Ehud Meir, Algebraic structures and descent by symmetric monoidal categories and Deligne's Theory.

Let W be a finite dimensional algebraic structure over a field K of characteristic zero (e.g. an algebra, a Hopf algebra, a comodule algebra).

In this talk I will explain how to construct a symmetric monoidal category C_W which is a complete invariant of W. This category will be a form of Rep_K-G, where G is the algebraic group of automorphisms of W, over some subfield K_0 of K.

By using the theory of Deligne on symmetric monoidal categories I will show how one can use this category to construct a generic form of W, and to study scalar invariants of W.

I will give some examples of this category when W is of the form $^{\alpha}H$ where H is a group algebra or Sweedler or Taft Hopf algebra, and α is some two cocycle. If time permits, I will also explain how can one use this category to study embeddings of projective varieties in projective spaces.

Lior Bary-Soroker, Sums of two squares of polynomials and the hyperoctahedral group.

Consider the set R of integers that are representable as a sum of two squares. A classical theorem of Landau gives the asymptotic density of R in the interval $(1,x)$: it is asymptotically equal to a constant over the square root of $\log x$. Although R was extensively studied, there is an abundant of open problems, for example, What is the density of R in short intervals of length x^{ϵ} around x? Is it the same as in the long interval $(1,x)$?

The talk is devoted to function field analogues of R. We will present one naive and one more educated analogues. We will also discuss Landau's theorem and the recent resolution of some of the open problems in this setting. A key step in this resolution is a new calculation of a Galois group of a polynomial $F(x^2)$, where the 3 lowest term coefficients of F are variables and the rest are arbitrary.

Michael Larsen, Linear groups (third talk in CMS series).

A linear group is any group of invertible matrices over a field. Many—perhaps one could even say most—interesting groups can in fact be realized as linear groups, and this is often a useful thing to do, since there are powerful geometric tools for studying matrices.

In my first two talks, I will discuss the structure theory of linear groups. A key role is played by linear algebraic groups, which are defined by polynomial equations in the matrix entries. I will discuss a wide range of results which assert, in one way or another, that well behaved groups are not too far from being linear algebraic. These include Jordan’s theorem and its extensions by Nori, Pink, and myself; the Peter-Weyl theorem; Hilbert’s Fifth Problem; the Chevalley-Pink Theorem; and the classification of finite simple groups. In my third talk, I will try to illustrate how these structural results, and more generally, the algebro-geometric point of view on group theory, can be used in applications to finite and finitely generated groups.

Mike Zieve, Near-injectivity of polynomial functions on number fields.

I will show that, for any polynomial $f(x)\in\mathbb{Q}[x]$, the function $\mathbb{Q}\to\mathbb{Q}$ induced by $c\mapsto f(c)$ is (≤ 6)-to-1 over all but finitely many values. I will also explain why an analogue of this result for rational functions would comprise a vast generalization of Mazur's theorem on rational torsion on elliptic curves, and I will present the progress that has been made towards proving such an analogue.