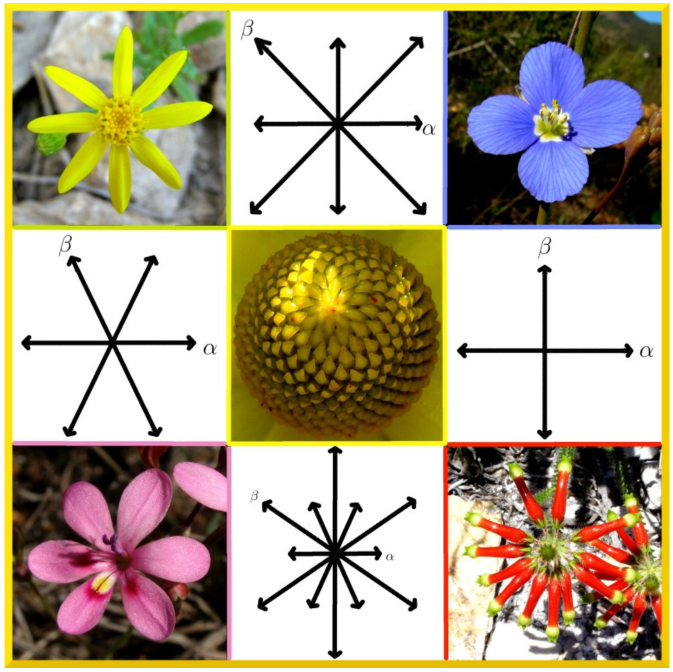

JOINT CONFERENCE ON
LIE GROUPS, LIE ALGEBRAS AND APPLICATIONS
28-29 NOVEMBER 2018

1. Schedule

Wednesday, November 28, 2018 (Location: ORT Braude College)

10:00-10:40 Arrival and coffee

10:40-10:50 Opening remarks and welcome

10:50-11:40 Uriya First, University of Haifa

Representations and transfer maps for the Brauer group

11:50-12:40 Alex Lubotzky, Hebrew University of Jerusalem

First order rigidity of high-rank arithmetic groups

12:40-14:00 Lunch

14:00-14:50 Dmitry Gourevitch, Weizmann Institute

Generalized and degenerate Whittaker quotients, and Fourier coefficients

14:50-15:10 Tea

15:10-16:00 Lior Rosenzweig, Afeka College

Galois groups of random elements in linear groups

Thursday, November 29, 2018 (Location: University of Haifa)

10-10:30 Arrival and coffee

10:30-11:20 Anna Melnikov, University of Haifa

Orbital varieties with a dense Borel orbit and smooth orbital varieties

11:30-12:20 Ivan Penkov, Jacobs University Bremen

Categories of $\mathfrak{sl}(\infty)$*-modules*

12:20-14:00 Lunch

14:00-14:50 Inna Entova-Aizenbud, Ben-Gurion University

Stabilization of representations of periplectic Lie superalgebras

14:50-15:10 Tea

15:10-16:00 Uri Bader, Weizmann Institute

How do linear transformations grow?

16:00-16:05 Closing remarks

2. Abstracts

Uri Bader, Weizmann Institute

Title: How do linear transformations grow?

Abstract: What happens when you're taking powers of a given linear transformation? What about random products? Here is an example of a random product: take a quiver representation and a random path on the underlying graph. Here is a geometric version: take a vector bundle over a manifold and parallel transport along a random curve. I will discuss an abstract theory of random products in Lie groups, based on these examples.

Joint work with Alex Furman.

Inna Entova-Aizenbud, Ben-Gurion University

Title: Stabilization of representations of periplectic Lie superalgebras

Abstract: Vector superspaces are $\mathbb{Z}/2\mathbb{Z}$-graded vector spaces with the Koszul sign rule, which means that a sign appears every time one swaps two "odd" vectors. This allows one to talk about Lie superalgebras, and to study their (super) representations. Given a vector superspace $V = \mathbb{C}^{n|n}$ with an odd (parity-changing) non-degenerate symmetric pairing $V \otimes V \to \mathbb{C}$, we can consider the periplectic Lie superalgebra $p(n)$ of endomorphisms preserving such a pairing. The category of (super) representations of $p(n)$ is a non-semisimple tensor category, and has interesting abelian structure. I will describe the construction of a certain limit of such categories when n goes to infinity, called the Deligne category $Rep(P)$. This limit reflects nice stabilization phenomena for representations of $p(n)$, but also has a nice universal property which I will explain in the talk.

Joint work with Vera Serganova.

Uriya First, University of Haifa

Title: Representations and transfer maps for the Brauer group

Abstract: I will explain how representation theory of group schemes can be applied to construct a "corestriction map" $Br(X) \to Br(Y)$ when $X \to Y$ is a finite flat ramified covering of algebraic varieties. The existence of the corestriction in the non-ramified case is a classical result of Ojanguren and Knus. Relevant definitions will be recalled during the talk.

Joint work with Asher Auel and Ben Williams.

Long abstract: Let H denote a contravariant functor from algebraic varieties to abelian groups, e.g. some cohomology theory $H(X) = H^i(X, ?)$. Given a finite morphism of varieties $f : X \to Y$, one always has an induced map $H(f) : H(Y) -> H(X)$. However, in many examples, under some assumptions on f, one can also construct a canonical "wrong way" map $Tr(f) : H(X) \to H(Y)$, often called the transfer or norm or corestriction relative to f. Numerous examples with abundant applications exist in the literature. For example, when $H(X) = H^i(X, G_m)$, there is a transfer map $Tr(f) : H(X) \to H(Y)$ defined for every finite flat morphism $f : X \to Y$.

