

# **Complex Geometry, Analysis and Foliations**

## **Rapport sur les contributions**

ID de Contribution: 5

Type: **Non spécifié**

## **Holomorphic foliations and invariant currents.**

*lundi 29 septembre 2014 15:30 (1 heure)*

In this talk, we will point out some numerical properties of codimension 1 foliations on projective manifolds which ensure the existence/inexistence of holonomy invariant positive current.

**Author:** TOUZET, Frédéric (Rennes)

**Orateur:** TOUZET, Frédéric (Rennes)

ID de Contribution: 6

Type: **Non spécifié**

## Taxonomy of Class VII Surfaces

*lundi 29 septembre 2014 14:00 (1 heure)*

In Kodaira's classification of compact complex surfaces Class VII hasn't been yet completely understood. An important part of Marco Brunella's mathematical work deals with dynamical properties of class VII surfaces. Part of this work was published posthumously.

In this talk we present new ways of subclassifying class VII surfaces, in which Marco's ideas and results play an important role. We also sketch the first steps of a tentative study of these surfaces based on the properties of their closed positive currents (work in progress together with Ionut Chiose).

**Author:** TOMA, Matei (Nancy)

**Orateur:** TOMA, Matei (Nancy)

ID de Contribution: 9

Type: **Non spécifié**

## Foliations with a compact leaf

*mercredi 1 octobre 2014 11:30 (1 heure)*

We investigate foliations on projective surfaces having a compact leaf.

This is a joint work in progress with Benoît Claudon, Jorge Vitorio Pereira and Frédéric Touzet.

**Author:** LORAY, Frank (Rennes)

**Orateur:** LORAY, Frank (Rennes)

ID de Contribution: 10

Type: Non spécifié

## Index theorems and geodesic flow for meromorphic connections along foliations

*lundi 29 septembre 2014 11:30 (1 heure)*

The study of meromorphic connections on Riemann surfaces is a classical topic, related for instance to the 21st Hilbert problem.

In this talk I shall introduce a novel point of view, with unexpected analytic, geometric and dynamical applications. More precisely, I shall show how to associate to holomorphic maps having a positive-dimensional fixed point set a foliation in Riemann surfaces with meromorphic connections along the leaves, and how to use this structure to prove several index theorems generalizing and extending both the classical holomorphic Lefschetz index theorem and the Camacho-Sad index theorems for foliations. Furthermore, I shall describe how to study with analytical and geometrical techniques the geodesic flow associated to a meromorphic connection, with the aim of describing the asymptotic behavior of the real geodesic defined by the connection. Finally, I shall describe a few applications of these results to the study of the dynamics of germs tangent to the identity, to the study of the flow of homogeneous vector fields, and to the study of meromorphic self-maps of the complex projective space.

**Orateur:** ABATE, Marco (Pisa)

ID de Contribution: 11

Type: **Non spécifié**

## On bihermitian structures on Kato surfaces

*vendredi 3 octobre 2014 11:30 (1 heure)*

There has been much works recently on bihermitian structures on compact complex surfaces, especially in the Kähler case in relation with generalized Kähler geometry. On the other hand, for non-Kähler surfaces we have so far still rather few examples. Recently, however, Apostolov, Bailey and Dloussky have obtained a new nice sufficient condition for their existence. In this talk I will explain how their result can produce, together with the result of Brunella on locally conformally Kähler metrics on Kato surfaces, new examples of bihermitian structures on some parabolic Inoue surfaces and intermediate Kato surfaces.

This is a joint work with M. Pontecorvo.

**Orateur:** FUJIKI, Akira (Osaka)

ID de Contribution: 12

Type: **Non spécifié**

## A generalization of Malmquist's theorem

*mardi 30 septembre 2014 17:00 (1 heure)*

The centennial theorem of Malmquist states that a non-autonomous algebraic ordinary differential equation of the first order having an entire solution is in fact a Riccati equation. We will speak about related results concerning algebraic differential equations having at least one single-valued solution.

**Orateur:** GUILLOT, Adolfo (Cuernavaca)

ID de Contribution: 13

Type: **Non spécifié**

## Foliations and webs inducing Galois coverings

*jeudi 2 octobre 2014 11:30 (1 heure)*

Motivated by previous work of Cerveau and Déserti, we introduce the notion of Galois holomorphic foliation

on the complex projective space as those whose Gauss map is a Galois covering when restricted to an appropriate Zariski open subset.

We characterize Galois foliations on  $\mathbb{P}^2$  belonging to certain classes, which include homogeneous foliations and we give a geometric characterization of Galois foliations in terms of their inflection divisor and their singularities.

