningfulness,' is closely related the common practice requiring that the form of a scientific law must not be altered by a change of the units of the measurement scales. By itself, meaningfulness does not put any constraint on the possible data. The second principle requires that the output variable is 'order-invariant' with respect to any transformation (of one of the input variables) belonging to a particular family or class of such transformations. These principles are ordre-invariance axioms have strong consequences on the feasible theories. Three applications of our results are discussed in details, involving the Lorentz-FitzGerald Contraction, Beer's Law, and the Monomial Laws, each of which is derived from four axioms implementing meaningfulness and order-invariance concepts. Not all scientific laws are order-invariant in the sense of this paper. An example is Van der Waals' Equation.