1. **Mike Hopkins** *Lectures I and II: Homotopy theory in mathematical modeling.*

   I will discuss joint work with Dan Freed on applying Borel equivariant stable homotopy theory to classification problems in condensed matter physics. The classification problems concern invertible topological phases which correspond to spectra by the work of Galatius-Madsen-Tillmann and Weiss. The equivariance arises from needing to incorporate "reflection positivity" which is a Wick rotated version of unitarity.

   Lectures III and IV: Brauer groups in chromatic homotopy theory.

   These lectures will describe joint work with Lurie in which we determine the Brauer group of K(n)-local modules over Morava E-theory. The answer involves a generalization of the construction of Clifford algebras.

   Ben Antieau, *Preface to the theory of higher Azumaya algebras*

   I will survey the state of the art on the theory of higher Azumaya algebras and in particular on the expected properties of a three-fold delooping of the sphere spectrum. This talk will focus on outlining several foundational research directions whose development will be crucial to extending the analysis of derived Azumaya algebras la Antieau-Gepner and Toën to higher Azumaya algebras and connecting higher degree classes in tale cohomology to algebraic or categorical objects. At the same time, I will talk about joint work with David Gepner constructing non-trivial globally twisted forms of the theory of stable infinity-categories and applications to twisted secondary K-theory.

2. **Paul Balmer**, *Application of tensor-triangular geometry to equivariant stable homotopy theory*

   In joint work with Beren Sanders, we describe the spectrum of the equivariant stable homotopy category of a finite group. In this talk, I'll recall the structural results which allow us to study this category by induction on the order of the group and I'll discuss the methods of tensor-triangular geometry that are relevant for this problem.

3. **Agnès Beaudry**, *Gross-Hopkins duals of higher real K-theory spectra*

   In this talk, I will discuss the connection between K(n)-local dualities for higher real K-theory spectra and the non-triviality of the exotic K(n)-local Picard group. I will then describe a hands-on approach to computing the Gross-Hopkins duals of some higher real K-theories, accompanied with examples of such computations.

4. **Denis-Charles Cisinski** *Generic motivic base change formula*

   The generic base change formula was proved by Deligne in the setting of torsion etale sheaves over a scheme. We shall explain how to extend this formula to motives. The proof involves etale descent, as well as a description of constructible motives as rigid objects, locally for the constructible topology. The generic base change formula has a few nice consequences, for independence of l results. We shall outline one of them, which is the existence of filtrations of motives of affine varieties which compute etale cohomology uniformly in a suitable sense, and provide serious candidates for generators for the conjectural motivic t-structure.

5. **David Gepner,** *Elliptic (co)homology and duality*

We will begin with a gentle introduction to elliptic cohomology from the point of view of derived algebraic geometry, following Lurie et. al. We will then consider duality in this context; in particular, how it suggests a surprisingly close relationship between the equivariant elliptic homology and cohomology for various compact Lie groups.

6. **John Greenlees**, *The ubiquity of Gorenstein ring spectra*

   It seems that we now have the material and perspective to update Basss famous 1963 title. We have examples of Gorenstein ring spectra from manifolds, rings, schemes, Hochsild homology and group actions, with proofs from Morita theory and ascent, and there is a rich range of calculations to illustrate this. The talk will attempt to go beyond stamp collecting to highlight common themes. This comes out of joint work with Benson, Dwyer, Iyengar, Meier and Stojanoska.

7. **Kathryn Hess**, *Motivic homotopical Galois extensions*

   I will describe a formal framework for homotopical Galois extensions, motivated by the case of commutative ring spectra developed by Rognes, within which we can prove invariance of Galois extensions under extension of coefficients and the forward part of a Galois correspondence. I will indicate why both motivic spaces and motivic spectra fit into this framework, then provide explicit example of motivic homotopical Galois extensions, some of which have no classical analogue. (Joint work with Agnès Beaudry, Magdalena Kedziorek, Mona Merling, and Vesna Stojanoska.)

8. **Mike Hill**, *Mackey functors, Tambara functors, and Andre-Quillen Homology*

   I'll discuss several closely related points in equivariant algebra which describe certain deformations of Tambara functors. This gives a new way to interpret and exploit multiplicative structure present in a number of naturally occurring spectral sequences. I'll finish by describing some ongoing work with Basterra-Blumberg-Lawson-Mandell where we consider the topological versions of these constructions, and I'll describe yet another way the slice filtration arises naturally in this context.

9. **Lennart Meier**, *Towards the Brauer group of TMF*

   The Picard group of the spectrum TMF of topological modular forms has been determined by Mathew and Stojanoska about three years ago. A more subtle invariant is the Brauer group of a ring spectrum. Complete calculations are very difficult for non-connective ring spectra although some progress has been made in the case of real K-theory by Gepner and Lawson.

