SSL-Darmstadt Programm (Stand 19.7.2012):

Freitag, 5.10.2012

9:00-9:45 Jimmie Lawson (Baton Rouge): The Unfolding Story of the Matrix Geometric Mean

Abstract: The geometric mean of two positive numbers can be generalized to positive definite matrices via several natural approaches, all uniquely yielding the same result. However, generalizations to the multivariable case for more than two variables have turned out to be much more difficult and complicated. Nonetheless the recent past has witnessed a number of major breakthroughs. The purpose of this talk is to present in an accessible and coherent manner highlights of this unfolding story.

Coffee break

10:15-11:00 Johannes Hübschmann (Lille): A step towards Lie's dream

Abstract. The origins of Lie theory are well known: Galois theory had clarified the relationship between the solutions of polynomial equations and their symmetries. Lie had attended lectures by Sylow on Galois theory and came up with the idea to develop a similar theory for differential equations and their symmetries which he and coworkers then successfully built. At a certain stage, they noticed that „transformations groups“ with finite-dimensional Lie algebra was a very tractable area. This resulted in a brilliant and complete theory, that of Lie groups, but the connection with the origins gets somewhat lost.

The idea of a Galois theory for differential equations prompted as well what has come to be nowadays known as differential Galois theory. We will present a kind of generalized gauge theory that encompasses ordinary Galois extensions (of commutative rings), differential Galois theory, and principal bundles (in differential geometry and algebraic geometry). The new notion that we introduce for that purpose is that of principal comorphism of Lie-Rinehart algebras. This approach can be seen as an attempt to go back to the origins of Lie theory.

11:15-12:00 Karl-Heinrich Hofmann: Homogeneous spaces of compact groups

Abstract. Is it true that a connected and locally contractible space on which a compact group acts transitively is a manifold? 50 years of advances and retreats.

Dinner

15.15 Uhr
Begrüßung durch den Dekan des Fachbereichs Mathematik Burkhard Kümmerer

15:30 Uhr
Klaus Keimel (Darmstadt): Begegnungen mit Karl Heinrich Hofmann und seiner Mathematik

16.45 Uhr
Günter Ziegler (Berlin): Das ist doch keine Kunst - Mathematik-Bilder von Leonardo bis Hofmann

Samstag, 6.10.2012

9:00-9:45 Konrad Schmüdgen: Induced representations of $\ast$-algebras in Hilbert space

Abstract:
Let B be a unital $\ast$-subalgebra of a $\ast$-algebra A and let p be a conditional expectation of A onto B. We define and study induced $\ast$-representations of A in Hilbert space which are induced from $\ast$-representations of B. Under some assumptions the complete Mackey analysius is developed in this setting and well-behaved representations are defined and characterized. This theory applies to the Weyl algebra, to enveloping algebras of $su(2)$ and $su(1,1)$, to the Virasora algebra, and to many quantum algebras.

10:15-11:00 Bernhard Krötz: Ext-groups of Harish-Chandra modules

Abstract (work in progress with Eric Opdam): We show that the algebraic Ext-groups of Harish-Chandra modules are identical to the Ext-groups of their smooth completions in the topological category of Frechet modules of the Schwartz algebra of the underlying group. With the help of this fact we can show that the Euler-Poincare pairing of Harish-Chandra modules is identical to the elliptic character pairing.

11:15-12:00 Helge Glöckner: Regularity properties of infinite-dimensional Lie groups

Abstract: Among all Lie groups modelled on locally convex spaces, John Milnor singled out a class of well-behaved groups (the regular Lie groups). A Lie group G is regular if each smooth path in its Lie algebra **g** arises as the logarithmic derivative of a smooth path γ in G starting in e, and the endpoint $\gamma(1)$ depends smoothly on γ.

The modelling space of a regular Lie group is necessarily Mackey-complete (Neeb). But it is unknown whether every Lie group with Mackey-complete modelling space is regular. Thus, regularity needs to be proved by hand for particular Lie groups of interest, using individual arguments.

