Speaker: Stephen Anco

Affiliation: Brock University, Canada

Title: ********** TBA ***********

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
********* TBA ***********

Speaker: Alexander Bihlo

Affiliation: Memorial University of Newfoundland, Canada

Title: Conservative Parameterization Schemes

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
A major problem in meteorology and geophysics is the wide variety of scales on which physical processes take place. Due to the prohibitive amount of computations that would be required to resolve all physically active scales explicitly, it is generally necessary to describe small scale effects in numerical models conceptually. The problem of modelling the effects of these so-called subgrid-scale processes on the resolved grid-scale part of numerical model is referred to as parameterization. In this talk we will introduce different methods for constructing conservative parameterization schemes, i.e. closure models that preserve conservation laws of differential equations. The problem of finding conservative parameterization schemes is critical as even if subgrid-scale effects cannot be resolved explicitly in a numerical model of the Earth system, the closed model should still respect the fundamental conservation laws of the original governing differential equations. We will present examples for conservative parameterization schemes for the shallow-water equations and the incompressible Euler equations in a rotating reference frame.

Speaker: George Bluman

Affiliation: University of British Columbia, Canada

Title: Career Highlights in Working in the Field of Symmetries/DEs

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
In this talk, the following will be discussed:

- A short overview of problems in Symmetries/DEs
- Highlights of work with superb collaborators
- Chronology of progress and major influences in our work
- Some Postdoctoral Fellows and young researchers mentored at UBC

Speaker: Philip Broadbridge

Affiliation: La Trobe University, Australia

Title: Applications of Nonclassical Symmetry Reductions of Nonlinear Reaction-Diffusion Equations

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
The 1969 paper by Bluman and Cole stimulated a lot of research on invariant solutions that could not be recovered from Lies classical method. Only a special class of reaction-diffusion equations has full nonclassical reductions to solutions that are not invariant under classical symmetries. However some of those equations have important applications.

For 1+1 dimensional linear diffusion with a nonlinear reaction, only equations such as the Fitzhugh-Nagumo equation, and the Huxley equation, with cubic source terms, have strictly nonclassical invariant solutions. Under the assumptions set down by Fisher in 1930, the advance of a new advantageous gene through a diploid population, is governed not by Fishers equation but by Huxley's equation.

For nonlinear reaction-diffusion equations in two spatial dimensions, there is a single restriction relating nonlinear diffusivity to nonlinear reaction, that always allows nonclassical reduction to Laplace's equation. This allows us to construct a large class of unsteady solutions to a reaction-diffusion equation with Arrhenius reaction term, that follows from the Gibbs non-analytic temperature-dependent probability distribution.

Speaker: Brian J. Cantwell

Affiliation: Stanford University, USA

Title: Coupling Between Fuel Mass Transfer and Free-Stream Mass Flux in Boundary Layer Combustion in a Circular Cross-Section Channel

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
Boundary layer combustion is the primary mechanism of hot gas generation in hybrid rocket propulsion. The idea of a hybrid rocket is to store the oxidizer as a liquid and the fuel as a solid, producing a design that is less susceptible to chemical explosion than conventional solid and bipropellant liquid designs. The fuel is contained within the rocket combustion chamber in the form of a cylinder, with a circular channel called a port hollowed out along its axis. Upon ignition, a diffusion flame forms over the fuel surface along the length of the port. Combustion is sustained by heat transfer from the flame to the solid fuel causing continuous fuel vaporization until the oxidizer flow is turned off. The theory of boundary layer combustion developed in the 1960's shows that the fuel mass transfer rate is proportional to the free-stream mass flux. The mass flow rate increases with axial distance leading to coupling between the local fuel regression rate and the local mass flux. For proper design, accurate expressions are needed for both the time dependent oxidizer-to-fuel ratio at the end of the port, and the time at which all the fuel is consumed. The coupled, nonlinear first order partial differential equations that govern the mass flow admit a three-dimensional Lie algebra that can be used to determine a similarity solution of the problem. Comparison between the similarity solution and experimental data from recent motor firings shows a remarkable level of agreement.