   To attack the Brauer group of TMF, it is first necessary to compute the Brauer group of the moduli stack of elliptic curves. We will report on joint work with Ben Antieau, which does exactly that over many base schemes. We will also discuss consequences of this computation for the Brauer group of TMF.

10. **Sarah Scherotzke**, *A categorification of the Chern character*

    In this talk, I will present joint work with Hoyois and Sibilla on a categorification of the Chern character, that refines earlier work of Toën and Vezzosi. If X is an algebraic stack, our categorified Chern character is a symmetric monoidal functor from a category of mixed noncommutative motives over X, to S^1-equivariant perfect complexes on the derived free loop stack LX. Finally, I will explain the Grothendieck-Riemann-Roch Theorem for categorified Chern characters.

11. **Thomas Schick**, *Geometric models for twisted K-homology*

    K-homology, the homology theory dual to K-theory, can be described in a number of quite distinct models. One of them is analytic, uses Kasparov's KK-theory, and is the home of index problems. Another one uses geometric cycles, going back to Baum and Douglas. A large part of index theory is concerned with the isomorphism between the geometric and the analytic model, and with Chern character transformations to (co)homology.

    In applications to string theory, and for certain index problems, twisted versions of K-theory and K-homology play an essential role. We will describe the general context, and then focus on two new models for twisted K-homology and their applications and relations. These are again based on geometric cycles in the spirit of Baum and Douglas. We will include in particular precise discussions of the different ways to define and work with twists (for us, classified by elements of the third integral cohomology group of the base space in question).

12. **Urs Schreiber**, *Super topological T-Duality*

    Twisted cohomology is maps in the tangent homotopy theory of parameterized spectra. Its rationalization has a Quillen-Sullivan-type model in terms of unbounded L_∞ algebras. Interesting examples appear by constructing iterated maximal higher central extensions of super L_∞ algebras, invariant with respect to automorphisms modulo R-symmetries a super-equivariant version of the Whitehead tower. Applied to the superpoint, this process turns out to discover all the twisted cohomology seen in string/M-theory, rationally, in particular twisted topological K-theory with 5-brane correction and with supersymmetric Chern-forms on 10d-superspace. Passage to cyclic L_∞ cohomology reflects double dimensional reduction of super p-branes. Applied to twisted K-theory on 10d superspace this yields two L_∞ cocycles on 9d superspace which both classify the tangent complex of super T-folds. There appears a super L_∞ equivalence between them exhibiting supersymmetric topological T-duality, rationally.

    These rational phenomena indicate that integrally the super-equivariant Whitehead tower of the superpoint is a mechanism for discovering interesting twisted super-differential cohomology theories. Possibly one should promote super L_∞ algebras to spectral super-schemes, namely spectral schemes over an even periodic ring spectrum, and then repeat the process.

13. **Vesna Stojanoska,** *Descent techniques for Picard spectra*

    The Picard spectrum is a finer invariant of an E_∞ ring spectrum and has better formal behavior than just the Picard group; for example, it satisfies descent. I will talk about techniques for computing Picard groups using descent for Picard spectra, including truncated logarithm maps and computation of differentials in the descent spectral sequence. All will be guided by examples, like K-theory, higher real K-theory, and topological modular forms. This is based on work with Heard and Mathew.

14. **Gabriele Vezzosi**, *Singularity categories and vanishing cycles*

    We will use non commutative and derived geometry in order to establish a precise link between dg-derived category of singularities of Landau-Ginzburg models and vanishing cohomology over an arbitrary henselian trait. We will then discuss trace formulas for dg-categories and an application to Bloch's conductor conjecture. The first part refers to joint work with A. Blanc, M. Robalo and B. Toën, while the last part to a joint work with B. Toen.

15. **Craig Westerland**, *Fox-Neuwirth/Fuks cells, quantum shuffle algebras, and Malles conjecture for function fields*

    In 2002, Malle formulated a conjecture regarding the distribution of number fields with specified Galois group. The conjecture is an enormous strengthening of the inverse Galois problem; it is known to hold for abelian Galois groups, but for very few non-abelian groups.

    We may reformulate Malles conjecture in the function field setting, where it becomes a question about the number of branched covers of the affine line (over a finite field) with specified Galois group. In joint work with Jordan Ellenberg and TriThang Tran, we have shown that the upper bound in Malles conjecture does hold in this setting.

    The techniques used involve a computation of the cohomology of the (complex points of the) Hurwitz moduli spaces of these branched covers. Surprisingly (at least to me), these cohomology computations can be rephrased in terms of the homological algebra of certain braided Hopf algebras arising in combinatorial representation theory and the classification of Hopf algebras. This relationship can be leveraged to provide the upper bound in Malles conjecture.