ANNUAL REPORT 2017

10 YEARS

IFISC*

Universitat de les Illes Balears · CSIC

Institute for Cross-Disciplinary Physics and Complex Systems

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10 YEARS OF IFISC

IFISC celebrated its tenth anniversary in 2017. Through the organization of various activities, IFISC not only has commemorated its first ten years of life but also set the future foundation of the center to remain at the forefront of research in the field of Complex Systems Physics.

As a main event, IFISC organized the conference **Crossroads in Complex Systems** (June 5-8). The conference defined new trends of research in the field of complex systems. It also included the institutional event commemorating the 10 years of the Institute and a roundtable with directors of international reference research centers in complex systems.

Throughout the year different activities had been carried out at all levels: from events of scientific dissemination addressed to the general public, such as participating in the international Pint of Science event or organizing the cycle of conferences "10 Years Exploring the Boundaries between Knowledge" at CaixaForum Palma, to conferences and workshops for researchers, such as QuProCS II or COSTNET17. In addition the institute made a change of image, releasing a renewed logo and a complete redesign of its website coinciding with its anniversary.

Here is a listing of the different 2017 events celebrating IFISC 10th anniversary:

- Throughout the year: COLLOQUIA: Colloquia of Excellence in Complex Systems, at IFISC
- February 6: DISSEMINATION EVENT: IFISC Open Doors day + Poster Party, at IFISC
- April 6-7: WORKSHOP: Quantum Probes for Complex Systems, at IFISC
- May 15-17: DISSEMINATION EVENT: Pint of Science in Mallorca, at Palma 80's Café
- May 13-20: WORKSHOP: Majorana states in condensed matter: Towards topological quantum computation, at Club Pollentia Resort, Port de Pollença
- May 23, May 30, June 6: DISSEMINATION EVENTS: 10 years exploring the boundaries between knowledge, at Caixafòrum, Palma
- June 2-4: WORKSHOP: Young Researchers at the Crossroads, at IFISC
- June 5-9: IFISC 10 years CONFERENCE: Crossroads in Complex Systems, at the UIB campus.
- June 6: INSTITUTIONAL 10 years-events
  - Round table: present and future challenges of Complexity Science. UIB Campus
  - Public Lecture: Genes y genealogías humanas, Susanna Manrubia. Caixafòrum, Palma
- June 19-30: SCHOOL: VII Summer School on Statistical Physics of Complex and Small Systems, at IFISC
- September 4-8: SCHOOL: COMSOTEC Summer School on Computational Social Science, at IFISC
- October 25-27: WORKSHOP: COSTNET workshop on Statistics of Network Data Science, at IFISC
- October 28-30: DISSEMINATION EVENT: II Fira de la Ciència i la Tecnologia d'Inca. Inca
- November 28: DISSEMINATION EVENT: "It's not quantum mechanics that's weird - it's us", Philip Ball conference, Club Diario de Mallorca
- December 20: INTERNAL WORKSHOP: 2017 IFISC Winter Solstice meeting, at IFISC

These activities will be described in more detail in the following pages of this 2017 IFISC Annual Report.

In its 10 years of existence, IFISC has become an international hub of research in complex systems. Today, over 70 scientists from 18 different nationalities work on 6 research lines transferring knowledge from Complex Systems Physics to Quantum Technologies, Information and Communication Technologies, and the Earth, Life and Social Sciences. The scientific publications that derive from this research are published in physics journals and also in journals of other disciplines, which is a clear indicator of the cross disciplinary character of the center.

Signs of identity of IFISC during these 10 years are: 1) Internal synergies, 2) Talent attraction and 3) Science dissemination:

INTERNAL SYNERGIES:
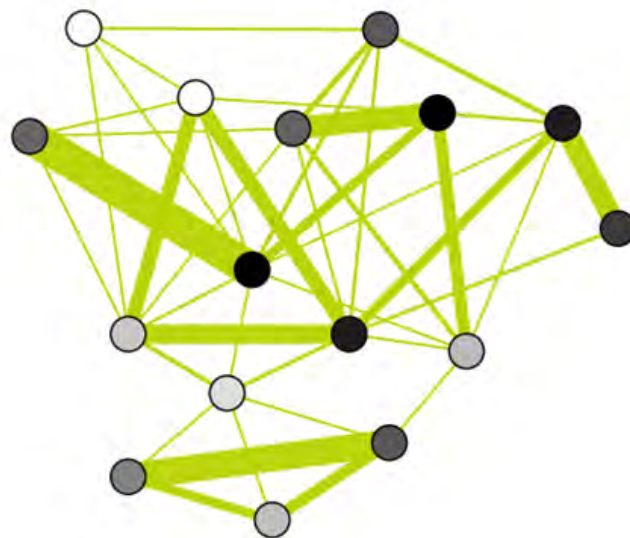
Network of co-authorship of research papers among IFISC permanent researchers (nodes of the network). Strength of the link indicates number of joint papers. Color gray scale of the node indicates total number of papers of the node.

TALENT ATTRACTION:

PERSONNEL 2007 - 2017

Italy	31
Germany	18
Argentina	12
France	11
USA	9
Belgium	7
Brazil	7
Venezuela	6
Iran	5
Poland	5
Korea	3
UK	3
Greece	3
Hungary	3
Russia	3
Cameroon	2
China	2
Estonia	2
Japan	2
Mexico	2
Portugal	2
Ukraine	2
15 other countries	1
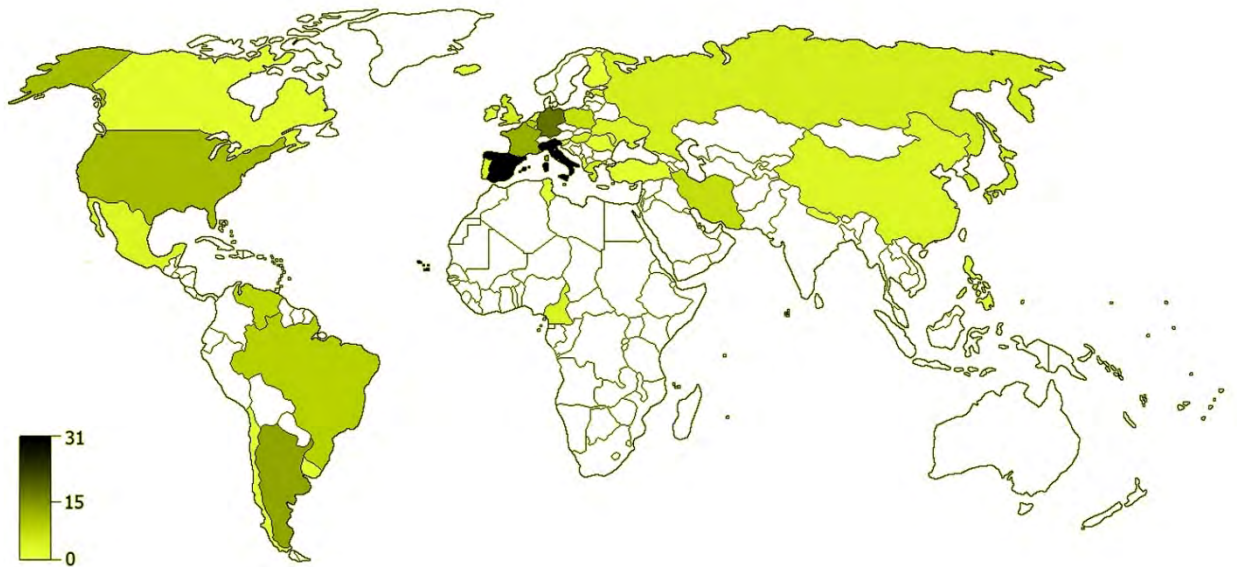
MAP OF NATIONALITIES OF PEOPLE THAT HAS WORKED AT IFISC IN THESE 10 YEARS.

DISSEMINATION:

1

PRESENTATION AND RESEARCH LINES

IFISC (Institute for Cross-Disciplinary Physics and Complex Systems) is a joint research institute of the University of the Balearic Islands (**UIB**) and the Spanish National Research Council (**CSIC**) created in 2007 building upon the former Cross-Disciplinary Physics Department of the Mediterranean Institute for Advance Studies (**IMEDEA**) dating from 1995. Its mission is to develop *Cross-Disciplinary* and *Strategic Research* in Complex Systems following the established scientific approach of physicists.

By *Cross-Disciplinary* Research we mean the transfer of knowledge, concepts and methods to create bridges among traditional disciplines. By *Strategic Research* we mean focusing on advanced studies in emerging strategic fields with a strong potential impact, avoiding the "basic-applied" polarization.

IFISC´s working environment is a complex system in itself seeking coherence and integration from diversity, interaction, scientific dialog, transversal structures, bridge building and selforganization. Research is therefore organized in terms of research lines, rather than research groups.

Emerging from a back-bone transversal research line of exploratory nature on Complex Systems, Statistical and Nonlinear Physics, there are 5 research lines of transfer of knowledge in the interface with other disciplines (Quantum Technologies, Information and Communication Technologies, Earth Sciences, Life Sciences and Social Sciences):
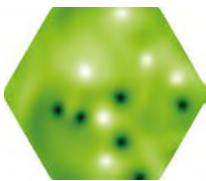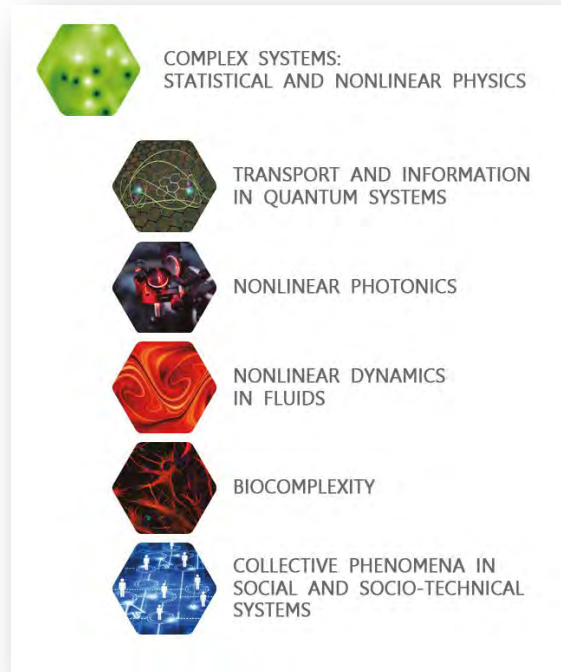
Complex systems. Nonlinear and statistical physics

Complex systems are characterized by emergent and collective phenomena of many interacting units. Fundamental understanding of these systems and the Micro-Macro paradigm, comes from Statistical Physics together with Computational Methods, Quantum Mechanics, Information Theory, Complex Networks, Big Data analysis and the Theory of Dynamical Systems, which includes the study of nonlinear dynamics, chaos and the effect of fluctuations and random events on system's evolution.

This research line of exploratory nature is the backbone of IFISC: We develop new concepts and methods for the study of Complex Systems, and we analyze generic phenomena such as synchronization, phase transitions, nonequilibrium instabilities, spatiotemporal pattern formation, and the dynamics and evolution of complex networks.

COMPUTING LAB

The Computing Services Unit manages the computational resources at IFISC. Capabilities to perform intensive numerical calculations are provided by an IBM iDataPlex cluster with 48 dx360M4 diskless nodes and a total of 576 computational cores and 1.8 TB of RAM configured for High Throughput Computing (HTC). This is complemented by two servers with 256GB of RAM used for memory intensive scientific calculations.

Big Data storage and management is dealt with a distributed database cluster. It uses a MongoDB non-relational database which is distributed over 10 shards, each consisting of three storage servers replicating data. Storage servers are IBM dx360M2 machines with 8 cores, 4 TB of disk and 80GB of RAM. A Data repository is available on a IBM DS4700 disk cabinet with 96 TB of raw storage capacity, connected via fiber channel to 4 dx360M2 servers and using GPFS as file system. Additional storage capacity, and the network integration to deal with user's linux, macs, and windows desktops and laptops is provided by NFS and backup servers, as well as with a Virtualization server and a Private Cloud. The resulting system, complemented with a number of peripherals, provides IFISC members with a transparent environment and access to the computer power needed by their research needs.

ELECTRONICS LAB

The Nonlinear Electronics Lab focuses on the application of nonlinear dynamics to a variety of topics including synchronization of chaotic systems and information processing based on delay-coupled dynamical systems. The Nonlinear Electronics Lab currently offers a diversity of circuits and systems for the study and demonstration of chaos and bifurcation phenomena (including Autonomous Boolean Networks, Chua, Mackey-Glass and Rössler oscillators), chaos synchronization, and the study of networks with delay-coupled nonlinear elements for information processing.
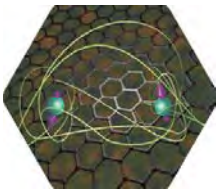
Transport and Information in Quantum Systems

Understanding of Quantum Complex Phenomena plays a key role in the development of Quantum Technologies identified as one of the most strategic areas for future research and innovation.

In this research line, we are devoted to questions related to quantum transport for charge(nanoelectronics), spin (spintronics), energy (thermoelectrics) and information (quantum correlations), with a particular focus on nanostructures. Moreover, we investigate decoherence effects in complex environments, explore quantum probing, and emergent phenomena such as synchronization, with a focus on quantum correlations and thermodynamics and their impact on information processing.

Nonlinear Photonics

Within this line of research, we explore complex phenomena in photonics, filling the gap between Modern Photonic Sources and Functional Complex Systems. Our Nonlinear Photonics Lab, working alongside a strong theoretical team, aims to gain an in-depth understanding of complex phenomena and to provide novel solutions from communication to information processing, transferring knowledge to the Information and Communication Technologies (ICT) domain.

We study nonlinear and spatio-temporal emission properties of semiconductor lasers, implement optical complex networks based on lasers, advance characterization techniques, and demonstrate the utility of optical complexity for information technologies including encryption and ultra-fast neuro-inspired photonic information processing.

PHOTONICS LAB

Since 2009 a Photonics Laboratory of highest standards has been established. The lab is equipped with a Faraday cage for electromagnetic shielding and houses several experiments of delay-coupled lasers and laser arrays, optoelectronic systems, as well as photonic information processing systems using the latest technology to characterize the optical emission with multi-Gigahertz bandwidth: in the temporal domain via fast detectors and 16 GHz real-time oscilloscope, and in the spectral domain via a 14 GHz real-time spectrum analyzer. In addition, high-resolution optical characterization can be performed via heterodyne techniques and different spectrometers. Finally, optical and electrical laser modulation can be implemented with arbitrary waveforms up to 9.6 GHz bandwidth.
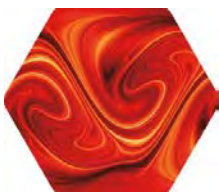
Nonlinear dynamics in fluids

Fluid flows occur in a huge range of scales, from blood capillaries to atmospheric weather systems. The way in which substances are transported has large impacts, e.g., on how pollutants arrive to distant locations, plankton meets the nutrients, or into the whole heat balance involved in the Earth climate.

