

14TH WORKSHOP ON SYMPLECTIC GEOMETRY, CONTACT
GEOMETRY, AND INTERACTIONS

CAST 2020

UNIVERSITY OF ANTWERP, 6-8 FEBRUARY 2020



Organisers:

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1 PRACTICAL INFORMATION

1.1 Website of the conference

<https://www.uantwerpen.be/nl/personeel/sonja-hohloch/private-webpage/conference-workshop/workshop/>

1.2 Wifi

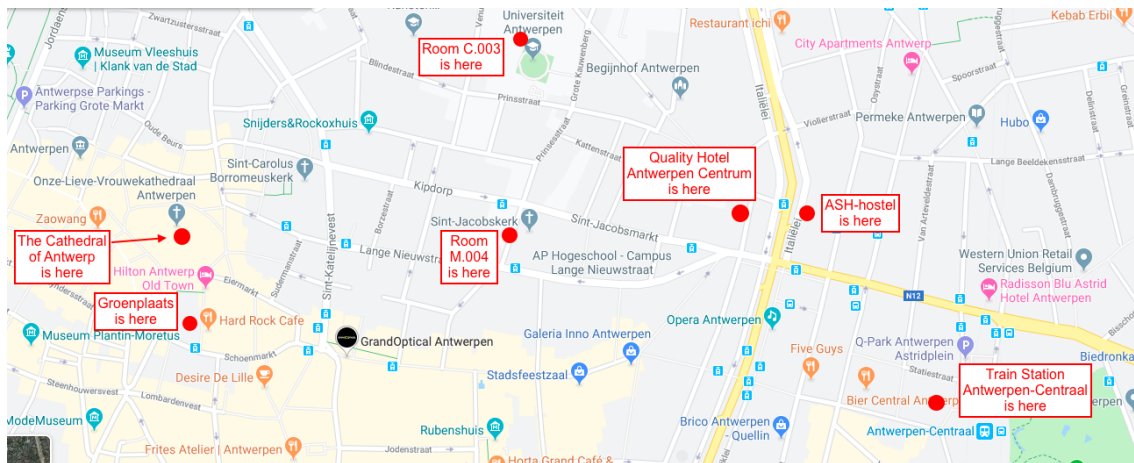
You can use your eduroam account within the university buildings. You can also use the individual account that you received upon registration.

1.3 Emergency numbers in Belgium

Fire and Ambulance: **112**

Police: **101**

1.4 Map of the city center



1.5 Lecture halls

- Feb 6 - Feb 7: Room **M.004**, *Sint-Jacobstraat 2* (see section 2.1 for indications).
- Feb 8: Room **C.003**, *Prinsstraat 13* (see section 4.1 for indications).

1.6 Additional study rooms

- You can use the additional study rooms in building M:
 - **Thursday**: room M.104 (9:00-19:00)
 - **Friday**: room M.101 and M.107 (9:00-19:00).
- The Antwerp University Library is open to the public (see *Bibliotheek, Prinsstraat 13* section 5.2).
 - **Opening time**: Wednesday (8:30-21:00), Thursday (8:30-21:00), Friday (8:30-19:00), Saturday (10:00-17:00).

2 THURSDAY, FEBRUARY 6

2.1 How to reach lecture hall M.004

On Thursday and Friday, the talks take place in the lecture hall **M.004** in the UA Faculty of Social Sciences, *Sint-Jacobstraat 2*, 2000 Antwerpen. To reach the lecture hall, please follow the indication below.



2.2 Timetable (Room M.004)

| | |
|---|---|
| 9:30 | Registration |
| 10:00 | |
| 10:00 | Umberto Hryniewicz |
| 11:00 | <i>Transverse links that force chaos</i> |
|  | Coffee break |
| 11:30 | Tudor Ratiu |
| 12:30 | <i>Generic equilibria for generalized rigid body systems</i> |
| | Lunch |
| 14:30 | Rob Vandervorst |
| 15:30 | <i>Morse representations for a class of discrete braids</i> |
|  | Coffee break |
| 16:00 | Gabriele Benedetti |
| 17:00 | <i>On the local systolic optimality of Zoll contact forms</i> |
| | Break |
| 17:15 | Joseph Palmer |
| 18:15 | <i>Immersed Floer cohomology, mean curvature flow, and Lagrangian surgery</i> |

