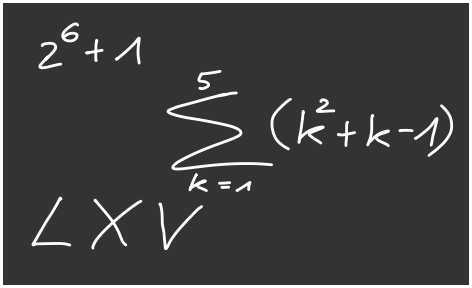
Universität Münster

M²A²-2 : Mathematical Modeling and Analysis-2

20 – 24 July 2026
Münster, Germany



Organizer

Mariya Ptashnyk (Heriot-Watt Univ.)

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MM Mathematics Münster
Cluster of Excellence

Workshop M²A²-2 : Mathematical Modeling and Analysis-2

20-24 July 2026, in Münster, Germany

	Monday 20 July	**Tuesday 21 July**	**Wednesday 22 July**	**Thursday 23 July**	**Friday 24 July** *- Industry Day -*
9:00-9:45	Arnd Scheel	Alessia Nota	André Schlichting	Mark Groves	
9:45-10:30	Ansgar Jüngel	Christof Melcher	Elena Dematte	Théophile Dolmaire	
10:30-11:00	*coffee break*				10:00-10:45 Ivano Primi
11:00-11:45	Nina Gantert	Chun-Chi Lin	Peter Albers	Alexandra Stavrianidi	10:45-11:30 Gunnar Kaib
11:45-12:30	Elio Espejo	François Hamel	Kyungkeun Kang	Mariya Ptashnyk	11:30-12:15 Giuseppe Capriani
12:30-14:15	*lunch break*	*Reibekuchen Food Truck*	*lunch break*		*Lunch: Catering*
14:15-15:00	Sebastian Hensel	Stephan Luckhaus	14:00-14:45 Jens Rademacher	14:15-15:15 *Kolloquium Talk (M4)* Julian Fischer	14:00-14:45 Benedikt Jost
15:00-15:45	Ulisse Stefanelli	Michael Winkler	14:45-15:30 Jan Fuhrmann		14:45-15:30 Christoph Tenbrock
15:45-16:15	*coffee break*				15:30 Coffee/Cake/Discussions
16:15-17:00	Karsten Matthies	Juan Velázquez	15:30-17:30 DISCUSSION SESSION		
17:30	Reception: Wine + Cheese 17:30 SRZ Foyer 2nd floor *- for all participants -*				
19:00			Conference Dinner: 19:00 Caputo's - by invitation -		

General information

Venue. The conference talks take place in lecture hall M5 on the ground floor of the lecture hall building located at Einsteinstr. 64, 48149 Münster. Registration, coffee breaks and the reception take place in the lounge of the seminar building SRZ (second floor). The seminar building SRZ is located next to the Faculty of Mathematics and Computer Science and the Cluster of Excellence Mathematics Münster at Orléans-Ring 12, 48149 Münster (see map on p. 3).

You can find the latest information on the webpage:
www.uni-muenster.de/MathematicsMuenster/events/2026/M2A2-2.shtml

Wi-Fi access. If you are part of the eduroam community, you may connect to the network "eduroam" as usual. Otherwise you can connect to the SSID "GuestOnCampus" and start any web browser. You will automatically be redirected to the login page. Confirm the terms of use and click on "log in for free". 1 GB data volume is available per device and day. Please note that the connection is not encrypted.

Public transportation. You can check the bus schedule on the website of Stadtwerke-Münster (in German and English), or use Google maps.

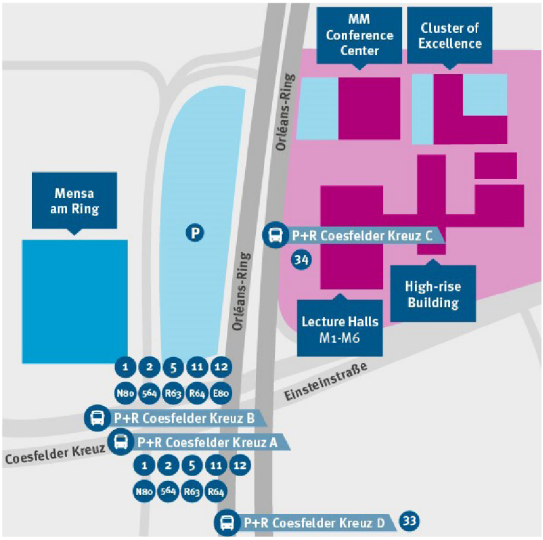
Coffee break/Lunch. We provide coffee and snacks during the coffee breaks.

