

**Colloque 2016 du GDR 2875,  
Topologie Algébrique et  
Applications**

**Report of Contributions**

Contribution ID: 1

Type: **Invited speaker**

## Équation de Yang-Baxter, tableaux de Young, factorisations de groupes

*Wednesday, 12 October 2016 14:20 (50 minutes)*

On commencera par des généralités sur la cohomologie des ensembles pré-cubiques et, plus particulièrement, des solutions idempotentes de l'équation de Yang-Baxter. Cette théorie générale nous permettra de fabriquer des complexes relativement petits calculant la cohomologie de Hochschild de certaines algèbres associatives. On s'intéressera à deux applications :

- 1) Pour les tableaux de Young munis du produit de Knuth, on simplifiera et précisera les calculs cohomologiques apparus au cours du récent renouveau de l'intérêt envers ces structures.
- 2) On établira une forme faible de la formule de Künneth pour les groupes factorisés.

**Primary author:** Mrs LEBED, Victoria (Trinity College Dublin)

**Presenter:** Mrs LEBED, Victoria (Trinity College Dublin)

**Track Classification:** Topologie algébrique et applications

Contribution ID: 3

Type: **Invited speaker**

## Intersections complètes

*Thursday, 13 October 2016 14:20 (50 minutes)*

Soit  $X = \text{Spec}(R)$  une variété affine lisse sur un corps  $k$ , et soit  $Y$  une sous-variété fermée correspondant à un idéal  $I$ . Il est en général difficile de donner un ensemble de générateurs de  $I$ , même dans le cas où  $X$  est un espace affine. Néanmoins, le lemme de Nakayama montre que le nombre de générateurs de  $I$  est au moins égal au nombre de générateurs de son fibré conormal et au plus égal à ce nombre plus 1. Dans cet exposé, nous utiliserons des idées “topologiques” au sens large pour déterminer le nombre de générateurs de  $I$ , donnant au passage une réponse positive à une vieille conjecture de Murthy.

**Primary author:** Prof. FASEL, Jean (Université Grenoble-Alpes)

**Presenter:** Prof. FASEL, Jean (Université Grenoble-Alpes)

**Track Classification:** Topologie algébrique et applications

Contribution ID: 4

Type: **Invited speaker**

## Topological coHochschild homology

*Thursday, 13 October 2016 16:40 (50 minutes)*

(Joint work with Brooke Shipley) Topological Hochschild homology (THH) is a version for ring spectra of classical Hochschild homology of rings, the importance of which is due primarily to its close connection to algebraic K-theory, mediated by the Dennis trace map. In this talk, I will introduce a dual version of THH for coalgebra spectra, called topological co-Hochschild homology (coTHH), which is a spectral version of coHochschild homology (coHH) of dg coalgebras, and explain its relationship to both THH and algebraic K-theory, also expressed in terms of a trace map. As a warm up, I will begin by reviewing coHH of dg coalgebras, with an extension to dg cocategories, and will then present new results in the dg case. To conclude, I will present recent computational results for coTHH, due to Bohmann, Gerhardt, Høgenhaven, Shipley, and Ziegenhagen.

**Primary author:** Prof. HESS BELLWALD, Kathryn (EPFL)

**Presenter:** Prof. HESS BELLWALD, Kathryn (EPFL)

**Track Classification:** Topologie algébrique et applications

Contribution ID: 5

Type: **Contributed talk**

## **Eilenberg-MacLane mapping algebras and higher distributivity**

*Friday, 14 October 2016 10:40 (50 minutes)*

Primary cohomology operations are given by homotopy classes of maps between Eilenberg-MacLane spectra. Composition of such maps is bilinear up to homotopy, but not strictly: it is strictly linear in one variable and linear up to coherent homotopy in the other variable. In joint work with Hans-Joachim Baues, we introduce the notion of weakly bilinear mapping theory to encode this structure. I will describe the higher distributivity laws satisfied by this structure, along with some examples in mod 2 cohomology.