At IFISC we develop techniques useful to characterize transport in fluids, quantify stretching, mixing, and connectivity between parts of a fluid. We apply them to geophysical settings, mostly in the ocean. We develop tools to identify barriers to the transport of oxygen and nutrients, evaluate the ecological implications of larval transport, or track the origins of water vapor masses transported by atmospheric winds.
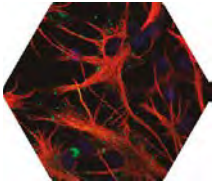
Biocomplexity

Living systems are the paradigm of complex systems, with nonlinear interactions occurring at all spatial and temporal scales, from molecules and genes to the planetary scales defining the global biosphere. One of the focus of our research is the ecological level where we consider modes of organisms' mobility and their interplay with food search, disease propagation, spatial patterning, and also with the basic ecological interactions such as competition, predation, or mutualism. Another focal issue in our studies is understanding brain function, which requires approaches at scales that range from individual neurons to the whole brain. At the neuronal level, we concentrate on aspects of synchronization between interacting neuronal populations and study how information flows. With the help of statistical measures, we analyze experimental data and compare the results with neuronal models.

Dynamics and collective phenomena of social systems

Social systems are prominent examples of Complex Systems, emergent phenomena, and the Micro-Macro paradigm. Today's main societal changes and challenges arise from the feedback loop that entangles society with Information and Communication Technologies (ICT) as a prototypical socio-technical system.

In this line of research we develop new concepts, tools and models aiming at identifying generic mechanisms underlying collective phenomena in these systems. We do this in the framework of Computational Social Sciences with the use of Game Theory, Statistical Physics, Agent Based Models, Complex Networks Theory, and Big Data analysis. We study phenomena such as opinion formation, cooperation, cultural conflicts, language competition and social learning. Moreover, we focus on ICT data-driven research on socio-technical systems, addressing problems of human mobility, transportation, tourism, city science, epidemics, and energy consumption.

1.2 STRUCTURE CHART

UIB Universitat de les Illes Balears

CSIC

Joint UIB-CSIC Committee

External Scientific Advisory Committee

Director

Deputy Director

IFISC Board

Administrative Unit

Unit of Computer Services

IFISC Departments

Complex Systems

Cross-Disciplinary Physics

Assembly of the Scientific Staff

Research lines

Complex Systems. Nonlinear and Statistical Physics

Transport and Informaation in Quantum Systems

Nonlinear Photonics

Nonlinear Dynamics in Fluids

Biocomplexity

Dynamics and Collective Phenomena of Social Systems

1.3 SOME REPRESENTATIVE RESEARCH RESULTS OF 2017

In the following we summarize some research results published during 2017. They are representative of the different research lines and thus illustrate the range of topics studied at IFISC

Dynamics on networks: competition between temporal and topological correlations

Artime, Oriol; Ramasco, José J.; San Miguel, Maxi
Scientific Reports 7, 41627.

The study of dynamical processes on networks, like the evolution of two competing opinions on an arbitrary issue in a large group of people or the spread of a disease at the worldwide scale, has become a topic of major interest. The goal of this work is to study the effect of two features observed in human-related data on the evolution of generic dynamical models: memory effects and topological correlations that appear in the activation process of the network connections. The first effect regulates the probability of interaction given previous interactions and the second is a reflection of the community structure of the network. We propose a framework in which one can include these correlations and control their strength when a dynamical process is running on top of a network.

We focus on two paradigmatic models of different nature: the voter model of opinion dynamics and the Susceptible-Infected (SI) model of epidemiology. The scenario in which the different correlations are present alone has already been addressed: with respect to the uncorrelated case, the temporal correlations accelerate the dynamics while the presence of topological ones delays it. We recover this result and provide an explanation for the speeding up. Temporal correlations help to maintain a percolating structure of active links, facilitating to the dynamical process the global accessibility to the network (see Figure). In the scenario in which the combination of correlations is present, the final outcome is far from trivial. Once fixed the value of the temporal correlation, depending on the strength of the topological correlation one might find either acceleration or delay of the dynamics. The interplay between topology and time is crucial and the inclusion of the correlations leads to substantial quantitative and qualitative changes in the dynamics respect to that of uncorrelated networks.
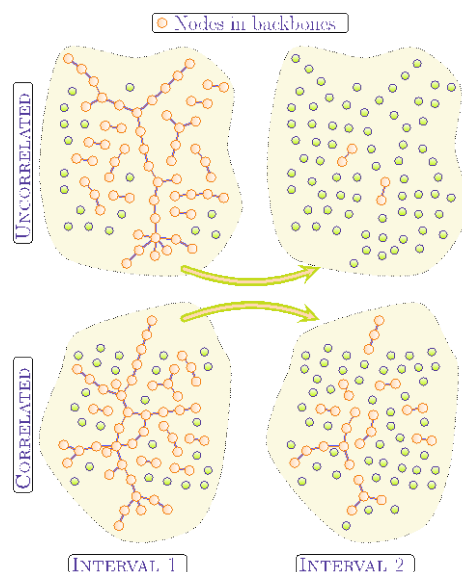

Figure: Backbones of activated links in two consecutive time windows. The top row corresponds to an uncorrelated dynamic, being evident that the percolating structure is destroyed. The bottom row represents the correlated dynamics and it is immediately seen that the structure is preserved.

Active cluster crystals

Delfau, Jean Baptiste; Lopez, Cristobal; Hernandez-Garcia, Emilio
New Journal of Physics 19, 095001 (1-9)

The collective behavior of *self-propelled particles* is a fascinating topic both for its numerous applications (from bacterial motion to self-assembling structures) and for its intrinsic theoretical interest as a far from equilibrium system. Several different phenomena have been investigated in this kind of *active matter*: in the *mobility-induced phase separation* process the active fluid separates into a gas and a liquid-like phase. Active crystals have been reported when the self-propelled particles interact attractively in some range of distances.

Here we have studied a different type of crystallization occurring under purely repulsive interactions. In thermal equilibrium *clusters crystals* may form for some type of soft repulsive potentials which are appropriate to model polymeric or colloidal particles. These crystals are periodic arrangements of the particles in which the unit cell is not a single particle but a cluster of them. We have explored the properties of cluster crystals formed by particles which interact in that way and in addition have an intrinsic self-propulsion velocity. We find that they form nonequilibrium *active cluster crystals*. Self-propulsion deforms the clusters of the equilibrium situation by depleting particle density inside. The figure shows twodimensional computer simulations of these crystals for low (left) and large (right) self-propulsion force. For very large self-propulsion the crystal melts. We have also developed a continuous description of this system in terms of density and polarization fields. The lower inset in the figure displays the density structure of one of the clusters in such description, showing the depleted density at the cluster interior.
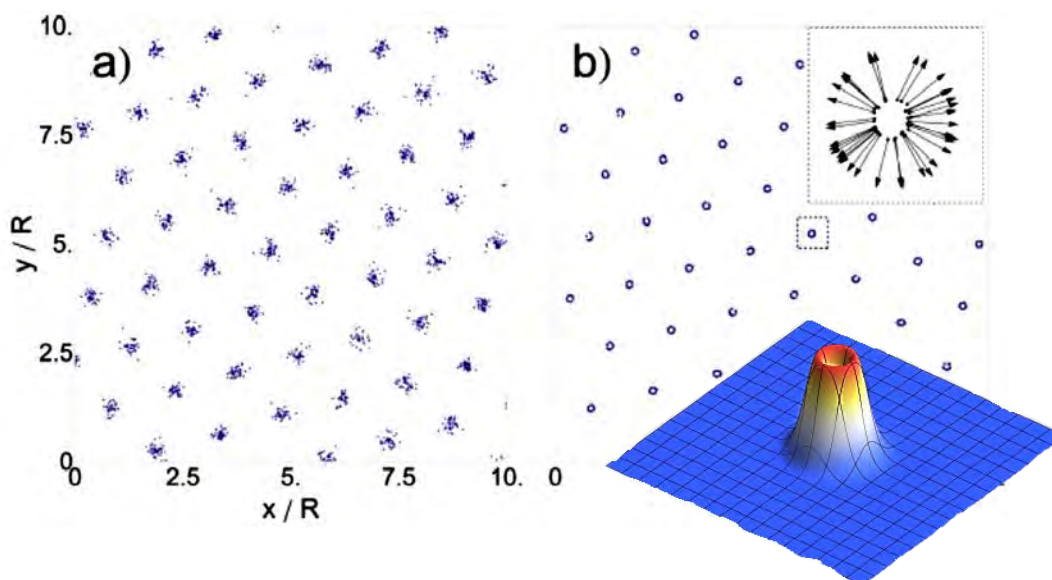
Stochastic thermodynamics for Ising chain and symmetric exclusion process

After the seminal work by Christopher Jarzinsky, Phys. Rev. Lett. **78** (1997) 2690 on the non-equilibrium work theorem $<e^{-\beta W}> = e^{-\beta \Delta F}$, that relates fluctuations in the work W performed during a thermodynamic process in which a system is driven away from equilibrium, to a free energy difference ΔF between two equilibrium states of the system, a plethora of new relations and applications have been developed. From these developments the field of *stochastic thermodynamics* has emerged, deepening and extending our understanding of thermodynamics and its relation to the microscopic laws. In our paper we consider a new setup in which the principles of stochastic thermodynamics can be applied and verified, the Ising linear chain in the microcanonical ensemble and whose two ends are in contact with thermal baths at different temperatures. The system can alternatively be mapped onto a model for particle transport, namely, the symmetric exclusion process, which has been the subject of intense research as one the few examples for which a non-equilbrium potential has been found. With a proper interpretation of the boundary conditions, the system can function as well as a small-scale thermal engine.

Three are the major contributions of this paper to the field of stochastic thermodynamics: we verify two specific predictions, namely the universality of efficiency at maximum power for thermal machines in the simple symmetric exclusion process and the fluctuation theorem for the finite Ising chain in contact with two thermal reservoirs; furthermore, we prove numerically that the energy probability distribution in this complicated non-equilibrium steady state can be well represented by an equilibrium formal expression with an effective temperature which is given analytically as a weighted average of the temperatures of the two ends of the chain. While the first two results validate the results of stochastic thermodynamics in yet another model system, the effective energy distribution was unexpected in view of the complicated non-local structure of the exact probability distribution of the microscopic states and rises the question on whether similar results can be applicable to other more complicated systems, both from numerical or experimental setups.
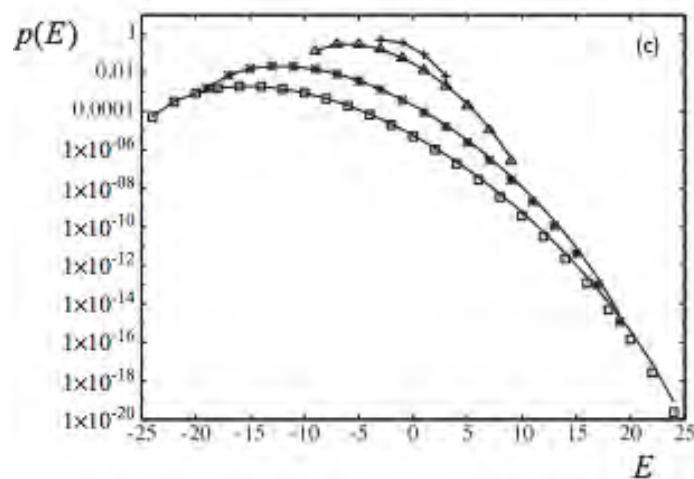
The figure shows the probability distribution for the energy (symbols) and the fit to an effective Boltzmann distribution with an effective temperature for different system sizes of the linear chain.

## Reversal of thermoelectric current in tubular nanowires

The thermoelectric effect arises when the sides of a conductive material are held at different temperatures. The resulting energy difference drives an electric current. Usually, this flow of charge moves from the hot to the cold side. The effect can be exploited in different applications, such as the construction of high precision temperature-determining devices dubbed thermocouples. However, when the size of the system is reduced to the nanometric scale, special features show up.

We have shown that in the case of nanometric tubular conductors (nanowires) the generated electric current can travel from the cold to the hot end, which may seem counter-intuitive. This surprising phenomenon has been observed in two types of nanowires, the so-called topological insulators and the core-shell nanowires. In both cases, a tubular conductive material with bulk insulating properties is required, in which case the electrons are confined to move on the nanowire shell.

To obtain a reversal of the expected current, the system must be under the influence of a magnetic field perpendicular to the axis of the nanowire as shown in the figure. We find that the effect is a consequence of the coexistence of snaking and Landau states. Both the magnetic strength and the temperature difference between the ends of the system allow us to manipulate the sign of the generated current. This anomalous current can be observed even with nanowires with a certain level of impurities, although the magnitude of the anomalous current is reduced as the disorder degree increases.

The reversed current phenomenon had already been predicted and tested experimentally in the case of quantum dots. However, for the case of nanowires our paper predicts a much stronger current, which would ease its future technological applications. In particular, the detection of the current reversal can be seen as an indication of the tubular distribution of the conduction electrons, which is crucial for topological insulator nanowires.
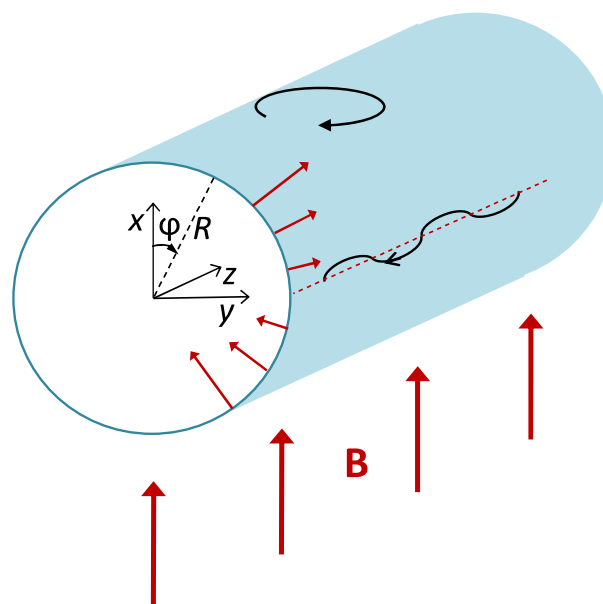
Microscopic description for the emergence of collective dissipation in extended quantum systems

Galve, Fernando; Mandarino, Antonio; Paris, Matteo G. A; Benedetti, Claudia; Zambrini, Roberta

In this paper we derived a very generic condition for the emergence of correlated, or collective, dissipation for a extended quantum systems. This type of dissipation implies that it affects the collective coordinate – for example the center of mass-- of a multi-unit spatially extended system, instead of affecting local coordinates of individual units.

These two different situations yield very different physics, because in the case of collective dissipation, some degrees of freedom become noiseless, thus allowing their use as protected subspaces for quantum information processing.

