Titles and Abstracts

Luigi Alfonsi: ***Global Double Field Theory as gerbe geometry***

Abstract:
I will review the "Global Double Field Theory is Higher Kaluza-Klein Theory" proposal from [arXiv:1912.07089]. In this framework the doubled space is a higher principal bundle: the bundle gerbe of Kalb-Ramond field. The invariance under its higher principal action is exactly the (global) strong constraint and the patching problem of DFT is naturally solved by gluing the doubled space with a higher group of symmetries. Moreover, the infinitesimal symmetries of the doubled space are encoded by a familiar Courant algebroid twisted by a gerbe (also known as Extended Riemannian Geometry). I will also show that this picture gives automatically rise to T-duality and that the NS5-brane is exactly a higher version of the Gross-Perry monopole.

Severin Bunk: ***From Nonassociative Translations to Symmetries of Gerbes***

Abstract:
Gerbes are geometric objects describing the third integer cohomology of a manifold and the B-field in string theory. They are related to line bundles in many ways, but their structure is significantly richer. Infinitesimal symmetries of gerbes on a manifold M are associated with algebroid structures on M. In this talk, we investigate finite symmetries of gerbes; we demonstrate how, in the presence of a Lie group action on M, gerbes on M lead to higher group extensions which have several applications in geometry and physics.

Gil Cavalcanti: ***Stable Generalized Complex Structures with Self-Crossing***

Abstract:
Stable generalized complex structures are those for which the anticanonical section is transverse to the zero section. Many four dimensional examples exist, but in higher dimension the transversality condition proves to be too strong and rules out interesting manifolds, such as Fano varieties. To overcome this problem, we weaken the stable condition and allow the zero locus of the anticanonical section to have self crossings. I will present the basic theory of these structures, give examples in dimension 4 and higher and review what stable structures with self crossing can tell us about genuine stable structures.

Martin Cederwall: Extended geometry

Abstract:
I plan to, as calmly as possible, walk through the ingredients of extended geometry (structure algebras, modules, physical content, generalised diffeomorphisms, strong constraint, ...) and the fundamental role played by certain superalgebras. Maybe I also have some time to outline some thoughts and plans for the future.

Miquel Cueca Ten: ***The Cohomology of Courant algebroids and their characteristic classes***

Abstract:
Courant algebroids originated over 20 years ago motivated by constrained mechanics but now play an important role in Poisson geometry and related areas. Courant algebroids have an associated cohomology, which is hard to describe concretely. Building on work of Keller and Waldmann, I will show an explicit description of the complex of a Courant algebroid where the differential satisfies a Cartan-type formula. This leads to a new viewpoint on connections and representations of Courant algebroids and allows us to define new invariants as secondary charcateristic classes, analogous to what Crainic and Fernandes did for Lie algebroids. This is joint work with R. Mehta.

Mario García-Fernández: ***Morita equivalence for string algebroids***

Abstract:
I will present a gauge-theoretic picture for string algebroids, a special class of holomorphic Courant algebroids introduced in arXiv:1807.10329. Our approach is based on a new notion of Morita equivalence for these objects. If time allows, I will comment on some applications to the Hull-Strominger system problem which follow from our theory. This is joint work with Roberto Rubio and Carl Tipler in arXiv2003.

Gueo V. Grantcharov: ***Killing vector fields and para-hyperhermitian surfaces***

Abstract:
In a 4-dimensional vector space with metric of signature (2,2), two null vectors spanning a null-plane determine a canonical action of the split quaternions. We noticed that on an oriented manifold with two null Killing vector fields spanning an isotropic plane everywhere, the induced almost para-hypercomplex structure is integrable. Based on the classification of compact complex surfaces this allows to describe the topology of the compact 4-manifolds with such vector fields. In the talk I'll discuss the result and present examples of para-hyperhermitian structures admitting 2 null Killing vector fields on most of these manifolds. If time permits, I'll explain a reduction procedure for para-hyperhermitian structures and how the instanton moduli space on compact para-hyperhermitian surfaces carries a para-hyperhermitian structure.

Marco Gualtieri: ***Quantization of generalized Kahler structures***

Abstract:
I will explain an approach to generalized Kahler metrics in which a holomorphic Poisson structure may be viewed as a polarization giving rise to a geometric quantization. Applying this idea to multiples of a symplectic form, we obtain a graded algebra, which unlike the usual case of a homogeneous coordinate ring, may be noncommutative.

Madeleine Jotz Lean: ***Dorfman connections and Courant algebroids***

Abstract:
This talk surveys a few results on the notion of connection in the context of Courant algebroids. Splittings of the standard Courant algebroid over a vector bundle are described by `Dorfman connections' -- in the same manner as linear connections split the tangent Lie algebroid of a vector bundle. This is used, for instance, in the study of linear generalised complex structures.
Then the case of principal bundles is considered. As principal connections split the Atiyah sequence of a principal bundle, principal Dorfman connections split the Atiyah-Dorfman sequence of a principal bundle. The full picture is here still work in progress, but some aspects of the theory are presented.
This research is partly joint with Malte Heuer and with Jan Nöller.