There are a couple of restaurants for lunch in the vicinity:

- Milano im Westend (Italian), Mon closed
  Wilhemstrasse 26, 650m - 10min walk
- Ristorante Il Gondoliere (Italian), Mon closed
  Von-Esmarch-Straße 28, 700m - 10min walk
- Buddha Palace (Indian/Nepalese), Tue closed
  Von-Esmarch-Straße 18, 700m - 10min walk
- Gustav Grün (Healthy/green Fast Food)
  Wilhelmstraße 1, 1km - 15min walk
- ÁRO Neutor (Green Fast Food)
  Neutor 3, 1km - 15min walk
- roestbar am Ring (cafe)
  Hüfferstraße 77, 900m - 15min walk
- Backhaus Jankord (bakery)
  Hüfferstraße 26, 1km - 15min walk
- Cafeteria UKM (canteen)
  Albert-Schweitzer-Straße 41, Etage 0, 1.1km - 15min walk
- Mensa am Ring (Canteen), Sat/Sun closed
  Domagkstraße 61, 100m - 3min walk
- Mensa Da Vinci (Canteen), Sat/Sun closed
  Leonardo-Campus 8, 1.1km - 15min walk

Free time activities. Here are some suggestions for the little free time around the busy schedule of the workshop: Go see the Schloss (University main building), the park behind it and the embedded botanic garden. Visit a museum, e.g. the LWL Museum of Art and Culture (special exhibition on "The Fascination of Lacquer") or the Picasso-Museum. Have a walk around the lake 'Aasee' or make yourself familiar with European history at the Historical City Hall which is one of the two places where 1648 the Peace of Westphalia was signed.

Mathematics Münster Campus



High-Rise Building / Hochhausgebäude
Einsteinstraße 62
48149 Münster

MM Conference Centre
Seminarraumzentrum (SRZ)
Orléans-Ring 12
2. Stock/2nd floor

Lecture Halls / Hörsaalgebäude
Vortragssäle M1 – M6
Einsteinstraße 64

Cluster of Excellence
Orléans-Ring 10
Erdgeschoss/ground floor

Book of abstracts

Geometric approximation inequalities and billiards

Peter Albers (Univ. of Heidelberg) Wed 11:00

In this talk, I will explain how various geometric approximation inequalities due to Dowker, Molnár, and Eggleston are related to the convexity of Mather's beta function. The link is via monotone twist maps and corresponding variational principles. This leads to new inequalities (even for conventional billiards) for higher rotation numbers. Joint work with Sergei Tabachnikov.

On a coupled kinetic system describing the interaction of gas with monochromatic radiation

Elena Demattè (MPI MIS, Leipzig) Wed 9:45

In this talk we consider a kinetic model that describes the interaction of gas and radiation. The behavior of the gas-radiation system can be modeled by the coupling of two well-known kinetic equations, namely the Boltzmann equation and the radiative transfer equation. Specifically, we assume that the gas molecules can be either in a ground or in an excited state and that they undergo elastic and nonelastic collision between themselves as well as they can absorb or emit photons. In particular, we will consider the case in which the interaction of the gas-photon system is mainly due to the radiation processes. In this case the kinetic system converges to a new kinetic equation, for which a well-posedness result can be established.

