Advances in Symplectic topology (Virtual)

Rapport sur les contributions

ID de Contribution: **1**   Type: **Non spécifié**

Umberto Hryniewicz (RWTH-Aachen): Reeb flows in dimension three with exactly two periodic orbits

lundi 17 mai 2021 15:00 (50 minutes)

In this talk I will present a complete characterization of Reeb flows on closed 3-manifolds with precisely two periodic orbits. The main step consists in showing that a contact form with exactly two periodic Reeb orbits is non-degenerate. The proof combines the ECH volume formula with a study of the behavior of the ECH index under non-degenerate perturbations of the contact form. As a consequence, the ambient contact 3-manifold is a standard lens space, the contact form is dynamically convex, the Reeb flow admits a rational disk-like global surface of section and the dynamics are described by a pseudorotation of the 2-disk. Moreover, the periods and rotation numbers of the closed orbits satisfy the same relations as (quotients of) irrational ellipsoids, and in the case of S^3 the transverse knot-type of the periodic orbits is determined. Joint work with Cristofaro-Gardiner, Hutchings and Liu.

ID de Contribution: **2**

Type: **Non spécifié**

Jo Nelson (Rice University): Embedded Contact Homology of Prequantization Bundles

lundi 17 mai 2021 16:30 (50 minutes)

In 2011, Farris provided a means of computing Z_2-graded embedded contact homology (ECH) of prequantization bundles over Riemann surfaces, producing an isomorphism between ECH of the bundle and the exterior algebra of the homology of the base. In joint work with Morgan Weiler, we upgrade to a full Z-grading on the chain complex and obtain a stabilization result. We additionally explain how to make the Morse-Bott computations rigorous by means of the direct limits for filtered ECH established in Hutchings-Taubes proof of the Arnold-Chord conjecture. We comment on future work on knot filtered ECH of certain Seifert fiber spaces.

ID de Contribution: **3**   Type: **Non spécifié**

Coffee Break

ID de Contribution: **4**

Type: **Non spécifié**

Coffee Break and discussion

ID de Contribution: **5**
Type: **Non spécifié**

Ana Rechtman (Université de Strasbourg): Broken books and Reeb dynamics in dimension 3

mardi 18 mai 2021 15:00 (50 minutes)

Giroux's correspondance gives, in particular, for every contact structure on a closed 3-manifold an adapted open book decomposition. Hence, it exists a Reeb vector that is tangent to the binding and transverse to the interior of the pages. For this vector field, each page is a Birkhoff section and the dynamics of the flow can be studied from the first return map. This correspondence is unsatisfactory when one wants to study all the Reeb vector fields associated to a contact structure.

In collaboration with V. Colin and P. Dehornoy, we proved that every non-degenerate Reeb vector field on a closed 3-manifold is adapted to a broken book (a generalisation of an open book). This construction gives a system of transverse surfaces with boundary and allows to establish results on the dynamics of the vector field.

ID de Contribution: **6**   Type: **Non spécifié**

Dan Cristofaro-Gardiner (IAS and UC Santa Cruz): The Kapovich-Polterovich question

mardi 18 mai 2021 16:30 (50 minutes)

The group of Hamiltonian diffeomorphisms of a symplectic manifold admits a remarkable bi-invariant metric, called Hofer's metric. Many basic questions about the geometry of this metric remain open. For example, in 2006 Kapovich and Polterovich asked whether or not this group, in the case of the two-sphere, is quasi-isometric to the real line. I will explain joint work with Humilière and Seyfaddini resolving this question: we show that the group contains quasi-isometric copies of R^n for any n, and we also show that the group is not coarsely proper. Key to our proofs is a new sequence of spectral invariants defined via Hutchings'Periodic Floer Homology.

ID de Contribution: **7**   Type: **Non spécifié**

Álvaro del Pino Gómez (Universiteit Utrecht): Flexibility of distributions through convex integration.

mercredi 19 mai 2021 15:00 (50 minutes)

Building on the work of Nash on C1-isometric embeddings, Gromov devised a method, called convex integration, to construct and classify solutions of partial differential relations. For the scheme to work, one must assume that the relation in question is ample (and often open as well). The idea behind ampleness is that it allows us to start with a formal solution and add to it rapidly oscillating perturbations, one direction at a time, in order to produce an actual solution that is C0-close.

