RENORMALIZATION AND SCALING (SYRS)*

gemeinsam veranstaltet von den Fachverbänden
Dynamik und Statistische Physik (DY),
Dielektrische Festkörper (DF),
Chemische Physik und Polymerphysik (CPP) und
Tiefe Temperaturen (TT)

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ÜBERSICHT DER HAUPTVORTRÄGE UND FACHSITZUNGEN

(Hörsaal TU H3010)

Hauptvorträge

SYRS 1.1	Sa	08:30	(TU H3010)	**Anisotropic Scale Invariance in Systems with Boundaries: Bulk and Surface Critical Behavior at Lifshitz Points**, Hans Werner Diehl
SYRS 1.2	Sa	09:00	(TU H3010)	**Stacked triangular antiferromagnets: critical and multicritical behavior**, Andrea Pelissetto, Ettore Vicari
SYRS 1.3	Sa	09:30	(TU H3010)	**Transport properties of percolation clusters**, Olaf Stenull
SYRS 2.1	Sa	10:30	(TU H3010)	**Reaction-diffusion processes: the non perturbative renormalization group approach**, Bertrand Delamotte, Leonie Canet
SYRS 2.2	Sa	11:00	(TU H3010)	**Functional renormalization group methods for interacting Fermi systems**, Walter Metzner
SYRS 2.3	Sa	11:30	(TU H3010)	**Functional Renormalization for Disordered Systems: The Way out of Dimensional Reduction**, Kay J. Wiese
SYRS 2.4	Sa	12:00	(TU H3010)	**Universality classes in coarsening**, Benjamin Vollmayr-Lee

Fachsitzungen

SYRS 1	**SYRS I**	Sa 08:30–10:00	TU H3010	SYRS 1.1–1.3
SYRS 2	**SYRS II**	Sa 10:30–12:30	TU H3010	SYRS 2.1–2.4
DY 23	**Contributed Talks I**	Sa 14:00–15:30	TU H3010	DY 23.1–23.6
DY 25	**Contributed Talks II**	Sa 16:00–17:00	TU H3010	DY 25.1–25.4
DY 34	**Poster**	Mo 15:30–18:00	Poster TU D	DY 34.114–34.118

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Fachsitzungen

– Hauptvorträge –

SYRS 1 SYRS I

Zeit: Samstag 08:30–10:00 Raum: TU H3010

Hauptvortrag SYRS 1.1 Sa 08:30 TU H3010

Anisotropic Scale Invariance in Systems with Boundaries: Bulk and Surface Critical Behavior at Lifshitz Points — •Hans Werner Diehl — Fachbereich Physik, Universität Duisburg-Essen, Campus Essen, D-45117 Essen, Germany

A wealth of physical phenomena, both at thermal equilibrium and away from it, exhibit *anisotropic* scale invariance: distances along one or several principal axes scale as powers of the distances along the remaining ones. This anisotropy makes such phenomena already in *bulk* systems much richer and more challenging to study. All the more so, this applies to *boundary* critical phenomena in anisotropic scale invariant systems. For those, the orientation of a boundary plane matters in an essential way, since the distance from it scales differently, depending on how it is oriented. Critical phenomena at bulk Lifshitz points—multicritical points, at which a disordered phase meets both a homogeneous ordered as well as a modulated ordered phase— provide important examples of such systems. Their bulk universality classes are described by natural generalizations of the standard ϕ^4 n-vector model, whose systematic analysis via modern field-theoretic renormalization group methods has been a long-standing challenge ever since their introduction in the 1970s. A survey of recent progress made in this direction for the bulk case is presented. The construction of semi-infinite minimal ϕ^4 models representing the universality classes of the various surface transitions at m-axial bulk Lifshitz points for distinct types of surface orientations is explained. Results obtained mostly via dimensionality expansions are given and compared with available Monte Carlo and other results.

Hauptvortrag SYRS 1.2 Sa 09:00 TU H3010

Stacked triangular antiferromagnets: critical and multicritical behavior — •Andrea Pelissetto[1] and Ettore Vicari[2] — [1]University of Roma La Sapienza — [2]Pisa University

We review our present understanding of the critical behavior of stacked triangular antiferromagnets. We review the latest numerical and field-theoretical results on the nature of the transitions in these materials and discuss the implications for experimental systems.