2.3 Abstracts

UMBERTO HRYNIEWICZ

Transverse links that force chaos

We exhibit examples of closed contact 3-manifolds and transverse isotopy classes of links on them with the following two properties: 1) these contact manifolds carry Reeb flows with zero topological entropy, and 2) if a defining contact form realizes links in these classes as periodic Reeb orbits then the Reeb flow has positive topological entropy. In particular, we generalize a result of Denzler-Mackay to the Finsler case and also to more general contexts. This is joint work with Marcelo Alves and Pedro Salomão.

TUDOR RATIU

Generic equilibria for generalized rigid body systems

I will present the Williamson type classification for generic equilibria of generalized rigid body systems on all real forms of complex semisimple Lie algebras. The general result will be presented resulting in tables for the equilibria according to the Lie algebraic classification.

ROB VANDERVORST

Morse representations for a class of discrete braids

We discuss a special class of piecewise linear braids and their natural connection to parabolic dynamics, in particular twist maps. The interaction between the topology of the discrete braid classes and the dynamics of (discrete) parabolic equations gives rise to algebraic invariants for braids. We explain how the discrete braid classes lead to Morse representations and Morse decompositions and how such representations behave with respect to ‘refinement’. The latter plays a role in relating the invariants to Floer homology for more general classes of braids.

GABRIELE BENEDETTI

On the local systolic optimality of Zoll contact forms

In a joint work with Alberto Abbondandolo we prove a normal form for contact forms close to a Zoll one and deduce that Zoll contact forms on any closed manifold are local maximizers of the systolic ratio. Corollaries of this result are: (i) sharp local systolic inequalities for Riemannian and Finsler metrics close to Zoll ones, (ii) the perturbative case of a conjecture of Viterbo on the symplectic capacity of convex bodies, (iii) a generalization of Gromov’s non-squeezing theorem in the intermediate dimensions for symplectomorphisms that are close to linear ones.

JOSEPH PALMER



Immersed Floer cohomology, mean curvature flow, and Lagrangian surgery

We study the behaviour of (immersed) Floer cohomology under coupled mean curvature/Kähler Ricci flow. Given an unobstructed immersed Lagrangian we prove (under some conditions) a lower bound on the time for which the immersed Floer cohomology is invariant under the flow, as long as the flow exists, and in particular show that the Floer cohomology is invariant as the immersion passes through a self-tangency. Furthermore, in some cases when the Lagrangian becomes obstructed (if the q -valuation of the Maurer-Cartan solution at a self-intersection point goes to zero) we show how performing a Lagrangian surgery allows the flow to be continued in such a way that the Floer cohomology instead remains unobstructed and is invariant. This surgery prevents certain geometric singularities in the mean curvature flow before they can form. This is partially motivated by a conjecture of Joyce.

This work is joint with Chris Woodward, see the preprints arXiv:1903.01943 and arXiv:1804.06799.

3 FRIDAY, FEBRUARY 7

3.1 Timetable (Room M.004)

| | |
|---|---|
| 10:00 | Maÿlis Limouzineau |
| 11:00 | <i>Embedded exact Lagrangian fillings not coming from surgery</i> |
|  | Coffee break |
| 11:30 | Fabio Gironella |
| 12:30 | <i>Bourgeois contact structures: tightness, fillability and applications</i> |
| | Lunch |
| 14:30 | Lisa Traynor |
| 15:30 | <i>The Geography of Immersed Lagrangian Fillings of Legendrian Submanifolds</i> |
|  | Coffee break |
| 16:00 | Yaniv Ganor |
| 17:00 | <i>Limited interaction phenomena in Floer theory of disjointly supported Hamiltonians</i> |
| | Break |
| 17:15 | Jack Smith |
| 18:15 | <i>Floer theory without Floer theory</i> |

