Eur. Phys. J. Plus (2019) **134**: 554
DOI 10.1140/epjp/i2019-13078-0

THE EUROPEAN PHYSICAL JOURNAL PLUS

Editorial

Focus Point on Fractional Differential Equations in Physics: Recent Advantages and Future Direction

Fractional calculus is an emerging interdisciplinary field. To see its deep properties and excellent predictions, we need to gather more information about the studied complex systems with respect to classical calculus.

Together with the classical fractional operators reported in classic high-level books, some new types of fractional calculus were reported and successfully applied to extract extra hidden information from some real-world phenomena.

The fractional differential equations associated with non-local phenomena in physics have qualitatively and quantitatively different properties than the classical ones. Therefore, this type of equations has been studied with great interest and new results have been reported.

The non-locality of fractional calculus makes it a solid candidate to reveal new properties of non-local physical phenomena. We think that the complicated non-local physical phenomena will strongly validate the applicability of fractional calculus and they will show the superiority of the standard and novel fractional calculi over the classical formulation.

This *Focus Point* contains some exciting recent developments in the theory and applications of fractional calculus. Since fractional calculus is a *generalization of meaning*, the viewpoints presented here come from various perspectives.

The high-quality research papers presented within this Focus Point deal with: Fractional Rényi entropy; numerical solutions of interval-valued fractional nonlinear differential equations; the analysis of 3D IS-LM macroeconomics system models within the scope of fractional calculus; invariant subspace and approximate analytic solutions of a fractional model of convective longitudinal fins in thermal conductivity; the beta derivative applied to dark and singular optical solitons for the resonance perturbed NLSE; Legendre wavelets for fractional partial integro-differential equations involved with weakly singular kernels arising from viscoelasticity; the application of fractional differential equation to interpret the dynamics of dissolved heavy metal uptake in streams at a wide range of scales; fractional calculus with power law.

Moreover, the Focus Point deals with the following important topics: $(2+1)$-dimensional physical models endowed with spatiotemporal memory indices; double pipe heat exchanger temperatures estimation using fractional observers; Lyapunov-type inequalities via fractional proportional derivatives and application on the free zero disc of Kilbas-Saigo generalized Mittag-Leffler functions; investigation on fractional derivative model in characterizing sodium chloride transport in a single fracture; linear viscoelastic responses and constitutive equations in terms of fractional operators with non-singular kernels; a variable-order fractional constitutive model for the time-dependent mechanical behavior of polymers across the glass transition; strange chaotic attractors under fractal-fractional operators using newly proposed numerical methods; and force-driven vibrations of fractionally damped plates subjected to primary and internal resonances.

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Guest Editors