

Pre-Calabi–Yau Day



3rd November 2023

Institut Fourier / Université Grenoble Alpes

Activity supported by IDEX IRGA 2022-2023 “DAP”

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Schedule

08h00–08h15	Welcome (at the Entrance Hall)		
08h15–09h15	W.-K. Yeung	An introduction to pre-Calabi-Yau structures	Online
09h15–10h15	T. Bozec	From CY to (quasi-)bisymplectic structures	IF, Room 4
10h15–10h45	Coffee Break (at the Entrance Hall)		
10h45–11h45	A. Takeda	Inverting smooth CY structures in practice	IF, Room 4
11h45–12h45	Z. Wang	The Goresky-Hingston coproduct via pre-Calabi-Yau structures	IF, Room 4
12h45–14h00	Lunch Buffet at the Cafeteria (2nd floor)		
14h00–15h00	E. Skvortsov	Higher spin gravity, pre-Calabi-Yau, Formality and convex geometry	IF, Room 4
15h00–16h00	J. Leray	Properadic calculus applied to pre-Calabi-Yau algebras	IF, Room 4
16h00–16h30	Coffee Break (at the Entrance Hall)		
16h30–17h30	N. Wahl	Lifting the intersection product along fibrations: a topological point of view on string topology	Online
19h30–...	Workshop Dinner in the restaurant L'Épicurien		

T. Bozec (Angers)

From CY to (quasi-)bisymplectic structures

The Kontsevich-Rosenberg principle consists in defining and understanding structures on associative algebras that induce known geometric structures on their representation spaces. The former are called “non-commutative” (NC) versions of the latter. For example, bisymplectic structures introduced by Crawley-Boevey, Etingof and Ginzburg form the NC counterpart of Hamiltonian structures; or Van den Bergh’s double Poisson structures the NC analog of Poisson varieties. Later, in the context of differential graded categories, Brav and Dyckerhoff showed that the NC analog of symplectic structures consisted of so-called Calabi-Yau ones. In this talk, I will explain a link between these NC algebraic structures, precisely how Calabi-Yau structures on moment maps induce (quasi-)bisymplectic structures. This is a report on joint work with Damien Calaque and Sarah Scherotzke.

J. Leray (Nantes)

Properadic calculus applied to pre-Calabi–Yau algebras

In this talk, I will introduce the properadic calculus, developed in collaboration with E. Hoffbeck and B. Vallette. I will use it to establish some homotopical properties of pre-Calabi–Yau algebras and some related structures. The results of this talk arise from a joint work with B. Vallette.

E. Skvortsov (Mons)

Higher spin gravity, pre-Calabi-Yau, Formality and convex geometry

I will briefly review the idea of construct models of quantum gravity via higher spin gravities and proceed to discussing a concrete model of this kind. The model has a form of the higher dimensional Poisson sigma model with the Poisson structure originating from a certain pre-Calabi-Yau algebra. The first maps of these algebra are related to (Shoikhet-Tsygan-)Kontsevich formality, while all of them are represented as integrals over a configuration space of convex polygons. The A_∞ relations can be proven via Stokes theorem.

A. Takeda (Uppsala)

Inverting smooth CY structures in practice

In this talk I will revisit some of the results from my joint work with Kontsevich and Vlassopoulos (<https://arxiv.org/abs/2301.01567>) about the relation between smooth CY structures and nondegenerate pre-CY structures. This relation takes the form of a noncommutative Legendre transform, generalizing an older construction of Khudaverdian and Voronov of the Legendre transform for odd (co)tangent bundles. In this talk, however, I will focus on how this relation works in practice, and present some examples that will reappear in another one of the talks in the conference (Z. Wang's), in the context of string topology.

N. Wahl (Copenhagen, Online)

Lifting the intersection product along fibrations: a topological point of view on string topology

We describe the string product and coproduct on the homology of the free loop space of a manifold as lifts of the homology intersection product of the manifold, and explain how the nature of the lift affects the invariance properties of the resulting lifted structure. This is partially based on joint work with Nancy Hingston, as well as with Florian Naef and Manuel Rivera.

Z. Wang (Stuttgart)

The Goresky-Hingston coproduct via pre-Calabi-Yau structures

We will construct an algebraic analogue of the Goresky-Hingston coproduct in string topology. The algebraic framework is built upon the Hochschild chain complex of a smooth dg category equipped with a pre-Calabi-Yau structure and a trivialisation of the Chern character of the diagonal bimodule. We show that this coproduct exhibits striking similarities with the topological GH coproduct, subject to a specific symmetry condition on the Chern character, if the pre-Calabi-Yau structure is nondegenerate. This is a joint work with Rivera and Takeda.