3.2 Abstracts

MAYLIS LIMOUZINEAU

Embedded exact Lagrangian fillings not coming from surgery

Consider a Legendrian knot Λ in S^3_{std} and an exact Lagrangian filling L in B^4_{std} , with genus $g(L)$ and $i(L)$ immersed points. A classical result states that $g(L)$ and $i(L)$ must compensate each other, as : $tb(\Lambda) = 2(g(L) + i(L)) - 1$. On the other hand, Polterovich surgery gives us a way to solve immersed points of an immersed Lagrangian filling to get an embedded one. A natural question is then, can any embedded Lagrangian filling be obtain by surgery on a immersed one? We will see that the answer is no and give counter-examples. This is joint work with O. Capovilla-Searle, N. Legout, E. Murphy, Y. Pan and L. Traynor.

FABIO GIRONELLA

Bourgeois contact structures: tightness, fillability and applications

Starting from a contact structure on an odd-dimensional manifold together with a supporting open book, Bourgeois '02 constructed an explicit contact structure on the product of the manifold with the 2-torus. The first objective of the talk is to recall such construction and present some new results concerning its properties. Namely, in dimension 5 these contact structures are always tight; moreover, if the original open book has page of genus 0 and the resulting contact manifold is strongly fillable, then the monodromy of the open book used in the construction needs to be in the commutator subgroup of the mapping class group of the page. In the second part of the talk, I will describe the main ideas behind the proof of the fillability result. Everything is joint work with Jonathan Bowden and Agustin Moreno.

LISA TRAYNOR

The Geography of Immersed Lagrangian Fillings of Legendrian Submanifolds

Given a smooth knot K in the 3-sphere, a classic question in knot theory is: What surfaces in the 4-ball have boundary equal to K ? One can also consider immersed surfaces and ask a “geography” question: What combinations of genus and double points can be realized by surfaces with boundary equal to K ? I will discuss symplectic analogues of these questions: Given a Legendrian knot, what Lagrangian surfaces can it bound? What immersed Lagrangian surfaces can it bound? These Lagrangian surfaces are commonly called Lagrangian fillings of the Legendrian knot and are more rigid than their topological counterpart. In particular, while any smooth knot bounds an infinite number of topologically distinct surfaces, there are classical and non-classical obstructions to the existence of Lagrangian fillings of Legendrian knots. Specifically, a polynomial associated to the Legendrian boundary through the technique of generating families can show that there is no compatible embedded Lagrangian filling. Immersed Lagrangian fillings are more flexible, and I will describe how this polynomial associated to the Legendrian boundary forbids particular combinations of genus and double points in immersed Lagrangian fillings. In addition, I will describe some constructions of immersed fillings that allow us to completely answer the Lagrangian geography question for some Legendrian knots. This is joint work with Samantha Pezzimenti.

YANIV GANOR

Limited interaction phenomena in Floer theory of disjointly supported Hamiltonians

Filtered Floer homology is a central tool in the study of Hamiltonian dynamics on symplectic manifolds. In a local-to-global theme, one may ask "How does the filtered Floer homologies of disjointly supported Hamiltonians relate to that of their sum?". There are several works studying this interaction between disjointly supported Hamiltonians and their sum, mostly through associated quantitative invariants. These works indicate that there is a limited Floer-theoretic interaction between such Hamiltonians. We study this Floer-theoretic interaction directly on the level of Floer trajectories on closed aspherical manifolds, and find restrictions from which we derive several applications. In particular, we prove that the spectral invariants of the fundamental and the point classes are indifferent to the topology outside the Hamiltonian's support in certain situations. This is a joint work in progress with Shira Tanny.

