Titles and Abstracts

BV pushforward of topological theories

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The BV pushforward is a simple construction that adapts the idea of integrating the ultraviolet elds in Wilson renormalization to the Batalin-Vilkovisky setting. If one applies it to AKSZ theories, that are topological, one can see interesting relations with physical theories dened in the infrared. After a brief review of basic facts of BV, I will discuss examples of this construction in two dimensions. I will also discuss its application to the equivariant extension of Yang-Mills theory in four dimensions.

Poisson structures from corners of eld theories

Alberto Cattaneo

ETH Zürich

The BV formalism and its shifted versions in eld theory have a nice compatibility with boundary structures. Namely, one such structure in the bulk induces a shifted (possibly degenerated) version on its boundary, which can be interpreted as a Poisson structure (up to homotopy). I will present the results for some eld theories, in particular, 4D BF theory
and 4D gravity.

Braces algebras arising from dg Hopf algebroids over dg manifolds

Jiahao Cheng(程家豪)

Nanchang Hangkong University

Deligne conjectured that the Hochschild cochain complex of an associative algebra admits an algebra structure over the little 2-discs operad. The canonical braces algebra structure on the Hochschild cochain complex is important in the solutions of Deligne's conjecture. There is also a construction of Gerstenhaber and Voronov which associates a braces algebra to each given operad. In this talk, we will discuss braces algebras in dg geometry. We propose the construction of a dg operad from a dg Hopf algebroid over a dg manifold. Combining with Gerstenhaber-Voronov's construction, we obtain a braces algebra arising from a dg Hopf algebroid over a dg manifold. We then apply these results to dg manifolds associated with perfect integrable distributions. This is a joint work with Z. Chen, Y. Qiao, M. Xiang.

Projective representations of groups and anomalous QFTs

Fiorenza Domenico

Sapienza University of Rome

Projective representations of a group G with assigned 2-cocycle are equivalent to (certain) representations of the central extension of G associated with . This classical result can be seen as a piece of 2-category theory fallen into the realm of 1-categories, and in this perspective it admits natural generalizations relevant to the context of anomalous topological, Euclidean or super Euclidean quantum eld theories. In particular, Stolz-Teichner's Cliord eld theories and modular forms attached to super Euclidean QFTs naturally emerge as a particular example of this construction. Joint work in progress with Chetan Vuppulury.

Graded manifolds and homogeneity

Janusz Grabowski

Polish Academy of Sciences

We will present an approach to graded manifolds based on the concept of homogeneity, rather than on sheaves of graded algebras. The homogeneity is represented by a weight vector field, and graded morphisms respect this vector field, not the gradation in a graded vector space, hence the concept of a graded bundle. It is locally a trivial graded vector bundle, but the transition maps are graded morphisms, not graded vector bundle morphisms, that leads to category of graded bundles, completely different from the category of graded vector bundles.
Our fundamental observation is that in the most appealing case of $\mathbb{N}$-gradations, graded bundle structures are completely equivalent to homogeneity structures represented by smooth actions of the multiplicative monoid $(\mathbb{R},\cdot)$ of reals. This leads to an equivalence of categories and provides a powerful tool which substantially simplifies many concepts and proofs in differential geometry.
We will also describe a process of linearization, which associates with any $\mathbb{N}$-graded bundle a symmetric vector multibundle and is an equivalence of categories. A well-known example is the linearization of the second tangent bundle T^2Q in the form of the double vector bundle TT Q, together with the canonical identification of T^2Q with holonomic vectors in TT Q.

Graded bundles and weighted geometric structures

Katarzyna Grabowska

University of Warsaw

A fundamental problem in dening compound geometrical structures is the compatibility of the ingredients. For instance, VB-groupoids and VB-algebroids are vector bundles endowed with compatible structures of a Lie groupoid and Lie algebroid, respectively. Canonical examples emerge from the tangent lifts of Lie groupoids and Lie algebroids. More generally, weighted

structures are geometric structures on $\mathbb{N}$-graded bundles that are compatible with the graded structure. They lead to VB-structures if the graded bundle is of degree one, i.e., it is actually a vector bundle.
We will consider compatibility conditions for a large class of geometric structures, e.g., those represented by tensors elds (Poisson, symplectic, Nijenhuis, etc.) as well as many others, like distributions, foliations, Ehresmann connections, principal bundles, etc. These compatibility conditions are expressed in the language of the homogeneity associated with $\mathbb{N}$- graded bundles, understood as a smooth action of the multiplicative monoid of real numbers.
An intelligent guess of what the compatibility means in each case comes from canonical examples of higher tangent lifts of the structure in question, and is based on the belief that the lifts are automatically compatible with the canonical graded bundle structures of higher tangent bundles.