**Primary authors:** Prof. BAUES, Hans-Joachim (Max-Planck-Institut für Mathematik); Dr FRANKLAND, Martin (Universität Osnabrück)

**Presenter:** Dr FRANKLAND, Martin (Universität Osnabrück)

**Track Classification:** Topologie algébrique et applications

Contribution ID: 6

Type: **Invited speaker**

## Local structure of finite groups and their $p$ -completed classifying spaces

*Friday, 14 October 2016 15:00 (50 minutes)*

I plan to describe the close connection between the homotopy theoretic properties of the  $p$ -completed classifying space of a finite group  $G$  and the  $p$ -local group theoretic properties of  $G$ . One way in which this arises is in the following theorem originally conjectured by Martino and Priddy: for finite groups  $G$  and  $H$ ,  $BG_p^\wedge \simeq BH_p^\wedge$  if and only if  $G$  and  $H$  have the same  $p$ -local structure (the same conjugacy relations among  $p$ -subgroups). Another involves a description, in terms of the  $p$ -local properties of  $G$ , of the group  $\text{Out}(BG_p^\wedge)$  of homotopy classes of self equivalences of  $BG_p^\wedge$ .

After describing the general results, I'll give some examples and applications of both of these, especially in the case where  $G$  and  $H$  are simple Lie groups over finite fields.

**Primary author:** Prof. OLIVER, Bob (Université Paris 13)

**Presenter:** Prof. OLIVER, Bob

**Track Classification:** Topologie algébrique et applications

Contribution ID: 7

Type: **Contributed talk**

## Le modèle de Lambrechts–Stanley des espaces de configuration

*Thursday, 13 October 2016 10:40 (50 minutes)*

Nous prouvons la validité sur  $\mathbb{R}$  d'un modèle en CDGA pour les espaces de configurations des variétés simplement connexes dont la caractéristique d'Euler est nulle, répondant ainsi à une conjecture de Lambrechts et Stanley. Cela entraîne que le type d'homotopie réel de ces espaces de configuration ne dépend que d'un modèle à dualité de Poincaré de la variété. En nous fondant sur la preuve de Kontsevich de la formalité des opérades des petits disques, nous prouvons également que le modèle est compatible avec l'action de l'opérade de Fulton–MacPherson quand la variété est parallélisée en utilisant un complexe de graphes étiquetés. Nous utilisons ce résultat plus précis pour obtenir un complexe calculant l'homologie de factorisation.

Référence : <http://arxiv.org/abs/1608.08054>

**Primary author:** Mr IDRISSI, Najib (Université Lille 1)

**Presenter:** Mr IDRISSI, Najib (Université Lille 1)

**Track Classification:** Topologie algébrique et applications

Contribution ID: 8

Type: **Invited speaker**

## The loop space of a p-local group

*Thursday, 13 October 2016 11:40 (50 minutes)*

The homotopy type of the loop space on the p-complete classifying space of a finite group was studied by myself and a few other researchers since the early 90s. The homology of such loop spaces is of particular interest from the homotopy theoretic point of view, as it exhibits a rather rigid behaviour, yet not very well understood. From the algebraic point of view, works of Benson-Greenlees-Iyengar suggest the loop space homology of p-completed classifying spaces provides interesting examples of much more general phenomena. In his 2009 paper “An algebraic model for chains on  $\Omega B G_p^\wedge$ ”, Benson showed that the homology can be defined purely algebraically through what he named a “squeezed resolution” for the group in question.

The theory of p-local finite and compact groups allows one to study homotopy theoretic and algebraic properties of p-completed classifying spaces in a very general context, and where a genuine group is not necessarily available. Thus the question that arises naturally is whether one can construct an analog of a squeezed resolution for p-local groups. The answer to this question turns out to be positive in a more general sense. In an ongoing project with Broto and Oliver we show that for any small category  $\mathcal{C}$  satisfying certain conditions, the homology of the loop space of its p-completed nerve can be understood algebraically by means of a squeezed resolution. In this talk I will present the construction of squeezed resolutions in this context and discuss some of their properties. I will also relate this to a number of interesting homotopy theoretic questions.