JACK SMITH

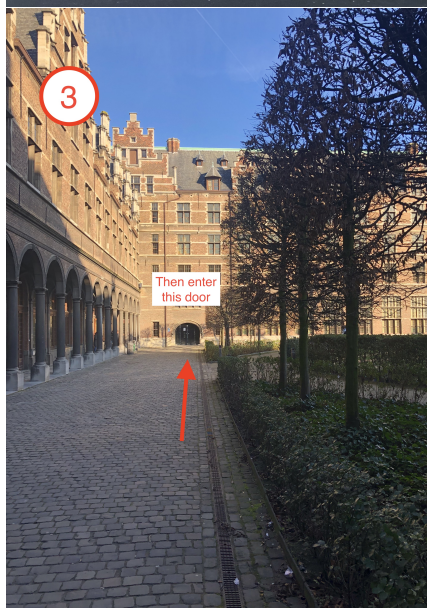
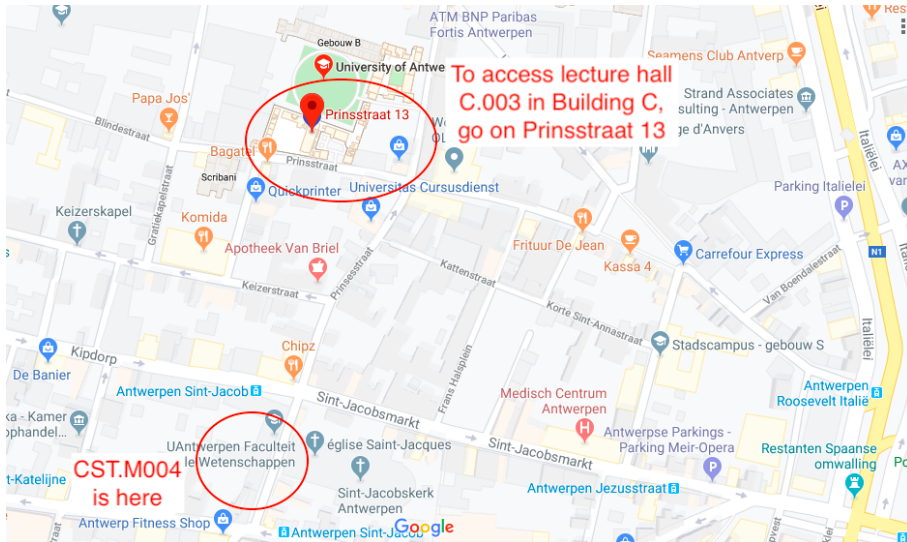
Floer theory without Floer theory

The Fukaya A-infinity structure on Lagrangian Floer cohomology contains important geometric information but is near-impossible to access directly. Cho, Hong and Lau introduced the remarkable idea of "localised mirror functors", which can dramatically simplify the problem by translating it into the algebraic language of matrix factorisations. I'll discuss the basic idea behind their construction and some applications towards mirror symmetry.

4 SATURDAY, FEBRUARY 8

4.1 How to reach lecture hall C.003

On Saturday February 8, the talks take place in the lecture hall **C.003** in the building C of the UAntwerpen Stadscampus, *Prinsstraat 13*, 2000 Antwerpen. To reach the lecture hall, please follow the indication below.



4.2 Timetable (Room C.003)

| | |
|-------|--|
| 10:00 | Charlotte Kirchhoff-Lukat |
| 11:00 | <i>Generalized complex branes, coisotropic submanifolds and deformations</i> |
| 11:05 | Gaël Meigniez |
| 12:05 | <i>Deforming foliations into contact structures in large dimensions</i> |

4.3 Abstracts

CHARLOTTE KIRCHHOFF-LUKAT

Generalized complex branes, coisotropic submanifolds and deformations

I will begin by giving an overview of generalized complex branes as natural submanifolds of generalized complex manifolds and summarising known results on their deformations. After a general introduction, the focus of the talk will be coisotropic A-branes in symplectic manifolds. It is known that such objects should be additional objects in the Fukaya category. A-branes are coisotropic submanifolds with an additional structure. I will discuss initial results on the deformation theory of such objects in examples, as well as in comparison to that of coisotropic manifolds.

GAËL MEIGNIEZ

Deforming foliations into contact structures in large dimensions

A classical construction by Eliashberg-Thurston allows one, in dimension 3, to deform many foliations of codimension 1 into contact structures. I shall explain how the like can be done in higher dimensions; the methods are more elaborate, using modern works by Eliashberg-Murphy and Borman-Eliashberg-Murphy, as well as a foliated analogue of Morse theory, in order to construct a conformal symplectic structure on the leaves. This is a work in collaboration with M. Bertelson.