Hauptvortrag SYRS 1.3 Sa 09:30 TU H3010

Transport properties of percolation clusters — •Olaf Stenull — Fachbereich Physik, Universitaet Duisburg-Essen, Campus Essen, 45117 Essen

Percolation is one of the most prominent problems in statistical physics. Theoretical studies of percolation and the application of percolation models in diverse scientific disciplines have resulted in thousands of papers over the last decades. The talk focuses on the electric transport properties of isotropic and directed percolation clusters as explained by the renormalization group. For studying these properties we consider simple and intuitive models, viz. the random resistor network, a bond percolation model where open bonds function as insulators and occupied bonds function as resistors, and the random diode network, where occupied bonds function as diodes. We explain the field theoretic formulation of these models and sketch their diagrammatic perturbation theory. It turns out that the Feynman diagrams for these models can be interpreted as if they were real networks: they consist of insulators and respectively resistors or diodes, they carry currents and so on. Being interested in a certain property of a real network we essentially just have to determine the corresponding property of the Feynman diagrams. For example, the resistance of the Feynman diagrams provides us with the average resistance of the real networks etc. We review some of the results obtained by exploiting this real world interpretation and compare them to numerical results.

SYRS 2 SYRS II

Zeit: Samstag 10:30–12:30 Raum: TU H3010

Hauptvortrag SYRS 2.1 Sa 10:30 TU H3010

Reaction-diffusion processes: the non perturbative renormalization group approach — •Bertrand Delamotte[1] and Leonie Canet[2] — [1]Laboratoire de Physique Theorique des Liquides, University Paris VI, 4 Pl. Jussieu, 75252, Paris Cedex 05, France — [2]Department of Physics and Astronomy, University of Manchester, Manchester M13 9PL, U.K.

Non perturbative phenomena play often a prominent role in equilibrium and out of equilibrium phase transitions. The reason is twofold: either these transitions correspond to the strong coupling regime of the field theories describing them or genuinely non perturbative excitations (topological defects, bound states, etc) drive the transition. In both cases, using perturbation theory becomes problematic. We describe on the example of reaction-diffusion processes how the non perturbative renormalization group formalism can be implemented for out of equilibrium systems. We show how to determine both universal and non universal properties (phase diagrams) of some branching and annihilating random walks in all dimensions.

Hauptvortrag SYRS 2.2 Sa 11:00 TU H3010

Functional renormalization group methods for interacting Fermi systems — •Walter Metzner — Max-Planck-Institut fuer Festkoerperforschung, Heisenbergstr. 1, D-70569 Stuttgart

The functional renormalization group is an ideal tool for dealing with the diversity of energy scales and competition of correlations in interacting Fermi systems. Starting point is an exact hierarchy of flow equations which yields the gradual evolution from a microscopic model Hamiltonian to the effective low-energy action as a function of a continuously decreasing energy cutoff. Suitable truncations of the hierarchy have recently led to powerful new approximation schemes. Applications to be discussed in the talk include: i) d-wave superconductivity and other instabilities in the two-dimensional Hubbard model, ii) transport through a barrier and resonant tunneling in a one-dimensional Luttinger liquid metal.

Hauptvortrag SYRS 2.3 Sa 11:30 TU H3010

Functional Renormalization for Disordered Systems: The Way out of Dimensional Reduction — •Kay J. Wiese — LPT-ENS, 24 rue Lhomond, 75005 Paris, France

After 30 years of research, disordered systems remain one of the great challenges of theoretical physics. This is due to the existence of multiple minima, or broad distributions of disorder. The latter render meaningless standard perturbation theory, and its most prominent prediction, namely dimensional reduction, which states that disordered systems behave as pure systems in two space dimensions less. A theoretical treatment therefore has to take into account and follow under renormalization the whole disorder distribution. We review this approach and discuss a recent application to contact line depinning.

Hauptvortrag SYRS 2.4 Sa 12:00 TU H3010

Universality classes in coarsening — •Benjamin Vollmayr-Lee — Department of Physics, Bucknell University, Lewisburg PA 17837, USA

Coarsening systems, such as the phase separation dynamics that follows a rapid quench into an unstable region of the phase diagram, exhibit critical-like behavior. At late times, the system evolves into a self-similar state with a length scale that grows as a power of time $L \sim t^{\alpha}$. This growth exponent is highly universal, depending only on conservation laws and the nature of the order parameter. A dynamical renormalization group fixed point provides the natural scenario for understanding these features, but unfortunately no systematic RG approach exists for this problem. Further, recent exact solutions have made clear that the universality classes for the growth exponent and the correlation function differ. We are then faced with the problem of determining universality classes for a strong coupling RG fixed point. I will present a survey of the available results, a strategy for how to proceed, and a conjecture for coarsening universality classes.