Amitsur Symposium 2014

Bar Ilan University, June 15th 2014

Abstracts (by order of lectures)

Efim Zelmanov (UCSD). *Graded Modules over Infinite Dimensional Algebras and Superalgebras.*
Abstract. We will discuss basic examples of Lie algebras and superalgebras of finite Gelfand-Kirillov dimension and their representations.

Aner Shalev (Hebrew U). *Invariable Generation of Finite and Infinite Groups.*
Abstract. We say that a group G is invariably generated by a subset S of G if G is generated by $\{s^{g(s)} : s \in S\}$ for every choice of conjugating elements $g(s), s \in S$.

We show that every finite simple group is invariably generated by two elements. We also show that a finitely generated linear group is invariably generated by finitely many elements if and only if it is virtually solvable.

Related results for profinite groups and permutation groups, as well as open problems, will also be discussed. This is a joint work with Bill Kantor and Alex Lubotzky.

Murray Schacher (UCLA). *Finite Subgroups of Quaternion Algebras.*
Abstract. We consider quaternion algebras that have several maximal orders, and study how finite groups may be distributed among them. Joint work with Mark Lewis.

David Saltman (U Texas). *Subfields of Division Algebras.*

Toma Albu (Simion Stoilow Inst. of Math. of the Romanian Academy). *Relativization, Absolutization, and Latticization in Module Theory.*
Abstract. The aim of this talk is to illustrate a **general strategy** which consists on putting a *module-theoretical* result into a *latticial frame* (we call it *latticization*), in order to translate that result to *Grothendieck categories* (we call it **absolutization**) and *module categories* equipped with *hereditary torsion theories* (we call it *relativization*). The renowned *Hopkins-Levitzki Theorem* and *Osofsky-Smith Theorem* from Ring and Module Theory are among the most relevant illustrations of the power of this strategy.

Uriya First (Hebrew U). *Representations and Spectrum in Simplicial Complexes.*
Abstract. Ramanujan graphs are k-regular graphs admitting optimal connectivity

properties (namely, optimal expanders). Infinite families of such graphs were first constructed by Lubotzky, Phillips and Sarnak in 1988 by relating the spectrum of a graph with certain representations of $\mathrm{GL}_2(\mathbb{Q}_p)$. These ideas were generalized to simplical complexes by Lubotzky, Samuels and Vishne in 2005.

We will present a further generalization, showing that there is a natural way to relate spectral properties of simplicial complexes with certain representations of groups acting on their universal covers. Several results of this connection will be discussed. In particular, we strengthen the spectral properties of the complexes constructed by L-S-V, showing that they have "optimal spectrum in dimension > 0".

Michael Schein (Bar Ilan). *Some Combinatorial Methods in Subgroup Counting.*

Abstract. Given a finitely generated group G, we consider its normal subgroup zeta function, namely the Dirichlet generating series obtained from the sequence $(a_n(G))$, where $a_n(G)$ is the number of normal subgroups of G of index n. Many of the results in this area have been obtained through p-adic integration. We present a purely combinatorial approach that allows us to compute the local zeta factors of the Heisenberg groups over the ring of integers of a number field; remarkably, all the local factors have a functional equation. We also present results for some non-nilpotent groups that can be obtained by the same method. This is joint work with Christopher Voll.

Lance Small (UCSD). *Some old and new Problems in Ring Theory.*

Abstract. We will discuss some old—even ancient— problems in PI theory concerning, for example, embeddings into matrices over commutative rings. Other more recent questions concerning enveloping algebras, etc. will also be mentioned.