**Orateur:** NICOLAU, Marcel (Barcelona)

ID de Contribution: 14

Type: **Non spécifié**

## **On deformations of elliptic fibrations, according to Cayley, Cremona, Halphen and Brunella.**

*lundi 29 septembre 2014 17:00 (1 heure)*

In the first part of the talk I'll take the risk of doing history of mathematics, presenting results of Cayley, Cremona and Halphen on deformations of elliptic fibrations (without sections). After, I'll show some experiments of degenerations of the configurations treated by these authors. At last, I'll give some ideas of Brunella's general result on deformations of elliptic fibrations and singular holomorphic foliations, which is not widely diffused.

**Orateur:** MENDES, Luis Gustavo (Porto Alegre)

ID de Contribution: 15

Type: **Non spécifié**

## The Green-Griffiths locus of quotients of bounded symmetric domains

*vendredi 3 octobre 2014 10:00 (1 heure)*

The Green-Griffiths locus is a closed subset of a compact projective manifold which contains the image of all entire curves contained in the manifold. In this talk we shall describe this locus for compact quotients of bounded symmetric domains. It turns out that the following dichotomy holds : either the uniformizing bounded symmetric domain is the ball and the Green-Griffiths locus is empty, or the Green-Griffiths locus is the whole manifold. This is a joint work with E. Rousseau.

**Orateur:** DIVERIO, Simone (Paris)

ID de Contribution: **16**

Type: **Non spécifié**

## **Germes of singular holomorphic two dimensional foliations**

*jeudi 2 octobre 2014 17:00 (1 heure)*

see joint pdf.

**Orateur:** LINS NETO, Alcides (Rio de Janeiro)

ID de Contribution: 17

Type: **Non spécifié**

## Circle actions on the 7-sphere with unbounded periods and non-linearizable multicentres

*mardi 30 septembre 2014 11:30 (1 heure)*

We give an example of a free circle action on the 7-dimensional sphere whose orbits have unbounded lengths (equivalently: unbounded periods). As an application we construct a smooth vector field  $X$  in a neighbourhood  $U$  of the origin in the 8-dimensional real space such that :  $U - \{0\}$  is foliated by closed integrale curves, the differential  $DX(0)$  generate a 1-parametri group of rotations, but  $X$  is not orbitally equivalent to its linearization at the origin, hence proving that Poincare' Centre Theorem, true for planar non-degenerate centers is not generalizable in 8 dimensiioni.

**Orateur:** VILLARINI, Massimo (Modena)

ID de Contribution: 18

Type: Non spécifié

## On periodic orbits in complex billiards

*mercredi 1 octobre 2014 14:00 (1 heure)*

A conjecture of Victor Ivrii (1980) says that in every billiard with smooth boundary the set of periodic orbits has measure zero. This conjecture is closely related to spectral theory. Its particular case for triangular orbits was proved by M. Rychlik (1989), Ya. Vorobets (1994) and other mathematicians, and for quadrilateral orbits in our joint work with Yu. Kudryashov (2012). We present a new approach to planar Ivrii's conjecture for billiards with piecewise-analytic boundary: to study its complexified version with reflections from holomorphic curves. The direct complexification of Ivrii's conjecture is false in general.

It would be interesting for real applications to classify the counterexamples: complex billiards with open sets of periodic orbits of a given period. We will show that the only "nontrivial" counterexamples with four reflections are formed by couples of confocal conics. We will discuss a small result concerning odd number of reflections. We provide applications of these results to real billiards, including Plakhov's Invisibility Conjecture and Tabachnikov's commuting billiard problem.

**Orateur:** GLUTSYUK, Alexey (Lyon and Moscow)

ID de Contribution: 19

Type: **Non spécifié**

## Kähler threefolds without subvarieties

*mercredi 1 octobre 2014 10:00 (1 heure)*

Let  $M$  be a compact Kahler manifold without non-trivial complex subvarieties. Using Brunella's alternative for holomorphic foliations, Nadel's vanishing theorem and Demailly's regularization of positive currents, we prove that  $M$  is a compact torus. This is a joint work with F. Campana and J.-P. Demailly.

**Orateur:** VERBITSKY, Misha (Moscow)

ID de Contribution: 20

Type: **Non spécifié**

## **Points singuliers de feuilletages holomorphes en dimension 3.**

*mardi 30 septembre 2014 10:00 (1 heure)*

Il s'agit d'un travail avec Alcides Lins Neto et Marianna Vago où l'on donne une description des types de singularités modulo la connaissance de leur partie initiale.