Some recent progresses in dissipative kinetic theory

Théophile Dolmaire (Univ. of L'Aquila) Thu 9:45

Understanding the Boltzmann equation for non-conservative particle systems, where kinetic energy is dissipated at each collision, is challenging and its derivation has remained an open problem. The main difficulty arises from the singularities that both the particle system and the associated kinetic equation may develop in finite time. The inelastic Lorentz gas, composed of light particles undergoing inelastic collisions with infinitely heavy scatterers and evolving according to the inelastic linear Boltzmann equation, provides a non-trivial yet tractable model in which many questions can be addressed. In this talk, we present a rigorous derivation of the inelastic Lorentz gas from the deterministic dynamics of tagged particles colliding with inelastic scatterers distributed according to a Poisson point process. We will also discuss the long-time behaviour of the inelastic Lorentz gas in the case of Maxwell molecules, and in the presence of a uniform gravitational field. In particular, we show the existence of an out-of-equilibrium steady state that attracts all solutions within the considered functional framework. This is a joint work with Nicola Miele and Alessia Nota (GSSI) (arXiv:2504.02155, arXiv:2511.02934).

Coherent-structure detection in images via a modified Keller–Segel system

Elio Espejo (Univ. of Nottingham Ningbo, China)

Mon 11:45

The Keller–Segel system, originally introduced to model chemotactic aggregation in biological populations, has been the subject of an enormous PDE literature centred on blow-up and pattern formation. In this talk, I will show how a structurally modified Keller–Segel system can be turned into an analytical tool for image enhancement and target detection. The model has three ingredients: a regularised gradient-dependent diffusion coefficient that preserves sharp features; a bounded chemotactic sensitivity that activates only above a threshold value of the chemical signal; and a density-saturated production rate. Together they produce a regime in which spatially coherent clusters of features matching a chosen signature are amplified, while off-signature features and isolated noise are left to diffusion. I will present (i) a global well-posedness theorem in two dimensions, organised around an Lp parabolic estimate at p=4 that unlocks an energy estimate, an L∞ iteration, and a uniqueness argument in a single chain; (ii) a leading-order linearised stability analysis identifying the parameter regime in which the imaging mechanism operates; (iii) a structure-preserving finite-volume scheme that retains the analytical bounds at the discrete level; and (iv) a numerical experiment on a synthetic infrared maritime scene demonstrating class-selective amplification.

Joint work with Takashi Suzuki (Osaka University, Japan).

Minimal surfaces in random environments: Quantitative homogenization, superconcentration, and applications in fracture mechanics

Julian Fischer (IST, Klosterneuburg) M4 Thu 14:15

Minimal surfaces in a random environment arise naturally in the homogenization of models in fracture mechanics. They also are one of the natural higher-dimensional generalizations of planar first-passage percolation, the problem of finding the shortest path in a random environment. Under suitable assumptions on the probability distribution - assuming in particular statistical isotropy of the random medium -, we establish an algebraic rate of convergence for the energy of the minimal surface dividing a box $(-R,R)^d$ in the limit $R \to \infty$. We also prove a superconcentration principle for energy fluctuations in up to four ambient spatial dimensions: Energy fluctuations of the minimal surface are suppressed, as compared to the the energy fluctuations of a fixed surface like $(-R,R)^{d-1} \times \{0\}$. We discuss possible implications of the superconcentration principle concerning the accuracy of variational models for fracture in the setting of heterogeneous media.

Joint works with Antonio Agresti, Nicolas Clozeau, Assylbek Olzhabayev, Christian Wagner

Traveling waves and blow-up in a Keller-Segel type model of cell motility

Jan Fuhrmann (Univ. of Heidelberg) Wed 14:45

We present a simplified model of crawling cell motility in two dimensions inspired by keratocyte movement. For this free boundary problem for a Keller-Segel type system we show existence of steady state and traveling wave solutions describing resting and steadily moving cells, respectively. Moreover, we discuss finite time blow-up for the associated problem with fixed boundary. In contrast to the classical Keller-Segel system in two dimensions we observe two distinct critical masses and hence three distinct solution behaviors: unconditional global existence for small total mass, unconditional blow-up in finite time for large total mass, and blow-up of some but not all solutions for intermediate total mass. For all the results, some biological interpretation will be given as well.