**Primary author:** Prof. LEVI, Ran (Aberdeen)

**Presenter:** Prof. LEVI, Ran

**Track Classification:** Topologie algébrique et applications



Contribution ID: 9

Type: **Invited speaker**

## Topological complexity of configuration spaces

*Friday, 14 October 2016 11:40 (50 minutes)*

Topological complexity is a numerical homotopy invariant whose definition (due to M. Farber) was inspired by the motion planning problem in Robotics. It has enjoyed much recent attention from homotopy theorists, partly due to its potential applicability, and partly due to its close resemblance to another more classical invariant, the Lusternik-Schnirelmann category.

Classical configuration spaces (whose points are tuples of pairwise distinct points in some manifold, either ordered or unordered) are a natural class of spaces to consider, from either the homotopy theory or the Robotics point of view. We will survey some known results about their topological complexity, some of which were obtained in recent joint work with D. Recio-Mitter. The bounds we employ depend only on the fundamental group, allowing appealing geometric arguments using braids.

**Primary author:** Dr GRANT, Mark (University of Aberdeen)

**Co-author:** Mr RECIO-MITTER, David (University of Aberdeen)

**Presenter:** Dr GRANT, Mark

**Track Classification:** Topologie algébrique et applications

Contribution ID: 10

Type: **Invited speaker**

## Minimal models for operadic algebras over arbitrary rings

*Wednesday, 12 October 2016 16:40 (50 minutes)*

The classical theory of minimal models for operadic algebras works when they have projective homology, e.g. if they are defined over a field. In the associative case, Sagave extended the theory to arbitrary algebras over any ring by means of a new kind of structure which merges  $A$ -infinity algebras and projective resolutions, called derived  $A$ -infinity algebras. We will endow the category of derived  $A$ -infinity algebras with a homotopical structure equivalent to that of differential graded algebras. We will show that, in this new homotopy category, any differential graded algebra is equivalent to its minimal model. Moreover, we will extend all this beyond the associative setting by using Koszul duality results from Maes's thesis, which extend work of Livernet-Roitzheim-Whitehouse.

**Primary author:** MURO, Fernando (Sevilla)

**Presenter:** Prof. MURO, Fernando

**Track Classification:** Topologie algébrique et applications

Contribution ID: 11

Type: **Minicours**

## Autour du théorème B de Quillen

*Wednesday, 12 October 2016 09:00 (1h 15m)*

Pour un foncteur entre petites catégories, le théorème B de Quillen donne un critère pratique pour déterminer la fibre homotopique de l'application entre espaces classifiants de ces catégories. Dans cette série de trois conférences, je vais donner une démonstration d'une version plus générale, pour un foncteur entre catégories simpliciales. Cette version plus forte a comme applications immédiates plusieurs théorèmes importants, entre autres un théorème de descente pour des espaces simpliciaux, une construction d'univers univalents en théorie homotopique des types, et, last but not least, une démonstration efficace du "group completion theorem" et du théorème de périodicité de Bott. Si le temps nous le permet, j'expliquerai comment les méthodes s'appliquent dans le contexte de la théorie d'homotopie des préfaisceaux simpliciaux, utilisés par exemple en théorie d'homotopie  $A^1$ .

**Primary author:** Prof. MOERDIJK, Ieke (Utrecht)

**Presenter:** Prof. MOERDIJK, Ieke

**Track Classification:** Topologie algébrique et applications

Contribution ID: 12

Type: **Contributed talk**

## Espaces d'intersection, homotopie rationnelle et structures de Hodge mixte

*Wednesday, 12 October 2016 10:40 (50 minutes)*

La théorie des espaces d'intersection permet de restaurer la dualité de Poincaré pour des espaces à singularités isolées, par exemple les variétés algébriques projectives complexes à singularités isolées. Etant donnée un tel espace à singularités isolées  $X$ , on peut lui associer une famille d'espaces topologiques  $I^p X$ , ses espaces d'intersection, vérifiant une "dualité de Poincaré généralisée".