The Brauer group is an important invariant of varieties which can viewed as a subfunctor of $H^2(-, G_m)$. It is well-known that when $f : X \to Y$ is a finite unramified covering, the transfer map $Tr(f) : H^2(X, G_m) \to H^2(Y, G_m)$ restricts to a map between the corresponding Brauer groups $Br(X) \to Br(Y)$, and moreover, admits an explicit description in terms of Azumaya algebras.

Few recent works have raised the need for a transfer map $Br(X) \to Br(Y)$, defined explicitly on the level of Azumaya algebras, when $f : X \to Y$ is ramified. I will discuss a forthcoming work with Asher Auel and Ben Williams where such transfer maps are constructed under some assumptions (e.g. when f has degree 2) and discuss their applications. In the heart of the construction lies the problem of whether certain group schemes admit a linear representation.

Dmitry Gourevitch, Weizmann Institute

Title: Generalized and degenerate Whittaker quotients, and Fourier coefficients

Abstract: The study of Whittaker models for representations of reductive groups over local and global fields has become a central tool in representation theory and the theory of automorphic forms. However, only generic representations have Whittaker models. In order to encompass other representations, one attaches a degenerate (or a generalized) Whittaker model WO, or a Fourier coefficient in the global case, to any nilpotent orbit. We will discuss the relation between different kinds of degenerate Whittaker models, and existence of these models. If time permits we will also discuss the Piatetsky-Shapiro – Shalika formula that expresses a cuspidal automorphic form on GL(n) through its Fourier coefficients, as well as some generalizations to other groups and to non-cuspidal forms, and applications in string theory.

Alex Lubotzky, Hebrew University

Title: First order rigidity of high-rank arithmetic groups

Abstract: The family of high rank arithmetic groups is a class of groups playing an important role in various areas of mathematics. It includes $SL(n, Z)$, for $n > 2$, $SL(n, Z[1/p])$ for $n > 1$, their finite index subgroups and many more. A number of remarkable results about them have been proven including; Mostow rigidity, Margulis Super rigidity and the Quasi-isometric rigidity.

We will talk about a new type of rigidity : "first order rigidity". Namely if G is such a non-uniform characteristic zero arithmetic group and H a finitely generated group which is elementary equivalent to it then H is isomorphic to G.

This stands in contrast with Zlil Sela's seminal work which implies that the free groups, surface groups and hyperbolic groups (many of which are low-rank arithmetic groups) have many non isomorphic finitely generated groups which are elementary equivalent to them.

Joint work with Nir Avni and Chen Meiri.

Anna Melnikov, University of Haifa

Title: Orbital varieties with a dense Borel orbit and smooth orbital varieties

Abstract: Let G be a complex reductive group and $\mathfrak{g}$ its Lie algebra. Let B be Borel subgroup of G, $\mathfrak{B} = Lie(B)$ and $\mathfrak{n}$ its nilradical. G acts on $\mathfrak{g}$ by adjoint action.The intersection of a nilpotent $G-$orbit with $\mathfrak{n}$ is reducible in general and in this case it is equidimesional. Its components are called orbital varieties. Although an orbital variety is stable under the action of B, in general it does not admit a dense $B-$orbit. As well, orbital varieties are not smooth in general. In this talk we show that, in the case where G is classical, every nilpotent $G-$orbit contains at least one orbital variety with a dense $B-$orbit and one smooth orbital variety.

The existence of a dense $B-$orbit does not provide in general that an orbital variety is a union of a finite number of $B-$orbits. Moreover, there are nilpotent orbits in which there are no orbital varieties with finite number of $B-$orbits. However, if G is classical then all the orbital varieties corresponding to a nilpotent orbit admit a dense $B-$orbits if and only if the intersection with the nilradical contains finite number of $B-$orbits. We provide the full classification of orbits with finite number of $B-$orbits in the intersection with $\mathfrak{n}$ for G classical. There is also an interesting duality orbital varieties with a dense B-orbit and smooth orbital varieties.

Joint work with Lucas Fresse.

Ivan Penkov, Jacobs University Bremen

Title: Categories of $\mathfrak{sl}(\infty)$-modules

Abstract: The infinite-dimensional Lie algebra $\mathfrak{sl}(\infty)$ has many natural categories of representations. In particular, there are several $\mathfrak{sl}(\infty)$-analogues of the category of finite-dimensional modules over $\mathfrak{sl}(n)$, as well as several analogues of the BGG category $\mathcal{O}$. In this talk I will try to present an atlas of such categories and discuss some applications.

Lior Rosenzweig, Afeka College

Title: Galois groups of random elements in linear groups

Abstract: Pick a finite set of invertible matrices over the set of complex numbers, and denote by $\Gamma(S)$ the finitely generated group generated by this set. Denote by F the smallest subfield of the complex numbers containing all entries of the matrices, and by G the Zariski closure of the finitely generated group generated by the set. In this lecture I will consider the following questions: Given an elements g in $\Gamma(S)$, what are the options for the Galois group of the splitting field of the characteristic polynomial of it over F. Is there a "generic result? How does the answer depend on the geometry of $G(S)$?

Joint work with Alex Lubotzky.