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Apartheid in the Dirac theory of constraints.

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When a dynamical theory is described by dynamical variables that are not independent of one another, certain equations present themselves relating these variables. These are called constraints. P. A. M. Dirac [Canad. J. Math. 2 (1950), 129–148; MR 13, 306] divided these constraints into first and second classes. A constraint is first class if its Poisson bracket with any other constraint weakly vanishes. The present authors ask, “Does the preservation of a first-class constraint necessarily result in another first-class constraint? Conversely, does every first-class constraint arise from the requirement that some other first-class constraint be preserved? Is the same true for second-class constraints?” They then prove that a first-class constraint can only lead to another first-class constraint but that this need not be true for second-class constraints.

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