Multisymplectic Geometry and Classical Field Theory - A Status Report

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ABSTRACT: The purpose of the lecture is to give an overwiew of the state of the art in the development of multisymplectic geometry - a relatively new area of geometry that provides a mathematical framework for classical field theory (in a covariant hamiltonian approach), much in the same way as symplectic geometry does for classical mechanics. To begin with, we advocate a recently proposed definition of the (closely related but not identical) concepts of a multisymplectic structure and a polysymplectic structure. This definition, which encompasses all previous attempts, is at the same time sufficiently general to cover the cases of interest in physics and sufficiently specific to allow us to prove interesting and useful theorems. Remarkably, it grew out from a careful appreciation of some conceptual aspects which are often neglected, such as the role of space-time and the possibility to naturally incorporate gauge symmetries. Further topics to be addressed include the relation to functional methods, the definition of Poisson brackets and the treatment of symmetries and conservation laws (Noether's theorem) using Lie groupoids and algebroids.