Speaker: Temuer Chaolu

Affiliation: Shanghai Maritime University, China

Title: Characteristic Set Algorithm for PDE Symmetry Calculation, Classification, Decision and Extension

Presentation date/time: June XX, 2014; 00:00 am

Abstract:

In this talk, we give a review on characteristic set algorithm for PDE symmetry calculation, classification, decision and extension done in recent years by author. A key step of solving these problems is to analysis and solves so called determining system. The essential idea of our research for the purposes is in the following. First we turn the problems of PDE symmetry calculation, classification, decision and extension equivalently into ones of dealing with the zero point set of differential polynomial system (d.p.s). The target of the idea is that we focus our attention on the analysis of the zero point set and algebra properties of the d.p.s corresponding to determining equations of the symmetry. Then we use the characteristic set theory and algorithm fundamental tool in differential algebra on the transferred problems and solve original problems. Doing so, we can get an alternative ways to discuss these problems from differential algebra point and get automatic algorithm to obtain concrete symmetry and decision of (non-classical) symmetry existence for a PDE. Meantime, the algorithm can give symmetry classification and symmetry extension of a PDE with arbitrary parameters. The main research works are presented in the following articles.

[1] Temuer Chaolu & George Bluman. *An algorithmic method for showing existence of nontrivial non-classical symmetries of partial differential equations without solving determining equations.* J. Math. Anal. Appl. **411** (2014) 281–296.

[2] Temuer Chaolu & Pang Jing. *An algorithm for the complete symmetry classification of differential equations based on Wu's method.* J. Eng. Math. **66** (2010) 181–199.

[3] Temuer Chaolu & Bai Yu Shan. *A new algorithmic theory for determining and classifying classical and non-classical symmetries of partial differential equations* (in Chinese). Sci. Sin. Math. **40**(4) (2010) 331–348.

[4] Temuer Chaolu, Eerdun Buhe & Xia Tiecheng. *Non-classical symmetry of the wave equation with source term.* Chinese Journal of Contemporary Mathematics **33**(2) (2012) 157–166.

[5] George Bluman & Temuer Chaolu. *New conservation laws obtained directly from symmetry action on a known conservation law.* J. Math. Anal. Appl. **322** (2006) 233–250.

[6] George Bluman & Temuer Chaolu. *Local and nonlocal symmetries for nonlinear telegraph equation.* J. Math. Phys. **46** (2005) 023505.

[7] George Bluman & Temuer Chaolu. *Conservation laws for nonlinear telegraph equations.* J. Math. Anal. Appl. **310** (2005) 459–476.

[8] George Bluman & Temuer Chaolu. *Comparing symmetries and conservation laws of nonlinear telegraph equations.* J. Math. Phys. **46** (2005) 073513.

Speaker: Roman Cherniha

Affiliation: University of Nottingham, UK

Title: Symmetries of Boundary Value Problems: Definitions, Algorithms and Applications to Physically Motivated Problems

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
One may note that the symmetry-based methods were not widely used for solving BVPs. To the best of our knowledge, the first rigorous definition of Lies invariance for BVPs was formulated by George Bluman in early 1970s. In our recent papers [1, 2], a new definition of Lie's invariance of BVP with a wide range of boundary conditions (including those at infinity and moving surfaces) was formulated. Moreover, an algorithm of the group classification for the given class of BVPs was worked out. The definition and algorithm were applied to some classes of nonlinear two-dimensional and multidimensional BVPs of Stefan type with the aim to show their efficiency. In particular, the group classification problem for these classes of BVPs was solved, reductions to BVPs of lower dimensionality were constructed and examples of exact solutions(with physical meaning) were found. Very recently, a definition of conditional invariance for boundary-value problems (BVPs) was proposed and applied to some nonlinear BVPs including those with the governing (1+2)-dimensional heat equation. Its relation with the definitions, which were earlier worked out for Lie's invariance, is also shown.

The talk will be based on the papers [1, 2] and some unpublished results obtained recently in collaboration with John R. King.

This research was supported by a Marie Curie International Incoming Fellowship within the 7th European Community Framework Programme.

References:

[1] R. Cherniha & S. Kovalenko, *Lie Symmetries of Nonlinear Boundary Value Problems*, Commun. Nonlinear. Sci. Numer. Simulat. **17** (2012) 71– 84.

[2] R. Cherniha & S. Kovalenko, *Lie Symmetries and Reductions of Multi- Dimensional Boundary Value Problems of the Stefan Type*, J. Phys. A: Math. Theor. **44** (2011) 485202 (25 pp.).