5 WHERE TO HAVE LUNCH

5.1 List of restaurants

These restaurants are located less than 10 minutes walking distance from the lecture hall. There are also many restaurants around Groenplaats and the cathedral of Antwerp (see map in Section 1.4).

ASIAN RESTAURANTS

Tasty Thai Express, *Kipdorpbrug 2*

Zaowang, *Oude Koornmarkt 22*
Sushi restaurant near the cathedral.

Hawaiian Poké Ball, *Meir 119*

Satay, *Wijngaardbrug 8*
They serve South East Asia specialities.

Tong Mein, *Hendrik Conscienceplein 13*

BURGERS

Hard Rock Cafe, *Groenplaats 35*
They serve burgers and American food.

Manhattan's Burgers, *Groenplaats 1*
They serve burgers.

BRASSERIES

't Klein Verdiep, *Maria Pijpelincxstraat 2*
They only accept cash here!

Brasserie De Post, *Groenplaats 26*

Horta Grand Café & Art Nouveau Zaal, *Hopland 2*

ITALIAN RESTAURANT

Da Giovanni, *Jan Blomstraat 8*
Close to the cathedral and there is plenty of space. There is a discount on the food if you have a student card.

SANDWICHES, SALADS, SOUPS

The Foodmaker, *Meir 27*

They serve salads and sandwiches. There is plenty of space.

Lunch Garden Antwerpen Inno Meir, *Meir 82*

This restaurant is located on the 4th floor of the shop Inno Meir. This is like a cafeteria.

Exki, *Wiegstraat 7/9*

They serve salads, sandwiches, pastas, etc.

Kool & Zo, *Prinsstraat 40*

This is a salad bar.

Panos Antwerpen Meir, *Meir 24*

This is a sandwich bar. They also serve salad and soup.

Tartine, *Minderbroedersrui 60*

The place is not big. They serve very good tartines (bread slice with many things on it).

Foodvibes, *Minderbroedersrui 52*

They serve pastas and salads. On Friday it opens only at 4pm. I.e. don't go on Friday.

Le Pain Quotidien, *Graanmarkt 6*

Bakery where they also serve soups and tartines for lunch. There is enough space to sit.

