ESI Erwin Schrödinger International Institute for Mathematical Physics

universität wien

DVR 0065528

**Programme on**
**"Modern Trends in Topological Quantum Field Theory"**

**organized by**
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**Nicolai Reshetikhin, and Christoph Schweigert**

**February 3 - March 28, 2014**

## String Geometry Meeting - Schedule, February 24 - 28, 2014

- **Monday, February 24, 2014**

  09:00 – 10:30 *free working time*

  10:30 – 11:00 *coffee break*

  11:00 – 12:30 **Christian Voigt**
  *Clifford algebras, Fermions, and categorification*

  12:30 – 14:00 *lunch break*

  14:00 – 15:30 **Christian Becker**
  *Relative differential cohomology and Chern-Simons theory*

  15:30 – 16:00 *break*

  16:00 – 17:30 *free working time*

- **Tuesday, February 25, 2014**

  09:00 – 10:30 *free working time*

  10:30 – 11:00 *coffee break*

  11:00 – 12:30 **Joost Nuiten and Urs Schreiber**
  *Cohomological quantization*

  12:30 – 14:00 *lunch break*

  14:00 – 15:30 **Thomas Nikolaus**
  *T-Duality in K-Theory and ellitptic cohomology*

  15:30 – 16:00 *break*

  16:00 – 17:30 *free working time*

- **Wednesday, February 26, 2014**

  09:00 – 10:30 *free working time*

  10:30 – 11:00 *coffee break*

  11:00 – 12:30 **Michael Völkl**
  *The intrinsic eta-invariant and geometrizations*

  12:30 – 14:00 *lunch break*

  14:00 – 15:30 **Christoph Wockel**
  *Topological group cohomology and Chern-Weil Theory*

  15:30 – 16:00 *break*

  16:00 – 17:30 *free working time*

- **Thursday, February 27, 2014**

  09:00 – 10:30 *free working time*

  10:30 – 11:00 *coffee break*

  11:00 – 12:30 **Ulrich Pennig**
  *An introduction to I-spaces and a conjecture about K(ku)*

  12:30 – 14:00 *lunch break*

  14:00 – 15:30 **Konrad Waldorf**
  *String geometry vs. spin geometry on loop spaces*

  15:30 – 16:00 *break*

  16:00 – 17:30 *free working time*

- **Friday, February 28, 2014**

  09:00 – 10:30 *free working time*

  10:30 – 11:00 *coffee break*

  11:00 – 12:30 **Bas Janssens**
  *Representation theory of gauge groups*

  12:30 – 14:00 *lunch break*

  14:00 – 15:30 *free working time*

  15:30 – 16:00 *break*

  16:00 – 17:30 *free working time*

**All lectures take place in the ESI Schrödinger Lecture Hall**

## Abstracts

- **Christian Becker** *Relative differential cohomology and Chern-Simons theory*

  We introduce two different notions of differential cohomology and derive long exact sequences for both. We discuss the module structure and construct fiber iintegration that commutes with the exact sequences. Transgression to loop space is a special case thereof.
  As a particular example we obtain the Cheeger-Chern-Simons relative character. In the same way as the Cheeger-Simons character generalizes the Chern-Simons invariant for closed manifolds, the Cheeger-Chern-Simons character generalizes the Chern-Simons invariant for manifolds with boundary.

- **Bas Janssens** *Representation theory of gauge groups*

  Despite the fact that gauge groups are infinite dimensional, their bounded unitary representations behave remarkably like those of finite dimensional semisimple Lie groups. We give a classification result for these bounded unitary representations and indicate how this generalises to (possibly unbounded) positive energy representations. These turn out to behave much like highest weight representations of affine Kac-Moody algebras.

- **Thomas Nikolaus** *T-Duality in K-Theory and ellitptic cohomology*

  TBA

- **Joost Nuiten and Urs Schreiber** *Cohomological quantization*

  We discuss a general natural scheme for formalizing quantization via pull-push in twisted generalized cohomology. We show how this reproduces traditional geometric quantization in a "holographic"way as the boundary field theory of a 2d Poisson-Chern-Simons theory and generalizes it to a geometric quantization of Poisson manifolds that captures for instance the üniversal orbit methodöf Freed-Hopkins-Teleman. The recent preprint by Hopkins and Lurie turns out to use a special case of this construction. This is based on Nuiten's MSc thesis `http://ncatlab.org/schreiber/show/master+thesis+Nuiten` and on the notes `http://ncatlab.org/schreiber/show/Homotopy-type+semantics+for+quantization`.

- **Ulrich Pennig** *An introduction to I-spaces and a conjecture about K(ku)*

  We give an introduction to I-spaces and commutative I-monoids and show how they can be used to model the units of commutative symmetric ring spectra. As an application we discuss how our operator algebraic model for the units of K-theory fits into this picture. In the second half of the talk we will discuss a conjectural non-commutative geometric model for the algebraic K-theory of topological K-theory K(ku).

- **Michael Völkl** *The intrinsic eta-invariant and geometrizations*

  In this talk we will briefly review the homotopy theoretic content of Bunke's universal eta-invariant. Then we will discuss a generalization of this eta-invariant. For this we recall Chern-Weil theory and generalise it to so-called geometrizations. This allows us to define the new eta-invariant. We close with some easy examples.

- **Christian Voigt** *Clifford algebras, Fermions, and categorification*

  We describe a categorification of complex Clifford algebras arising from certain categories of twisted modules over fermionic vertex superalgebras. The product in our categorified Clifford algebra is closely related to fusion of surface defects in 3D topological field theory. The higher categorical structure arises from varying polarisations in the construction of fermionic Fock spaces. We will include some background from the theory of unitary vertex algebras, explain the connection of our setup with infinite Grassmannians, and discuss how the String 2-group fits naturally into the picture.

- **Konrad Waldorf** *String geometry vs. spin geometry on loop spaces*

  I will present some recent progress concerning the correspondence between string geometry on a mani-

fold and spin geometry on its free loop space. The ultimate goal of this correspondence is the definition of a Dirac operator on the loop space, and the computation of its index. While this ultimate goal is still far out of reach, some technical requirements for the definition of a Dirac operator are now better understood, most importantly the distinctive features of spin structures and spin connections on loop spaces.

- **Christoph Wockel** *Topological group cohomology and Chern-Weil Theory*

  We will explain how the topological group cohomology (equivalently, the Segal-Mitchison cohomology or the measurable cohomology) of a finite-dimensional Lie group with torus coefficients can be computed via Chern-Weil theory, the smooth group cohomology and the classifying space cohomology. In the end we will also discuss applications to bounded continuous cohomology and some open problems there.