Also, it solves an open question in the field of open quantum systems: what is the mechanism producing a smooth transition between collective and local, or separate, dissipation in real systems? This question is important for the correct modeling of modern experiments with multi-unit setups.
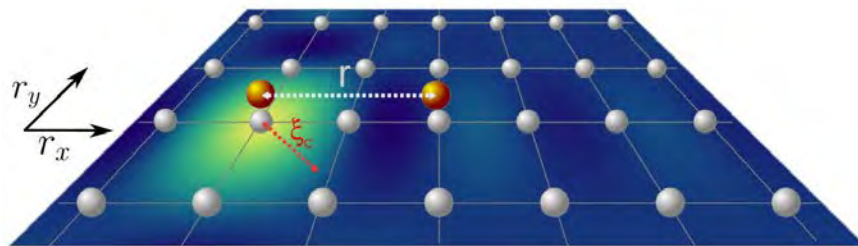
Starting from a model of structured environment, an N-dimensional periodic crystal, we derived the dissipation of two units coupled to it. We show that the distinction between these two very different types of dissipation is given by a single quantity, the cross-talk or cross-damping coefficient, which amounts to the propagator of excitation in the structured environment at the frequency of the two coupled units. It is not, contrary to some previous claims in the literature, related to any correlation length of the environment itself. We show that depending on such frequency, the very same environment can produce local (separate) dissipation, and for other frequency collective dissipation, even when the two units are very far apart.
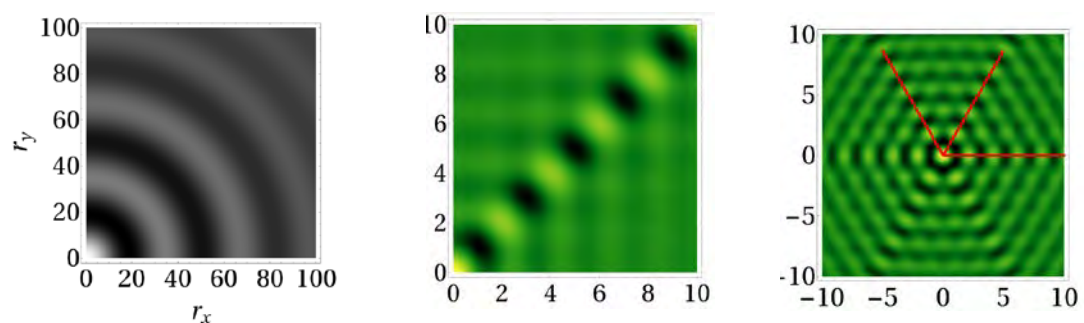
The spatial shape of this all-important cross-damping term depends very much on the symmetries of the environment, and can yield peculiar types of cross-dissipation, where units coupled along a diagonal direction and very far apart feel a collective dissipation, whereas very close-by units not along the diagonal, suffer separate dissipation.

Finally, we related high frequency cutoffs, typically put by hand in theory papers and usually understood as a property of the environment, to finite spatial extension of the units themselves.

Photonic Reservoir Computing: Advances and Perspectives

Bueno, J.; Brunner, D.; Soriano, M.C.; Fischer, I.
Conditions for reservoir computing performance using semiconductor lasers with delayed optical feedback.
Optics Express 25, 2401-2412

Van der Sande, G.; Brunner, D.; Soriano, M.C.
Advances in photonic reservoir computing.
Nanophotonics 6, 561-576

Reservoir Computing is a neuro-inspired concept that aims at processing sequential information in a natural manner. It relies on a recurrent network that maps an input signal nonlinearly onto a high-dimensional state space. In a reservoir computer, the recurrent network, called the reservoir, acts as a hidden layer in the terminology of artificial neural networks. Importantly, the recurrent nature of the network implies closed loops in the network connectivity. Due to these loops the reservoir is capable of storing information about the past and, therefore, to create different responses depending on previous inputs. A readout layer is connected to the reservoir and delivers outputs which are linearly weighted sums of the reservoir node states. Training a reservoir computer for a specific task requires only to adapt these readout weights, the reservoir itself remains unaltered. A reservoir computer's ability to solve complex tasks is usually guaranteed by having a large number of nonlinear nodes in the reservoir. An alternative is to use just one single nonlinear node that is subject to a delayed feedback loop. This approach has been initially developed by IFISC researchers and entails delivering a signal in a series of designated time slots (time multiplexing) to create a "virtual" multi-node reservoir. The need for fewer hardware nodes greatly simplifies the hardware requirements. This has allowed the development of conceptually simple photonic reservoir computers that can operate at high speeds.

In the first work, we study a particularly attractive implementation of a photonic reservoir computer system consisting of a semiconductor laser with delayed feedback that processes information optically injected at 5 GSamples/s. We provide the dependence between operational parameters and system properties, including injection locking, consistency, and memory properties and ultimately identify the conditions for good RC performance for time-series prediction tasks. We find that for injection of a modulated signal, the response system can experience an intermediate state between the known unlocked and fully locked states characterized by partial locking. Consistency of the response to modulated injection and memory capacity both show characteristic dependencies on the locking conditions. For full locking, we observe the highest consistency, and for unlocking the lowest consistency. Memory capacity is found to be the largest at the boundaries of full to partial locking. We demonstrate that these properties of our reservoir computer determine the performance landscape and that a compromise of consistency and memory can be obtained yielding the best prediction performance.
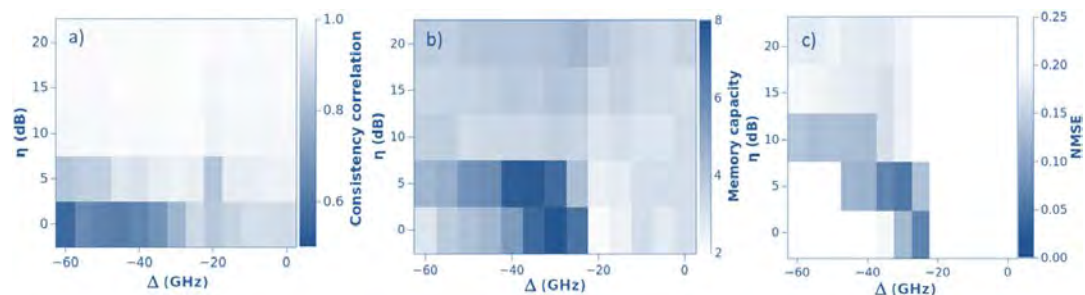
Figure. a) Consistency correlation of the system as a function of the frequency detuning, Δ, and the feedback strength, η. b) Memory capacity of the system as a function of Δ and η. c) Normalized Mean Square Prediction Error, NMSE, as a function of Δ and η.

In the second article, we highlight the current relevance of neuro-inspired photonic hardware at the forefront of the quest for alternative approaches to reboot computing. Complementary to the semiconductor laser-based approach, other implementations of photonic reservoir computing are discussed, including integrated devices, laser arrays and optoelectronic devices. We provide perspectives for this exciting and rapidly growing field.

Coexistence of stable dark- and bright-soliton Kerr combs in normal-dispersion resonators.

Parra-Rivas, P.; Gomila, D.; Gelens, L.

The Lugiato-Lefever equation (LLE) is a prototypical model to describe the generation of Kerr frequency combs in microresonators driven by a continuous-wave laser. These devices can be integrated on chips and used to measure time intervals and light frequencies with very high accuracy. In this context a frequency comb corresponds to the frequency spectrum of a temporal dissipative soliton or pattern circulating in the cavity. Previous works showed that in the normal-dispersion regime only dark solitons exist over an extended parameter range. These solitons correspond to switching waves connecting the top and bottom homogeneous solutions. In the LLE the switching waves (or fronts) show spatial oscillations only around the bottom homogeneous solution, which allow to pin only two fronts forming a dark soliton (a dip). A bump on the bottom solution will collapse and disappear (see Fig. 1a).

In this work we demonstrate that in presence of third-order dispersion (TOD) stable bright solitons can also form and they coexist with dark solitons (Fig. 1b). This is due to the fact that TOD modifies the shape of the switching waves, introducing spatial oscillations also around the top homogeneous solution. In this case both types of solitons, dark and bright, can form as a result of the pinning of two fronts. TOD is also found to suppress temporal oscillatory instabilities of dark solitons, while bright solitons are never found to oscillate. As a side effect both dark and bright solitons are found to move with a velocity that depends on their width. This constant velocity does not prevent, however, their use as frequency combs. Finally both dark and bright solitons are organized in a collapsed snaking bifurcation diagram, such that broader solitons always exist over a narrower parameter range.
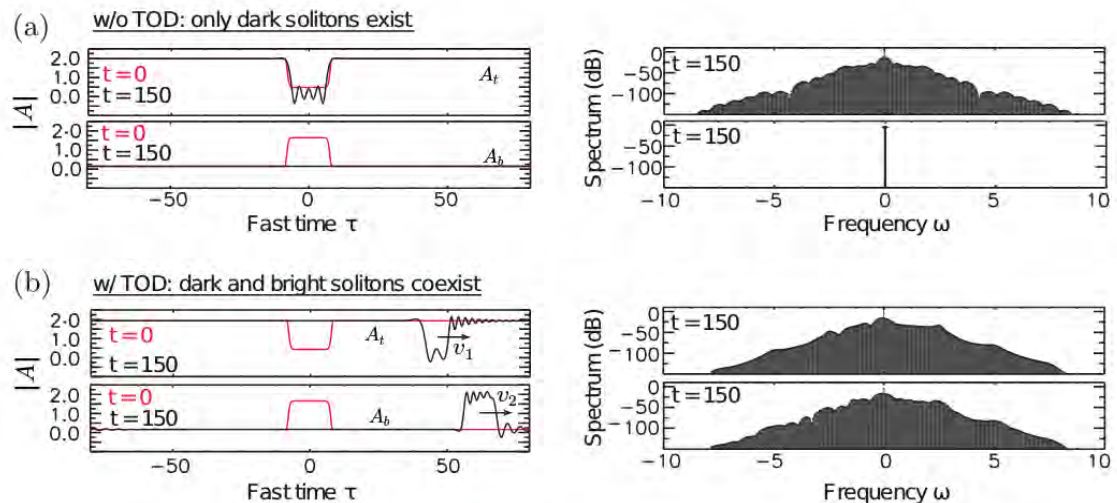

Figure 1: Solutions profile at t=150 (black) after time evolution in the Lugiato-Lefever equation of an initial condition consisting of a dip in the top homogeneous steady state (HSS) A_t or a bump on the bottom HSS A_b (red) in the absence (a) or presence (b) of third order dispersion. The right panels show the comb spectrum associated to the time profiles on the left at time t=150.

Characterization of the structure and cross-shore transport properties of a coastal upwelling filament using three-dimensional finite-size Lyapunov exponents

Bettencourt, J.H.; Rossi, V.; Hernandez-Garcia, E.; Marta-Almeida, M.; Lopez, C.
Journal of Geophysical Research: Oceans 122, 7433-7448

The transport of nutrients, heat, salt and other substances in the ocean is mediated by large structures (eddies, fronts, filaments, etc.) which, by their persistence and impact on fluid trajectories, have been termed Lagrangian Coherent Structures (LCSs). In this paper we investigate the three-dimensional structure, dynamics and dispersion characteristics of a water filament in the Iberian upwelling system (the Atlantic Ocean region in front of Portugal; the filament is traced by a white line in the figure). We used a realistic regional simulation of the western Iberian shelf which is simultaneous with an in-situ oceanographic campaign that surveyed the area.

We computed 3d fields of finite-size Lyapunov exponents (color coded in the figure) from 3d velocity fields and extracted the field's ridges to study the spatial distribution and temporal evolution of the Lagrangian Coherent Structures (LCSs) evolving around the filament.

We found that the LCSs extend in depth like vertical curtains, and that the most intense of them delimit the boundaries of the whole filamentary structure whose general properties match well the observations. The filament interior is characterized by small dispersion of fluid elements. Cold water upwelled near the coast moves towards the open sea along the filament, while conserving its density. The comparison of LCSs with potential temperature and salinity gradient fields shows that the outer limits of the filament coincide with regions of large hydrographic gradients, similar to those observed, explaining the isolation of the interior of the filament with the surrounding waters. As a conclusion, the Lagrangian analysis used in this work is useful in explaining the dynamics of cross-shore exchanges of materials between coastal regions and the open ocean due to mesoscale processes.
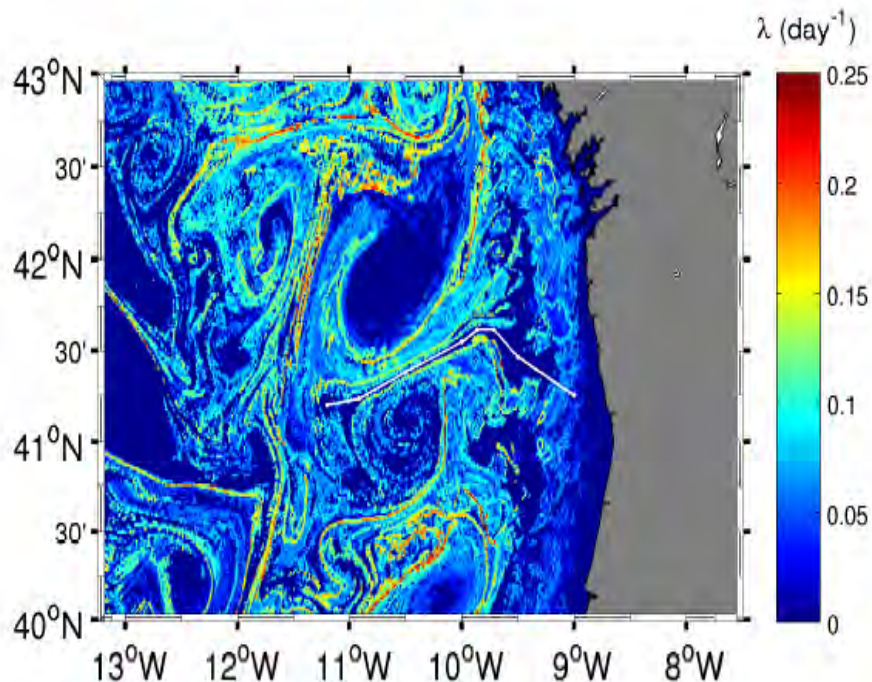
Modeling the dynamical sinking of biogenic particles in oceanic flow

Monroy, Pedro; Hernndez-García, Emilio; Rossi, Vincent; López, Cristóbal
Nonlinear Processes in Geophysics 24, 293-305

The sinking of small particles in fluids is a topic of both fundamental importance and of practical implications in diverse fields ranging from rain nucleation to industrial processes. In the oceans, photosynthesis by phytoplankton in the surface produces organic matter which falls towards the sea bottom and then becomes isolated from the atmosphere. This downward flux of carbon-rich biogenic particles is one of the key processes of the biological carbon pump, and responsible for much of the oceans' role in the Earth's carbon cycle.

In this contribution we evaluate the diverse mechanisms (weight, fluid motion, friction, Coriolis force, and inertia) determining the rate of sinking of small particles in flows, focusing in the spatial and temporal ranges appropriate for matter of biological origin. The conclusion is that the sinking process is very anisotropic, with much larger displacements in the horizontal than in the vertical. It turns out to be well described by a model in which the particles follow passively the ocean flow, with an added small vertical velocity resulting from the Stokes balance between gravity and friction.

Despite these simple mechanisms, the distribution of particles sedimented on the ocean bottom is extremely inhomogeneous, even if they are homogeneously produced at the surface. The figure shows the result of a numerical computation of the sedimentation of small particles in the south Atlantic, off the coast of Namibia. Colors indicate the particle density at the different locations, relative to the initial (homogeneous) density at the surface where the particles are released. We explain these inhomogeneities in terms of the geometry of the transport and sinking process.
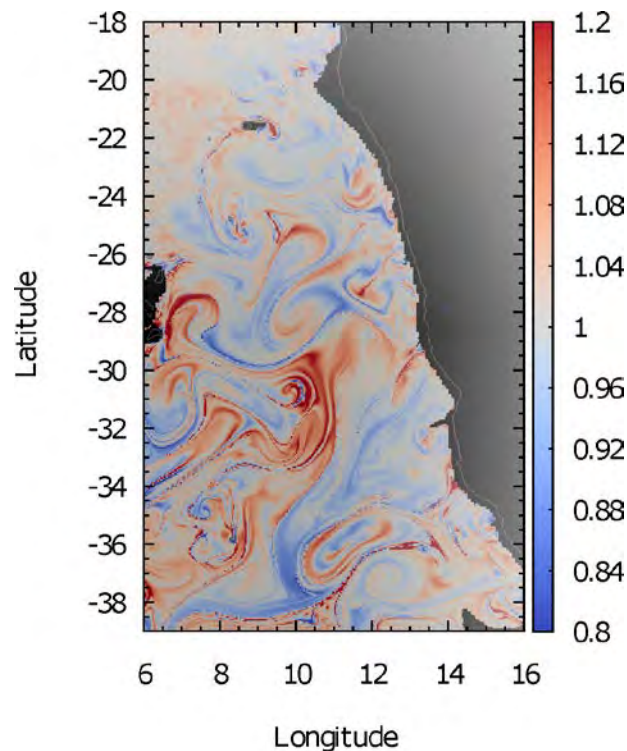
Fairy circle landscapes under the sea

Posidonia oceanica meadows constitute one of the most relevant and largest ecosystems in the Mediterranean sea. It extends along the coastline covering about 50.000 Km^2. It is known to increase about three times the average biomass and oxygen production where it is present and plays a major role in the trophic chain. It is the natural habitat of giant mollusks (Pinna nobilis) and shrimps (Pontonia pinnoplax) in risk of extinction. The complex rhizome network developed prevents from soil erosion and it has a relevant impact in the global warming since it is able to capture 30 million tons of CO_2 per year. Unfortunately, this ecosystem is in regression.

