



## Lecture No. 78

**Czech Society for Mechanics  
and Institute of Thermomechanics, CAS**

invite you to a lecture and discussion within  
the lecture series **Institute of Thermomechanics Seminar**

### Non-coaxiality between two tensors: Application to stress rate decomposition and non- coaxial invariants

given by

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Given a stress tensor and its rate, what are the analytical expressions of the parts of the stress-rate tensor that are (a) coaxial with the stress; (b) non-coaxial with the stress; (c) proportional with the stress; (d) non-proportional but coaxial with the stress; (e) orthogonal and coaxial with the stress and (f) orthogonal and non-coaxial with the stress? To answer the foregoing questions the coaxial and totally non-coaxial parts of a tensor in regard to another reference tensor are derived in closed analytical form based on representation theorems of tensor-valued isotropic functions. In the process a new interpretation is obtained for a singular case of representation theorems. The particular application of rotational shear is presented where analytical expressions are obtained for the parts of a stress rate tensor that induce (1) change of stress principal axes at fixed principal stress values, and (2) change of stress principal values at fixed stress principal axes such that the deviatoric stress orbit is circular on the  $\pi$ -plane. Additional application in mechanics are discussed such as the definition and role of invariants related to the non-coaxial and orthogonal parts.

**The lecture will be held on Wednesday, November 13, 2019 at 13:00 in the building of the Institute of Thermomechanics (lecture room B), Dolejšková 5, 182 00 Prague 8.**