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Editorial

Mathematical Methods and Models in the Natural to the Life Sciences

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The search for mathematical models and their analysis was born as a powerful tool for the investigations of nature and as an aid to solve the daily problems that life is offering us. On the other hand, the last decades have witnessed an increased interest in the growth and progress of the study of mathematical methods that are crucial in the quick advancement of the natural, physical, engineering, social, and life sciences.

The purpose of this special issue is to bring together papers covering a wide range of scientific interests concerned with differential equations emanating from mathematical models of classical fields, such as solids and fluid mechanics, or from some fields as biology, economics and finance, and sciences of life that, only in the second part of the last century, have begun to take into consideration the tools offered from mathematics. The mathematical techniques are not only devoted to the search for numerical and exact solutions of the underlying differential equations for general and special problems; they also include new theoretical developments suitable for novel applications of solving real-world problems.

The response to this special issue was beyond our expectation. We received 60 papers to be considered for publication. Those submissions, from different countries and continents, fall in different areas of the above-mentioned research fields. All papers submitted to this special issue went through a rigorous peer-refereeing process. Based on the reviewers reports, thirty-three original research articles have finally been accepted for publication. The contents embrace different qualitative and quantitative techniques, Lie symmetry techniques, numerical methods, stability analysis, and statistical methods to analyze different aspects that are concerned with differential equations arising in economics, finance, biology, physics, and fluid dynamics. It is certainly impossible to provide in this short editorial a more comprehensive description for all articles of this special issue. However, the guest editors believe that the results included reflect some recent trends in research and outline new ideas for future studies. In the following, we briefly describe the significance of the key contributions to our special session.

Lie symmetry methods are powerful tools to find conservation laws/first integrals, reductions, and exact solutions of differential equations. Some papers in our special issue have used Lie symmetry methods to study interesting problems like heat transfer in extended surfaces of different geometries, nonlinear Jaulent-Miodek equation, neutron transport equations in nonhomogeneous media, nonlinear fin equation, and general bond-option pricing equation of mathematical finance. Moreover, different approaches to construct first integrals for ordinary differential equations are compared, as well as symmetries, and their associated first integrals and double reduction of difference equations are also investigated.

Several authors study some interesting fluid mechanics models. Similarity solutions of MHD heat and mass transfer flow of the steady viscous incompressible fluid over a flat