Si  $X$  est une variété algébrique projective complexe à singularités isolées, alors la cohomologie rationnelle de ses espaces d'intersection peut être munie d'une structure de Hodge mixte canonique, alors même que ces espaces ne sont pas des variétés algébriques projectives complexes à singularités isolées. Après avoir expliqué la construction des espaces d'intersection, on montrera via des techniques d'homotopie rationnelle comment définir ses structures de Hodge mixtes. On utilisera ces dernières pour obtenir des résultats de formalité.

**Primary author:** Dr KLIMCZAK, Mathieu (Université de Nantes)

**Presenter:** Dr KLIMCZAK, Mathieu (Université de Nantes)

**Track Classification:** Topologie algébrique et applications

Contribution ID: 13

Type: **Invited speaker**

## A small projective resolution of complex K-theory

*Wednesday, 12 October 2016 11:40 (50 minutes)*

Around 1982 Nick Kuhn proved that the symmetric powers of the sphere spectrum give rise to a minimal projective resolution of  $H\mathbb{Z}$ . He then asked if there were other interesting examples of small projective resolutions of spectra, in particular of spectra like  $bo$  or  $bu$ . In this talk I will show how to construct a small projective resolution of the connective K-theory spectrum  $bu$ . Our resolution has many similarities to the classic one that arises from the symmetric powers filtration. We give a unified proof of exactness of both resolutions, that is different from Kuhn's proof. A key ingredient in our proof is a vanishing result for the Bredon homology of the complex of partitions and the complex of direct-sum decompositions. Joint work with Kathryn Lesh.

**Primary author:** ARONE, Greg (Stockholm)

**Presenter:** Prof. ARONE, Greg

**Track Classification:** Topologie algébrique et applications

Contribution ID: 14

Type: **Contributed talk**

## Bifibrations of model categories

*Friday, 14 October 2016 14:00 (50 minutes)*

In this talk, I will explain how to endow the total category  $\mathcal{E}$  of a well-behaved Grothendieck bifibration  $\mathcal{E} \rightarrow \mathcal{B}$  with a structure of a model category when both the basis  $\mathcal{B}$  and all fibers  $\mathcal{E}_b$  of the bifibration are model categories.

The motivating example is the well-known Reedy model structure on a diagram category  $[\mathcal{R}, \mathcal{M}]$ . The crucial step in its construction by transfinite induction lies in the successor case, which is usually handled by reasoning on latching and matching functors. A first observation is that those functors define a Grothendieck bifibration on the restriction functor  $[\mathcal{R}_{\lambda+1}, \mathcal{M}] \rightarrow [\mathcal{R}_\lambda, \mathcal{M}]$  where  $\mathcal{R}_\lambda$  denotes the full subcategory of  $\mathcal{R}$  whose objects have degree less than  $\lambda$ . Unfortunately, this bifibration fails to fulfil the conditions of application of existing theorems in the literature ([1], [2]), which would have allowed to lift the model structure from the base category  $\mathcal{B} = [\mathcal{R}_\lambda, \mathcal{M}]$  to the total category  $\mathcal{E} = [\mathcal{R}_{\lambda+1}, \mathcal{M}]$ .

I will explain how to relax the hypotheses appearing in [1] and [2] by focusing on (co)cartesian lifts over acyclic (co)fibrations rather than over weak equivalences. This idea leads us to a simple and elegant condition for our new construction: some commutative squares in the base category are required to satisfy a homotopical version of the Beck-Chevalley condition. To conclude, I will apply the result to the Reedy construction and its generalizations ([3], [4]).