The understanding of its growth dynamics has become a cornerstone in the analysis of its condition and to investigate how it may vary as a result of the presence of invasive species, the climate change, an increase of water pollution or the overexploitation in fishing. At the same time, it might be of great help in the design of novel restoration programs.

In this paper we investigate the emergence of self-organized patterns in marine environments, in which Posidonia oceanica is a remarkable example of this phenomenon, that result from the intrinsic plant dynamics coupled to plant interactions within the meadow. We report the occurrence of submarine fairy circle seascapes in seagrass meadows and propose a simple model that reproduces the diversity of seascapes observed in these ecosystems. These seascapes include two extreme cases, a continuous meadow and a bare landscape, along with intermediate states that range from the occurrence of persistent but isolated fairy circles, or solitons, to seascapes with multiple fairy circles, banded vegetation, and leopard-skin patterns consisting of bare seascapes dotted with plant patches. The model predicts that these intermediate seascapes extending across kilometers emerge as a consequence of local demographic imbalances along with facilitative and competitive interactions among the plants with a characteristic spatial scale of 20 to 30 m, consistent with known drivers of seagrass performance. The model, which can be extended to other clonal plants in other landscapes showing fairy rings, reveals that the different seascapes observed hold diagnostic power as to the proximity of seagrass meadows to extinction points that can be used to identify ecosystems at risks.
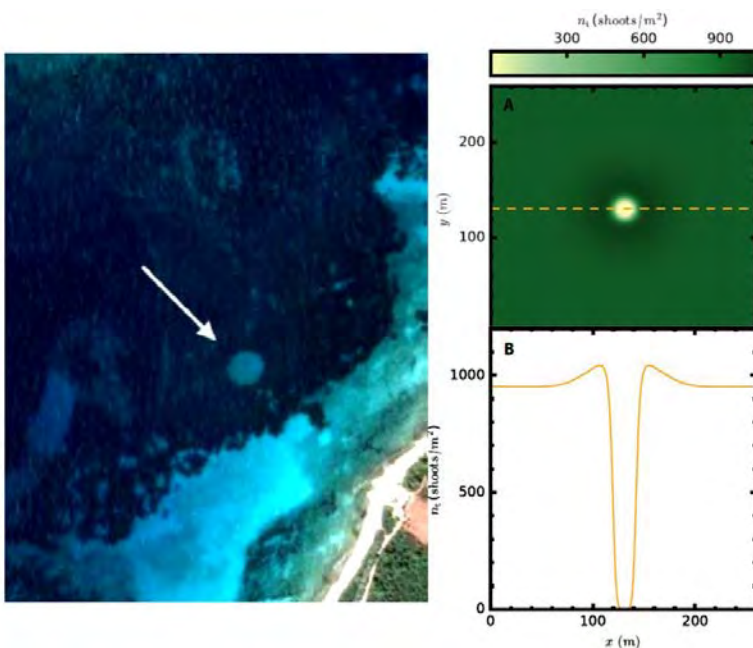
(Left) Fairy circle in a P. oceanica meadow in the Adriatic Sea (Google maps, 44°05′37.5″N, 14°55′37.6″E; other fairy circles can be found at the following locations: 44°04′01.8″N, 14°57′53.3″E and 39°08′48.2″N, 2°56′07.1″E. (Right) Biomass profile obtained from our model, showing a fairy circle resulting from plants' competition for resources.

The Ecology of Human Mobility

Meekan, Mark G.; Duarte, Carlos M.; Fernández-Gracia, Juan; Thums, Michele; Sequeira, Ana M.M.; Harcourt, Rob; Eguíluz, Víctor M.
Trends in Ecology & Evolution 32, 198-210

The increasing number of smartphones and in general electronic devices has moved human mobility research into big data. These data describe human mobility and behavior with unprecedented resolution, revealing a wealth of emergent features across a diverse array of phenomena including commuting, epidemics, the spread of innovations and culture, and collective behavior (Figure A). Interestingly, we identify many clear parallels with studies of animal movement. Ecological theories of animal movement have been developed in a context where data is expensive to obtain and data acquisition requires the deployment of sensors in each animal (Figure B). Movement ecology, which explores how animals cope with and optimize variability in resources, has the potential to provide a theoretical framework to aid an understanding of human mobility and its impacts on ecosystems. In this contribution, we review the most salient studies of human mobility and argue how these provide a base for a framework for the ecology of human mobility. In turn, big data on human movement can provide solutions for urgent conservation problems and management challenges.
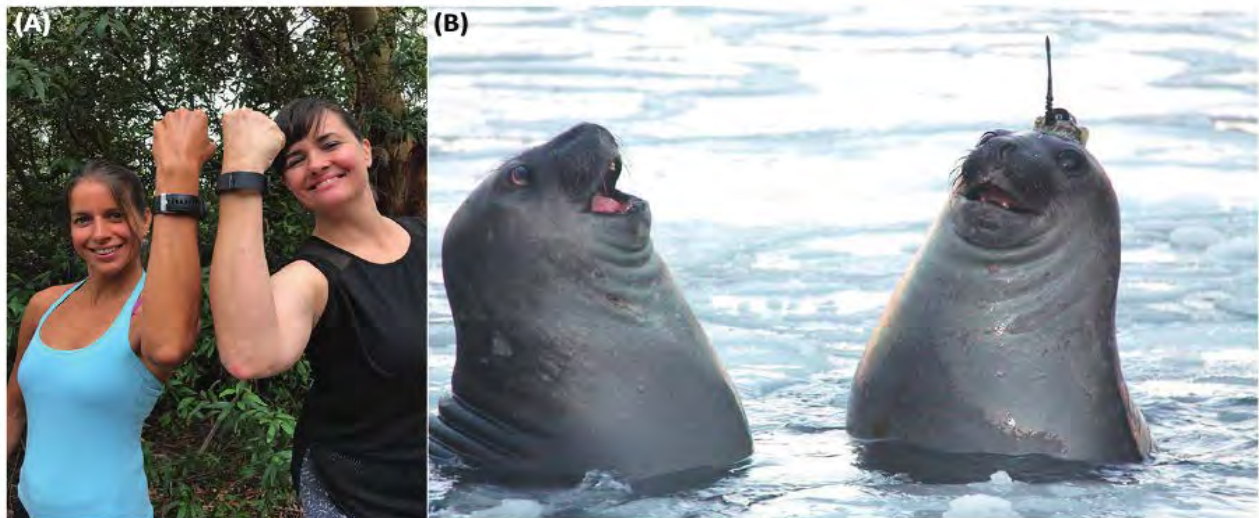
Trends in Ecology & Evolution

Figure. Wearable devices, such as the 'Fitbit' shown in (A) provide a new data stream that opens a window into movement and body physiology. This development mirrors the field of telemetry and biologging in animals where tracking tags (B – southern elephant seals, Mirounga leonina, note tag on head of seal) not only transmit location data but also store data from a variety of sensors that can record body position in three dimensions and internal (e.g., heartrate) and environmental (e.g., temperature, depth, altitude) variables. As they have done for animals, wearable devices will allow the development of theories connecting human behavior, body condition, and health to movement and activity.

Effective connectivity in the hippocampus circuit.

López-Madrona, V.J.; Matias, F.S.; Pereda, E.; Canals, S.; Mirasso, C.R.
On the role of the entorhinal cortex in the effective connectivity of the hippocampal formation, CHAOS 27, 047401

Finding a relation between structural and functional brain connectivity is one of the major goals of neuroscientists. In order to tackle this issue, two questions can be addressed: How do anatomical connections among brain regions influence the information flow in the brain network? And how to determine the structural connectivity from the effective connectivity (or, more precisely, from causal measurements)?

Inferring effective connectivity from neurophysiological data is a challenging task. In particular, only a finite (and usually small) number of sites are simultaneously recorded, while other sites that are not being recorded can influence the response of one of these sites. In the hippocampal formation, for instance, the connections between areas CA1, CA3, the dentate gyrus (DG), and the entorhinal cortex (EC) are well established. However, little is known about the relations within the EC layers, which might strongly affect the resulting effective connectivity estimations. In this work, we used a computational model of the hippocampal formation and the EC to explore the capacity of linear and nonlinear measurements of directed statistical interdependencies to retrieve effective connections. Six populations, composed by excitatory and inhibitory neurons, were built to describe the areas CA1, CA3, the DG, and the three layers (LII, LIII, and LV) of the EC. Each area and each layer were modeled as a neuronal ensemble composed of 400 excitatory and 100 inhibitory sparsely connected (10% connectivity) neurons described by the Izhikevich model. For the coupling between the different ensembles, either excitatory or inhibitory, we assume that each postsynaptic neuron received 20 synapses from presynaptic ones in the sender population. Effective connectivity estimations were done using the time series obtained from the numerical integration of the population models. To reduce the number of possible combinations of connections, and considering that in many experiments only data form CA1, CA3 and the DG are recorded, we maintained the connections between the areas fixed, and varied only those between the three layers in the EC. Despite this simplification, we still had a total of 64 possible combinations for the connections between these layers (considering the possibility of both unidirectional and bidirectional links).
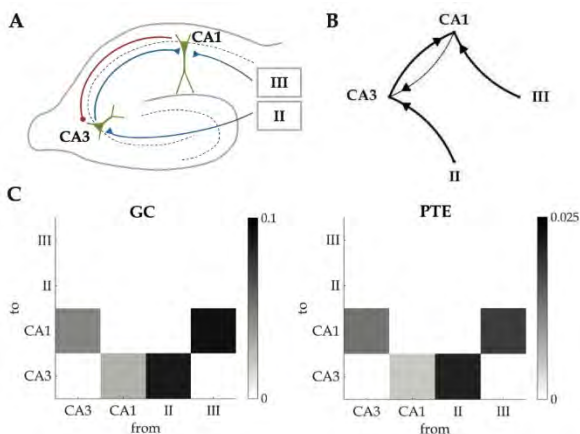
Motif with an interneuron. (a) Scheme of one of the implemented circuits, in which the layers in the EC are assumed to be disconnected (layer V does not connect to any of the three areas). Blue (red) arrows represent excitatory (inhibitory) links. (b) Network representation of the estimated causalities. (c) Matrices with GC (left) and PTE (right) values for the analyzed circuit.

Our results of causal analysis, based on Granger Causality (GC) and Partial Transfer Entropy (PTE) measurements, revealed that the estimation of effective connectivity in the hippocampus strongly depends on the connectivities between EC layers. Moreover, we find, for certain EC configurations, very different results when comparing GC and PTE measurements. We further demonstrate that causal links can be robustly inferred regardless of the excitatory or inhibitory nature of the connection, adding complexity to their interpretation. Overall, our work highlights the importance of a careful analysis of the connectivity methods to prevent unrealistic conclusions when only partial information about the experimental system is available, as usually happens in brain networks. Our results suggest that the combination of causality measures with neuronal modeling based on precise neuroanatomical tracing may provide a powerful framework to disambiguate causal interactions in the brain.

Layered social influence promotes multiculturality in the Axelrod model

Battiston, Federico; Nicosia, Vicenzo; Latora, Vito; San Miguel, Maxi
Scientific Reports **7**, 1809

The coexistence of different cultures, in spite of increasing pressure towards globalisation is one of the most salient empirical findings in the investigation of collective behavior in human societies. In a pioneering work Robert Axelrod showed how local convergence caused by homophily and social influence can generate global polarization (multiculturality). However, such multicultural states were shown by Klemm et al (*Phys Rev. E 67, 045101R (2003)*) to be unstable in the presence of a widely acknowledged social mechanism known as cultural drift, i.e. the spontaneous mutation of traits in the population. As a consequence, how multiculturality can emerge and persist over time remained as an open question answered in this paper by invoking that social influence occurs in a multilayer social network. Our findings suggest that the layered organisation of social influence typical of modern societies is the key ingredient to explain why and how multiculturality emerges and thrives in our world
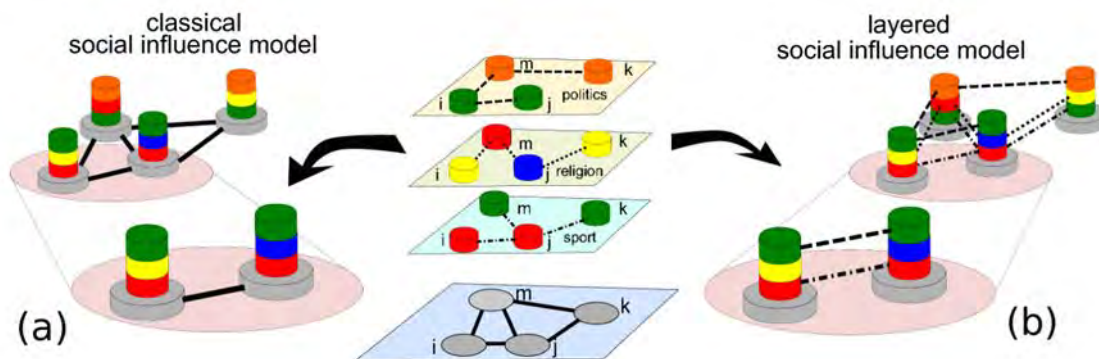
Social influence is inherently layered. *Social systems are multiplex networks because individuals tend to differentiate their social contacts according to the different subjects of the interaction. In the classical social influence model, the specific type of each interaction is neglected and all connections are treated together (**a**). Conversely, we propose here a multilayer cultural influence model in which each interaction can only affect the corresponding cultural feature (**b**). As an example, in the classical model the bond between agents i and j is still active : the two agents have a different religious trait but according to social influence, one of the two agents will eventually absorb the religious trait of the other one. The same bond is instead frozen in the layered model, as imitation cannot affect religious beliefs, since the two agents are not linked on the corresponding layer.*

By exploiting the recent advances in the mathematical modelling of multiplex networks, we show that multiculturality or cultural diversity naturally emerges, self-sustains and is a dynamically stable phase by simply considering a layered social influence. Moreover, our model allows reproducing a novel social phase, where different levels of consensus are achieved on different topics. This is another well-known feature of human societies, where the same group of individuals often shows vast agreement on specific topic, and strong fragmentation on some other ones. Our results are tested in empirical multilayer networks.

