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Symmetry and Equivalence Transformations:Theory and Their Applications to Real Phenomena Modeling

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Message from the Guest Editors

Dear Colleagues,

Differential equations can be considered one of the most powerful tools to describe real phenomena as those of the natural and life sciences.

The search for their solutions has been an exciting challenge for scientists, in particular for mathematicians. A great impulse of this research was provided by Lie at the end of 19th century. He applied symmetry and equivalence transformations to differential equations originating developments of several methods based on the group transformations that allow often to get solutions for differential equations in a methodological way.

Nowadays, using computer algebra packages (such as MAPLE, MACSYMA, REDUCE, etc.) it is very simple to determine Lie symmetries and, by applying the reduction method, solutions of a specific differential equation.

However, such packages are not so powerful when in differential equations have some arbitrary elements (constitutive functions) or when the equation admits only trivial symmetries, or even no symmetry. For these last cases, other methods for determining reductions (nonclassical or conditional symmetry, weak symmetry, etc.) have been developed...

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Message from the Editor-in-Chief

Symmetry is ultimately the most important concept in natural sciences. It is not surprising then that very basic and fundamental research achievements are related to symmetry. For instance, the Nobel Prize in Physics 1979 (Glashow, Salam, Weinberg) was received for a unified symmetry description of electromagnetic and weak interactions, while the Nobel Prize in Physics 2008 (Nambu, Kobayashi, Maskawa) was received for the discovery of the mechanism of spontaneous breaking of symmetry, including CP symmetry. Our journal is named *Symmetry* and it manifests its fundamental role in nature.

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