

**Colloque 2015 du GDR 2875,
Topologie Algébrique et
Applications**

Report of Contributions

Contribution ID: 1

Type: **Exposé de recherche sur invitation**

(Op)lax natural transformations for higher categories, relative quantum field theories, and the "even higher" Morita category

Friday, October 23, 2015 11:40 AM (50 minutes)

A relative (also called twisted) quantum field theory should be some transformation between quantum field theories, which themselves are symmetric monoidal functors out of a space-time category. In examples, the notion of natural transformation turns out to be too strong, making it necessary to relax it. In joint work with Theo Johnson-Freyd we provide a framework for both lax and oplax transformations and their higher analogs, known as transfors, between strong (∞, n) -functors. It is given by a double (∞, n) -category built out of the target (∞, n) -category that we call its (op)lax square, which governs the desired diagrammatics. Lax or oplax transfors then are functors into parts of the oplax square. Finally, I will explain how to use the (op)lax square to extend the construction of the higher Morita category of E_d -algebras in an (∞, n) -category \mathcal{C} to an even higher level using the higher morphisms of \mathcal{C} .

Primary author: Dr SCHEIMBAUER, Claudia (Max Planck Institute for Mathematics, Bonn)

Co-author: Dr JOHNSON-FREYD, Theo (Northwestern)

Presenter: Dr SCHEIMBAUER, Claudia (Max Planck Institute for Mathematics, Bonn)

Track Classification: TopAlg

Contribution ID: 2

Type: **Exposé de recherche sur invitation**

Generalized Quillen rational homotopy and its applications

Thursday, October 22, 2015 2:20 PM (50 minutes)

Starting from the study of the rational homotopy type of mapping spaces under Quillen's approach, we develop homotopy techniques in order to connect rational homotopy theory with a wide range of areas such as deformation theory and number theory.

Primary author: Dr BUIJS, Urtzi (UCL Louvain/ Malaga)

Presenter: Dr BUIJS, Urtzi (UCL Louvain/ Malaga)

Track Classification: TopAlg

Contribution ID: 3

Type: **Exposé de recherche sur invitation**

Gorenstein categories and universal coefficient theorems

Wednesday, October 21, 2015 4:40 PM (50 minutes)

One can frequently interpret universal coefficient theorems as computations of hom-sets in some triangulated category T via morphisms and extensions between certain cohomological functors. The relevant cohomological functors are obtained by restricting the hom-functors of T to a “suitably nice” subcategory C . I’ll discuss joint work with Ivo Dell’Ambrogio and Jan Stovicek which explains when C is “suitably nice” in terms of Gorenstein homological algebra in the category of representations of C and gives criteria to recognise suitably nice subcategories.

Primary author: Dr STEVENSON, Greg (Bielefeld)

Presenter: Dr STEVENSON, Greg (Bielefeld)

Track Classification: TopAlg

Contribution ID: 4

Type: **Exposé de recherche sur invitation**

Aspects of hyperbolic scissors congruences in quantum topology

Wednesday, October 21, 2015 11:40 AM (50 minutes)

I will explain how the 2-3 triangulation move, in the context of hyperbolic polyhedra, gives rise to an essentially unique sequence of $(2+1)$ -dimensional QFT, including the Chern-Simons functional of $\mathfrak{sl}(2, \mathbb{C})$ -connections (as the classical case), quantum Teichmüller theory, and the quantum hyperbolic invariants of 3-manifolds.

Primary author: Prof. BASEILHAC, Stéphane (Montpellier)

Presenter: Prof. BASEILHAC, Stéphane (Montpellier)

Track Classification: TopAlg

Contribution ID: 5

Type: **Exposé de recherche sur invitation**

Catégories, logique linéaire et langages de programmation

Thursday, October 22, 2015 11:40 AM (50 minutes)

On verra comment les notions de catégorie monoïdale, d'adjonction et de monade/comonade sont intimement liées à la sémantique des langages de programmation fonctionnels et à l'interprétation calculatoire des preuves. Ce lien se comprend bien à travers la logique linéaire, un raffinement de la logique intuitionniste et de la logique classique introduit par Jean-Yves Girard dans les années 1980.

Primary author: EHRHARD, Thomas (Paris 7)

Presenter: EHRHARD, Thomas (Paris 7)

Track Classification: TopAlg

Contribution ID: 6

Type: **Exposé de recherche sur invitation**

The rational classification of $(n-1)$ -connected $(4n-1)$ -manifolds ($n > 1$)

Wednesday, October 21, 2015 2:20 PM (50 minutes)

I shall report on joint work with Johannes Nordström in which we identify a new invariant of the rational homotopy type of a space X , which we call the Bianchi-Massey tensor.

The Bianchi-Massey tensor is a linear map on the degree $(4n-1)$ rational cohomology of X taking values in a subspace of the 4-fold tensor product of the degree n cohomology of X .