Deligne-Getzler groupoid arising from a Lie Pair

Chuangqiang Hu (胡创强)

BIMSA

The concept of a Lie pair provides a versatile framework that encompasses various geometric contexts, such as complex manifolds, foliations, and $\mathfrak{g}$-manifolds. In our study, we focus on the deformations of Lie pairs, which are governed by specic Maurer-Cartan (MC) elements within the Bandiera-Chen-Stiénon-Xu algebras. The gauge equivalence between these MC elements is elegantly described by Getzler trees. Remarkably, we nd that the set of MC elements, modulo gauge equivalence, eectively controls the deformations of Lie pairs, the correspondent functors are therefore naturally isomorphic. This is a joint work with Dadi Ni, Zhuo Chen, Maosong Xiang.

Dg-manifolds in topological and nonlinear sigma models

Noriaki Ikeda

Ritsumeikan University

We discuss applications of dg-manifolds to physical theories. In physical contexts, they are often called Q-manifolds. We discuss sigma models. Roughly, there are two types of sigma models, topological ones and non-topological ones. In topological versions, ASKZ sigma models are directly constructed from dg-manifolds, which give a large class of topological sigma models. We discuss a generalization of AKSZ sigma models by deforming a dg-structure on the mapping space. Next, we discuss a non-topological version, a gauged nonlinear sigma model (GNLSM). Though physicists have constructed GNLSMs by hand, a dg-manifold structure naturally gives a mathematical interpretation of physicists' guess, and we obtain a theoretical construction of GNLSMs.

Mirror symmetry for flag varieties

Changzheng Li (李长征)

Sun-Yat-sen University

In this talk, we will review the current study on mirror symmetry for ag varieties. We will also discuss a folklore mirror symmetry expectation on the eigenvalues of rst Chern class, using concrete examples of flag varieties of type A. This is based on my joint work with Konstanze Rietsch, Mingzhi Yang and Chi Zhang.

Hamiltonian S^1-manifolds which are like a coadjoint orbit of G_2

Hui Li(李慧)

Soochow University

Consider a compact symplectic manifold of dimension $2n$ with a Hamiltionan circle action. Then there are at least $n+1$ fixed points. There are recent studies on the case when the fixed point set consists of exactly $n+1$ isolated points. Motivated by these works, we consider a Hamiltonian S^1 action on a 10-dimensional compact symplectic manifold (M,ω) with exactly 6 isolated fixed points. Under a condition, we can show that the following conditions determine each other: the first Chern class of the manifold, the largest weight of the action, all the weights of the action, the total Chern class of the manifold, and the integral cohomology ring of the manifold. We show that these data are the same as those of a coadjoint orbit of the exceptional Lie group G_2, equipped with a Hamiltonian action of a subcircle of the maximal torus of G_2.

Quantum symmetry in deformation quantization and geometric quantization

Qin Li (李勤)

Southern University of Science and Technology

Quantum moment map is originally dened as a quantization of the moment map in symplectic geometry, which describes the quantum symmetry in deformation quantization. In this talk, I will explain how the quantum moment map also acts on geometric quantization in a compatible way.

Integrable systems on nilpotent Lie subalgebras via cluster theory

Yanpeng Li (李彦鹏)

Sichuan University

Let G be a complex semisimple Lie group and $\mathrm{Lie}(G) = n \oplus h \oplus n_-$be a triangular decomposition. We construct an integrable system on the dual space of n_-equipped with the Kirillov-Kostant-Souriau Poisson structure, using a Poisson-cluster seed for G/B(equipped with the standard Poisson structure) arising from symmetric Poisson CGL extension. This is joint work in progress with YuLi and Jiang-Hua Lu.

Semiregularity maps and deformations of modules over Lie algebroids

Marco Manetti

Sapienza University of Rome

Let $A \subset L$ be a flat inclusion of Lie algebroids (a.k.a. a Lie pair) on a smooth separated scheme over a field of characteristic 0 . For every locally free A-module M, its Atiyah class, as defined by Chen, Stiénon and Xu, fits into the general frameworks of filtered curved DG-algebras and therefore can be used to define semiregularity maps that, under some additional assumptions, annihilate obstructions to deformations of M. In case $A = 0$ and $L =$tangent bundle, this construction gives the usual Buchweitz-Flenner's semiregularity maps for coherent sheaves.