Effects of dynamic-demand-control appliances on the power grid frequency

The growth of the electricity demand together with the necessity to increase the amount of renewable energy fed into the power grid is increasing the fluctuations in the unbalance between demand and production, which translates in fluctuations of the electrical frequency. The frequency is, in fact, a good proxy to control and stabilize the power grid. Since there is no storage of electricity in the power grid, the power generated at any time has to match exactly the power consumed by all the loads attached to the grid. If at any time power demand exceeds supply, then frequency falls. Conversely, if the supply exceeds the demand then frequency rises. To ensure that frequency is within a tolerable range, control is typically applied on the supply side in a centralized manner. This is however very expensive, and new control philosophies applied to the demand side have been proposed. For instance dynamic demand control (DDC) is a distributed demand side control where smart devices modify their consumption according to the state or the frequency of the grid. Such devices can include electric boilers, air conditioners, fridges, electric cars, portable rechargeable devices, etc.

In this work we consider a simple model for a power plant with primary and secondary control subject to a fluctuating load composed by a large number of devices that switch on and off randomly. A fraction of such devices are smart and they can delay their switching depending on the frequency of the system. Pending tasks are then recovered at a later time, frequency conditions permitting. Our results show that DDC can reduce frequency fluctuations substantially. Figure 1 (left) shows time series of the frequency with a different fraction of smart devices in the demand. The control is applied only beyond a certain tolerance around the reference frequency (ω_R=50Hz) indicated by the red lines. One can clearly see how the fluctuations are largely reduced within the tolerance range when the fraction of DDC devices is increased. Some large frequency peaks are however still present. These peaks are a collective effect arising due to the need of recovering the pending tasks. Many devices need to switch on or off when the frequency comes back into the safe range after a large fluctuation, potentially triggering undesired peaks. A randomization of the switching of these devices largely avoids this problem, but not completely. This can be appreciated in the cumulative probability distribution of finding a perturbation larger than $\Delta\omega=|\omega-\omega_R|$, as shown in the right panel of Fig. 1. As it can be observed, when the pending tasks are recovered the probability distribution changes qualitatively in such a way that small or medium size fluctuations are reduced, but the probability of finding a very large fluctuation increases. We have find that a good compromise is found when the threshold for recovery pending tasks is set just above the tolerance of the control, as indicated by the grey symbols. Further research is being carried out to find more advanced protocols to avoid these potentially harmful large fluctuations. We also conclude that a deployment of DDC around 30-40% already allows a significant reduction of the fluctuations while keeping the number of pending tasks low.
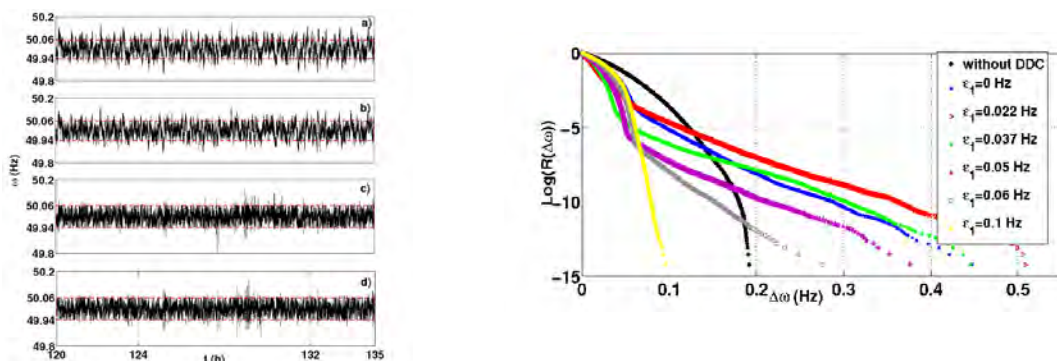
Figure 1: (Left) Time series of the frequency ω for an increasing fraction of smart devices in the demand: a) no smart devices, b) 1% of smart devices, c) 50% and d) 100%. (Right) Cumulative probability distribution of finding a fluctuation larger than $\Delta\omega=|\omega-\omega_R|$. Black symbols corresponds to the case without DDC, yellow with DDC without recovering pending tasks, and other colors are cases with different frequency thresholds ε_1 for the recovery.

Crowdsourcing the Robin Hood effect in cities

Economic inequalities in cities naturally reflect on the maps: some neighborhoods end up having income level per capita much higher than others. Land price, quality of services and even security are also related to income levels and may wildly diverge from one area of the city to other. This is the so-called "neighborhood effect" and it has been difficult to treat via public policies. In this work, we use the information on expenditure obtained from anonymized credit card records to propose an experiment designed to explore how strong the economic inequality is in space and how difficult it is to handle via changes in consumer habits. The data cover two Spanish provinces: Barcelona and Madrid for two years and the spatial analysis is performed at zip code scale. The idea is to check how many purchases must be changed from a shop in a certain zip code to another of the same type somewhere else to make the income distribution per business uniform in the city. Curiously, it is enough to modify only 5% of the purchases to obtain an 80% reduction in inequality. Not only that, it is possible to cut the total distance travelled in the purchases by 25% or even 50%. The results of this virtual experiment are thus very encouraging and show a large applicability potential for both citizens and public authorities to attain socio-economic goals in coordinated way via the mix of crowdsourcing and the use of information provided by ICT tools.
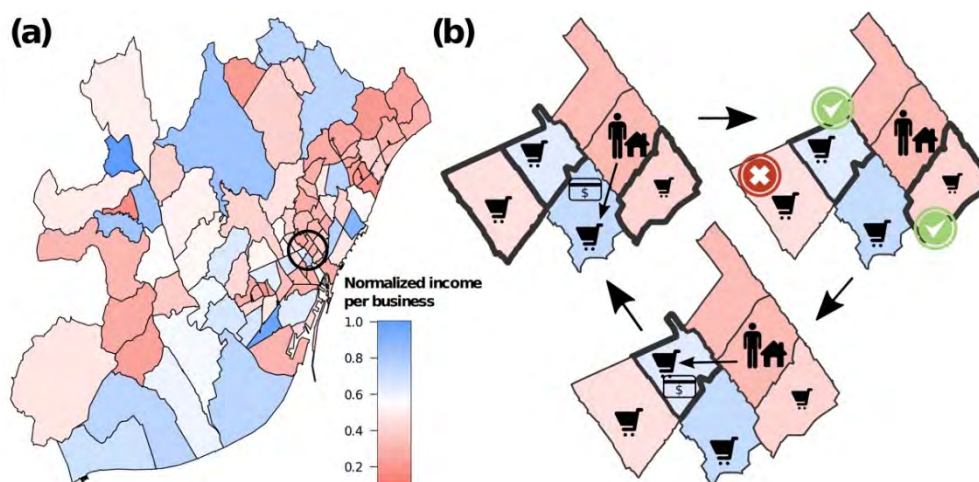
Figure The process of changes in the trips. In (a), the average income per business by zip code in the city of Barcelona. The average income is normalized with the maximum in order to highlight the inequalities that can reach a factor five between the different areas. In (b), a sketch with the mechanism to change the location of the purchases. A randomly selected purchase by an individual with a certain residence zip code can pass from the original shop to another selected at random within those of the same category. The movement is only accepted if the urban inequality is reduced and, besides, it can be imposed also other constraints as the reduction of the global traveled distance.

1

PRESENTATION AND RESEARCH LINES

2

PERSONNEL

2.1 PERMANENT SCIIENTIFIC STAFF

PERE COLET	CSIC Research Professor
VÍCTOR M. EGUÍLUZ	CSIC Tenured Scientist
INGO FISCHER	CSIC Research Professor
DAMIÀ GOMILA	CSIC Tenured Scientist
EMILIO HERNANDEZ-GARCÍA	CSIC Research Professor, IFISC Deputy Director
CRISTOBAL LÓPEZ	University Professor UIB
ROSA LÓPEZ	University Professor UIB
MANUEL MATÍAS	CSIC Senior Researcher
CLAUDIO MIRASSO	University Full Professor UIB
MAXI SAN MIGUEL	University Full Professor UIB, IFISC Director
JOSE J. RAMASCO	CSIC Permanent Scientist
DAVID SÁNCHEZ	University Professor UIB, IFISC Academic Secretary
LLORENÇ SERRA	University Full Professor UIB
TOMÀS SINTES	University Professor UIB
RAÚL TORAL	University Full Professor UIB
ROBERTA ZAMBRINI	CSIC Tenured Scientist

Contribution of the permanent staff to the IFISC research lines:

Every senior researcher participates in the transversal line on Complex Systems: Statistical and Nonlinear Physics. In addition, typically a senior researcher participates in one or two other focused lines. This collaborative organization provides coherence and integration as well as interaction and bridges. It is an alternative to static schemes with disjoint groups of researchers devoted exclusively to one line of research. The following table summarizes the participation of the senior researchers in the different lines during 2017.

Coherence and Integration Interaction and Bridges	Pere Colet	Víctor M. Eguíluz	Ingo Fischer	Damià Gomila	Emilio Hernández-García	Cristóbal López	Rosa López	Manuel Matías	Claudio Mirasso	José J. Ramasco	David Sánchez	Maxi San Miguel	Llorenç Serra	Tomàs Sintes	Raúl Toral	Roberta Zambrini
1) Complex Systems: Statistical and Nonlinear Physics.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2) Transport and Information in Quantum Systems							X				X	X				X
3) Nonlinear Photonics	X		X	X					X							
4) Nonlinear Dynamics in Fluids					X	X								X		
5) Biocomplexity		X	X		X	X		X	X					X	X	
6) Collective phenomena in Social and Socio-technical Systems	X	X			X					X		X			X	

2.2 SCIENTIFIC ASSOCIATES

HORACIO WIO

2.3 POSTDOCTORAL RESEARCH ASSOCIATES

APOSTOLOS ARGYRIS	Marie Curie Contract
MIGUEL C. SORIANO	Ramón y Cajal Fellow
AGNIESZKA CZAPLICKA	Postdoctoral Contract Project INTENSE@COSYP
JEAN-BAPTISTE A. DELFAU	Postdoctoral Contract Project INTENSE@COSYP
GABOR DROTOS	Postdoctoral Contract Project LAOP
JUAN FERNÁNDEZ GRACIA	Postdoctoral Contract Project CAASE
RICCARDO GALLOTTI	Postdoctoral Contract Project BigData4ATM
FERNANDO GALVE CONDE	Postdoctoral Contract Project EPheQuCS
YOSHIFUMI KAWASAKI	Japan Society for Promotion of Science(JSPS) Contract
NAGI KHALIL	UIB Lecturer
KONSTANTIN KLEMM	Ramón y Cajal Fellow
BYUNGJOON MIN	Postdoctoral Contract Project ESOTECOS
SILVIA ORTIN	Balear Government Postdoc Contract
ANTONIO PÉREZ LÓPEZ	Juan de la Cierva Contract
MEGHDAD SAEEDIAN	Postdoctoral Contract Project Complexity1

2.4 PHD STUDENTS

MARIA ISABEL ALOMAR	UIB Teaching Assistant
ORIOL ARTIME	Contract Project PATRES
ALEIX BASSOLAS	Balear Government Fellowship
XIONG BINYAN	HKUST, Hong Kong
JULIAN BUENO	FPI Contract Project TRIPHOP and IDEA
ALBERT CABOT	Contract Project QuProCS
BRUNO CAMPANELLI	Balear Government Fellowship
EDUARDO H. COLOMBO	PDSE, Brazil
LEONARDO DALLA	Fellow "Ciencia sin fronteras" sandwich CAPES, Brasil
CRISTIAN ESTARELLAS	Balear Government Fellowship
ANTONIO FERNÁNDEZ	FPU Contract
GONZALO MANZANO	FPI Contract UCM
MATTIA MAZZOLI	Contract Project ESOTECOS
PEDRO MONROY	FPI Contract Project ESCOLA
PEDRO J. PARRA	FWO Fellowship Brussels
MORITZ PFLÜGER	Contract Project NeuroQNet
TOMASZ RADUCHA	Contract Project ESOTECOS
JORGE P. RODRIGUEZ	FPU Contract
GUILLEM ROSSELLÓ	PhD Student
DANIEL RUIZ REYNÉS	FPI Contract ESOTECOS
SOMAYE SHEYKHALI	Contract Project CAASE
MIGUEL A. SIERRA	Balear Government Fellowship
PAOLA SOUTO	Contract Project CAASE
EDER B. TCHAWOU	FPI Contract Project INTENSE@COSYP

2.5 TECHNICAL AND ADMINISTRATIVE SUPPORT

CARLOS M. ALVAREZ	Computing Lab Technician since May
INMA CARBONELL	Administration Unit Head
MARCOS GALLETERO	Lab Technician since September
ADRIAN GARCÍA	Communication and Dissemination
PAU MASSUTTI-BALLESTER	Lab Technician since September
MARTA OZONAS	IFISC Secretary
EDUARD SOLIVELLAS	Computing Lab Technician
RUBÉN TOLOSA	Computing Lab Technician
M. ANTÒNIA TUGORES	Data Engineer

IFISC people - Winter Solstice 2017

2.6 VISITORS

LONG-TERM VISITORS
(more than one month)

LORENZO CAPRINI	University Aquila, Italy. Nov.-Dec.
MARIO COSENZA	Univ. de Los Andes, Venezuela. May-June
BRUNO GONÇALVES	Center for Data Science, NY Univ., USA. Sept.
BASTIAN HERZOG	Univ. TU Berlin, Germany. Nov.-Jan.
MAXIME LENORMAND	Irstea, Montpellier, France. September
M. FLORENCIA LUDOVICO	U. of Buenos Aires, Argentina. Oct.-Nov.
SABRINA MANISCALCO	Turku C. Quantum Physics, Finland. June-July
RICARDO MARTÍNEZ GARCÍA	Univ. Princeton, USA. June-July-August
FELIPE OLIVARES	Univ. Católica de Valparaíso, Chile. Oct.-Nov.
CHRISTIAN VAN DEN BROECK	Univ. Hasselt, Belgium. May-June
RAUL VICENTE ZAFRA	Univ. Tartu, Estonia. Oct.-Nov.-Dec.