We use the Bianchi-Massey tensor to show that there are many $(n-1)$ -connected $(4n-1)$ -manifolds which are not formal but which have no non-zero Massey products, and to present a classification of simply-connected 7-manifolds up to finite ambiguity.

Primary author: Dr CROWLEY, Diarmuid (Aberdeen)

Presenter: Dr CROWLEY, Diarmuid (Aberdeen)

Track Classification: TopAlg

Contribution ID: 7

Type: **Exposé de recherche sur invitation**

Application moment à homotopie près

Thursday, October 22, 2015 4:40 PM (50 minutes)

Les symétries des systèmes Hamiltoniens sur une variété symplectique peuvent être, dans les bons cas, exprimés en termes d'application moment. D'autre part il existe une généralisation de la mécanique Hamiltonienne pour des formes fermées de degré supérieur à deux. Ceci apparaît par exemple lorsque l'on considère des structures symplectiques sur des espaces de lacets. Le rôle des crochets de Poisson est alors joué par une algèbre L_∞ . Il est alors naturel de chercher l'analogue de la notion d'application moment dans ce cadre. Nous avons introduit dans un travail commun avec Martin Callies, Chris Rogers et Marco Zambon la notion d'application moment à homotopie près en tant que morphisme L_∞ entre l'algèbre de Lie encodant les symétries et l'algèbre L_∞ „de Poisson”. En particulier, dans ce nouveau cadre, la correspondance due à Atiyah et Bott entre cocycles en cohomologie équivariante et couples (application moment, forme symplectique) s'étend.

Primary author: Dr FRÉGIER, Yaël (Lens)**Presenter:** Dr FRÉGIER, Yaël (Lens)**Track Classification:** TopAlg

Contribution ID: 8

Type: **Exposé de recherche sur invitation**

Motivic realizations of categories

Friday, October 23, 2015 2:00 PM (50 minutes)

This is a report on a work in progress with Robalo and Vezzosi. I will present the construction of a motivic realization of (dg-)categories over base of arbitrary characteristics, based on some previous work by A. Blanc.

This will be used in order to define various realizations of categories, l-adic, de Rham, Betti etc, recovering the usual realizations when applied to the derived category of an algebraic variety.

As a consequence I will present an extension of p-adic Hodge theory to the non-commutative setting, as well as new relations between vanishing cycles and categories of matrix factorizations in positive and mixed characteristics.

Primary author: TOËN, Bertrand (CNRS et Toulouse)

Presenter: TOËN, Bertrand (CNRS et Toulouse)

Track Classification: TopAlg

Contribution ID: 9

Type: **Mini-cours**

Factorization homology and applications I: Axioms

Wednesday, October 21, 2015 9:00 AM (1h 15m)

Lecture I: Factorization homology is a bifunctor from (structured) manifolds of dimension n and algebras over the little n -cubes operad. We will explain the axioms it satisfies and how it can be thought of as a kind of (derived) generalization of Eilenberg-Steenrod usual axioms of Homology of spaces. We will also give some examples

Primary author: Dr GINOT, Grégory (Paris 6)

Presenter: Dr GINOT, Grégory (Paris 6)

Track Classification: TopAlg

Contribution ID: 10

Type: **Mini-cours**

Factorization homology and applications II: Computations for triangulated spaces

Thursday, October 22, 2015 9:00 AM (1h 15m)

Lecture II: we will explain how factorization homology (as defined in the first lecture) can be computed from a triangulation using higher Hochschild type homology.

Primary author: Dr GINOT, Grégory (Paris 6)

Presenter: Dr GINOT, Grégory (Paris 6)

Track Classification: TopAlg

Contribution ID: 11

Type: **Mini-cours**

Factorization homology and applications III: Applications to E_n -algebras

Friday, October 23, 2015 9:00 AM (1h 15m)

Lecture III: we will review some applications of factorization homology as an invariant of little n -cubes algebras. In particular, we will give an overview of Bar constructions for little n -cubes algebras and state non-abelian Poincaré duality, which computes factorization homology with values in iterated loop spaces.

Primary author: Dr GINOT, Grégory (Paris 6)

Presenter: Dr GINOT, Grégory (Paris 6)

Track Classification: TopAlg

Contribution ID: 12

Type: **Exposé de recherche sur proposition**

Algèbres preLie à puissances divisées

Thursday, October 22, 2015 3:40 PM (50 minutes)

Les algèbres preLie apparaissent naturellement dans plusieurs domaines des mathématiques, notamment dans la théorie de la déformation des structures algébriques.