In the talk, I'll explain how regularity can be established for many of the main classes of infinite-dimensional Lie groups, notably for prime examples of Lie groups which are a union G of an ascending chain of Lie groups G1 , G2, … . The proofs naturally lead to the consideration of strengthened regularity properties (like Ck-regularity). Also Cr,s-maps on products (with different degrees of differentiability
in the two factors) play an important role. The following facts illustrate the usefulness of regularity:

(a) If G and H are simply connected regular Lie groups with isomorphic Lie algebras, then $G \approx H$ (Milnor).

(b) Each abelian, connected regular Lie group is isomorphic to E/Γ for some locally convex space E and discrete additive subgroup Γ of E (cf. Michor and Teichmann).

Both (a) and (b) fail for suitable examples of non-regular Lie groups (modelled on non-Mackey-complete spaces). I'll also describe concrete natural examples of Lie groups which are not yet known to be regular.

Lunch

14:15-15:00
Karlheinz Spindler: On θ-congruent numbers, rational squares in arithmetic progressions, concordant forms and elliptic curves

Abstract: The correspondence between right triangles with rational sides, triplets of rational squares in arithmetic succession, integral solutions of certain quadratic forms and rational points on certain elliptic curves is well known and was used by Tunnell to solve the long-standing congruent number problem (modulo a weak rsion of the Birch-Swinnerton-Dyer conjecture). Presenting joint work with Erich Selder, it is shown how this

correspondence can be extended to the generalized notions of rational θ-triangles, rational squares occurring in arithmetic progressions and concordant forms. In our approach we establish one-to-one mappings to rational points on certain elliptic curves and examine in detail the role of solutions of the θ-congruent number problem and the concordant form problem associated with nontrivial torsion points on the corresponding elliptic curves. This approach allows us to combine and extend some disjoint results obtained by a number of authors, to correct some erroneous statements in the literature and to answer some hitherto open questions.

Coffee break

15:15-16:00 Alexander Schmeding: The Lie group structure of the diffeomorphism group of a (reduced) orbifold

Abstract: We consider the diffeomorphism group of a paracompact, non-compact smooth reduced orbifold. Our main result is the construction of an infinite dimensional Lie-group structure on the diffeomorphism group. Here orbifold morphisms are understood as maps in the sense of [1]. In the talk we sketch the construction and its main ingredients.
[1] Pohl, A.D.: The category of reduced orbifolds. arXiv:1001.0668v3, 12/2010
(http://arxiv.org/pdf/1001.0668v3)

16:15-17:00 Karl Strambach: Imprimitive transformation groups with prescribed action on the blocks

Abstract: Die Klasse der scharf zweifach transitiven Gruppen verallgemeinert in natürlicher Weise die Klasse der affinen Abbildungen einer Geraden über einem Körper; sie wird seit der Klassifikation der endlichen scharf zweifach transitiven Gruppen durch Zassenhaus 1936 intensiv studiert. Im Vortrag will ich die Klasse der (2, 2)-Transformationsgruppen vorstellen, die in ähnlicher Weise die Klasse der affinen Abbildungen einer Geraden über einem Ring der dualen Zahlen verallgemeinern. Die (2, 2)-Transformationsgruppen sind imprimitiv; daher ist ihre Axiomatik natürlich komplizierter als die von scharf zweifach transitiven Gruppen, die primitiv sind. Da eine (2, 2)-Transformationsgruppe auf der Menge der Blöcke scharf zweifach transitiv wirkt, ist für eine Klassifikation von (2, 2)-Transformationsgruppen die Kenntnis der scharf zweifach transitiven Gruppen unentbehrlich. So wie die Fastkörper bei Zassenhaus spielen bei Untersuchungen von (2, 2)-Transformationsgruppen die paradualen Fastringe eine entscheidende Rolle.