W.-K. Yeung (Hong Kong, Online)

An introduction to pre-Calabi-Yau structures

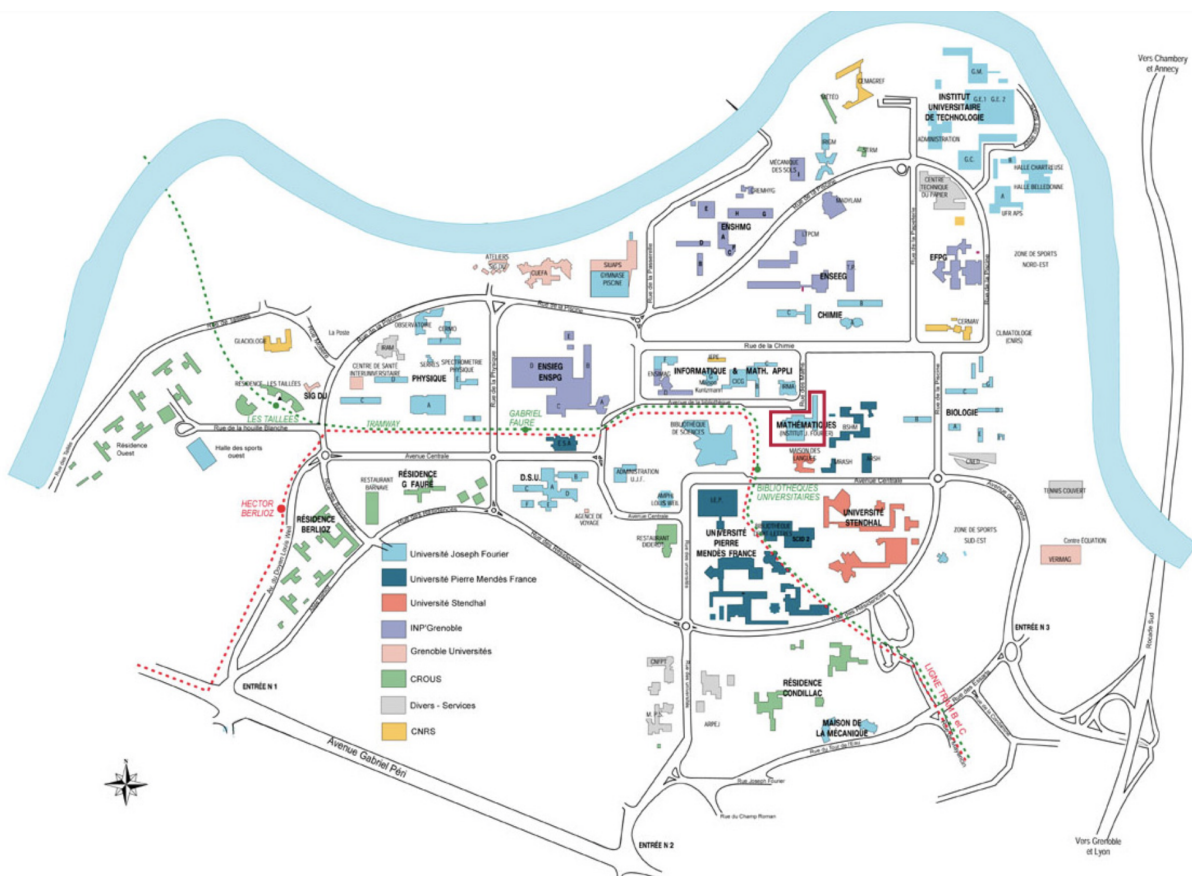
We give an introduction to several aspects of pre-Calabi-Yau structures.

Marion Boucrot (Grenoble)

On the category of pre-Calabi-Yau algebras

Pre-Calabi-Yau morphisms were defined in 2022 by M. Kontsevich, A. Takeda and Y. Vlassopoulos and in the properadic setting by J. Leray and B. Vallette. They also define the composition of pre-Calabi-Yau morphisms and prove that pre-Calabi-Yau algebras together with pre-Calabi-Yau morphisms and their composition form a category. We construct a functor between this category and the partial category of A_∞ -algebras of the form $A \oplus A^*[d-1]$ with A a graded vector space and whose morphisms are the data of an A_∞ -structure on $A \oplus B^*[d-1]$ together with A_∞ -morphisms $A[1] \oplus B^*[d] \rightarrow A[1] \oplus A^*[d]$ and $A[1] \oplus B^*[d] \rightarrow B[1] \oplus B^*[d]$, extending a result of D. Fernández and E. Herscovich.

All the on-site talks will take place in Room 4 at the Institut Fourier (100 rue des maths, 38610 Gières)



To reach the Institut Fourier

- **From Grenoble Main Station:** Tram B towards Gières. The closest tram stop to the Institut Fourier is Bibliothèques Universitaires, and then walk 50 meters—if the

tram had kept moving straight before its 90-degree turn just before the Bibliothèques Universitaires stop, it would have hit Institut Fourier. This trip will take around 20 minutes. Tram tickets must be purchased outside the tram (there are automats). They must be stamped before boarding.

- **From Seyssinet and Seyssins, Grenoble (Grand Boulevards), Saint Martin d'Hères:** Tram C to Bibliothèques Universitaires.
- **From Grenoble Sud, Echirolles, Eybens, Poisat, Saint Martin d'Hères:** Bus C5 or C7 to Bibliothèques Universitaires.
- **From Vizille, Vaulnaveys, Uriage:** Bus 23 to Bibliothèques Universitaires.
- **From Bernin, Saint Nazaire les Eymes, Saint Ismier, Biviers, Montbonnot, Meylan Est:** Transisère bus 6070 to Condillac Universités (which is located at one tram station from Bibliothèques Universitaires).

[Timetable for Tram B | Lines and timetables](#)

Online participation

The meeting will also take place via Zoom. To join you only need to click [here](#) or connect to your Zoom account, and then use the Meeting ID and passcode given below.

Meeting ID: 943 0792 9604

Passcode: 449087