Le but de cet exposé est d'expliquer la construction de structures à puissances divisées, $\Lambda(\text{PreLie}, -)$ - et $\Gamma(\text{PreLie}, -)$ -algèbres associées aux algèbres preLie et ses applications. La définition de ces structures à puissances divisées se base sur la notion d'algèbre à symétries divisées introduite par B. Fresse dans le contexte des opérades afin de généraliser des opérations définies par H. Cartan sur l'homotopie des algèbres commutatives simpliciales.

On montrera que les $\Lambda(\text{PreLie}, -)$ -algèbres sont identifiées avec les algèbres preLie restreintes introduites par A. Dzhumadil'daev. On donnera une description explicite des $\Gamma(\text{PreLie}, -)$ -algèbres en terme d'opérations de type brace et de ses applications dans la théorie de la déformation.

Primary author: Mr CESARO, Andrea (Université Lille 1)

Presenter: Mr CESARO, Andrea (Université Lille 1)

Track Classification: TopAlg

Contribution ID: 13

Type: **Exposé de recherche sur proposition**

Homological stability and non-stability for configuration spaces on closed manifolds

Thursday, October 22, 2015 10:40 AM (50 minutes)

Unordered configuration spaces of points (or particles) on connected manifolds are basic objects that appear in many different areas within topology. When the manifold M is non-compact, a theorem of McDuff and Segal states that these spaces are homologically stable, with integral coefficients, as the number of points goes to infinity. When M is closed, however, these spaces are in general homologically *unstable* - one can see this already in the degree-1 homology of configuration spaces on the 2-sphere. Moreover, there are natural “stabilisation” maps between configuration spaces in the non-compact case, which do not exist when M is closed.

I will describe some joint work with Federico Cantero, in which we prove several results that show that configuration spaces on closed manifolds nevertheless exhibit some more subtle kinds of stable behaviour. For example, we prove homological stability for odd-dimensional M after inverting 2 in the coefficients, and for even-dimensional M (with *non-vanishing* Euler characteristic) we prove that the mod- p homology of the configuration spaces is eventually periodic, with an explicit upper bound for the period. We also construct so-called “replication maps” between configuration spaces (when M has *vanishing* Euler characteristic), which induce homology isomorphisms in a stable range after inverting certain primes.

This builds on and improves previous work of several others, including O. Randal-Williams and [M. Bendersky - J. Miller]. The periodicity result is very similar to a theorem of R. Nagpal, although we have different estimates for the period. Very recently, the upper bound for the period has been improved in work of [A. Kupers - J. Miller], who also recover our result for odd-dimensional M with coefficients in $\mathbb{Z}[1/2]$ and give a more explicit description of the corresponding isomorphisms. There is also very recent work of [S. Galatius - O. Randal-Williams], who prove analogous “stability and non-stability” results for classifying spaces of diffeomorphism groups of high-dimensional closed manifolds. If time permits, I will also briefly describe some of this subsequent work, as well as new directions to explore.

Primary author: PALMER, Martin (Université Paris 13)

Presenter: PALMER, Martin (Université Paris 13)

Track Classification: TopAlg

Contribution ID: 14

Type: **Exposé de recherche sur proposition**

On the deformation theory of dg-categories

Wednesday, October 21, 2015 3:40 PM (50 minutes)

This is work in progress with Ludmil Katzarkov, Pranav Pandit and Bertrand Toën. I will explain how to use the theory of formal moduli problems of Lurie to obtain a better understanding of the deformation theory of a dg-category up to Morita equivalence, based on previous work by Preygel. This leads to a finiteness result about any formal deformation of a smooth and proper dg-category.

Primary author: BLANC, Anthony (MPI Bonn)

Presenter: BLANC, Anthony (MPI Bonn)

Contribution ID: 15

Type: **Exposé de recherche sur proposition**

Comparing the homotopy functor calculi

Wednesday, October 21, 2015 10:40 AM (50 minutes)

In the 90s, Goodwillie developed a calculus of homotopy functors of spaces/spectra, which gave rise to other variants, such as the orthogonal calculus of Weiss for functors of real inner product spaces.

I will report on joint work with David Barnes wherein we formalize the comparison of these two theories, which involves making rigorous the folk result that n -excisive implies n -polynomial.

Primary author: Dr ELDRED, Rosona (Münster)

Presenter: Dr ELDRED, Rosona (Münster)

Track Classification: TopAlg

Contribution ID: 16

Type: **Exposé de recherche sur proposition**

Catégories à dualité

Friday, October 23, 2015 10:40 AM (50 minutes)

Nous définissons la notion de foncteur à dualité dans la catégorie \mathcal{C} -mod des foncteurs covariants d'une catégorie \mathcal{C} vers k -mod. On donne une caractérisation pour l'existence d'un foncteur à dualité. Nous illustrons cette notion par des exemples.

Primary author: KSOURI, Ramzi (Sousse)**Presenter:** KSOURI, Ramzi (Sousse)**Track Classification:** TopAlg