Abstracts

- **Serge Bouc: Representations of finite sets**
  This is a joint work in progress with Jacques Thvenaz, in which we develop the theory of correspondence functors, i.e. representations of the category of finite sets and correspondences. We consider various classical questions about this abelian category (projective objects, simple objects, global dimension, symmetry, finite length, duality...).

- **Ragnar-Olaf Buchweitz: A McKay Correspondence for Reflection Groups**
  Let G be a finite subgroup of $GL(n, K)$ for a field K whose characteristic does not divide the order of G. The group G then acts linearly on the polynomial ring S in n variables over K and one may form the corresponding twisted or skew group algebra $A = S^*G$. With e in A the idempotent corresponding to the trivial representation, consider the algebra A/AeA. If G is a finite subgroup of $SL(2, K)$, then it is known that A is Morita-equivalent to the preprojective algebra of an extended Dynkin diagram and A/AeA to the preprojective algebra of the Dynkin diagram itself. This can be seen as a formulation of the McKay correspondence for the Kleinian singularities.

  We want to establish an analogous result when G is a group generated by reflections. With D the coordinate ring of the discriminant of the group action on S, we show that A/AeA is maximal Cohen-Macaulay as a module over D and that it is of finite global dimension as a ring.

  The ring A/AeA is the endomorphism ring of a maximal Cohen-Macaulay module over the ring of the discriminant, namely of the direct image of the coordinate ring of the associated hyperplane arrangement.

  In this way one obtains a noncommutative resolution of singularities of that discriminant, a hypersurface that is a free divisor, thus, singular in codimension one.

- **Jesse Burke: Generalized Koszul duality applied to complete intersections rings**
  I will discuss a general form of Koszul duality, in the sense of Keller and Lefevre-Hasegawa, that in particular can be applied over arbitrary base rings. I'll illustrate this on complete intersection rings. If $R = Q/I$ is such a ring, e.g. the group ring of a finite abelian p-group in characteristic p, then we can replace R by a Koszul complex A on the generators of I. The generalized Koszul dual of the dg-algebra A over the base ring Q is a curved symmetric algebra (S, W), and in particular there is an equivalence between the derived categories of (S, W) and A. This generalizes the classical BGG duality, and gives an analogy between

homological algebra over a complete intersection and equivariant cohomology, via Goresky-Kottwitz-MacPherson. I'll show how to use this analogy to organize classical results on complete intersections and to prove new results on the relationship between Q and R free resolutions of an R-module M. I will also talk about some representation theoretic situations where a similar approach is applicable.

- **Jon Carlson: Thick subcategories of the relative stable category**
  Let G be a finite group and k an algebraically closed field of of characteristic $p > 0$. Let H be a collecction of p-subgroups of G. We investigate the relative stable category $\mathtt{stmod}_H(kG)$ of finitely generated modules modulo H-projective modules. Triangles in this category correspond to H-split sequences. Hence, compared to the ordinary stable category there are fewer triangles and more thick subcategories. In this talk we describe several methods to construct thick tensor ideal subcategories. This is work in progress.

- **Joseph Chuang: Derived localisation of algebras and modules**
  Localisation of commutative rings is straightforward and well understood. Noncommutative localisation is more subtle, in part because it is not an exact functor. Andrey Lazarev, Chris Braun and I have been studying the derived localisation $L_S(A)$ of a (not necessarily commutative) ring A at a subset S; it is a differential graded ring obtained from A by inverting the elements of S in a universal, homotopy invariant, way. In my talk I will describe our main theorem, that the derived category of $L_S(A)$ is a Bousfield localisation of the derived category of A, explain how it leads to a conceptual proof of the topological group completion theorem and hint at applications in representation theory.

- **Karin Erdmann: Nilpotent elements in Hochschild cohomology**
  There is a class of special biserial weakly symmetric algebras which have criminals, that is, modules with bounded projective resolutions but which are not Ω-periodic. We show that degree ≥ 2 elements in the Hochschild cohomology ring of such and algebra are nilpotent.

