Dynamics Days Europe 2018
3-7 September, Loughborough University, UK

Plenary talks and opening address will be in room J1.04 in the **Edward Herbert Building**, no. 62 on the campus map.
Registration, Tea breaks and lunch are in **James France Building**, no. 67 on the campus map.
Gala dinner is in the **Sir David Wallace Building**, no. 98 on the campus map.

	Monday	Tuesday	Wednesday	Thursday	Friday
7:30-8:45 8:45-9:00	Registeration Conference Opening				
9:00-10:00	Knobloch	Benzoni-Gavage	Baladi	Pikovsky	Turaev
10:00-10:30	Tea break	Tea break	Tea break	Tea break	Tea break
10:30-12:30	Parallel sessions	Parallel sessions	Parallel sessions	Parallel sessions	Parallel sessions
12:30-14:00	Lunch	Lunch	Lunch	Lunch	Lunch
14:00-15:00	Silber	Ablowitz	Hairer	Junge	
15:00-15:30	Tea break	Tea break	Tea break	Tea break	
15:30-18:30	Parallel sessions	Parallel sessions	Parallel sessions	Parallel sessions	
19:00			Gala Dinner		

Parallel sessions: venues and times[1]

Room	Mon am	Mon pm	Tue am	Tue pm	Wed am	Wed pm	Thu am	Thu pm	Fri am
CC011	MS13	MS13	MS13	MS7	MS7	MS7	MS15	MS15	MS15
CC012	MS11	MS11	MS1	MS1	MS1	MS17	MS1	MS1	MS1
CC013	MS3	MS3	MS3	MS3	MS3	MS12	MS3	MS3	MS3
CC021	MS10	MS10	MS10	MS10	MS5	MS5	MS18	MS18	MS18
CC029a	Cont	Cont	Cont	Cont	Cont	Cont	Cont	Cont	
J001	MS8	MS8	MS8	MS22	MS6	MS6	MS6	MS6	MS6
J002	MS4	MS4	MS4	MS4	MS4	MS20	MS9	MS9	MS9
J104	MS21	MS21	MS2	MS2	MS2	MS2	MS2	MS2	MS2
SCH013	MS16	MS14	MS14	MS19	MS19				

MS1 Billiards. Room CC012 James France Building, no. 67 on the campus map.

MS2 Pattern formation. Room J1.04 Edward Herbert Building, no. 62 on the campus map.

MS3 Ergodic theory and dynamical systems. Room CC013 James France Building, no. 67 on the campus map

MS4 Networks. Room J002 Edward Herbert Building, no. 62 on the campus map.

MS5 Dynamical systems methods in fluid mechanics. Room CC021 James France Building, no. 67 on the campus map

[1]Detailed schedule of each MS can be found on its corresponding page.

MS6 Random dynamical systems. Room J001 Edward Herbert Building, no. 62 on the campus map.

MS7 Interfacial waves. Room CC011 James France Building, no. 67 on the campus map.

MS8 Dispersive hydrodynamics. Room J001 Edward Herbert Building, no. 62 on the campus map.

MS9 Nonlinear Schrödinger models and rogue waves. Room J002 Edward Herbert Building, no. 62 on the campus map.

MS10 Quantum chaos and semi-classical dynamics. Room CC021 James France Building, no. 67 on the campus map

MS11 Transition state theory. Room CC012 James France Building, no. 67 on the campus map.

MS12 Superfluids and turbulence. Room CC013 James France Building, no. 67 on the campus map.

MS13 Integrable dynamics. Room CC011 James France Building, no. 67 on the campus map.

MS14 Complex dynamics of quantum systems. Room SCH013 Schofield Building, no. 74 on the campus map

MS15 Dynamics of localized structures of nonlinear wave equations. Room CC011 James France Building, no. 67 on the campus map.

MS16 Microlocal analysis and applications. Room SCH013 Schofield Building, no. 74 on the campus map

MS17 Stochastic dynamics of cancer evolution: models and data. Room CC012 James France Building, no. 67 on the campus map.

MS18 Structure and dynamics of future energy systems: power grids as complex dynamical systems. Room CC021 James France Building, no. 67 on the campus map

MS19 Invariant sets in dynamical systems. Room SCH013 Schofield Building, no. 74 on the campus map

MS20 Linking the dynamics of oscillator models to real-world networks. Room J002 Edward Herbert Building, no. 62 on the campus map.

MS21 Dynamics of active matter. Room J1.04 Edward Herbert Building, no. 62 on the campus map.

MS22 Self-organization and self-assembly in fluid-structure interactions. Room J001 Edward Herbert Building, no. 62 on the campus map.

