



# SYMPOSIUM SYMPLECTIC GEOMETRY

Monday 24 July 2017. Mathematikon Seminarraum 3 | 3. OG

8:30 am | Doris Hein (Freiburg)

## Lokale Kontaktomologie mit Hilfe invarianter Morsetheorie

In Hamiltonscher Dynamik ist die lokale Floerhomologie isolierter periodischer Bahnen der Schlüssel zu einigen wichtigen Resultaten über die Existenz unendlich vieler Periodischer Bahnen. Für den Reebfluss auf Kontaktmannigfaltigkeiten sind Homologietheorien wesentlich weniger entwickelt, insbesondere ist nicht klar, wie sich die lokale Homologie eines isolierten periodischen Orbits unter Iteration verhält.

In diesem Vortrag werde ich eine neue lokale Invariante für isolierte periodische Reebbahnen vorstellen, deren Eigenschaften, auch unter Iteration, denen der lokalen Floerhomologie entsprechen. Die für die Definition benötigte lokale invariante Morsehomologie kann dabei ohne die Borelkonstruktion definiert werden, so dass man sehr konkret mit den Kettenkomplexen arbeiten kann und dadurch einen sehr direkten Zugang zur Dynamik bekommt.

9:20 am | Jean Gutt (Köln)

## Equivariant symplectic capacities

We study obstructions to symplectically embedding a cube (a polydisk with all factors equal) into another symplectic manifold with boundary of the same dimension. We find sharp obstructions in many cases, including all "convex toric domains" and "concave toric domains" in  $C^m$ . The proof uses analogues of the Ekeland-Hofer capacities, which are conjecturally equal to them, but which are defined using  $S^1$ -equivariant symplectic homology. This is joint work with Michael Hutchings.

10:40 am | Gabriele Benedetti (Leipzig)

## Periodic Orbits in Hamiltonian Dynamics: Looking for Islands of Stability in the Chaotic Sea

Periodic motions plays a decisive role in understanding the qualitative behaviour of Hamiltonian systems. Indeed, starting from the monumental monograph of Poincare on celestial mechanics, it has become increasingly clear that periodic orbits can be responsible both for local stability (elliptic orbits), and for chaotic phenomena (hyperbolic orbits).

One hundred years after Poincare, work of Hofer-Wysocki-Zehnder and of Dell'Antonio-D'Onofrio-Ekeland have provided crucial information about the existence and the type of periodic orbits for the important class of convex systems. In the last part of the talk, I will discuss how these results can be applied to a concrete case: the motion of a charged particle on the two-sphere under the effect of a magnetic field.

11:30 am | Luca Asselle (Bochum)

## Autonomous Tonelli Hamiltonian Systems on twisted cotangent bundles

Tonelli Hamiltonian systems play an important role at the crossroads between dynamical systems, symplectic geometry, differential geometry and physics, as they can be used to study several problems coming e.g. from hydrodynamics, electromagnetism, nuclear physics, etc. Roughly speaking, Tonelli Hamiltonian systems are a natural generalization of geodesic flows and, as such, share some common properties with them (e.g conservation of energy). However, they differ quite remarkably from the latter class of flows for many reasons: The dynamics depends strongly on the energy; in particular its properties change quite drastically when crossing some special energy values. Moreover, there are examples of energy levels without periodic orbits. From a symplectic geometry point of view, their study is made difficult by the fact that energy levels are - in most of the cases - not of contact type.

In this talk we quickly recall how such systems are defined and briefly describe their properties, with particular attention to the existence and multiplicity of periodic orbits. If time permits, we will also present some of the open questions in the field.