- **John Greenlees: Chromatic Gorenstein descent: homotopical Watanabe theorems**
  More or less directly from the definition, real K-theory KO is the conjugation fixed point spectrum of complex K-theory KU. Much more interestingly, KO is the homotopy fixed point spectrum of KU. The Gorenstein duality of KU is elementary and follows from that of the coefficient ring $KU_* = Z[v, v^{-1}]$, and a homotopical Watanabe theorem shows it follows for KO. Better still, this applies in the connective case, from which the periodic case follows. The obvious Gorenstein duality for ku (with coefficients $ku_* = Z[v]$) implies that for ko.

In fact there are a number of similar examples arising from topological modular and automorphic forms. The talk will explain the relationship between the connective and periodic forms, and describe how Benson-Carlson duality for group cohomology lets one prove homotopical Watanabe theorems. (Joint work with Vesna Stojanoska)

- **Ellen Henke: Subcentric linking systems**
  In the study of finite groups, many theorems and conjectures concern the structure of the p-local subgroups, i.e. the normalizers of the non-trivial p-subgroups for a fixed prime p. It turns out that many global properties of a finite group are determined locally. This is significant in modular representation theory, in the study of classifying spaces and cohomology of finite groups, and in the methods used for the classification of finite simple groups. The different approaches merge and complement each other in the study of saturated fusion systems and linking systems, which are categories modelling the p-local structure of finite groups. After surveying some parts of the theory, I will introduce a notion of a linking system which is slightly more general than the one commonly used in the literature and outline some advantages of this new concept.

- **Christopher Drupieski: Universal extension classes for algebraic supergroups**
  In 1997, Friedlander and Suslin introduced the category of strict polynomial functors and made various related cohomology calculations. Using these results, they exhibited certain "universal extension classes" for the general linear group, which enabled them to prove that the cohomology ring of a finite group scheme (equivalently, of a finite-dimensional cocommutative Hopf algebra) over a field is necessarily a finitely-generated algebra. In this talk I will discuss how analogous—though in some respects quite different—results can be obtained for finite supergroup schemes by considering the category of strict polynomial superfunctors recently defined by J. Axtell.

- **Jonathan Elmer: Symmetric powers of modular representations of elementary abelian p-groups**
  In the 1970s, Almkvist and Fossum gave formulae which describe completely the decomposition of symmetric powers of modular representations of cyclic groups into indecomposable summands. I will show how (in spite of the wildness of the representation type) some of their results can be generalized to representations of elementary abelian p-groups.

- **Srikanth Iyengar: Varieties for modules over commutative rings**
  There is a notion of a support variety associated to finitely generated modules over any commutative ring. This was introduced by Dave Jorgensen, based on work of Avramov, and Avramov and Buchweitz, on complete intersection rings.

The goal of my talk will be to explain this construction and its connections with work done in the modular representation theory of groups.

- **Bob Oliver: Automorphisms of fusion and linking systems of finite groups of Lie type**
  The fusion system of a finite group G with respect to a Sylow subgroup $S \in \mathrm{Syl}_p(G)$ is the category $\mathcal{F}_S(G)$ whose objects are the subgroups of S, and whose morphisms are the homomorphisms induced by conjugation in G. Set $\mathrm{Out}(S, \mathcal{F}_S(G)) = \mathrm{Aut}(S, \mathcal{F}_S(G))/\mathrm{Aut}_G(S)$, where $\mathrm{Aut}(S, \mathcal{F}_S(G))$ is the group of all automorphisms of S which preserve the fusion in G, and $\mathrm{Aut}_G(S)$ is the subgroup of those automorphisms induced by conjugation in G. There is a natural homomorphism from $\mathrm{Out}(G)$ to $\mathrm{Out}(S, \mathcal{F}_S(G))$, which in general need be neither injective nor surjective.

