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Open Problems Session:

Speaker: Roman Popovych (Silesian University in Opava, Czech Republic, & Institute of Mathematics of NAS of Ukraine, Kyiv, Ukraine))

Title: *Open problems of symmetry analysis of differential equations*

Abstract: Despite being a classical and well-established field of mathematics, symmetry analysis of differential equations has a number of various long-staying open problems of different levels, ranging from theoretical problems on its foundations to very particular problems for specific systems of differential equations or their classes that arise in real-world applications. We discuss two sets of such problems, theoretical and particular ones. The first set includes the creation of the theory of reduction modules (i.e., nonclassical symmetries) of general systems of differential equations starting from a proper definition of these objects as well as the problems on existence and uniqueness of effective generalized equivalence groups of classes of differential equations and on proper gauging of potential systems. As particular open problems we mention the exhaustive classification of reduction modules, generalized symmetries and local conservation laws of nonlinear Klein–Gordon equations of the form $u_{xy} = F(u)$, the complete description of the space of conservation laws of the Euler equations and the construction of the equivalence groupoid of the class of shallow water equations with variable bottom topography.