



Monday 10 October

- 15:30 Departure from QGM. We meet in the parking lot in front of bldg. 1530
- 17:45 Arrival at Sandbjerg
- 18:00 Dinner - (each evening at the same time)

Tuesday 11 October

- 08:00-09:00 Breakfast – (each morning same time)
- 10:15-11:15 **Hans-Christian Herbig:** On orbifold criteria for linear symplectic quotients
- 11:30-12:30 **Johan Martens:** Fourier - Mukai and Nahm transforms for parabolic Higgs bundles
- 12:30-13:15 Lunch
- 13:30-14:30 **Vito Iacovino:** TBA
- 14:45-15:45 **Douglas LaFountain:** A cell decomposition for homotopy Deligne-Mumford
- 19:00-20:00 **Reza Rezazadegan:** A spectral Sequence for Lagrangian Floer homology

Wednesday 12 October – TWO SIMULTANEOUS PARTS

‘KIDS RETREAT’	‘SENIOR RETREAT’
09:45-10:30 Paulo Masulli: Title: An introduction to equivariant homotopy theory	09:45-10:45 Danny Calegari: TBA
10:45-11:30 Amit De: TBA	11:15-12:15 Nuno Miguel Romão: Gauged vortices on a two – sphere
11:45-12:30 Shehryar Sikander: TBA	12:15-13:15 Lunch
12:30-13:30 Lunch	13:15-15.15 Free networking
13:30-14:15 Troels Bak Andersen: Title: "The Andersen Filtration"	
15.15-16.15 Søren Fuglede Jørgensen: Witten—Reshetikhin--Turaev invariants of mapping tori via skein theory	
16.30-17.30 Benjamin Himpel: The Witten - Reshetikhin - Turaev invariant of finite - order mapping tori	
18:00 Special Dinner	



Thursday 13 October

10:15-11:15 **Brendan Mclellan:** TBA

11:30-12:30 **Hiro Tanaka:** An Idea for New link invariants

12:30-13:15 Lunch

13:30-14:30 **Gregor Masbaum:** Irreducible factors of modular representations of mapping class groups arising in Integral TQFT

14.45-15:45 **Mario Garcia Fernandez:** Limits of balanced metrics on vector bundles and polarised manifolds

16:00 - *Departure* -

Book of Abstracts (in order of programme appearance):

Hans-Christian Herbig:

Title: On orbifold criteria for linear symplectic quotients.

We give examples of unitary torus representations whose symplectic quotient cannot be regularly symplectomorphic to a linear quotient of a finite group and whose GIT quotient is smooth. The notion of a regular symplectomorphism will be introduced in the talk.

Johan Martens:

Title: Fourier - Mukai and Nahm transforms for parabolic Higgs bundles.

I will introduce the Nahm and Fourier-Mukai transforms and give an overview of various results related to them. I will then describe joint work with Marcos Jardim on extending the Fourier-Mukai to parabolic Higgs bundles over a Riemann surface with marked points.

Vito Iacovino:

Title:

Abstract:

Douglas LaFountain:

Title: A cell decomposition for homotopy Deligne-Mumford.

In this talk we introduce and investigate a new bordification of decorated Teichmüller space, namely the space of filtered screens. In particular, we show that after an appropriate quotient of the space of filtered screens, we obtain a space (and accompanying cell decomposition) which is homotopy equivalent to the Deligne-Mumford compactification of Riemann's moduli space. This work is joint with Bob Penner.



Reza Rezazadegan:

Title: A spectral Sequence for Lagrangian Floer homology.

(Fibered) Dehn twists are an important class of symplectomorphisms of a symplectic manifold M which are given for each Lagrangian sphere in M (or more generally a spheric coisotropic submanifold). Such Dehn twists are used to obtain representations of the braid group or MCG by symplectomorphisms. In this talk I outline the construction of a spectral sequence which converges to the Floer homology of a composition of multiple fibered Dehn twists.

Danny Calegari (Caltech): (Senior retreat)

Title: Ziggurats and rotation numbers

I will discuss new rigidity and rationality phenomena (related to the phenomenon of Arnold tongues) in the theory of nonabelian group actions on the circle. I will introduce tools that can translate questions about the existence of actions with prescribed dynamics, into finite combinatorial questions that can be answered effectively. There are connections with the theory of diophantine approximation, and with the bounded cohomology of free groups. A special case of this theory gives a very short new proof of Naimi's theorem (i.e. the conjecture of Jankins-Neumann) which was the last step in the classification of taut foliations of Seifert fibered spaces. This is joint work with Alden Walker.

