EINLADUNG
Mathematisches Kolloquium
und
Junior Kolloquium

Karel Dekimpe *(University of Leuven)*
Mittwoch, 25. Mai 2016

15.00 Uhr – Junior Kolloquium:

"The nilpotent groups to Lie algebras: linearizing group theory"

15.45 Uhr – Kaffeepause

16.15 Uhr – Vortrag:
"A journey into Lie algebra structures arising from geometry"

Anschließend vinum cum pane

Ort: Fakultät für Mathematik, Oskar Morgenstern-Platz 1,
Sky Lounge

Junior Kolloquium:
"The nilpotent groups to Lie algebras: linearizing group theory"

Abstract

Nilpotent groups are a generalization of abelian groups. In this talk I will focus on the so-called finitely generated and torsion free nilpotent groups G, which should be seen as generalizing the free abelian groups $\mathbb{Z}^k$. A well known example of such a group is the discrete Heisenberg group

$$H = \left\{ \begin{pmatrix} 1 & x & z \\ 0 & 1 & y \\ 0 & 0 & 1 \end{pmatrix} \mid x, y, z \in \mathbb{Z} \right\}.$$

We will show how one can associate to these groups a Lie algebra $\mathfrak{g}$, which consist of a vector space and a bilinear product, called the Lie bracket, $[\cdot,\cdot] : \mathfrak{g} \times \mathfrak{g} \to \mathfrak{g}$, which is antisymmetric and satisfies the so-called Jacobi-identity: $[X,[Y,Z]] + [Y,[Z,X]] + [Z,[X,Y]] = 0$. There is a very strong relationship between the (auto)morphisms of the group G and the (auto)morphisms of the Lie algebra $\mathfrak{g}$. As the latter ones consist of linear maps (preserving the Lie bracket), these are much easier to deal with than automorphisms on the group level. We will illustrate the use of this with examples.

Vortrag:
"A journey into Lie algebra structures arising from geometry"

Abstract:
In this colloquium talk I will show how certain problems in geometry can be translated, using Lie groups, into a problem on Lie algebras. Since the latter have a linear structure, namely they consist of a vector space equipped with a bilinear product, it is obvious that this new problem is easier to deal with than the original one. Moreover, in many cases, it turns out that the Lie algebra problem we end up with, is not only interesting from the geometrical point of view, but is also of interest on its own and has already popped up in seemingly independent contexts. I will present a short overview on what prof. D. Burde and I have been working on in this area over the last 10 years and more.

Dietrich Burde
Harald Rindler