Speaker: Alexei Cheviakov

Affiliation: University of Saskatchewan, Canada

Title: ********** TBA ***********

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
********* TBA ***********

Speaker: S. Roy Choudhury

Affiliation: University of Central Florida, USA

Title: Building Integrable NLPDE Hierarchies with Temporally and Spatially Varying Coefficients

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
In the present talk, we present two techniques, based on generalized Lax pairs and similarity transformation methods, to derive generalizations of various integrable (in the Lax sense) NLPDE hierarchies. As illustrative examples, we consider a generalized NLS equation, as well as a very recent non-local and PT-symmetric NLS equation. We demonstrate that the techniques yield integrable equations with both time- AND space-dependent coefficients, and are thus more general than cases with only temporally varying coefficients treated earlier via the Painlevé Test and the use of Bell polynomials.

The methods have been applied to generalize some well-known integrable NLPDE hierarchies, and are currently being applied to others as well.

This is a joint work with Matt Russo.

Speaker: Vladimir Dorodnitsyn

Affiliation: Keldysh Institute of Applied Mathematics, Russian Academy of Sciences

Title: Symmetries and First Integrals for Difference Equations Which Do Not Possess a Variational Formulation

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
A new method to find first integrals for discrete equations is presented. It can be used for discrete equations which do not possess variational (Lagrangian or Hamiltonian) formulation. The method is based on a newly established identity which links symmetries of the underlying discrete equations, solutions of the adjoint equations and first integrals. The method was applied to an invariant discretization of a third order ODE. The set of independent first integrals allows one to find the general solution of the discrete scheme. Comparison with the direct method to find first integrals is presented.

Speaker: Elsa Dos Santos Cardoso-Bihlo

Affiliation: University of Vienna, Austria

Title: Invariant Parameterization Schemes

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
Numerical weather prediction models can only operate at finite resolution. However, processes below the model resolution have an impact on the processes resolved by the model and therefore cannot be omitted in the model. The proper formulation of subgrid-scale processes in terms of resolved grid scale quantities is referred to as parameterization. The aim of this talk is to discuss a method for constructing parameterization schemes that preserve invariance properties. The method is based on group classification of differential equations. By assuming a general functional dependency of the unknown subgrid-scale in terms of the known grid-scale quantities in a system of averaged differential equations turns the original unclosed differential equations into a class of differential equations which is approachable using tools from the classical group classification. The result of this procedure yields various forms of local closure ansatzes for the unresolved subgrid scale terms leading the closed differential equations having symmetry properties that are related to the original unaveraged differential equations.

This is a joint work with Roman Popovych.

Speaker: Mark Fels

Affiliation: Utah State University, USA

Title: Equations of Lie Type and Applications to Solving Differential Equations

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
In this talk I will define equations of Lie type and show how they appear in solving ordinary differential equations (ODE). In particular if the group in question is solvable this produces the well known result on solving by quadrature an ODE with a solvable Lie group of symmetries.

Using these ideas we will examine a family of scalar partial differential equations where the solution to the Cauchy problem can be solved using equations of Lie type. Again in the case of the group being solvable, the solution to the Cauchy problem is obtained using quadratures. This leads to formulas that are analogous to the D'Alembert formula for the solution to the Cauchy problem for the wave equation.

Speaker: Jean-François Ganghoffer

Affiliation: Université de Lorraine, Nancy, France

Title: Symmetry Methods in Continuum Mechanics of Materials

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
A novel and rational approach based on Lie analysis is proposed to investigate the mechanical behaviour of materials exhibiting experimental master curves. The approach relies on the idea that the mechanical response of materials is associated with hidden symmetries, which are reflected by the form of the energy functional and the dissipation potential, when considering the framework of irreversible thermodynamics.

The general objective is to reveal those symmetries from measurements and to construct constitutive laws from them. Two ways of formulating the constitutive laws from data are exposed, and the possibility of predicting new master curves and material charts is alos highlighted.

The first part of the talk is devoted to the presentation of the general methodology. Afterwards, the strategy is applied to the uniaxial creep and rupture behaviour of a Chrome-Molybdene alloy (9Cr1Mo) at different temperatures and stress levels. Constitutive equations for creep and rupture master responses are identified for this alloy, and validated on experimental data.We conclude by mentioning a few scientific challenges in the field of symmetries in mechanics.

Speaker: Peter Hydon

Affiliation: University of Surrey, UK

Title: Conservation Laws: from Differential to Difference

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
Conservation laws express fundamental properties that are common to every solution of a system of equations. For PDEs, conservation laws may be found directly, by using a method developed by George Bluman and Stephen Anco. If a given system of PDEs is the Euler-Lagrange system associated with a variational problem, one can also use Noether's two theorems on variational symmetries to extract conservation laws or relations between the PDEs.