Wasbar, *Melkmarkt 17*

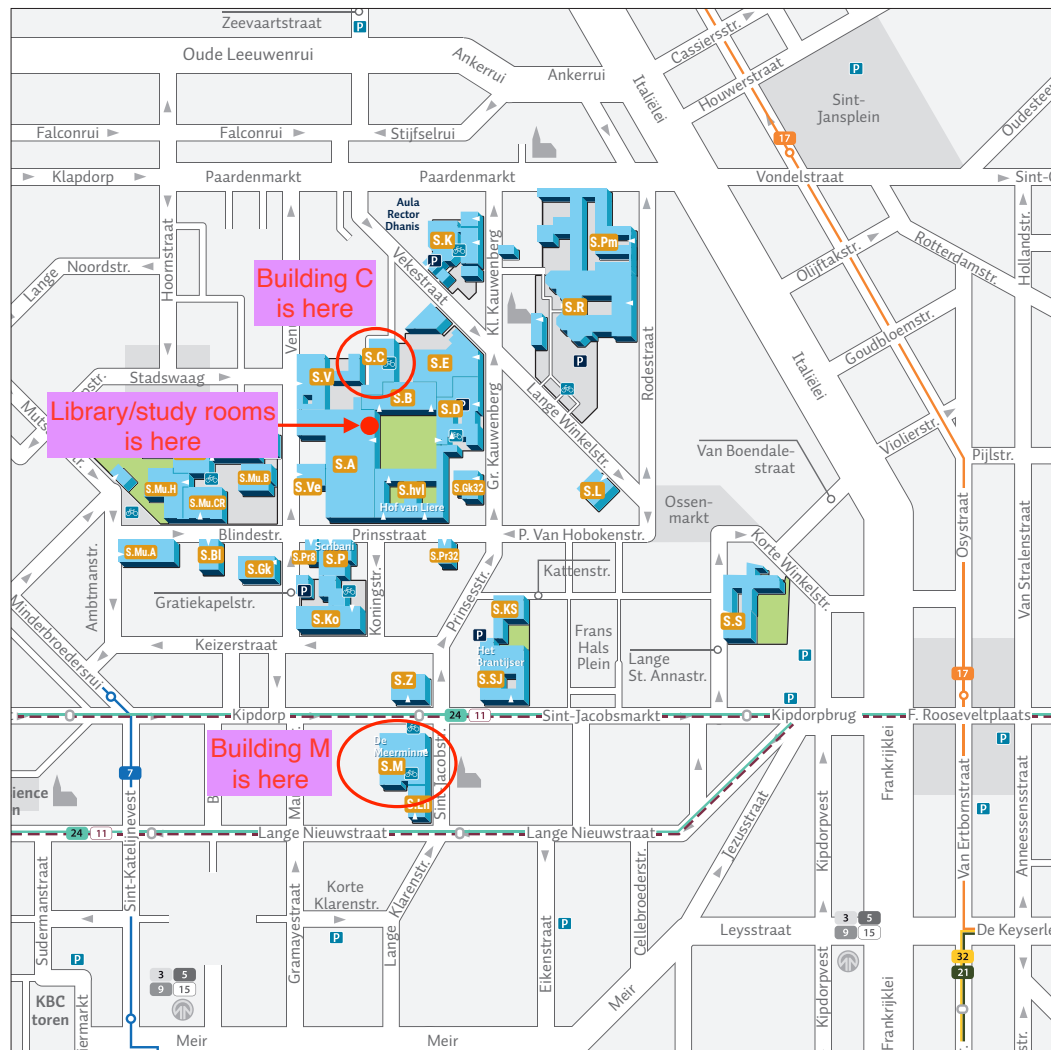
They serve bagels and brunches and there is enough space to sit. You can also do your laundry there...

5.2 Stadscampus map

More information on the website:

<https://www.uantwerpen.be/en/about-uantwerp/campuses/stadscampus/>

Stadscampus



- | | | | |
|--------|---|--------|---|
| S.A | - Bibliotheek, Prinsstraat 13 | S.P | - Scribani - Prinsstraat 10 |
| S.B | - Prinsstraat 13 | S.Pr8 | - Linguapolis - Prinsstraat 8 |
| S.Bl | - Open Universiteit / Centrum West - Blindestraat 14 | S.Pr32 | - Zomaar een dak - Prinsstraat 32 |
| S.C | - Prinsstraat 13 | S.Pm | - Rodestraat 12 |
| S.D | - Grote Kauwenberg 18 | S.R | - Rodestraat 14 |
| S.E | - Agora/Sporthal - Grote Kauwenberg 2 | S.S | - Grauwzusters - Lange Sint-Annastraat 7 |
| S.Gk | - Dienst Internationale Samenwerking - Gratiekapelstraat 10 | S.SJ | - Het Brantijser - Sint-Jacobsmarkt 13 |
| S.Gk32 | - Ruusbroecgenootschap - Grote Kauwenberg 32-34 | S.V | - Venusstraat 23 |
| S.hvl | - Hof van Liere - Prinsstraat 13 | S.Ve | - Vrijzinnige Dienst / Preventiedienst - Venusstraat 35 |
| S.hvl | - Universiteitsclub - Prinsstraat 13b | S.Z | - Peter Benoit - Kipdorp 61 |
| S.K | - Aula Rector Dhanis - Kleine Kauwenberg 14 | | |
| S.K | - Linguapolis - Kleine Kauwenberg 12 | | |
| S.Ko | - Komida studentenrestaurant/Labotheek - Koningstraat 8 | | |
| S.L | - Lange Winkelstraat 40-42 | | |
| S.M | - De Meeminne - Sint-Jacobstraat 2 | | |
| S.Mu | - Mutsaard - Faculteit Ontwerpwetenschappen - Mutsaardstraat 29 | | |
| S.Mu.A | - Mutsaard - Productontwikkeling - Ambtmanstraat 1 | | |
- Betaalparking