SHORT-TERM VISITORS
(Less than one month)

ERIK A. MARTENS	University of Copenhagen. Denmark. January
MURIELLE V. TCHAKUI	University of Yaounde I, Cameroon. Februrary
ERIC DONALD DONGMO	University of Yaounde I, Cameroon. Februrary
LILIANA ARRACHEA	ICAS, UBA, Buenos Aires, Argentina. February
LENDERT GELENS	KU Leuven, Belgium. March
MATHIEU DESROCHES	INRIA - Sophia Antipolis, France. March
DANIEL CZEGEL	Center for Ecological Research, Hungary. March
KONSTANTIN BLYUSS	University of Sussex, UK. March
YULIYA KYRYCHKO	University of Sussex, UK. March
FRANCESCO PLASTINA	Univ. della Calabria, Italy. April
TOMASZ CZYSZANOWSKI	Lodz University of Technology, Poland. April
RENAUD LAMBIOTTE	Namur Center for Complex Systems (Belgium). April
HANS HERMANN	ETH Zurich, Switzerland. April
JUAN A. BONACHELA	University of Strathclyde, Glasgow (UK). April
DANIEL BRUNNER	FEMTO-ST, Besançon, France. April
DARIO BAUSO	The University of Sheffield, UK. May
ERNESTO PEREDA	Univ. La Laguna, Tenerife, Spain. May
CHRIS VAN DEN BROECK	Universiteit Hasselt, Diepenbeek, Belgium. May
STEVEN BRESSLER	Florida Atlantic University, USA. May
PEDRO CARELLI	Recife, Brasil. May
JONG SOO LIM	KIAS, Seoul, Korea. May
VICTOR LOPEZ	Instituto Neurociencias, Alicante, Spain. May
MELISSA MAIDANA	Instituto Balseiro, Bariloche, Argentina. May
BENJAMIN CARRERAS	BACV Solutions Inc., USA. June
VINCENT ROSSI	Mediterranean Institute of Oceanografy, France. June
ANA SEQUEIRA	Univ. of Western Australia, Perth, Australia, June
NAOKI MASUDA	Univ. Bristol, UK. June
MARIO COSENZA	Univ. de los Andes, Venezuela. June
JORGE REVELLI	CONICET, Univ. Cordoba, Argentina. June
ANGELO VULPIANI	Università di Roma, Italy. June
JUAN M. PARRONDO	Univ. Complutense Madrid, Spain. June
MEGHDAD SAEEDIAN	Shahid Beheshti University, Iran. June
LAURENS MOLENKAMP	Würzburg University, Germany. June
ROBERTO DEZA	Univ. Nacional Mar del Plata, Argentina. June
MAJID TAKI	Univ. de Lille, France. June
LETICIA CUGLIANDOLO	Univ. Pierre et Marie Curie, France. June
JAUME CASADEMUNT	Univ. Barcelona, Spain. June
JORDI SORIANO	Univ. Barcelona, Spain. June
DIEGO RAMIRO FARIÑAS	IEGD-CCHS-CSIC, Spain. July
LUIS MARTINEZ	Instinto de Neurociencias de Alicante, Spain. July
FRANCISZEK BARTNIK	Techniche Universität Wien, Austria. July
JAN DANCKAERT	Vrije Universiteit, Brussel, Belgium. July
JOSEBA ALONSO	ETH Zürich, Switzerland. August
MAXIME LENORMAND	Irstea, Montpellier, France. September
ANDREAS FLACHE	Groningen University, The Netherlands. September
ALBERTO HERNANDO	SThAR and EPFL, Switzerland. October
GIANLUCA GIORGI	Univ. de Franche-Comté, Besançon, France. November
SANDRO MELONI	BIFI, Zaragoza, Spain. November
PHILIP BALL	Science writer, radio host and columnist, UK. November
EKHARD SALJE	Cambridge University, UK. December
MARIANO SIGMAN	Lab. de Neurociencia, Univ. Di Tella, Italy. December

2.7 MASTER AND COLLABORATION STUDENTS

In addition to the IFISC personnel, Master and Collaboration students have been also involved in IFISC research:

JAVIER AGUILAR	IFISC Master
LUIS MARTIN	IFISC Master
RODRIGO MARTINEZ	IFISC Master
MARTIN E. MAZA	IFISC Master
JUAN OTAIZA	IFISC Master
ALBERTO PUEYO	IFISC Master
GIACOMO SCETTRI	IFISC Master
IRENE ESTÉBANEZ	IFISC Master
ALBERT FERRER	IFISC Master
HANI L. FRANCISCO	IFISC Master
OSCAR E. GOMEZ	IFISC Master
EDUARDO VARELA	IFISC Master
JOAN LOSA	IFISC Master
ALEJANDRO CUNILLERA	IFISC Master and SURF@IFISC Fellowship
JOAQUIM LLORENS	SURF@IFISC Fellowship
BERNAT MOLERO	SURF@IFISC Fellowship
MARTA CAVERO	SURF@IFISC Fellowship
RODRIGO TENORIO	SURF@IFISC Fellowship
MARC FUSTER	SURF@IFISC Fellowship
CLEMENT HAECK	ENS Paris-Saclay, France
PETER NOTEBOOM	Utrech Univ., The Netherlands
JOHANNES STRIEBEL	Univ. of Münster, Germany
MATTHIAS HÄUSSLER	Univ. of Münster, Germay

2.8 SUMMARY OF IFISC HUMAN RESOURCES

HUMAN RESOURCES IFISC 2017

	Total	Male	Female
Permanent staff	16	14	2
Postdoctoral fellows	15	13	2
PhD students	24	21	3
Long-term visitors	11	9	2
Support personnel	9	6	3
Total	75	63	12

PERSONNEL IFISC 2012-2017
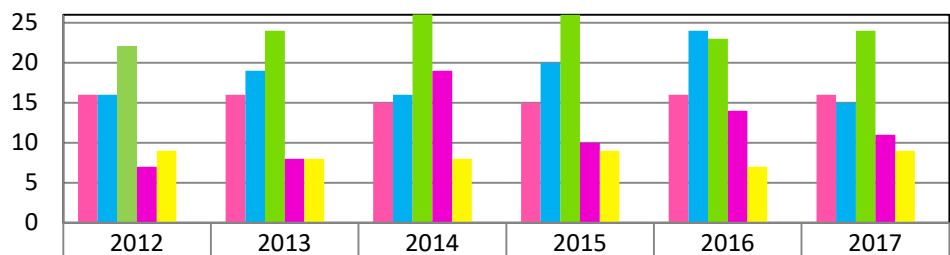
	2012	2013	2014	2015	2016	2017
■ PERMANENT STAFF	16	16	15	15	16	16
■ POSTDOCTORAL AND ASSOCIATED	16	19	16	20	24	15
■ PhD STUDENTS	22	24	27	26	23	24
■ LONG TERM VISITORS	7	8	19	10	14	11
■ SUPORT PERSONNEL	9	8	8	9	7	9
TOTAL	70	75	85	80	84	75

VISITING SCIENTISTS AT IFISC 2012-2017
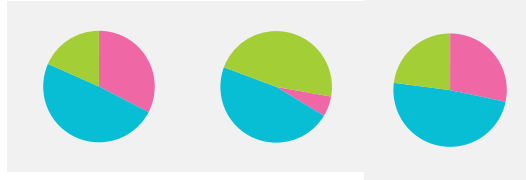
		Short visits	Long visits	Total visits
	SPAIN	65	4	69
	EUROPE	121	35	156
	REST OF THE WORLD	44	30	74
	TOTAL	230	69	299

3

RESEARCH PROJECTS AND FUNDING

DURING 2017 IFISC HAS RECEIVED FUNDING VIA THE ACTIVE RESEARCH PROJECTS LISTED IN THE FOLLOWING PAGES. IN BRIEF:

- European Commission Framework Program projects: **3**
- Spanish National Plan: **8**
- Collaboration Networks: **10**
- Research Contracts: **2**

- Grand total budget of active projects in 2017: **1.793.870 €**
- Grand total budget of European Commission Framework Programs active projects in 2017: **517.996 €**
- Budget of EC-funded active projects in 2017: **28,87 %** of total

BUDGET FIGURES FOR THE PERIOD 2012-2017 ARE SUMMARIZED IN THE FOLLOWING TABLE
(With budget of a project assigned to the year it is granted. The *Annualized total* is the sum of one-third of the budged granted in that year and in the two previous years):

BUDGET IFISC'S RESEARCH PROJECTS 2012-2017 (IN €)

	2012	2013	2014	2015	2016	2017	TOTAL
European Commission	803.952 €	625.349 €	0 €	219.875 €	298.121 €	0 €	1.947.297 €
Spanish National Plan for Science	261.360 €	934.830 €	0 €	77.000 €	799.084 €	54.450 €	2.126.724 €
Other Funding	0 €	0 €	47.250 €	123.813 €	312.740 €	60.500 €	544.303 €
Total	1.065.312 €	1.560.179 €	47.250 €	420.688 €	1.409.945 €	114.950 €	4.618.324 €
Anualized Total	1.049.669 €	1.201.140 €	890.914 €	676.039 €	625.961 €	648.528 €	

3.1 RESEARCH PROJECTS FUNDED BY THE EUROPEAN COMISSION

QuProCS

Quantum Probes for Complex Systems. H2020-FETPROACT-2014. [641277]. STREP Project. PrIncipal Investigator: Roberta Zambrini. (2015-2018). Budget: 219.875 €

BigData4ATM

Passenger-centric Big Data Sources for Socio-economic and Behavioural Researc in ATM. SESAR Subproject. European Commission [699260]. IFISC Principal Investigator: Jose J. Ramasco (2016-2018) .
Budget: 128.000 €

CENTURION

Signal processing in optical communication NeTworks Using Reservoir cOmputiNG. Marie Curie Intra-European Fellowships for carreer development. [7070768]. Principal Investigator: Ingo Fischer (2016-2018).
Budget: 170.121,60 €

3

RESEARCH PROJECTS AND FUNDING

EPheQuCS | **Emergent Phenomena and decoherence in quantum complex systems**. [FIS2016-78010-P]. Spanish Government. Principal Investigator: Roberta Zambrini. (2017-2019). Budget: 102.850€

NOMAQ | **Non-Markovian quantum evolutions in structured enviroments**. [FIS2014-60343-P]. Principal Investigator: Roberta Zambrini. (2015-2017). Budget: 27.000 €

SET@QT | **Espintrónica, Energía y Topología en el Transporte Cuántico**. [FIS2014-52564]. Principal Investigators: Rosa López and David Sánchez. (2015-2017). Budget: 50.000€

ESoTECoS | **Emergent social, technical and ecological complex systems**. CSIC [FIS2015-63628-C2-1-R] . UIB [FIS2015-63628-C2-2-R] Principal Investigators: Pere Colet and Maxi San Miguel. (2016-2018). CSIC Budget: 187.550€. UIB Budget: 211.750€

IDEA | **Improving data Decoding in optical communication networks All-optically using neuro-inspired photonic systems**. CSIC [TEC2016-80063-C3-1-R] and UIB [TEC2016-80063-C3-3-R]. Principal Investigators: Ingo Fischer, Claudio Mirasso and Miguel C. Soriano (2016-2019). CSIC Budget: 66.550€. UIB Budget: 46.585€

LAOP | **Estudios lagrangianos de fenomenos oceanicos: patrones de conectividad, barreras al transporte y poblaciones marinas**. [CTM2015-66407-P]. Principal Investigator: Cristóbal Lopez (2016-2018). Budget: 171.941€

QuStruct | **Quantum Information preserving with structured embbedings**. [FIS2015-66860-P]. Principal Investigator: Fernando Galve Conde (2016-2018). Budget: 11.858€

SPASIMM | **Spatiotemporality in sociobiological interactions, models and methods**. [FIS2016-80067-P]. Principal Investigators: Victor M. Eguíluz and Konstantin Klemm. (2017-2019). Budget: 54.450 €

3.3 OTHER IFISC RESEARCH PROJECTS

ND-PHOT | **Nonlinear Dynamics in photonics for future information and communication technologies**. CNRS-CSIC. Prinicipal Investigator: Damià Gomila (2016-2018). Budget: 10.000€

3
RESEARCH PROJECTS AND FUNDING

KNOWeSCAPE	**Analyzing the dynamics of information and knowledge landscapes**. COST ACTION TD1210. European Coordinator: Andreas Schamhorst. IFISC Spanish member of management committee: Maxi San Miguel. (2012-2017)
QTD	**Thermodynamics in the Quantum Regime**. COST ACTION1209. IFISC Spanish member of management committee: Roberta Zambrini. (2013-2017)
COSTNET	**European Cooperation for Statistics of Network Data Science**. COST Action [CA15109]. IFISC Spanish member of management committee: Maxi San Miguel (2016-2020)
RFE2017	**Red de física estadística de no equilibrio y sus aplicaciones multidisciplinares**. MINEICO [FIS2006-82028-REDT] IFISC Principal Investigator: David Sanchez. (2017-2019)
COMSOTEC	**Red de Sistemas Complejos Socio-tecnológicos**. [FIS2015-71795-REDT]. MINECO. IFISC Principal Investigator: Maxi San Miguel. (2015-2017).
TNT	**Red de Termoelectricidad: nuevas Teorías**. MINEICO [MAT2016-82015-REDT] Excellence Network. IFISC Principal Investigator: Rosa López. (2017-2019)
IBERSINC	**Red sobre dinámica y sincronizacion en redes complejas**. MINECO [FIS2015-71929-REDT]. IFISC Principal Investigator: Miguel C. Soriano (2016-2017)
RICTE	**Red de Información y Tecnologías Cuánticas.** [FIS2016-81891-REDT]. IFISC Principal Investigator: Roberta Zambrini. (2017-2019)
RICE	**Quantum Information Network in Spain**. [FIS2014-53592-REDT]. IFISC Principal Investigator: Roberta Zambrini. (2015-2017)
IN-TREE	**INCT in Interdisciplinary and Transdisciplinary Studies in Ecology and Evolution.** CNPq, CAPES, FAPESB Brazil. IFISC Principal Investigator: Emilio Hernández García. (2016-2022)

3.5 OTHER PUBLIC FUNDING

Convenio Institutos

Convenio cofinanciación Institutos de Investigación. Ayuda Govern de les Illes Balears (2016-2018). Budget: 20.000 €

AccGov

Ayuda Solicitud Proyectos. Acción Especial del Govern de les Illes Balears. Principal Investigator: Maxi San Miguel (2017) Budget: 17.000 €

3.6 RESEARCH CONTRACTS

CAASE

Coupled Animal and Artificial Sensing for Sustainable Ecosystems: The Red Sea as a CAASE Study. Office of Sponsored Research. KAUST (Saudi Arabia). Principal Investigator: Victor M. Eguíluz. (2016-2018). Budget: 160.840€

NeuroQNet

Neuromorphic Computing using Quantum Dot- Networks. Volkswagen Foundation (Germany). Principal Investigator: Ingo Fischer (2016-2018). Budget: 115.000€

3.7 OTHER FUNDING

Convenio REE

Convenio Red Electrica Española: funding for activities of the 10th IFISC. Budget: 12.000 €

IUPAP

The International Union of Pure and Applied Physics: funding for the conference Crossroads in Complex Systems. Budget: 5.000 €

EPS

European Physical Society: EPS Session of the Conference Crossroads in Complex Systems. Budget: 5.000 €

Springer

Springer Science: funding for the conference Crossroads in Complex Systems. Budget: 1.500 €

3

RESEARCH PROJECTS AND FUNDING

4

IFISC
SEMINARS

Coordinators:
Llorenç Serra
Ingo Fischer

The full listing of the 71 seminars given at IFISC during 2017 can be found in **http://ifisc.uib-csic.es/en/events/seminars/** and in the Appendix of this Report.