This talk describes how these ideas extend to partial difference equations. Some of the basic constructions for PDEs can no longer be used. Even so, difference analogues of the direct method and Noether's theorems have been found, together with a new result that bridges the gap between Noether's two theorems (for both PDEs and difference equations). The talk concludes with a brief discussion of the reason for the close analogy between conservation law methods for differential and difference equations.

Speaker: A. H. Kara

Affiliation: University of the Witwatersrand, South Africa

Title: Symmetry Structures of ASD Manifolds

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
The ASD Ricci-flat metric has a form that depends on the solutions of the second heavenly equation and has signature $(+\ +\ -\ -)$. We study the symmetries, viz., Noether and Lie symmetries, that arise from the Euler-Lagrange equations, i.e., the 'geodesic' equations, related to the metric. We explore the relationship between these and the Killing vectors admitted by the metric. As is well known, the Noether symmetries can be used to successively reduce the geodesic equations and, in fact, these symmetries allow for double reduction as each Noether symmetry corresponds to a known conservation law via Noether's theorem.

Speaker: Xuan Liu

Affiliation: Western University, Canada

Title: Algorithms for Finding the Lie Superalgebra Structure of Regular Super Differential Equations

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
Super differential equations are a non-commutative generalization of conventional differential equations, and arise naturally in some physics field theories. Exactly solving conventional differential equations is often difficult and similarly solving super differential equations maybe difficult or impossible. Lie super symmetry is a generalization of Lie symmetry to super differential equations and the infinitesimal form of the super symmetries satisfy a super symmetry defining system.

I show how to find the structure (commutator table) of Lie super algebra of symmetries of sufficiently regular super differential equations without solving their super symmetry defining system. I will use two examples to show the new method which uses existing commutative Maple commands for such non-commutative calculations.

Speaker: Lin Luo

Affiliation: Shanghai Second Polytechnic University, China

Title: Quasi-periodic Waves of the Supersymmetric Modified KDV Equation

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
Based on the bilinear method and Riemann theta function, a straightforward way is shown to construct quasi-periodic wave solutions of supersymmetric equations. The resulting theory is applied to supersymmetric Modified Korteweg de Vries equation. We analyze asymptotic properties of the solutions and give their asymptotic relations between the quasi-periodic wave solutions and the soliton solutions.

Speaker: Guowu Meng

Affiliation: Hong Kong University of Science and Technology

Title: Planetary Motions and Lorentz Transformations

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
The goal of this talk is to convey this message concerning planetary motions: The oriented elliptic orbits for the Kepler problem and its magnetized cousins are related to each other via future-preserving Lorentz transformations and scaling transformations.

Speaker: Abdus Sattar Mia

Affiliation: University of Saskatchewan, Canada

Title: Conservation Laws of the Incompressible Two-Fluid System

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
A nonlinear model has been derived by Camassa and Choi (1999) to approximate the two-dimensional Euler equations of incompressible motion of two non-mixing fluids in a channel. We derive conservation laws for the two-fluid model using the direct conservation law construction method. Eight different conservation laws are found, including the conservation of mass, total momentum, and energy. The conserved quantities for the Camassa-Choi model are compared with those for the full incompressible Euler system.

This is a joint work with Alexei Cheviakov.

Speaker: Martin Oberlack

Affiliation: TU Darmstadt, Germany

Title: Statistical Symmetries of the Infinite-Dimensional Correlation System of Turbulence, New Invariant Solutions and its Validation Using Large-Scale Turbulence Simulations

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
Textbook knowledge proclaims that Lie symmetries such as Galilean transformation lie at the heart of fluid dynamics, i.e. the Navier-Stokes equations. These important properties also carry over to the statistical description of turbulence, i.e. to the Reynolds stress transport equations and its generalization, the infinite set of multi-point correlation equations (MPCE). Interesting enough, the MPCE admit a much larger set of symmetries, in fact infinite dimensional, subsequently named statistical symmetries.

Most important, theses new symmetries have important consequences for our understanding of turbulent scaling laws, in the mathematical community named group invariant solutions. The symmetries form the essential foundation to construct exact solutions to the infinite set of MPCE, which in turn are identified as classical and new turbulent scaling laws. Examples on various classical and new shear flow scaling laws including higher order correlations will be presented. Even new scaling laws have been forecasted from these symmetries and in turn validated by large-scale simulations of Navier-Stokes equations in canonical geometries.

