Workshop in Algebra and Geometry
10–11 **September, Bern**

Monday September 10

10h-10h45 Matthias LEUENBERGER

Automorphisms of Danielewski surfaces

First we go through some old results about the algebraic and holomorphic automorphism group of $\mathbb{C}^n$. Then we will see which of these results generalize to the class of surfaces $\{xy = p(z)\}$ known as Danielewski surfaces.

11h-11h45 Matey MATEEV

On the h-vector of points in the projective plane

Given two h-vectors h and h, we study which are the possible h-vectors for the union of two disjoint sets of points in $\mathbb{P}^2$, respectively associated to h and h and how they can be constructed.

14h-14h45 Sebatian BAADER

Linear groups, Lie groups, Mapping class groups

We will discuss two exciting results about (non-)linearity of groups: a classic one on Lie groups due to Birkhoff, and a recent one on mapping class groups due to Korkmaz.

15h-15h45 Aglaia MYROPOLSKA

Schreier graphs of AutFn

For a given finitely generated group Schreier graph is defined as a generalization of its Cayley graph. One can deduce algebraic properties of group knowing geometric properties of its graph and vice-versa. Using as finitely generated group the automorphism group of the free group, we discuss its algebraic properties and geometric consequences for its Schreier graph.

16h30-17h15 Pierre-Nicolas JOLISSAINT

Embeddings of groups into Hilbert spaces: Motivations and examples

In this talk, I will introduce two different kinds of embeddings from a metric space into a Hilbert space. The first one, called coarse embedding, allows us to compare the large scale geometry of infinite metric spaces. On the other hand, bi-Lipschitz embeddings are more suitable to treat questions concerning finite metric spaces. After giving the basic definitions, I will spend some time on the motivations of the study of such embeddings and I would like to show how these two notions interplay with each other. During the second part of the talk, I will focus on the study of bi-Lipschitz embeddings of finite graphs into a separable Hilbert space $\mathcal{H}$ and give a method which provides a way of quantifying how distorted the image of a finite graph by a bi-Lipschitz embedding into $\mathcal{H}$ can be. I will finish by giving some examples, including the families of bounded-degree expanders. This is joint work with Alain Valette.

17h30-18h15 Maike MASSIERER

Attacking trace zero cryptosystems

Public key cryptosystems require a function that is easy to evaluate (encryption) but hard to invert (decryption), unless one knows a certain secret (the secret key). One such function is based on scalar multiplication of a point on an elliptic curve defined over a finite field. The inversion of this map is known as the discrete logarithm problem. We study the hardness of this problem, and thus of attacking such cryptosystems, in the so-called trace zero subgroup of an elliptic curve. We explain the algebraic, geometric and computational tools involved.

Tuesday September 11

10h-10h45 Immanuel STAMPFLI

Automorphisms of $\mathbb{C}^3$ that commute with a $\mathbb{C}^+$-action

The group $Aut(\mathbb{C}^n)$ of polynomial automorphisms of the affine space $\mathbb{C}^n$ is an object of great interest in affine algebraic geometry. A lot is known in dimension $n = 2$ due to a certain decomposition of $Aut(\mathbb{C}^2)$ as an amalgamated product, but little is still known in dimension $n = 3$. A subproblem is understanding the subset of unipotent automorphisms of $Aut(\mathbb{C}^3)$. In this talk we describe the group of all polynomial automorphisms of $\mathbb{C}^3$ that commute with a unipotent automorphism of $\mathbb{C}^3$, i.e. the automorphisms that commute with an algebraic action of the additive group $\mathbb{C}^+$ on $\mathbb{C}^3$. As an application, we give a sketch of the proof of the following result: Let $\theta : Aut(\mathbb{C}^3) \to Aut(\mathbb{C}^3)$ be an automorphism of groups. If θ is the identity on the subgroup of tame automorphisms of $Aut(\mathbb{C}^3)$, then θ fixes the Nagata automorphism.

11h-11h45 Pierre DE LA HARPE

Locally compact groups, compact generation and compact presentation.

14h-14h45 Peter FELLER

Adjacency of torus knot singularities

We explore connections between an algebraic notion of adjacency for singularities of curves in C^2 and a geometric notion of adjacency for smooth knots in S^3.

15h-15h45 Alexander KOLPAKOV

Dimension constraints for hyperbolic Coxeter polytopes

Let P be a Coxeter polytope in the hyperbolic space $\mathbb{H}^n$. Let us state certain condition that P should satisfy, which are up to our choice, e.g. P is finite-volume, or ideal, or compact, or right-angled, or it satisfies a reasonable combination of these conditions. What is know then about the dimension n of the ambient space $\mathbb{H}^n$ is that it is bounded from above. In this talk I will discuss the corresponding results and present my own research concerning the case of ideal right-angled polyhedra in $\mathbb{H}^n$, $n \geq 4$.

16h-16h45 Alberto RAVAGNI

On the parameters of non-linear binary codes of small defect