**Super-strong approximation and the group sieve method** — Emmanuel Breuillard

My lectures will focus on expanders and the super-strong approximation theorem: congruence quotients of thin subgroups of semisimple Lie groups are finite groups of Lie type exhibiting a uniform spectral gap. I will describe the ingredients in the proof, the Bourgain-Gamburd method, the classification of approximate subgroups, and a number of techniques from the theory of random matrix products. I will also describe some applications to sieving in a non-commutative context.

**Thin Monodromy Groups** — Elena Fuchs

Abstract: In recent years, it has become interesting from a number-theoretic point of view to be able to determine whether a finitely generated subgroup of GL_n(Z) is a so-called thin group. In general, little is known as to how to approach this question. In this talk we discuss this question in the case of hypergeometric monodromy groups, which were studied in detail by Beukers and Heckman in 1989. We will convey what is known, explain some of the difficulties in answering the thinness question, and show how one can successfully answer it in many cases where the group in question acts on hyperbolic space. This work is joint with Meiri and Sarnak.

**An Improvement To Zaremba’s Conjecture** — Shinnyih Huang

We introduce Zaremba’s Conjecture, with recent progress and application. Specifically, we will go over Bourgain and Kontorovich’s effective density one theorem, and Frolenkov and Kan’s positive density theorem. Finally, we discuss how to combine the major arcs analysis and the minor arcs analysis in both papers to obtain a refined effective density one statement.

**Applications of Thin Orbits** — Alex Kontorovich

We will discuss various natural problems in arithmetic and dynamics, which at their core are questions about thin groups and orbits.
**Dynamics and Kleinian Groups — Hee Oh**

Kleinian groups are discrete subgroups of $\text{PSL}_2(\mathbb{C})$ or more generally, a discrete subgroup of a rank one simple Lie group $G$. My aim is to discuss various counting and equidistribution problems for geometric objects which arise as an orbit of a Kleinian group, and measure classification problems on the quotient of $G$ by a Kleinian group. Specific topics will include
1. counting closed geodesics with holonomies;
2. asymptotic distribution of a non-closed horosphere as well as a closed horosphere of large volume;
3. the joining classification for horospherical group action.

**PRECONFERENCE COLLOQUIUM/PUBLIC LECTURE**

**On Number Theory and the Circle Packings of Apollonius — Peter Sarnak**

There has been much progress in recent years on questions concerning the diophantine properties of integral Apollonian Packings. We review the basic properties of such packings, the number theory associated with them and some of the recent advances. We highlight the theory of "thin matrix groups" which is one of the novel tools that has allowed for these developments.

**Thin Matrix Groups — Peter Sarnak**

The general Ramanujan Conjectures for congruence subgroups of arithmetic groups and approximations that have been proven towards them, are central to many diophantine applications. Recently analogous results have been established for quite general subgroups of $\text{GL}(n,\mathbb{Z})$ called "thin groups". We will describe some of these and review some of their applications(mainly diophantine) as well as the ubiquity of thin groups.

**Mixing of homogeneous frame flow for rank one locally symmetric spaces — Dale Winter**
We’ll discuss ergodic properties of frame flow on rank one symmetric spaces. In particular we’ll be interested in lifting the mixing property of the Bowen-Margulis-Sullivan measures from the tangent bundle up to the appropriate frame bundle. We’ll also describe some consequences of the mixing result for measure classification and for the decay of matrix coefficients.

Several Arithmetic Properties of the Integral Apollonian-3 Circle Packings
— Xin Zhang

In this talk I will discuss what we know about the integers arising as curvatures from Apollonian-3 circle packings. I will talk about the reduction theorem, the symmetry group, and a density one theorem towards the local-global conjecture.