**Orateur:** CERVEAU, Dominique (Rennes)

ID de Contribution: 21

Type: **Non spécifié**

## Brunella's Local Alternative

*mercredi 1 octobre 2014 09:20 (30 minutes)*

It is a local version of a conjecture of Brunella which says that a codimension 1 foliation in the projective three-dimensional space  $P^3$  either has an invariant algebraic surface or each leaf is sub-foliated by a one-dimensional foliation. In this local take, we have the following “local conjecture”: a germ of holomorphic codimension 1 foliation in  $C^3,0$  either possesses a germ of analytic invariant surface, or there exists a neighborhood of the origin wherein each leaf contains a germ of analytic curve. We give a positive answer to this local conjecture for certain types of foliations.

**Orateur:** RAVARA VAGO, Marianna (Rennes)

ID de Contribution: 22

Type: **Non spécifié**

## **Complete vector fields on affine surfaces**

*jeudi 2 octobre 2014 09:20 (30 minutes)*

see joint pdf.

**Orateur:** LEUENBERGER, Matthias (Bern)

ID de Contribution: 23

Type: **Non spécifié**

## From character varieties to isoperiodic foliations: a transfer principle

*mardi 30 septembre 2014 15:30 (1 heure)*

Schiffer variations are surgery operations that takes an abelian differential on a curve to another one with the same periods. Viewed in the moduli space of abelian differentials of a fixed genus  $g \geq 2$ , they draw a complex algebraic foliation of dimension  $2g-3$ , called the isoperiodic foliation. Its transverse structure is modelled on an open set contained in the group of complex periods, on which the mapping class group acts via the symplectic group. We will see that the (rich) dynamical properties of this latter are also satisfied by the isoperiodic foliation: this phenomenon is what we call the transfer principle. The fact that it holds relies on the connectivity of certain moduli spaces of abelian differentials on curves with prescribed periods.

This is a work in collaboration with Gabriel Calsamiglia and Stefano Francaviglia.

**Orateur:** DEROIN, Bertrand (Paris)

ID de Contribution: 24

Type: **Non spécifié**

## **Marco Brunella and the curvature of canonical line bundles**

*lundi 29 septembre 2014 10:00 (1 heure)*

The talk will present some striking results of Marco Brunella concerning the curvature of canonical and anticanonical line bundles of compact Kähler manifolds, and of foliations on such manifolds. These results all contain very deep ideas, and several ones are connected to important unsolved conjectures. We will try to give an overview of some of them.

**Orateur:** DEMAILLY, Jean-Pierre (Grenoble)

ID de Contribution: 25

Type: **Non spécifié**

## The bi-disc theorem

*jeudi 2 octobre 2014 14:00 (1 heure)*

The identification of surfaces with negative Kodaira dimension which are not fibred in rational curves with the natural foliations on bi-disc quotients can reasonably be considered the centre piece of the classification of foliated surfaces. It was very much a collaborative effort with Marco, and, curiously, I have never given a talk specifically devoted to this theorem.

**Orateur:** MCQUILLAN, Michael (Roma)

ID de Contribution: 26

Type: **Non spécifié**

## **Marco and the theory of Anosov flows in dimension 3**

*jeudi 2 octobre 2014 10:00 (1 heure)*

At the beginning of his career, Marco Brunella published five papers related to Anosov flows in dimension 3.

These papers had a great influence on the subsequent development of the theory.

I would like to review these papers and present the present status of the question.

**Orateur:** GHYS, Etienne (Lyon)

ID de Contribution: 27

Type: **Non spécifié**

## On cohomological invariants of complex manifolds

*jeudi 2 octobre 2014 15:30 (1 heure)*

We will focus on algebraic aspects of the  $\delta_1\delta_2$ -Lemma for bounded double complexes, characterizing it in terms of special cohomologies.

We will apply such a result to complex and symplectic manifolds.

We will also report on some results on Dolbeault-Massey triple products.

**Orateur:** TOMASSINI, Adriano (Parma)

ID de Contribution: **28**

Type: **Non spécifié**

## **From umbilical foliations to the plurisubharmonic variation of the Poincaré metric**

*mardi 30 septembre 2014 14:00 (1 heure)*

**Orateur:** PEREIRA, Jorge Vitorio (IMPA)

ID de Contribution: **30**

Type: **Non spécifié**

## **Smooth foliations on compact homogeneous kähler varieties**

*vendredi 3 octobre 2014 09:20 (30 minutes)*

see joint pdf.

**Orateur:** LO BIANCO, Federico (Rennes)