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Generalized Continuum Mechanics: Three Paths

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The material framework is considered to place in evidence three essential ways of generalizing stanard continuum mechanics, the latter being here the theory of one-component simple materials(after W.Noll) with symmetric Cauchy stress. the three possible paths to generalization are (i) the loss of the Euclidean nature of the backgrounbd material manifold, (ii) the loss of validity of Cauchy's construct of the notion of stress and (iii) the loss of symmetry of the latter. Special attention is paid to the consequences of these different losses on the canonical balance of momentum and its moment, whose ontological status is the same as that of the balance of energy, i.e., they concern the whole physical system under consideration (in particular, all degrees of freedom simultaneously). Because of (i), these cosniderations of necessaity are in that material framework which is the realm of configurational forces and forces driving structural defects.

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