A localization phase transition for branching Markov chains or: the local-to-global ratio in a population

Nina Gantert (TUM, Munich) Mon 11:00

Consider a continuous-time branching Markov chain $(Z_t, t \geq 0)$ on a locally finite graph G rooted at $\mathbf{o}$. Each particle moves according to an irreducible Markov process ξ and branches at a rate that depends on their location: the branching rate is $\lambda \geq 0$ at the root and $\lambda \geq 0$ elsewhere. The offspring distribution is concentrated on $\{1, 2, \ldots\}$, with mean $m > 1$, and finite second moment.

We characterize the recurrence/transience phase transition for this catalytic branching Markov chain. Furthermore, under suitable assumptions we prove a second phase transition concerning the asymptotic behaviour of the relative empirical density, $(Z_t(G))^{-1} Z_t$, where Z_t is the occupation measure at time t and $Z_t(G)$ is the total population size at time t. If $(m-1)(\lambda_0 - \lambda) > \gamma_{esc}$, where γ_{esc} is the escape probability (i.e. the probability that ξ never returns to the root), then $(Z_t(G))^{-1} Z_t$ converges almost surely to a deterministic probability measure. If $(m-1)(\lambda_0 - \lambda) \in (0, \gamma_{esc}]$, then $(Z_t(G))^{-1} Z_t$ converges almost surely to zero.

When the graph is the integer lattice $G = \mathbb{Z}^d$ and ξ is the simple random walk, our results confirm several conjectures of Mailler and Schapira [Ann. Appl. Probab. 2026], which studied this model via a different approach.

Based on joint work in progress with Xinxin Chen, Haojie Hou and Quan Shi

The KP-I equation

Mark Groves (Univ. of Saarbrücken) Thu 9:00

$$(u_t - 2uu_x + \tfrac{1}{2}(\beta - \tfrac{1}{3})u_{xxx})_x - u_{yy} = 0$$

arises as a weakly nonlinear model equation for gravity-capillary waves with Bond number $\beta > 1/3$, also called strong surface tension. This equation has recently been shown to have a family of nondegenerate, symmetric 'fully localised' or 'lump' solitary waves which decay to zero in all spatial directions. The full-dispersion KP-I equation

$$u_t + m(\mathbf{D})u_x + 2uu_x = 0,$$

where $m(\mathbf{D})$ is the Fourier multiplier with symbol

$$m(\mathbf{k}) = \left(1 + \beta|\mathbf{k}|^2|\right)^{\frac{1}{2}} \left(\frac{\tanh|\mathbf{k}|}{|\mathbf{k}|}\right)^{\frac{1}{2}} \left(1 + \frac{2k_2^2}{k_1^2}\right)^{\frac{1}{2}},$$

is obtained by retaining the exact dispersion relation in the modelling from the water-wave problem. In this talk I will show that the FDKP-I equation also has a family of symmetric fullly localised solitary waves which are obtained by casting it as a perturbation of the KP-I equation and applying a suitable variant of the implicit-function theorem.

Reaction-diffusion equations in periodic media: convergence to pulsating fronts

François Hamel (Univ. d'Aix-Marseille) Tue 11:45

This talk is concerned with reaction-diffusion-advection equations in spatially periodic media. I will discuss the asymptotic properties of the solutions of the Cauchy problem, under an assumption of weak stability of the constant steady states 0 and 1. I will especially show that front profiles appear, along sequences of times and points, in the large-time dynamics of the solutions, whether their initial supports be bounded or unbounded. I will also give further geometrical properties of the asymptotic invasion shapes of invading solutions. The talk is based on some joint works with Hongjun Guo and Luca Rossi.

The quantitative isoperimetric inequality: A calibration argument

Sebastian Hensel (Univ. of Leipzig) Mon 14:15

I discuss a novel argument to derive a quantitative form of the classical isoperimetric inequality, which in particular implies all previously known versions. The argument is based solely upon a notion of "quantitative calibrations" from which one may define a coercive relative energy, penalizing the difference between two interfaces in a, e.g., tilt-excess type way. I give some insights how this allows to prove the following local result: Let $F \subset \mathbb{R}^d$ be a set of finite perimeter with same barycenter and volume as the unit ball $B_1(0)$, then one can bound from below the energy gap $Per(F) - Per(B_1(0))$ by the associated relative energy (to be defined in the talk) provided this relative energy is sufficiently small. Based on this local version, we then deduce by a simple compactness argument a corresponding result for arbitrary admissible competitors. This is joint work with Tim Laux.