Charlotte Kirchhoff-Lukat: ***Generalized complex branes, coisotropic submanifolds and deformations***

Abstract:
I will begin by giving an overview of generalized complex branes as natural submanifolds of generalized complex manifolds and summarising known results on their deformations. After a general introduction, the focus of the talk will be coisotropic A-branes in symplectic manifolds. It is known that such objects should be additional objects in the Fukaya category. A-branes are coisotropic submanifolds with an additional structure.
I will discuss initial results on the deformation theory of such objects in examples, as well as in comparison to that of coisotropic manifolds.

Magdalena Larfors: ***Heterotic perspectives on G2 geometry***

Abstract:
Heterotic string compactifications on integrable G2 structure manifolds provide an interesting class of three-dimensional supergravity models. Solutions of this type preserve minimal supersymmetry, and result in Minkowski or AdS$_3$ geometries. As in the more studied four-dimensional Strominger-Hull system, the effective field theory describing the three-dimensional supergravity is largely determined by the geometry of the compactification.
In this talk, I will discuss two aspects of these three-dimensional supergravity models. Starting from the mathematical structure of the infinitesimal deformations, captured by a vector bundle Q, with a G2 instanton connection $\check {\cal D}$, I will show how one may determine a superpotential for the three-dimensional supergravity. I will then discuss the relation between these models and the four-dimensional Strominger-Hull system, with some remarks on the connection to generalised geometry.

Ruben Minasian: ***Beyond generalised geometry***

Abstract:
I'll review some recent string-theoretic computations of quantum corrections to the low energy actions, and the challenges they present for generalised geometry.

Michela Petrini: ***Systematics of consistent truncations***

Abstract:
I will describe how generalised geometry provides a general framework based on a generalised version of G-structure to construct consistent truncations with different amount of supersymmetry. This approach allows to reproduce known truncations and to construct new ones, where the G-structure is a truly generalised one.

Pavol Severa: ***Generalized Laplacian, generalized Ricci flow, and Poisson-Lie T-duality***

Abstract:
To a generalized metric in any Courant algebroid one can associate a natural Laplace operator acting on half-densities. Using this operator one can then easily show that Poisson-Lie T-duality (a non-abelian generalization of T-duality) is compatible with Ricci flow and, under certain mild conditions, also with supergravity equations.
Based on a joint work with Fridrich Valach.

Thomas Strobl: ***Sigma models and generalized geometry***

Abstract:
Two-dimensional sigma models with gauge symmetries are intimately related to generalized geometry. This applies to the standard notion of gauge theories, where a group is acting on the target space M of the sigma model, but also to the novel, purely geometric ones where more general singular foliations can be gauged. The choice of a (possibly small and singular) Dirac structure give rise to the orbits or leaves that are gauged in the target manifold M of the sigma model. The generalized metric, which is induced by the metric and the 3-form on M, is compatible with the gauging if it gives rise to what we call a generalized Riemannian foliation (as the name suggests, it generalizes the classical notion of a Riemannian foliation, as we will explain). Moreover, there exists a universal gauge theory, which is the (not necessarily topological) Dirac sigma model. In the purely topological case, it generalizes the Poisson sigma model to arbitrary Dirac structures, but also any other known non-topological gauged sigma models within the class described above factor through it.

Richard Joseph Szabo: ***The geometry of double field theory***

Abstract:
I will give an overview of recent developments aimed at providing a rigorous framework for "doubled geometry" in duality-invariant formulations of string theory, focusing on the approaches based on para-Hermitian geometry and gauged worldsheet sigma-models in Born manifolds.

Daniel Waldram: ***The Hull-Strominger system, moment maps and generalised geometry***

Abstract:
We show that the conditions for solutions of the Hull-Strominger system can be reformulated as an integrable SU(3)xSpin(6+n) structure on a suitable Courant algebroid. Geometrically they correspond to the existence of an involutive subbundle and the vanishing of a moment map for the action of generalised diffeomorphisms. The space of involutive structures admits a natural Kahler metric implying that solving the moment map is equivalent to a GIT quotient. The dilation functional of Garcia-Fernandez et al plays the role of the norm functional and there is an analogue of the Futaki invariant. If time permits we will discuss how analogous structures arise in the description of (generalisations of) G2 manifolds.

Marco Zambon: ***Deformations of Lagrangian submanifolds in b-symplectic manifolds***

Abstract:
b-symplectic manifolds are certain kinds of Poisson manifolds that are symplectic outside a codimension 1 subset. In many respects they behave similarly to symplectic manifolds. We focus on Lagrangian submanifolds contained in the singular codimension 1 subset, show that their deformations are governed by a certain DGLA, and that - unlike the symplectic case - infinitesimal deformations are generally obstructed. Based on joint work with my Ph.D. student Stephane Geudens.