In the past, engineers and physicists working on semi-empirical turbulence modelling have implicitly recognized at least one of the statistical symmetries, as it is the basis for one of the most well known scaling laws - the logarithmic law of the wall, which has been employed for calibrating essentially all engineering turbulence models. Hence, an obvious conclusion is to generally make engineering turbulence models consistent with as many as possible statistical symmetries employing the idea of group invariant modelling.

Speaker: Peter J. Olver

Affiliation: University of Minnesota, USA

Title: A historical overview of symmetry methods for differential equations: from Lie to Noether to Birkhoff to Ovsiannikov to Bluman and beyond

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
I will present a (somewhat biased) overview of the history of symmetry methods for differential equations, various generalizations, and applications particularly to integration, explicit solutions, and conservation laws.

Speaker: Juha Pohjanpelto

Affiliation: Oregon State University, USA

Title: Symmetries, Conservation Laws, and Variational Principles for Differential Equations

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
Noether's first theorem associates to every generalized symmetry of a variational problem a differential conservation law for the corresponding Euler-Lagrange equations. Noether's second theorem, in turn, asserts that infinite dimensional Lie symmetry pseudo-groups of a variational problem involving arbitrary functions of all the independent variables correspond to differential constraints among the Euler-Lagrange equations.

These two classical results suggest the following partial converse first rigorously enunciated by Takens in 1977: Suppose that a system of differential equations is invariant under a given pseudo-group of transformations and that the system admits the conservation laws or is subject to the differential identities corresponding to these symmetries. Does it then follow that the system is variational, i.e., that it can be written as the Euler-Lagrange equations of some Lagrangian function? Besides its intrinsic mathematical interest, Takens' question has far-reaching ramifications in physical field theories where symmetries and conservation laws are of primary importance in determining the form of the field equations.

In this talk I will discuss my recent joint work with G. Manno and R. Vitolo on Takens' problem for non-abelian gauge theories and with Ian Anderson on Takens' problem for metric field theories, involving the infinite dimensional pseudo-groups of gauge transformations and of local diffeomorphisms, respectively.

Speaker: Sarah Post

Affiliation: University of Hawaiì, USA

Title: Conservation Laws of Magnetohydrodynamic Equations and Their Transformational Properties

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
Conservation laws of incompressible flows of ideal and viscous resistive plasma are studied. Using the direct method we derive zero- and first-order conservation laws for dynamical and stationary models in cartesian (3-D flows) coordinate systems. Action of point infinitesimal symmetries on the conservation laws are given. For each reduction under consideration we get the minimal generating set of conservation laws.

Speaker: Dmitry Pshenitsin

Affiliation: Brock University, Canada

Title: Classification of Superintegrable Systems and Algebra Contractions

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
In this talk, I will discuss recent advances in understanding the classification of superintegrable systems and their connection to orthogonal polynomials, as inter-basis expansion coefficients as well as representations of the associated symmetry algebras. I will review the classification of 2D systems and the connection to limits within the Askey scheme of orthogonal polynomials. I will then present recent work, joint with Jonathan Kress (UNSW) on the 3D analogs and a possible extension of the Askey scheme to multivariable orthogonal polynomials.

Speaker: Changzheng Qu

Affiliation: Ningbo University, China

Title: Symplectic Invariants for Curves and Integrable Systems in Centro-Equiaffine and Similarity Symplectic Geometries

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
In this talk, explicit expressions of the symplectic invariants for curves in centro-equiaffine and similarity symplectic geometries are obtained. The relationships between the Euclidean symplectic invariants and the similarity symplectic invariants for curves are established. Invariant curve flows in centro-equiaffine and similarity symplectic geometries are also studied. It is shown that certain intrinsic invariant curve flows in four-dimensional similarity symplectic geometry are related to the integrable Burgers and matrix Burgers equations, and the matrix KdV equations and their extension arise from intrinsic curve flows in centro-equiaffine symplectic geometry.

Speaker: Greg Reid

Affiliation: Western University, Canada

Title: Approximate Symmetry Analysis of Differential Equations

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
Significant generalizations of symmetry such as nonclassical and potential symmetries were introduced by George Bluman. The overdetermined systems that must be analyzed for such symmetries motivated the author to develop algorithms for extracting symmetry information. One example is an effective symbolic algorithm to determine the Lie symmetry algebra structure of transformations leaving invariant algebraic systems of partial differential equations. Such algorithms depend on generalization of Gröbner basis methods to differential systems.