Multiphase cross-diffusion models for tissue structures with or without chemotaxis

Ansgar Jüngel (TU Wien) Mon 9:45

Multiphase models provide a continuum framework to investigate interactions between different components of a cellular fluid. Assuming force balances for the interphase pressures and viscous drag forces, the evolution of the volume fractions of the mixture phases is governed by nonlinear diffusion systems. In this talk, we formally derive a novel class of volume-filling cross-diffusion equations is formally derived and investigate the energy/entropy structure. Using entropy methods, we establish the existence of bounded weak solutions, analyze their long-time behavior, and prove weak–strong uniqueness for a regularized system. We further extend the model by incorporating chemotactic forces, which still allow for an existence and qualitative analysis.

Existence of weak solution of parabolic systems of PDEs with nonlinear diffusion and cross-diffusion

Kyungkeun Kang (Yonsei Univ., Seoul) Wed 11:45

We study systems of partial differential equations involving nonlinear diffusion and cross-diffusion. We discuss the existence of weak solutions and related mathematical consequences, together with some applications. (joint work with Angela Stevens)

The p-elastic flow of inextensible planar closed curves for $p \in (1, \infty)$

Chun-Chi Lin (National Taiwan Normal Univ., Taipei)

Tue 11:00

Building on the work of Blatt, Hopper, and Vorderobermeier (2022) on the existence of geometric flow for the p-elastic energy with $p \in [2, \infty)$, we investigate how to extend their results to the case when $p \in (1, 2)$. In this talk, we focus on the class of inextensible planar closed curves. We establish the existence of global weak solutions to the L^2-gradient flow of the p-elastic energy for all $p \in (1, \infty)$. Further directions, including extensions to open curves and possibleapplications to sub-Riemannian geodesics, will also be discussed. The results presented are based on joint work with Ying-Hsian Tsai.

Suspension of currents and rectifiability

Stephan Luckhaus (Univ. of Leipzig) Tue 14:15

We introduce a method, suspension of a current of dimension k along an embedding I into $\mathbb{R}^n$ on a given current T in $\mathbb{R}^n$, which increases the dimension of T by k. Our focus is on rectifiable currents T which are a model introduced by H. Federer, generalizing the notion of oriented d-dimensional submanifolds on $\mathbb{R}^n$. If T is a normal rectifiable current of dimension d and one suspends a sphere of dimension $n - d$ on T the result is a BV function. We show that the converse is also true if $d \leq n - 2$, and enough embeddings I are considered. This gives a proof in the De Giorgi framework of the Federer-Fleming compactness theorem.

Various more general rectifiability criteria are also proved.

(Joint work with Emanuele Spadaro)

Fronts and solitary waves in variants of the Fermi-Pasta-Ulam-Tsingou chain

Karsten Matthies (Univ. of Bath) Mon 16:15

Building on the work of Blatt, Hopper, and Vorderobermeier (2022) on the existence of geometric flow for the p-elastic energy with $p \in [2, \infty)$, we investigate how to extend their results to the case when $p \in (1, 2)$. In this talk, we focus on the class of inextensible planar closed curves. We establish the existence of global weak solutions to the L^2-gradient flow of the p-elastic energy for all $p \in (1, \infty)$. Further directions, including extensions to open curves and possibleapplications to sub-Riemannian geodesics, will also be discussed. The results presented are based on joint work with Ying-Hsian Tsai.

Self-similar expanders in half-harmonic map heat flows

Christof Melcher (RWTH Aachen Univ.) Tue 9:45

We discuss a non-local variant of the harmonic map heat flow with values in the sphere, based on a fractional diffusion process in terms of the half-Laplacian. The equation arises in the analysis of long-range interacting spin fields and in formulations of free boundary value problems for minimal surfaces. We show the existence on self-similarly expanding solutions arising from homogeneous initial maps. To this end we demonstrate a strong well-posedness framework based on the connection between Carlson measure-type regularity and fractional heat semigroups that allows for the treatment of singular initial conditions. This is joint work with Kilian Koch (RWTH Aachen).