  In recent work with Carles Broto and Jesper Moeller, we looked at the special case of finite groups of Lie type. If G is such a group, of universal or adjoint type, and p is the defining characteristic, then with just two exceptions ($G \cong \mathrm{Sz}(2)$ or $G \cong \mathrm{SL}_3(2)$), $\mathrm{Out}(G) \cong \mathrm{Out}(S, \mathcal{F}_S(G))$, and both are isomorphic to a certain outer automorphism group $\mathrm{Out}_{\mathrm{typ}}(\mathcal{L}_S^c(G))$ of the centric linking system of G. When p is not equal to the defining characteristic and the Sylow p-subgroups of G are nonabelian, there is always some other finite group G^* of Lie type such that the natural homomorphism κ_{G^*} from $\mathrm{Out}(G^*)$ to $\mathrm{Out}_{\mathrm{typ}}(\mathcal{L}_{S^*}^c(G^*))$ is split surjective ($S^* \in \mathrm{Syl}_p(G^*)$). In particular, $\mathrm{Out}_{\mathrm{typ}}(\mathcal{L}_S^c(G))$ and $\mathrm{Out}(S, \mathcal{F}_S(G))$ can be described as quotient groups of $\mathrm{Out}(G^*)$. This question of the existence of G^* with the same fusion such that κ_{G^*} is split surjective comes up in the program of Aschbacher, and in the work of Lynd, when analyzing centralizers of involutions in fusion systems.

- **Sejong Park: Cohomology of fusion systems**
  We extend Mislin's theorem on isomorphism of cohomology and control of fusion to fusion systems. We also conjecture that Dwyer's sharpness result on subgroup homology decomposition of the classifying space of a finite group extends to arbitrary Mackey functors and arbitrary saturated fusion systems and confirm the conjecture for some exotic fusion systems.

- **Bregje Pauwels: Quasi-Galois extensions in tensor-triangulated categories**
  We consider separable ring objects in symmetric monoidal categories and investigate what it means for an extension of ring objects to be (quasi)-Galois. Reminiscent of field theory, we define splitting ring extensions and examine how they occur. We also establish a version of quasi-Galois-descent for ring objects.

  Specializing to tensor-triangulated categories, we study how extension-of-scalars along a quasi-Galois ring object affects the Balmer spectrum. We define what it means for a separable ring to have constant degree, which turns out to be a necessary and sufficient condition for the existence of a quasi-Galois closure. Finally, we compute degree, splitting rings and Galois groups for separable rings in the stable category of a finite group over a field.

- **Julia Pevtsova: Stratification and cosupport for finite group schemes**
  I will report on the recent progress on the question of classifying localising subcategories in the (big) stable module category of a finite group scheme. This is a joint work with Dave Benson, Srikanth B. Iyengar and Henning Krause.

- **Jeremy Rickard: Simple Modules and Stable Categories**
  A few years ago, Raphael Rouquier and I investigated how much information about an algebra could be recovered from the stable module category together with knowledge of which objects were the simple modules. I'll review this work and talk about some more recent developments and possible applications.

- **Anna Paula Santana: On Auslander- Reiten sequences for Borel-Schur algebras**
  I will construct Auslander- Reiten sequences for a large class of simple modules over Borel-Schur algebras. Partial information on the structure of the socles of Borel-Schur algebras will also be given. This is joint work with Karin Erdmann and Ivan Yudin.

- **Radu Stancu: Vanishing evaluations of biset functors**
  Let G be a finite group and k be a field. The double Burnside module $kB(G, H)$ is the Grothendieck group of isomorphism classes of (G, H)-bisets. When $G = H$, the module $kB(G, G)$ has an internal multiplication, making it into a ring: the double Burnside ring.

  It turns out that the simple $kB(G, G)$-modules are evaluations at G of simple biset functors. The evaluation of simple functors can be zero, giving rise to the phenomenon of vanishing evaluations of functors, which is very hard to detect in general. As recently remarked by Rognerud, the control of this phenomenon gives information on the global dimension of $kB(G, G)$.

  The purpose of this talk is to give criteria to decide whether an evaluation of a biset functor vanishes. Under some conditions on the poset of sections of G, isomorphic to a given subquotient H, a closed formula for the evaluation of the simple functor $S_{H,V}$ is given.

  The talk presents a joint work with Serge Bouc and Jacques Thèvenaz.

- **Antoine Touzé: Frobenius twists and the cohomology of algebraic groups**
  A well-known theorem of Cline Parshall Scott and Van der Kallen shows that the rational cohomology of reductive algebraic groups can be thought of as an approximation of the cohomology of finite groups of Lie type. To be made

effective, their theorem requires an understanding of the effect of Frobenius twists in rational cohomology.

In this talk, I will explain a solution to this problem, relying on the use of strict polynomial functors. I will also explain a connection between this solution and the cohomological finite generation property of reductive algebraic groups.