---

[1] Stanculescu, A.E., Bifibrations and weak factorization systems, Applied Categorical Structures, 20(1):19-30, 2012

[2] Harpaz, Y, and Prasma, M., The Grothendieck construction for model categories, Advances in Mathematics, 218:1306-1363 (August 2015)

[3] Berger, C., and Moerdijk, I., On an extension of the notion of Reedy category, Mathematische Zeitschrift, 269(3):977-1004, December 2011

[4] Shulman, M., Reedy categories and their generalizations, arXiv preprint, arXiv:1507.01065 (2015)

**Primary author:** Mr CAGNE, Pierre (Univeristé Paris 7)

**Co-author:** Dr MELLIÈS, Paul-André (CNRS, Université Paris 7)

**Presenter:** Mr CAGNE, Pierre (Univeristé Paris 7)

**Track Classification:** Topologie algébrique et applications

Contribution ID: 15

Type: **Contributed talk**

## A generalized Blakers-Massey Theorem

*Wednesday, 12 October 2016 15:20 (50 minutes)*

(joint with M. Anel, E. Finster, and A. Joyal)

We present a generalized version of the Blakers-Massey Theorem in the context of  $\infty$ -topoi. The proof refines a proof of the classical theorem by Finster and Lumsdaine given in the language of Homotopy Type Theory and its “re-engineered” version by Rezk. The main tools are certain factorization systems (modality) and homotopical descent. The classical theorem and a recent generalization due to Chacholski-Scherer-Werndli are easy consequences.

As an application we prove a conjecture by Goodwillie: a Blakers-Massey Theorem for the calculus of homotopy functors. From it we obtain an independent proof of the fact that homogeneous functors deloop.

**Primary author:** Dr BIEDERMANN, Georg (LAGA, Paris 13)

**Presenter:** Dr BIEDERMANN, Georg (LAGA, Paris 13)

**Track Classification:** Topologie algébrique et applications

Contribution ID: 17

Type: **Contributed talk**

## Sur les K-théories de Morava des 2-groupes abéliens élémentaires

*Thursday, 13 October 2016 15:20 (50 minutes)*

Pour chaque nombre premier  $p$  et chaque entier naturel  $n$ , il existe une théorie cohomologique complexe orientée  $K(n)$  que l'on appelle la  $n$ -ième K-théorie de Morava modulo  $p$ . Dans cet exposé, on étudie le cas  $p=2$ . On utilise des techniques d'Atiyah-Segal et la loi de groupe formel associée à  $K(n)$  pour obtenir une description du foncteur  $V \mapsto K(n)^*(BV^\sharp)$  où  $V$  est un espace vectoriel de dimension finie quelconque, et  $\sharp$  désigne le dual linéaire. Pour  $n=2$ , on en déduit que ce foncteur est analytique. Il correspond alors à un module instable à gauche d'après le dictionnaire donné par Henn-Lannes-Schwartz. Le dual linéaire de ce module est détecté dans la structure d'anneau de Hopf de l'homologie de l'Omega-spectre qui représente la théorie de Morava.

**Primary author:** Mr NGUYEN, Le Chi Quyet (LAREMA - Angers)

**Presenter:** Mr NGUYEN, Le Chi Quyet (LAREMA - Angers)

**Track Classification:** Topologie algébrique et applications



Contribution ID: 19

Type: **Minicours**

## **Autour du théorème B de Quillen, II**

*Thursday, 13 October 2016 09:00 (1h 15m)*

Voir le résumé principal.

**Presenter:** Prof. MOERDIJK, Ieke

Contribution ID: 20

Type: **Minicours**

## **Autour du théorème B de Quillen, III**

*Friday, 14 October 2016 09:00 (1h 15m)*

Voir le résumé principal.

**Presenter:** Prof. MOERDIJK, Ieke

Contribution ID: 21

Type: **not specified**

## **Introduction aux ensembles simpliciaux**

*Tuesday, 11 October 2016 14:00 (1h 15m)*

**Presenter:** Mr IKONICOFF, Sacha

Contribution ID: 22

Type: **not specified**

## **Introduction à l'algèbre homotopique**

*Tuesday, 11 October 2016 16:00 (1h 15m)*

**Presenter:** Mr JUAREZ OJEDA, Rigel Apolonio