Contributed Talks. Room CC029a James France Building, no. 67 on the campus map

Titles and Abstracts of Plenary talks

Speaker: Edgar Knobloch
Title: Spatially Localized Structures in Driven Dissipative Systems: Theory and Applications
Abstract: Spatially localized structures arise frequently in driven dissipative systems. In this lecture I will describe a number of examples from different physical systems, followed by a discussion of the basic ideas behind the phenomenon of nonlinear self-localization that is responsible for their existence. I will illustrate these ideas using a simple phenomenological model and explain why the qualitative predictions of this model help us understand the properties of much more complicated systems exhibiting spatial localization, including those arising in fluid mechanics.
Session chair: Christopher Linton

Speaker: Mary Silber
Title: Pattern formation in the drylands: vegetation patterns captured by satellite images and by mathematical models
Abstract: A beautiful example of spontaneous pattern formation appears in the distribution of vegetation in some dry-land environments. Examples from Africa, Australia and the Americas reveal that vegetation, at a community scale, may spontaneously form into stripe-like bands, alternating with striking regularity with bands of bare soil, in response to aridity stress. A typical length scale for such patterns is 100 m; they are readily surveyed by modern satellites (and explored from your armchair in Google maps). These ecosystems represent some of Earth's most vulnerable under threats to desertification, and some ecologists have suggested that the patterns, so easily monitored by satellites, may have potential as early warning signs of ecosystem collapse. I will describe efforts based in simple mathematical models, inspired by decades of physics research on pattern formation, to understand the morphology of the patterns, focusing particularly on topographic influences. I will also describe efforts at analyzing the patterns via the satellite images, which, in some cases, we can accurately align with the aerial survey photographs from the 1950s to investigate details of the pattern evolution.
Session chair: Peter Ashwin

Speaker: Sylvie Benzoni-Gavage
Title: Whither dispersive hydrodynamics?
Abstract: Dispersive hydrodynamics refers to models of mathematical physics in which dissipative phenomena are negligible, while wave propagation is subject to dispersion. Applications range from water waves to superfluids and nonlinear optics. Even though this has been a very active field in the last decades, the corresponding mathematical theory still conceals tough open questions. The lack of damping in those models is one of the main difficulties, somehow compensated by the fact that they are usually endowed with a Hamiltonian structure. Besides open questions, the talk will review a series of recent results regarding stability and modulation of travelling wave solutions to a rather general class of such models.
Session chair: Karima Khusnutdinova

Speaker: Mark Ablowitz
Title: New classes of integrable nonlocal nonlinear equations and solitons
Abstract: Solitons and the Inverse Scattering Transform (IST) are well known in the Math/Physics community. A surprisingly large number of‘simple integrable nonlocal equations have been identified; their solutions, including solitons and properties will be discussed.
Session chair: Sara Lombardo

Speaker: Viviane Baladi
Title: On the measure of maximal entropy of Sinai billiards
Abstract: Sinai billiards maps and flows are uniformly hyperbolic - however grazing orbits give rise to singularities. Most existing works on the ergodic properties of billiards are about the SRB measure (i.e. the Liouville measure in the case of flows), for which exponential mixing is known (both in discrete and continuous time). Another natural equilibrium state is the measure of maximal entropy. Since the discrete-time billiard is discontinuous, the mere existence of this measure is not granted a priori. With Mark Demers, we have recently constructed a measure of maximal entropy and shown that it is Bernoulli and has full support. I will also discuss conditions ensuring that the measure of maximal entropy differs from the SRB measure.
Session chair: Matt Nicol

Speaker: Martin Hairer
Title: The natural evolution on loop space
Abstract: TBA
Session chair: Domokos Szász

Speaker: Arkady Pikovsky
Title: Global modes in oscillator populations
Abstract: Systems of many interacting oscillators can demonstrate nontrivial collective dynamics: different types of synchrony, collective chaos, chimera states. We discuss different ways to reduce the original complex system to a low-dimensional description in terms of a few global variables (order parameters). We show how the famous Watanabe-Strogatz and Ott-Antonsen methods can be extended by virtue of perturbative approaches.
Session chair: Christian Beck

Speaker: Oliver Junge
Title: Computational methods for global dynamics
Abstract: We survey computational methods for approximating the global long term behavior of dynamical systems. At the core, these methods are based on an operator, the transfer operator, which describes how probability densities on state space evolve under the dynamics. Starting with a set-oriented approach for computing arbitrary invariant sets, we describe how to use the resulting covering in order to obtain a finite matrix description of the transfer operator. From its spectrum, cyclic and almost invariant (metastable) macroscopic dynamics can be detected. In the case of a differential equation, there is an entire semigroup of these operators and it suffices to approximate its generator in order to obtain a macroscopic description of the long term dynamics - without any trajectory integration. For time-varying systems, these concepts can be generalized and lead to a method for the computation of advective coherent sets, e.g. in unsteady fluid flows. These coherent sets can also be computed by a seemingly different approach based on geometric ideas, leading to a finite-element based computational method which also works for sparse and incomplete trajectory data. Throughout the talk, the mathematical concepts will be illustrated by computational examples.
Session chair: Gary Froyland

Speaker: Dmitry Turaev
Title: Energy transfer in slow-fast Hamiltonian systems
Abstract: We demonstrate that if a Hamiltonian systemis not ergodicfor some range of parameter values,then a slow and time-periodic change of parameters may lead to a sustained energy growth. This principle extends to a general setting of slow-fast Hamiltonian systems: violation of ergodicity

in the fast subsystem leads to a rapid equilibration in the slow-fast system as a whole. We have a similar phenomenon in the quantum-mechanical setting where we show that a periodic destruction and restoration of a quantum integral leads to an exponential energy growth.

Session chair: Anatoly Nieshtadt