One of the issues of convex integration is that it is notoriously difficult to apply as a blackbox. It has been applied successfully to many relations of geometric origin, but always assuming (as far as the speaker knows) that "the relation is ample in all directions" (or at least that shortness holds in all directions). This condition means that, regardless of the formal data we start with, adding suitable oscillations along an arbitrary (!) frame of directions will allow us to produce a solution. In this talk I will discuss an example of differential relation where "ampleness in all directions" fails but convex integration still applies. The relation under study characterises a concrete family of non-degenerate distributions of rank 4 in dimension 6 (which therefore satisfy the h-principle). This is joint work with F.J. Martínez Aguinaga.

ID de Contribution: **8**   Type: **Non spécifié**

Urs Frauenfelder (Universität Augsburg): Frozen planet orbits.

mercredi 19 mai 2021 16:30 (50 minutes)

Frozen planet orbits are periodic orbits in the Helium atom, which play an important role in the semiclassical treatment of Helium. In the talk I discuss them from a mathematical point of view and explain how they are related to Hamiltonian delay equations.

ID de Contribution: **9**

Type: **Non spécifié**

Jonathan Bowden (Universität Regensburg): Open books, Bourgeois contact structures and their properties

jeudi 20 mai 2021 15:00 (50 minutes)

Twenty years ago Frederic Bourgeois introduced a construction of contact structures on the product of any contact manifold M with a 2-torus given a choice of compatible open book, whose existence was proven by Giroux-Mohsen. In particular, this yielded contact structures on all odd-dimensional tori answering a question of Lutz from the 70's. A systematic study of these contact manifolds was initiated by Lisi-Marinkovic-Niederkrüger and Gironella, the former asking several questions, which we address in this talk.

In particular, we show that if the initial contact manifold is 3-dimensional the resulting contact structure is tight, independent of the initial contact structure and choice of open book. Furthermore, we show that given ANY contact manifold one can always stabilise the open book so that the resulting contact structure is not strongly symplectically fillable. This then yields (many) examples of weakly but not strongly fillable contact structures in all dimensions. (joint work with F. Gironella and A. Moreno)

ID de Contribution: **10**   Type: **Non spécifié**

Lev Buhovsky (Tel Aviv University): On Fabry's quotient theorem.

jeudi 20 mai 2021 16:30 (50 minutes)

The Fabry quotient theorem states that for a complex power series with unit radius of convergence, if the quotient of its consecutive coefficients tends to s, then the point z=s is a singular point of the series. In my talk I will try to describe an elementary proof of the theorem.

ID de Contribution: **11**

Type: **Non spécifié**

Russel Avdek (Uppsala Universitet): Holomorphic curve invariants of convex hypersurfaces.

vendredi 21 mai 2021 15:00 (50 minutes)

Let S be a convex hypersurface with neighborhood N(S) inside of some contact manifold. When dim(S)=2 the contact topology of N(S) is governed by simple closed curves on S. However, few tools are currently available to study N(S) when dim(S)>2. We provide such a tool which is applicable in any dimension by computing the sutured contact homology of N(S) in terms of linearized invariants of the positive and negative regions of S. The proof combines Morse-Bott, obstruction bundle gluing, and virtual perturbation techniques.

ID de Contribution: **12**   Type: **Non spécifié**

Lisa Traynor (Bryn Mawr College): Legendrian Torus and Cable Links.

vendredi 21 mai 2021 16:30 (50 minutes)

Legendrian torus knots were classified by Etnyre and Honda. I will explain the classification of Legendrian torus links. In particular, I will describe restrictions on the Legendrian torus knots that can be realized as the components of a Legendrian torus link, and I will give examples of Legendrian torus links that cannot be destabilized even though they do not have maximal Thurston-Bennequin invariant. Furthermore, I will explain that there are some smooth symmetries of Legendrian torus links that cannot be realized by a Legendrian isotopy. These torus link statements have extensions to Legendrian cable links. All these results are applications of convex surface theory. This is joint work with Jennifer L. Dalton and John B. Etnyre.