Non-Maxwellian Long-Time Asymptotics for Homoenergetic Boltzmann Flows

Alessia Nota (GSSI, L'Aquila) Tue 9:00

In this talk, I will consider a particular class of non-equilibrium solutions to the Boltzmann equation, known as homoenergetic solutions. These solutions are useful for modeling the dynamics of Boltzmann gases subjected to mechanical deformations (such as shear, expansion, or compression), thereby yielding insight into the behavior of open systems. Their analytical significance lies in the fact that they model systems driven genuinely far from equilibrium: because they lack a detailed balance condition, their long-time behavior is not governed by a classical Maxwellian distribution, and the landscape of possible long-time asymptotics is extremely rich and diverse. I will present different possible long-time asymptotics for homoenergetic solutions to the Boltzmann equation in the case of shear deformations, and discuss some conjectures and open problems in this direction.

Multiscale modelling, analysis and simulation of plant biomechanics and growth

Mariya Ptashnyk (Heriot-Watt Univ.) Thu 11:45

The interplay between the complex microscopic structures and microscopic (cellular) processes enables many biological tissues to combine the ability to resist high pressure and mechanical forces with the flexibility required for large expansions and growth. To analyse the interactions between the mechanics, microscopic structure, and the

chemistry we derive microscopic models for plant biomechanics, assuming that the elastic/viscoelastic properties of plant cell walls depend on the chemical processes and chemical reactions depend on the mechanical stresses. Multiplicative decomposition of the deformation gradient into elastic and growth parts is used to model the stress or strain-based growth. To analyse and simulate the complex multiscale models, the macroscopic effective equations are derived using homogenization techniques. Numerical solutions for the macroscopic models demonstrate the impact of the microscopic structure and tissue heterogeneity on deformation and growth.

Patterns and domain walls in some spintronic nanowire models

Jens Rademacher (Univ. of Hamburg) Wed 14:00

The magnetisation dynamics of spintronic nanowires with applied current and magnetic field can be modelled by a Landau-Lifschitz equation augmented by Gilbert-damping and a non-variational term suggested by Slonczewski. Assuming spatial homogeneity and axial symmetry admits a mathematical analysis of spatiotemporal coherent patterns as well as domain walls. I discuss some joint work with Christof Melcher, Lars Siemer and Ivan Ovsyannikov.

Synchronizing relaxation oscillations

Arnd Scheel (Univ. of Minnesota, Minneapolis)
Mon 9:00

I'll describe results on excitable and oscillatory media, modeled by equations such as the FitzHugh-Nagumo equation, coupled van-der-Pol oscillators, or the Aliev-Panfilov model, with applications ranging from the development of columnar structures in the visual cortex to arrhythmias in cadiac oscillations. We are interested in the tendency of these systems to synchronize, in frequency or even in phase. Our results describe (i) a rigidity in the stability of FHN or vdP type oscillators, leading always to synchronization; (ii) an extraordinarily long synchronization time scale; (iii) an alternans type instability in AP type models; (iv) a fast frequency synchronization via spreading fronts. This is joint work with M Avery, P Carter, and B deRijk.

Cluster Formation and coarsening in locally attractive interacting particle systems

André Schlichting (Ulm University) Wed 9:00

Cluster formation and coarsening are ubiquitous phenomena in systems governed by attractive interactions. We investigate these processes for weakly interacting diffusions on the one-dimensional torus subject to locally attractive, finite-range interactions. In particular, we study the emergence of clusters and the subsequent coarsening of multi-cluster

configurations into a single-cluster state. Depending on the parameter regime, this coarsening is driven by two competing mechanisms:

(1) coalescence, whereby whole clusters move and merge in a manner reminiscent of diffusion-driven coalescence; and

(2) mass exchange, in which individual particles detach from one cluster and attach to another, leading to an effective transfer of mass between clusters.

Based on an Eyring–Kramers-type asymptotic analysis, we establish a unified effective model capturing the interplay between these mechanisms and show that the associated deterministic mean-field PDE exhibits dynamical metastability induced by mass exchange. In addition, we introduce a new variant of the strict Riesz rearrangement inequality to characterize the global minimizers of the free energy, showing that they are either spatially uniform or single-cluster states, i.e., symmetric and decreasing about their center of mass.