Seminars are broadcasted live and recorded.They are globally available at **http://ifisc.uib-csic.es/en/events/seminars/,** and also in the youtube channel **https://www.youtube.com/user/IFISCseminars/**

The following graphs show the distribution of seminars by geographic procedence of the speaker for 2017 and for the previous years:

PROVENANCE OF SPEAKERS AT IFISC SEMINARS 2017

IFISC: 35
Spain: 4
Europe: 23
Rest of the World: 9

TOTAL: 71

IFISC SEMINARS 2012-2017

	2012	2013	2014	2015	2016	2017	TOTAL
IFISC	14	26	40	34	35	35	184
SPAIN	10	8	7	6	8	4	43
EUROPE	23	23	16	9	14	23	108
REST OF THE WORLD	8	7	7	8	12	9	51
TOTAL	55	64	70	57	69	71	386
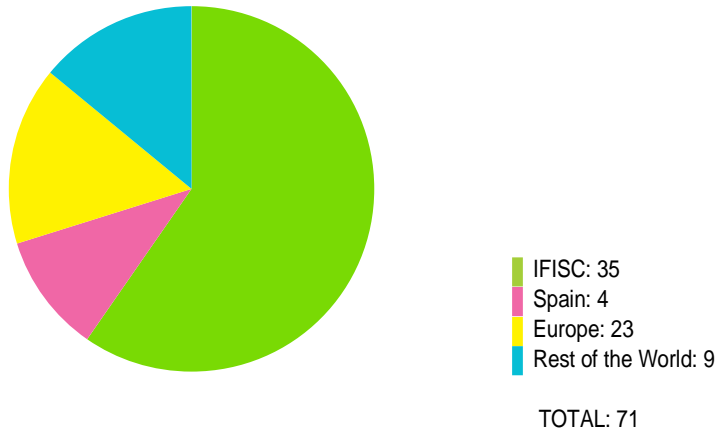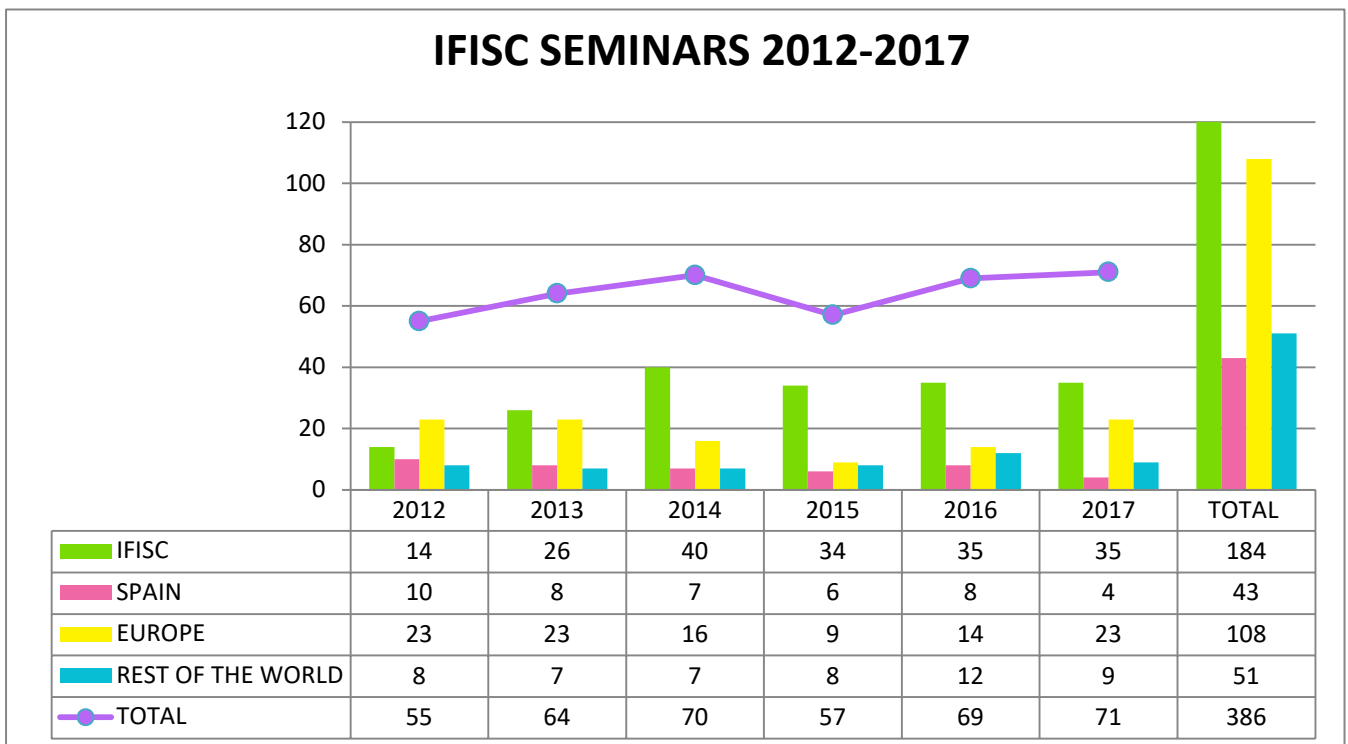
The **Colloquia of Excellence,** also coordinated by Profs. Ingo Fischer and Llorenç Serra**,** represent a special series of seminars by eminent speakers who are working at the forefront of complex systems and are inspiring the evolution of the field. Introduced in 2016, this series of Colloquia allows students and scientists of **IFISC** and the UIB to interact with leaders in Complex Systems science in the intimate environment of our Institute and to discuss the challenges and future directions of this cross-disciplinary research field.

April 05
Explosive percolation
Hans Herrmann, ETH Zurich, Switzerland.

June 05
Contagion processes in Complex Systems
Alessandro Vespignani, Northeastern University, Boston, USA.

June 06
Parsimonious Rules in Complex Marine Ecosystems
Carlos Duarte, King Abdullah University of Science and Technology, Thuwal, Saudi Arabia

4

June 07
Quantum Brownian Motion Revisited
Maciej Lewestein, ICFO and ICREA, Barcelona, Spain

June 08
Levels of reality in weather forecasting: the lesson by Richardson and von Neumann
Angelo Vulpiani, Università di Roma, Italy

June 08
Seen the Light- at the end of the tunnel?
Rajarshi Roy, University of Maryland, College Park, USA

June 21
Topological Physics in HgTe-based Quantum Devices
Laurens Molenkamp, Würzburg University, Germany.

4

IFISC SEMINARS

5

PUBLICATIONS

IFISC RESEARCH RESULTS HAVE BBEN REPORTED IN THE FOLLOWING PUBLICATIONS DURING 2017:

• Papers in journals indexed in the Journal Citation Reports: **58**
• Other publications: **14**

The following tables put these numbers in the context of the publication activity during the past years, and specify which are the main journals in which IFISC papers are published. It is a strategic commitment of IFISC to target cross-disciplinary research areas lying outside the domain of traditional physics. The success in this objective is highlighted in the tables by indicating the number of publications in *non-physics journals*.

With respect to publications in high impact journals, in the period 2012-2017 IFISC has published 1 paper in Reviews of Modern Physics, 3 papers in PNAS, 4 papers in Nature Communications, 1 paper in Nature Geophysics, and 21 papers in Physical Review Letters.

Full listing of publications and links to the full text are in **http://ifisc.uib-csic.es/en/publications/** and in the Appendix of this Report.

IFISC PUBLICATIONS 2012-2017
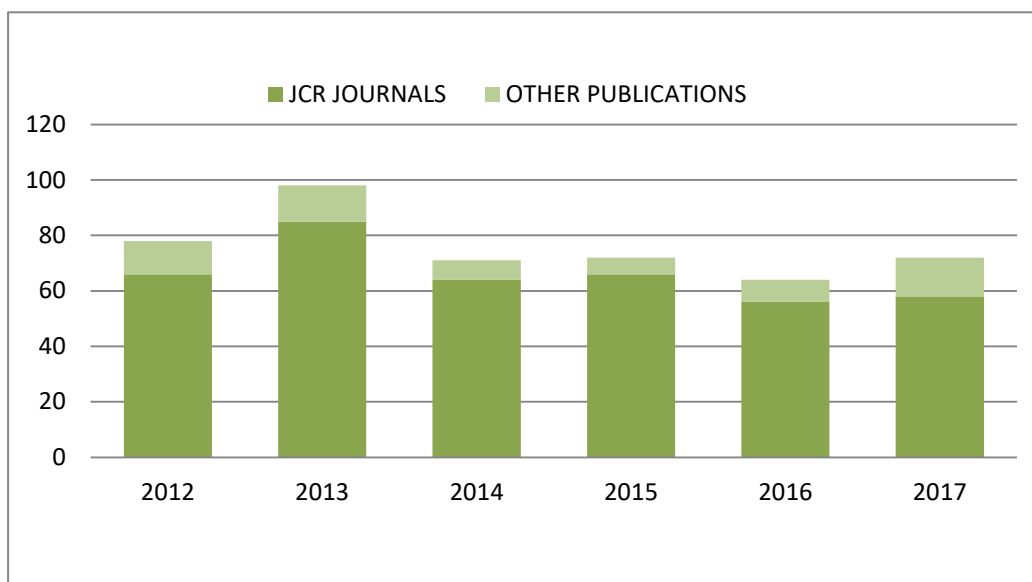
	2012	2013	2014	2015	2016	2017	TOTAL
JCR JOURNALS	66	85	64	66	56	58	395
OTHER PUBLICATIONS	12	13	7	6	8	14	60
TOTAL	78	98	73	72	64	72	455

JOURNALS WITH THE LARGEST NUMBER OF PUBLICATIONS

IFISC PUBLICATIONS	2012	2013	2014	2015	2016	2017	TOTAL
Physics journals							
Physical Review E	11	9	14	12	9	4	59
Physical Review B	2	8	7	7	5	4	33
Physical Review Letters	4	8	3	4	1	1	21
Physical Review A	3	5	5	2	3	3	21
New Journal of Physics	3	2	3	1	5	3	17
European Physical Journal B	1	3	1	1	2	3	11
Chaos	0	1	0	3	2	5	11
Multidisciplinary journals							
Scientific Reports	3	4	2	3	7	11	30
Plos One	4	0	5	6	2	1	18
Nature Communications	0	1	0	3	0	0	4
IEEE journals	1	4	0	3	2	1	11
Other non-physics journals	10	13	13	8	8	7	59

The journals included in the "other non-physics journals" category are the following:

Biosciences:

Trends in Ecology and Evolution, Journal of Theoretical Biology, Journal of the Royal Society Interface, Neuroimage, Interface Focus, PLoS Computational Biology, Ecological Complexity, BMC Medicine, Macromolecules, Ecography, Frontiers in Computational Neuroscience, Frontiers in Human Neuroscience, Frontiers in Neuroinformatics, Journal of Heredity, Physiological Reports, Journal of Applied Ecology, Theoretical Biology and Medical Modelling, and Global Ecology and Biogeography.

Geosciences:

Nature Geoscience, Journal of Geophysical Research, Geophysical Research Letters, Deep-Sea Research I, Nonlinear Processes in Geophysics, Ocean Modelling, Continental Shelf Research, Environmental fluid mechanics, Journal of Climate, and ICES Journal of Marine Science.

Social and sociotechnical systems:

Journal of Artificial Societies and Social Simulation, Quantitative Finance, International Journal of the Sociology of Language, Transportation Journal, Transportation, Journal of Air Transport management, and Journal of Transport Geography.

Data science:

Computing and Informatics, EPJ Data Science, Journal of Machine Learning Research, Cognitive Computation, and Applied Network Science.

5 PUBLICATIONS

6

CONFERENCES AND WORKSHOPS

6

6.1 IFISC WORKSHOPS AND CONFERENCES

QuProCS II

Quantum Probes for Quantum Systems II

April 6 – 7
IFISC SCIENTIFIC ORGANIZERS: Roberta Zambrini and Fernando Galve Conde.
UIB Campus, Palma de Mallorca, Spain

Quantum **Pro**bes for **C**omplex **S**ystems is a joint research project that is part of FET PROACTIVE QUANTUM SIMULATIONS (Horizon 2020 Programme of the European Union). During the workshop the members of the consortium as well as invited speakers presented their recent work. The event was organized during the **10th anniversary of IFISC**.

Web site: **https://quprocs.ifisc.uib-csic.es/**

Group Picture MAJONEXT

MAJONEXT

Majorana states in condensed matter: towards topological quantum computation.

May 14 – 20
SCIENTIFIC ORGANIZERS: Rosa Lopez and Llorenç Serra from IFISC and Ramon Aguado y Pablo San Jose from ICMM, CSIC, Madrid.
Club Pollentia Resort, Mallorca, Spain

This conference brought together the key international players in the ongoing efforts towards a topologically protected platform for quantum computation based on Majorana states.

Different sessions focused on discussing the latest developments in the ongoing experimental search for Majorana states in condensed matter, including semiconducting nanowires, quantum spin Hall edges with induced superconductivity or recent proposals based on magnetic impurities on top of superconductors. Presentations of challenging theoretical ideas, novel detection schemes and protocols for demonstrating non-Abelian braiding in these systems also enriched the discussions.

Web site: **http://majonext2017.ifisc.uib-csic.es/**

YRX

Young Researchers at Crossroads

June 2 – 4
IFISC SCIENTIFIC ORGANIZERS: Adrian Carro, Aleix Bassolas, Oriol Artime and Riccardo Gallotti.
UIB Campus, Palma de Mallorca, Spain

It is known that a group is more than the sum of its components. With this in mind, this pre-event workshop aimed to offer young researchers from all over the world a space for interaction, giving rise to emergent behaviors. The participants learned cutting-edge communication methods, exchange their different views on science, present their work, discuss it with their peers, and established new and exciting ties with other young researchers. Being our view that skills can only be acquired and improved by directly using them in practical cases, the workshop also focused on hands-on sessions specifically designed to promote collaboration.

Crossroads

Crossroads in Complex Systems

June 5 – 8
IFISC SCIENTIFIC ORGANIZERS: Pere Colet, Emilio Hernández-García, Manuel Matias, Maxi San Miguel, Raul Toral and Roberta Zambrini.
UIB Campus, Palma de Mallorca, Spain.

The conference Crossroads in Complex Systems took place at IFISC on occasion of the 10th anniversary of IFISC.

Thematic keynote, invited and contrituted talks, a poster sesión , round table discussions and a pulbic event contributed to a rich program. The conference aimed to represent a broad spectrum of topics on Complex Systems as wide, at least, as the IFISC range of research lines.

Web site: **https://crossroads2017.ifisc.uib-csic.es**

COSTNET

The European Cooperation for Statistics of network data science

October 25 -27
IFISC SCIENTIFIC ORGANIZERS: Konstatin Klemm, Nagi Khalil, Jorge P,
Rodriguez and Joan Pont Serra.
UIB Campus. Palma de Mallorca, Spain

This Action aims to facilitate interactions and collaborations between diverse groups of statistical network modellers, establishing a large and vibrant interconnected and inclusive community of network scientists. The aim of this interdisciplinary Action is two-fold. On the scientific level, the aim is to critically assess commonalities and opportunities for cross-fertilization of statistical network models in various applications, with a particular attention to scalability in the face of Big Data. On a meta-level, the aim is to create a mainly online community which includes researchers from across the whole of Europe and at every stage in their scientific career and to facilitate contact with stakeholders.

Web site: **http://costnet2017.ifisc.uib-csic.es/**

Group Picture COSTNET

6.2 SCHOOLS

VII GEFENOL Summer School on Statistical Physics of Complex Systems

June 19 – 30
IFISC Scientific Organizers: Roberta Zambrini and Gian Luca Giorgi
UIB Campus, Palma de Mallorca, Spain.

Statistical Physics, which was born as an attempt to explain thermodynamic properties of systems from its atomic and molecular components, has evolved into a solid body of knowledge that allows for the understanding of macroscopic collective phenomena. The tools developed by the Statistical Physics together with the Theory of Dynamical Systems are of key importance in the understanding of Complex Systems which are characterized by the emergent and collective phenomena of many interacting units. While the basic body of knowledge of Statistical Physics and Dynamical Systems is well described in textbooks at undergraduate or master level, the applications to open problems in the context of Complex Systems are well beyond the scope of those textbooks. Aiming at bridging this gap the Topical Group on Statistical and Non Linear Physics (**GEFENOL**) of the **Royal Spanish Physical Society** is promoting the Summer School on Statistical Physics of Complex Systems series, open to Master and PhD students and young postdocs world-wide.

Web site: **https://school2017.gefenol.es/**

Summer School on Complex Socio-Technical Systems

September 4 – 8
IFISC Scientific Organizers: Pere Colet, Jose J. Ramasco and Maxi San Miguel.
UIB Campus, Palma de Mallorca Spain.