In many applications, however, the differential equations describing a model are only approximately known. For example they may contain approximate parameters. However direct application of such methods to models involving approximate data is unstable and usually yields uninteresting results. In particular the presence of even tiny errors means that such methods can at most detect generic symmetries of nearby models, rather than exceptional symmetry rich models.

In this talk we discuss progress in the numerical detection of symmetry rich models which is stable to small errors in data. This builds on earlier results where we showed that the dimension of symmetry algebras of nearby symmetry rich models could be detected. Our method is to couple the Cartan-Kuranishi prolongation-projection algorithm of the geometry of PDE, with the singular value decomposition of numerical linear algebra. The Cartan-Kuranishi algorithm is a geometrical cousin of Gröbner bases.

This is joint work with Tracy Huang and Ian Lisle of the University of Canberra.

Speaker: Michael Ward

Affiliation: University of British Columbia, Canada

Title: An Asymptotic Analysis of the Persistence Threshold for the Diffusive Logistic Model in Spatial Environments with Localized Patches

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
An indefinite weight eigenvalue problem characterizing the threshold condition for extinction of a population based on the single-species diffusive logistic model in a spatially heterogeneous environment is analyzed in a bounded two-dimensional domain with no-flux boundary conditions. In this eigenvalue problem, the spatial heterogeneity of the environment is reflected in the growth rate function, which is assumed to be concentrated in n small circular disks, or portions of small circular disks, that are contained inside the domain. The constant bulk or background growth rate is assumed to be spatially uniform. The disks, or patches, represent either strongly favorable or strongly unfavorable local habitats. For this class of piecewise constant bang-bang growth rate function, an asymptotic expansion for the persistence threshold λ_1, representing the positive principal eigenvalue for this indefinite weight eigenvalue problem, is calculated in the limit of small patch radii by using the method of matched asymptotic expansions. By analytically optimizing the coefficient of the leading-order term in the asymptotic expansion of λ_1, general qualitative principles regarding the effect of habitat fragmentation are derived. In certain degenerate situations, it is shown that the optimum spatial arrangement of the favorable habit is determined by a higher-order coefficient in the asymptotic expansion of the persistence threshold.

(Joint work with Alan Lindsay, U. Notre Dame.)

Speaker: Thomas Wolf

Affiliation: Western University, Canada

Title: A Group Foliation Method for Finding Exact Solutions to Nonlinear PDEs

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
In this talk a novel symmetry-group method will be outlined which has been used successfully to find exact solutions to multi-dimensional wave equations and heat equations with power nonlinearities. The method is based on the geometrical idea of group foliation in which the solution jet space of a given nonlinear PDE is reduced to a quotient space of orbits under the action of a one-dimensional group of symmetries admitted by the PDE. Certain algebraic homogeneity features of the group-invariant equations describing the orbits are used to seek explicit solutions by a relatively simple separation ansatz.

This is joint work with Stephen Anco.

Speaker: Tiecheng Xia

Affiliation: Shanghai University, China

Title: Approximate Symmetry Analysis of Differential Equations

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
From a spectral problem, we derived new coupled soliton equations and obtained its The Hamiltonian Structure. And then a $1 + 1$-dimensional coupled soliton equations are decomposed into two systems of ordinary differential equations. The Abel-Jacobi coordinates are introduced to straighten the flows, from which the algebrogeometric solutions of the coupled $1 + 1$-dimensional equations are obtained in terms of the Riemann theta functions.

This is joint work with Pan Hongfei.

Speaker: Zhenya Yan

Affiliation: Institute of Systems Science, Chinese Academy of Sciences, China

Title: Matter Waves of Some Generalized Gross-Pitaevskii Equations with Varying Potentials and Nonlinearities

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
In this report, we consider matter wave solutions and parameters analysis of one-, two-, and three-dimensional generalized Gross-Pitaevskii equations with varying potential and nonlinearities arising from Bose-Einstein condensates on the basis of the symmetry analysis and some transformations.

Speaker: Akira Yoshioka

Affiliation: Tokyo University of Science, Japan

Title: Star Product and its Application

Presentation date/time: June XX, 2014; 00:00 am

Abstract:
Deformation quantization is to deform a commutative algebra of functions on a manifold into an associative, commutative or noncommutative, algebra, and the deformed product is called a star product. The concept of deformation quantization was proposed by mathematical physicist around 1970, and now is used as an idea to deal with noncommutative algebra in quantum physics.

In this talk, we give a brief review on deformation quantization, or star product, and discuss its applications with examples.