Joint work with N. Gerber, R. Gvalani, M. Hairer, and G. Pavliotis.

Long-time behavior for systems of Fisher-KPP type with interacting components

Alexandra Stavrianidi (Univ. of Münster) Thu 11:00

The Fisher–KPP equation is closely connected to branching Brownian motion (BBM): through the McKean representation, the solution describes the distribution of the rightmost particle of BBM. In this talk, we will discuss the long-time behavior of cascading Fisher–KPP systems with interacting components arising from multitype branching Brownian motion. For such systems, we prove convergence of each

component to the minimal-speed Fisher–KPP traveling wave and obtain sharp asymptotics for the front location. In the two-component case, the interaction changes the classical Bramson logarithmic delay from $32 log t \frac{3}{2} \log t$ to $12 log t \frac{1}{2} \log t$. Moreover, our results yield a PDE-based proof of the conjectured convergence in distribution of the centered rightmost particle in cascading multitype BBM, and extend the front asymptotics to general Fisher–KPP nonlinearities.

Phase-field models for accretive growth in viscoelastic solids

Ulisse Stefanelli (Univ. of Vienna) Mon 15:00

Accretive growth is a fundamental mechanism in biological, natural, and technological systems. I will present two phase-field models for finite-strain viscoelastic solids undergoing mechanically driven accretion, addressing both phase-transition dynamics and the build-up of growth-induced incompatibilities.

The first model describes a two-phase viscoelastic medium in which one phase irreversibly accretes at the expense of another, with growth governed by a generalized eikonal equation coupled to quasistatic viscoelastic equilibrium. Both diffuse- and sharp-interface formulations are considered, and existence of weak/viscosity solutions is established together with energy balances and sharp-interface convergence.

The second model includes the description of incompatible growth through a multiplicative decomposition of deformation into elastic strain and backstrain, modeling the residual stresses generated as newly accreted material is deposited in an unstressed state. A compliant

fictitious surrounding medium regularizes the free-boundary problem, enabling the proof of existence for the fully coupled system.

This is joint work with Andrea Chiesa (U. Vienna).

Solutions with non-trivial fluxes in kinetic equations

Juan J. L. Velázquez (Univ. of Bonn) Tue 16:15

In this talk I will describe the properties of some solutions of some kinetic equations that exhibit non-trivial fluxes between different states. This is in contrast with the situation that takes place when the so-called detailed balance property holds. In the solutions satisfying the detailed balance property, the fluxes of particles between two arbitrary states are completely balanced and there is not any effective flux in any direction. On the contrary, in the solutions that will be described in this talk, there are non-trivial fluxes in the space of states. This situation is typical of systems out of equilibrium. I will describe examples of these types of solutions for the classical Boltzmann equation, as well as for the Smoluchowski coagulation equation and for some models of chemical reactions motivated by the study of biological systems.

Facets of complexity in chemotactic aggregation

Michael Winkler (Univ. of Paderborn) Tue 15:00

Keller-Segel type cross-diffusion systems have been playing an outstanding role in the understanding of various patterning phenomena in biology. Concentrating on issues of predominant application relevance, the description of taxis-driven explosions has been among the most challenging topics in their analysis, and a natural focus of the literature in this regard is on the characterization of solution behavior near collapse. The presentation aims at reporting both on classical and on some recent developments, with a particular focus on the identification of circumstances under which solutions either must blow up at single points only, or alternatively may form singularities throughout larger regions in space.

Industry Day

Friday 24 July 10:00-16:00

10:00-10:45 Ivano Primi
10:45-11:30 Gunnar Kaib
11:30-12:15 Giuseppe Capriani

Lunch: Catering

14:00-14:45 Benedikt Jost
14:45-15:30 Christoph Tenbrock

15:30 Coffee/Cake/Discussions

The conference acknowledges funding from

Cluster of Excellence "Mathematics Münster" (MM)
www.uni-muenster.de/MathematicsMuenster