Nuno Romao (MPI, Bonn): (Senior retreat)

Title: Gauged vortices on a 2 – sphere

I shall discuss three sorts of localisation phenomena arising in the study of L^2 geometry on the moduli space of k $U(1)$ -vortices on a round 2-sphere, which is CP^k equipped with a 1-parameter family of $SO(3)$ -invariant Kaehler structures. I will also explain how one can make use of localisation to compare these Kaehler structures with the Fubini-Study structure on CP^k (joint work with I. Mundet i Riera).

Søren Fuglede Jørgensen:

Title: Witten—Reshetikhin--Turaev invariants of mapping tori via skein theory

In the Reshetikhin--Turaev TQFT, one obtains a family of invariants of all closed 3-manifolds. For the family of 3-manifolds consisting of mapping tori over closed surfaces, the invariants arise as characters of the so-called quantum representations of surface mapping class groups. Usually at QGM, these representations come up naturally in the framework of geometric quantization, but in fact they admit a completely elementary construction in terms of skein theory. In the talk, this construction will be explained in detail, and we discuss some of the properties of the resulting representations. Particular attention will be given to the associated mapping torus invariants, and time permitting we will discuss how the invariants fit into the



asymptotic expansion of Witten's Chern--Simons path integral in some special cases. This is joint work with Jørgen Ellegaard Andersen

Benjamin Himpel:

Title: The Witten-Reshetikhin-Turaev invariant of finite-order mapping tori.

Witten's influential invariants for links in 3-manifolds given in terms of a non-rigorous Feynman path integral have been rigorously defined first by Reshetikhin and Turaev. Their combinatorial definition based on the axioms of topological quantum field theory is expected to have an asymptotic expansion in view of the perturbation theory of Witten's path integral with leading order term (the semiclassical approximation) given by formally applying the method of stationary phase. Furthermore, the terms in this asymptotic expansion are expected to be well-known classical invariants like the Chern-Simons invariant, spectral flow, the Rho invariant and Reidemeister torsion. For mapping tori, the Witten Reshetikhin-Turaev invariants can also be defined as the characters of representations of central extensions of the mapping class group, constructed using the machinery of geometric Kähler quantization applied to the moduli space of flat connections on a surface. I will present recent results on the expansion for finite order mapping tori, whose leading order terms we identified with classical topological invariants. Joint with Jørgen Ellegaard Andersen.

Paolo Masulli: (Kids retreat)

Title: An introduction to equivariant homotopy theory

Abstract: Equivariant homotopy theory deals with topological spaces that are endowed with the action of a group: the usual notions from homotopy theory, such as homotopy groups and CW-complexes, translate and generalise to this context. To define these concepts, one can consider equivariant spheres associated to group representations. Such spheres have a group action induced by the representation, and can be used to define equivariant homotopy groups and (co)homology theories. In the talk I will give an introduction to these topics and present some classical results in the subject.

Amit De: (Kids retreat)

Title:

Abstract:

Shehryar Sikander: (Kids retreat)

Title:

Abstract:



Troels Bak Andersen: (Kids retreat)

Title: "The Andersen Filtration"

Abstract: "There is a natural filtration on the space of homomorphisms from a Verma module to a tilting module known as the Andersen Filtration. I will set up the framework for obtaining this filtration and possibly explain how it is related to the Jantzen filtration of a Verma module."

Mario Garcia Fernandez:

Title: Limits of balanced metrics on vector bundles and polarised manifolds.

In two well known cases the existence of a canonical metric in Kähler geometry is related to a stability condition in algebraic geometry. First, the Hitchin-Kobayashi correspondence for Hermitian-Einstein metrics on vector bundles and second the Yau-Tian-Donaldson conjecture for constant scalar curvature Kähler (cscK) metrics on projective manifolds. In each of these theories balanced metrics play a crucial role. On the one hand the existence of a balanced metric can be shown to be equivalent to a stability condition in the sense of finite dimensional Geometric Invariant Theory. On the other hand, the asymptotic behaviour of a sequence of balanced metrics is governed by a "density of states" expansion, from which the Hermitian-Einstein or cscK equations can be extracted. In this talk we combine these ideas by considering simultaneously balanced conditions for metrics on a vector bundle and its underlying manifold. This is joint work with Julius Ross.

Brendan Mclellan:

Title:

Abstract:

Hiro Tanaka (Northwestern University):

Title: An Idea for New link invariants

I will begin this talk by discussing the notion of a "Homology theory for manifolds." This is not the same notion as a homology theory in the sense of Eilenberg and Steenrod--the homology theories I'll talk about capture more information than just the homotopy type, and the idea was formalized by John Francis. I will then talk about joint, ongoing work with John Francis and David Ayala, in which we try to create invariants of embedded manifolds. In particular I will discuss the case of embedded links, and contrast the algebraic structures of classical invariants with ours.