

Niky Kamran (McGill University)

CRM - Fields - PIMS Prize 2014  
December 3, 2013

The Canadian Mathematical Sciences Institutes are pleased to announce that the winner of the CRM - Fields - PIMS Prize for 2014 is Prof Niky Kamran of McGill University. He has spent his career in Canada, working in the areas of analysis and differential geometry. His interests are far reaching, with the two main directions of his research being in the theory of exterior differential systems and Lie theory, a central area of the geometric analysis of systems of partial differential equations, and the mathematical analysis of general relativity.

Prof. Kamran's work on the topic of exterior differential systems has its roots in the foundational insight of E. Cartan, which describes local geometrical objects in terms of systems of differential forms which are invariant under diffeomorphisms and other infinite dimensional Lie (pseudo)group actions. Prof. Kamran's principal contributions have been in the theory of existence of solutions and the classification of infinite dimensional symmetries. His publications on isotropy subgroups of transitive analytic Lie pseudogroups of infinite type are definitive, and involve global elements, such as the cohomology of certain differential complexes, and local, which for example include Malgrange's estimates arising from his proof of the Cartan-Kahler theorem.

Prof. Kamran's contributions to the mathematical analysis of the Einstein equations of general relativity are extremely influential as well, in an area that is currently running as a 'hot topic'. His work, in a series of important papers with co-authors F. Finster, J. Smoller and S.-T. Yau, addresses the basic question of stability of Lorentzian space-times, something that is fundamental to our understanding of present day cosmology. The key in such questions about nonlinear systems of evolution equations is to understand on a deep level the solution operator for the linearized equations; Prof. Kamran and collaborators have given a systematic treatment of the 'black-hole' space-times, namely of the Schwarzschild and Kerr solutions to Einstein's equations. His most recent work addresses the anti-deSitter solutions as the central object of interest in the approach to quantum gravity known as the Anti-deSitter - Conformal Field Theory correspondence.

Prof. Kamran has published over 125 scientific articles. In addition he is a superb expositor, and has contributed influential survey articles and monographs. His work is remarkable for its brilliant, original insights, in combination with a deep mathematical culture, representing a wide and varied range of topics of interest. Niky's contributions will have a lasting scientific impact on Canadian mathematics and on the global mathematical community. The CRM is especially proud that Niky Kamran, a member of the CRM and the CIRGET laboratory, has been awarded the CRM - Fields - PIMS Prize.