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Frame Indifferent (Truly Covariant) Formulation of Electrodynamics CHRISTO CHRISTOV, University of Louisiana at Lafayette — The Electromagnetic field is considered from the point of view of mechanics of continuum. It is shown that Maxwell's equations are mathematically strict corollaries form the equation of motions of an elastic incompressible liquid. If the concept of frameindifference (material invariance) is applied to the model of elastic liquid, then the partial time derivatives have to be replaced by the convective time derivative in the momentum equations, and by the Oldroyd upper-convected derivative in the constitutive relation. The convective/convected terms involve the velocity at a point of the field, and as a result, when deriving the Maxwell form of the equations, one arrives at equations which contain both the terms of Maxwell's equation and the socalled laws of motional EMF: Faraday's, Oersted-Ampere's, and the Lorentz-force law. Thus a unification of the electromagnetism is achieved. Since the new model is frame indifferent, it is truly covariant in the sense that the governing system is invariant when changing to a coordinate frame that can accelerate or even deform in time.

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