A_∞ algebras arising from Lie pairs

Mathieu Stiénon

Penn State

Given an inclusion $A \to L$ of Lie algebroids sharing the same base manifold M , i.e. a Lie pair, the graded vector space $\Gamma\left(\Lambda^\bullet A^*\right) \otimes_{C^\infty(M)} \mathcal{D}$, admits a natural but non-obvious A_∞ algebra structure $_-\mathcal{D}$ denotes the quotient of the universal enveloping algebra of the Lie algebroid $L$by the left ideal generated by $\Gamma(A)$. I will explain how this A_∞ algebra structure is inherited, by homotopy transfer, from the universal enveloping algebra of the differential graded Lie algebroid arising as the pullback of the Lie algebroid $L \to M$ through the canonical surjective submersion $A[1] \to M$. This is a joint work with Luca Vitagliano and Ping Xu.

A graphical calculus for microformal morphisms

Andreas Swerdlow

University of Manchester

Microformal or thick morphisms, introduced by Ted Voronov, are a generalisation of smooth maps between manifolds that still give rise to pullbacks on functions. These pullbacks are in general nonlinear and formal, and in special cases they dene L-innity morphisms between the algebras of functions on homotopy Poisson or homotopy Schouten manifolds. In this talk, I will give a brief introduction to thick morphisms, and describe a graphical calculus which calculates all terms in the formal power series that result from their pullbacks. The method is heavily inspired by the work of Cattaneo-Dherin-Felder on formal symplectic groupoids, which itself is based on techniques from the numerical analysis of ODEs.

Geometry from categorical enumerative invariants

Junwu Tu (涂君武)

ShanghaiTech University

Assuming certain comparison between non-commutative Hodge structures and classical Hodge structures, we show the categorical enumerative invariants associated with a smooth projective family of Calabi-Yau 3-folds satisfy the holomorphic anomaly equations. This naturally leads to the study of geometric structures on moduli spaces of smooth projective Calabi-Yau 3-folds.

Shifted contact structures on dierentiable stacks

Luca Vitagliano

University of Salerno

The main aim of this talk is proposing a denition of +1-shifted contact structure on a dierentiable stack thus laying the foundations of +1-shifted contact geometry. As a side result I will show that the kernel of a multiplicative 1-form on a Lie groupoid (might not exist as a vector bundle of Lie groupoids but) it always exists as a vector bundle of dierentiable stacks and it carries a stacky version of the curvature of a distribution. Prequantum bundles over +1-shifted symplectic groupoids provide examples of +1-shifted contact structures. Time permitting, I will also discuss 0-shifted contact structures which, in some aspects, are surprisingly more complicated than +1-shifted ones. This is joint work with A. Maglio and A. Tortorella.

Homotopy Theory of Nijenhuis (Lie) Algebras

Kai Wang (王凯)

East China Normal University

The Nijenhuis structure has signicant applications in geometry. In this talk, we will explore the deformation theory of Nijenhuis (Lie) algebras from an algebraic perspective. We will present an L-innity algebra that controls the deformations of Nijenhuis (Lie)algebras. Moreover, it will be revealed that this L-innity algebra is essentially provided by the minimal model of the operad of Nijenhuis (Lie)algebras. Consequently, we introduce higher versions of Nijenhuis (Lie) algebras, namely homotopy Nijenhuis (Lie) algebras. Additionally, we will investigate the connection between our construction and the prole of Nijenhuis geometry introduced by Merkulov.

Bott-Samelson atlas and Lusztig's total positivity on a flag variety

Shizhuo Yu

Nankai University

The Bott-Samelson atlas is an atlas on a flag variety constructed via Kazhdan-Lusztig maps. When equipping with the standard Poisson structure, the Bott-Samelson atlas makes a flag variety covered by of symmetric CGL extensions. Moreover, all shifted big cells can be realized as \cut" of the symmetric CGL extensions, which induce the Lusztig's total positivity simultaneously but dierent cluster structures separately. In particular, each coordinate function inside the Bott-Samelson atlas is positive. This is a joint work with Jiang-Hua Lu.

Noncommutative Hamiltonian structures and quantizations on preprojective algebras

Hu Zhao (赵虎)

Zheji ang University

Given a noncommutative Hamiltonian space A, we show that the conjecture "quantization commutes with reduction" holds on A. We also construct a semi-product algebra $A \rtimes \mathcal{G}^A$ equivariant sheaves on the representation space are related to left $A \rtimes \mathcal{G}^A$-modules. In the quiver setting, via the quantum and classical trace maps, we establish the explicit correspondence between quantizations on a preprojective algebra and those on a quiver variety.