Mathematical Physics in Jena 2014 PhD-Symposium:
Organized by Markus Lange and Marcel Schmidt (both Jena)

The PhD-Symposium will take place in Hoersaal 250, Unihauptgebaeude, Fuerstengraben 1 (same room as the other talks).

It will be in the afternoon session on Thursday, Sept. 18.

Program:

14:00 – 14:40	*Florentin Münch*
14:45 – 15:25	*Martin Gebert*
15:30 – 16:10	*Christian Rose*

Titles and abstracts can be found on the next page.

We still have free slots, so if you have something you would like to present, let one of the organizers know.

Martin Gebert

“The exact asymptotics of the orthogonality catastrophe in Fermi gases for δ-perturbations”

Abstract:
We prove the exact asymptotics of the ground-state overlap of two non-interacting Fermi gases in the thermodynamic limit in the special case of a zero-range perturbation. More precisely, in 3-dimensional Euclidean space we restrict the pair of Schrödinger operators H := $-\Delta$ and $H' \coloneqq -\Delta + \delta_\alpha$ to the ball B_L of radius L about the origin. We show that the square of the scalar product of the corresponding non-interacting N-particle fermionic ground-states admits the asymptotic behaviour $L^{\frac{-\delta^2(\sqrt{E})}{\pi^2}+o(1)}$ in the thermodynamic limit, $L, N \to \infty, \frac{N}{|B_L|} \to \rho(E)$ Here $\delta_\alpha$denotes a repulsive Dirac δ-interaction at the origin, $\rho(E)$ the integrated density of states of the operator H and $\delta(\sqrt{E})$ the scattering phase shift at the Fermi energy E > 0. This result confirms the asymptotics Anderson claimed in [And67]. It also supports that the upper bound on the ground-state overlap deduced for more general pairs of Schrödinger operators in [GKMO14] coincides with the exact asymptotics.
References:
[And67] P. W. Anderson, Ground state of a magnetic impurity in a metal, Phys. Rev. 164, 352–359 (1967).
[GKMO14] M. Gebert, H. Küttler, P. Müller, and P. Otte, The exponent in the orthogonality catastrophe for Fermi gases, arXiv:1407.2512 (2014).

Florentin Münch

“Li-Yau inequalities on finite graphs”

Abstract:
We prove the logarithmic Li-Yau inequality on finite graphs. The only assumption is a variation of the curvature-dimension condition. To establish this condition, we introduce a non-linear variant of the calculus of Bakry and Émery. We show that in the case of manifolds, the varied calculus and the varied curvature-dimension condition coincide with the common ones. In this sense, the new curvature-dimension condition helps to gain a more general conception of curvature on graphs and on manifolds. We show that Abelian Cayley graphs have a non-negative curvature in this conception. Moreover, many other non-logarithmic Li-Yau type gradient estimates can be obtained by using the new Bakry-Émery type calculus.

Christian Rose

“Positive Schrödingeroperatoren auf Mannigfaltigkeiten – Die Rolle der Geometrie“