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COMPLEX BIOMECHANICS: EMERGENT PATTERNS FROM ATOMS TO PATIENTS

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Summary: Complex systems are characterized by an overall behavior which is different from that of the components making up the systems - hence, (nonlinear) interactions between the components play a very important role. Taking an interdisciplinary approach rooted in theoretical and applied mechanics and engineering mechanics, we report on two types of recently studied systems where individual system components (atoms and patients) interact in a way which unfolds very interesting emerging patterns which can be mathematically quantified through concepts arising from (bio-)mechanics: (i) the interaction of atoms within a short thread of DNA, which, as a compound, result in family of a highly nonlinear beam structures with varying, but always coupled torsion-stretching modes [1]; (ii) the concession of sets of patients to the lethal effect of SARS-COV-2 [2], which was shown to follow integer-differential equations which were introduced by Boltzmann in the context of creep (or hereditary) mechanics. We conclude that smart classical concepts of applied mechanics and physics continue to show an unparalleled potential for solving pressing global problems in the context of computational bioengineering.

References

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