Complexity Science has a privileged position to largely contribute to the advance of knowledge in social and economic systems. In this context, big data generated by Information Technologies has brought an unprecedented opportunity to explore human interactions and to better understand social and economic systems. Furthermore, the presence of new technologies provides new means of effective interaction among people and triggers the emergence of new social phenomena. The summer school provided specific training on this new fast developing field addressed to Master and PhD students and to young postdocs. It was organized with the collaboration of the Spanish Association for the Study of Complex Socio-Technical Systems COMSOTEC and the network of excellence of the Ministry of Economy and Competitiveness SocioComplex.

Web site: **https://sociocomplex2017.ifisc.uib-csic.es/**

6

CONFERENCES AND WORKSHOPS

6.3 **COMMUNICATIONS TO SCIENTIFIC CONFERENCES 2017**

- Invited talks: **46**
- Oral Communications: **43**
- Posters: **79**
- Total: **168**

Full listing in the Appendix of this Report.

PRESENTATIONS AT CONFERENCES AND WORKSHOPS 2012-2017
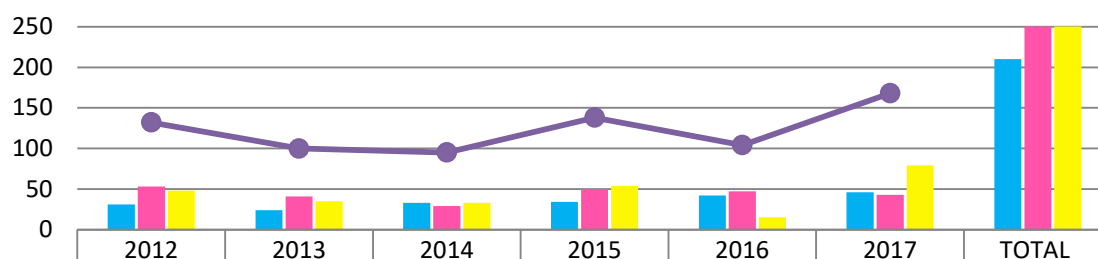
	2012	2013	2014	2015	2016	2017	TOTAL
INVITED TALKS	31	24	33	34	42	46	210
ORAL TALKS	53	41	29	50	47	43	263
POSTERS	48	35	33	54	15	79	264
TOTAL	132	100	95	138	104	168	737

6.4 SCIENTIFIC COMMITTEES AND ORGANIZATION OF CONFERENCES AND WORKSHOPS

Gallotti, Riccardo
Elected member of the council of the Complex Systems Society.
October 28

Ramasco, Jose J.
Elected member of the council of the Complex Systems Society.
November 16

Toral, Raul
Member of the Board of the Statistical and Nonlinear Physics Group of the European Physical Society.
January 01 – 31

Toral, Raúl
President of GEFENOL Topical Group on Nonlinear and Statistical Physics of the Spanish Physical Society.
2013 - 2018

Colet, Pere
Member of the Board of the Computational Physics Group of the European Physical Society.
January 01 - 31

Colet, Pere
Member of the board of the Topical Group on Nonlinear and Statistical Physics of the Spanish Physical Society.
January 01 - 31

Galve, F.; Zambrini, R.
Organizers of II QuProCS meeting. Palma de Mallorca, Spain
April 6 – 7

López, Rosa; Serra, Llorenç
Organizers of Majorana States in condensed matter: towards topological quantum computation.
May 14 - 20

Fischer, Ingo
Workshop on Dynamical Systems and Brain Inspired Computing.
Scientific and Program Committee member.
May 30 - April 02

Artime, Oriol; Bassolas, Aleix; Carro, Adrian; Gallotti, Riccardo
Young Researchers at the Crossroads.
Organizers of the Warm-Up conference for young researchers, before the main event Crossroads on Complex Systems.
June 02 - 04

Sintes, Tomas
Member of the Scientific board of the Conference of Statistical Physics FISES
2017-2018

Colet, Pere; Hernandez-Garcia, Emilio; Matias, Manuel; San Miguel, Maxi; Toral, Raul; Zambrini, Roberta
Program committee of the conference Crossroads in Complex Systems.
June 05 - 08

Ramasco, Jose J.
NetSci 2017.
Participation in the Scientific Committee.
June 19 – 23

6
CONFERENCES AND WORKSHOPS

Colet, Pere; Toral, Raúl
Organizers of the VII GEFENOL Summer School on Statistical Physics of Complex Systems.
Summer School promoted by the Topical Group on Statistical and Non Linear Physics of the Spanish Physical Society (RSEF).
June 19 - 30

Colet, Pere
Member of the International Scientific Committee of the XXIX IUPAP Conference on Computational Physics, CCP 2017.
July 09 - 13

San Miguel, Maxi
International Conference on Statistical Physics SigmaPhi2017.
Member of Advisory Committee.
July 10 - 14

Colet, Pere; Ramasco, Jose J.
Summer School on Complex Socio-Technical Systems "SocioComplex2017".
September 04 - 08

Ramasco, Jose J.; Klemm, Konstantin
ENIC'17: 4th European Network Intelligence Conference 2017.
Participation in the Scientific Committee.
September 11 - 12

Mirasso, Claudio; Valizadeh, Alireza
Information transmission and communication in brain circuits.
Organizers of the Satellite Workshop, Bernstein Conference 2017.
September 13

Ramasco, Jose J.
SocInfo 2017.
Participation in the Scientific Committee.
September 13 - 15

Ramasco, Jose J.
UrbanSys 2017.
Organizers of the satellite of the conference CCS 2017 hold in Cancun, Mexico.
September 21

Klemm, K.; Khalil, N.; Pont, J.; Rodríguez, J.P.
COSTNET17
Members of the organizing committee of the conference, Palma de Mallorca, Spain.
October 25 – 27

Ramasco, Jose J. San Miguel, Maxi
MACFANG-17: First Workshop on Mapping Complexity - Foundations and Applications of Network Geometry.
Participation in the Scientific Committee.
November 06 - 08

Ramasco, Jose J.
European Symposium Societal Challenges in Computational Social Science: Inequality and Imbalance.
Participation in the Scientific Committee.
November 15 - 17

Colet, Pere
Member of the International Advisory Committee of the International Symposium on Physics and Applications of Laser Dynamics, IS-PALD 2017.
Paris, France.
November 15 - 17

Ramasco, Jose J.
Seventh SESAR Innovation Days.
Participation in the Scientific Committee.
November 28 – 30

San Miguel, Maxi
Vice-chair of IUPAP C3Commission on Statistical Physics.
2017 – 2019

San Miguel, Maxi
Chair of the International Scientific Advisory Board of the Internet Interdisciplinary Institute (IN3) of the Open University of Catalunya (UOC).
2017 - 2019

6 CONFERENCES AND WORKSHOPS

7

OTHER ACTIVITIES

7.1 MASTER THESIS

Czegel, Daniel
On the shape of semantic space - what can we infer from large-scale statistical properties of texts?
Supervisor: San Miguel, Maxi
March 16

Buendía, Víctor
Modelling Quorum Sensing Mechanisms in Bacterial Populations
Supervisors: Matías, Manuel A.; Martínez-García, Ricardo
July 24

Parrado, Pedro
Searching Chimeras in the Non Local Complex Ginzburg Landau Equation
Supervisors: Gomila, Damià; Matías, Manuel A.
July 27

García Candel, Adrián
Dynamics of attracting Brownian particles
Supervisors: Lopez, Cristóbal; Hernández-García, Emilio
August 23

Pont Serra, Joan
Exact Computation of Percolation Cluster Sizes in Finite Network
Supervisor: Klemm, Konstantin
September 15

Alonso, Ana
Synchronization in a Neural Mass Model
Supervisor: Mirasso, C.
September 19

Morán Costoya, Alejandro
Improved detection of collective rhythms in multi-channel electroencephalography signals
Supervisor: Soriano, Miguel C.
September 26

Sánchez, Patrick
Financial contagion in the interbank market
Supervisor: Colet, Pere
September 29

Trigo, Miguel
Universality of the Fundamental Diagram in Pedestrian Dynamics
Supervisor: Ramasco, JJ
October 3

Molas, Alex
Field theory for recurrent mobility
Supervisor: Ramasco, JJ
October 3

Pisano, Gianmarco
Multiple options noisy voter model: application to European elections
Supervisors: Fernandez-Gracia ,J.; Ramasco, JJ
October 3

7.2 PHD THESIS

Parra-Rivas, Pedro
Dynamics of dissipative localized structures in driven nonlinear optical cavities
Supervisors: Gomila, Damià; Gelens, Lendert; Danckaert, Jan
June 1

Manzano, Gonzalo
Thermodynamics and synchronization in open quantum systems
Supervisors: Parrondo, Juan M. R.; Zambrini, Roberta
July 11

Alomar, M. Isabel
Spin and charge transport in thermally and ac driven nanodevices
Supervisor: Sánchez, David
October 9

7.3 AWARDS

Rodriguez, Jorge P.
"El árbol pendular"
Sected photography for the exhibition Fotciencia14.

Sierra, Miguel A.; Sanchez, David; Lopez, Rosa
"Thermoelectric Kondo effect in quantum dots beyond linear response".
Best poster award at the 28th International Conference on Low Temperature Physics.
Gothenburg, Sweden.

Toral, Raul
"Theory of Partitions Explained by Statistical Physicists"
Best teaching article in the Spanish Royal Society of Physics (RSEF) publications.
RSEF - BBVA Foundation Physics Awards.

7.4 MEMBERS OF EDITORIAL BOARD OF SCIENTIFIC JOURNALS

Member of the Editorial Advisory Board of the Journal Ecological Complexity.
Hernandez-Garcia, Emilio

Members of the editorial board of Frontiers in Physics (Interdisciplinary Physics section):
Ramasco, J.J., Klemm, Konstatin, Wio, Horacio, and Eguiluz, Victor M.

Member of the editorial board of PLoS ONE
Ramasco, JJ

Member of the editorial board for Scientific Reports.
Ramasco, JJ
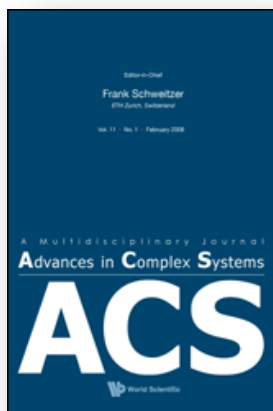
Editorial board member of the Journal Advances in Complex Systems.
Klemm, Konstantin; Eguíluz, Victor M.

Member of the Editorial Advisory Board of Chaos: An Interdisciplinary Journal of Nonlinear Science.
Fischer, Ingo

Member Advisory Editorial Board of European Physical Journal B.
Wio, Horacio

Associate Editor of Physica A.
Wio, Horacio

7.5 RESEARCH STAYS IN OTHER CENTERS

Physics Department, Universidade Federal de Pernambuco, Brazil.
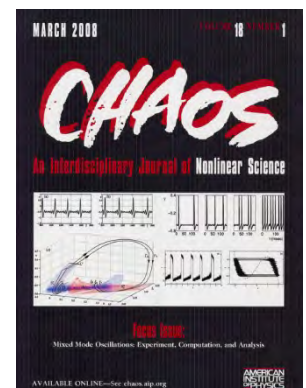Mirasso, Claudio
January 22 - February 23

Instituto de ciencia de materiales de Madrid (ICMM), Spain.
Rosselló, Guillem
January 23 - April 05

Center for Data Science (New York University), USA.
Sánchez, D.
January 29 - February 16

FEMTO-ST. Besançon, France.
Bueno, Julian.
January 30 - April 05

School of Science and Engineering, Reykjavik University, Iceland.
Serra, Llorenç
February 10 - 25

Max-Planck Institute for Dynamics and Self-organization. Göttingen, Germany.
Tchawou Tchuisseu, Eder Batista
March 20 - June 21

Nuubo, Madrid, Spain.
Soriano, Miguel C.; Mirasso, Claudio R.; Ortín, Silvia
April 18

Complex Systems Group, Department of Applied Mathematics, Universidad Politécnica de Madrid, Spain.
Artime, Oriol
May 08 - 13

Technical University of Denmark, Germany.
Collaboration on vascular flow networks with Erik A. Martens.
Klemm, Konstantin
June 01 - July 31

Departamento de química y bioquímica de la Universidad de California en San Diego, USA.
Colaboration with prof. Katja Lindenberg.
Toral, Raúl
July 22 - August 15

Eawag (Kastanienbaum), Switzerland.
Research stay with Prof. Carlos Melián.
Rodríguez, Jorge P.
August 17 - September 07

Max Planck Institute for Meteorology, Hamburg, Germany.
Visit to B. Stevens, T. Mauritsen, and T. Becker.
Drotos, Gabor
August 22 - September 02

FEMTO-ST (Besançon) France
Pflüger, Moritz
August 28 - September 20

Instituto de Fisica, Universidade Federal da Bahia (UFBA), Salvador, Brazil.
Hernandez-Garcia, Emilio
September 09 - 27

Yukawa Institute for Theoretical Physics, Kyoto University, Japan.
Research stay as Distinguished Invited Professor of the International Research Unit for Advanced Future
Fischer, Ingo
October 03 - 25

Max Planck Institute of Quantum Optics, Garching, Germany.
Visiting J. Ignacio Cirac and A. Tudela
Zambrini, Roberta; Galve, Fernando
October 09 - 11

Group of Applied Physics, University of Geneva, Switzerland.
Manzano, Gonzalo
October 31 - November 04

7.6 SURF@IFISC

      The Summer Undergraduate Research Fellowships (**SURF@IFISC**) program is part of one of the IFISC compromises: to offer training for the future generations of researchers in the field of complex systems.

      Since 2013 we offer fellowships for introduction to academic research under the supervision of an IFISC researcher. Miguel C. Soriano, has been the responsible of the program. These fellowships are aimed at world-wide undergraduate students of physics, mathematics, chemistry, biology and engineering.

2017 Selected students

- Tenorio Márquez, Rodrigo (Universitat de les Illes Balears), Entanglement generation and distribution through tiled/structures lattices. Advisors: Fernando Galve and Roberta Zambrini

- Cavero Lozano, Marta (Universitat Autònoma de Barcelona), Modeling and dynamics of the power grid. Advisors: Damià Gomila and Pere Colet

- Cunillera Pérez, Alejandro (Universidad Complutense de Madrid), Anticipated synchronization in Hodgkin-Huxley neuronal circuits. Advisor: Claudio R. Mirasso

- Fuster Rullan, Marc (Universitat Autònoma de Barcelona), Data Science: the attraction basin of the New York City airports. Advisors: Riccardo Gallotti and Jose Ramasco

- Llorenç Giralt, Joaquím (Universitat de Barcelona), Implementing Neuro-Inspired Information processing in autonomous boolean networks. Advisors: Miguel Soriano and Ingo Fischer

- Molero Agudo, Bernat (Universitat Autònoma de Barcelona), Berry phases and transport through Majorana devices. Advisor: Llorenç Serra

IFISC Master in *Physics of Complex Systems*

https://ifisc.uib-csic.es/master/

In October 2012 IFISC started a Master program in Physics of Complex Systems. It is a one year (60 ECTS) official Master of the University of the Balearic Islands, in collaboration with CSIC. The courses provide an innovative entry point to Complex Systems fundamentals and applications and introduce the students in the research lines developed at IFISC. They are though by IFISC researchers.

This is the 2017-2018 Master syllabus:
Structural module courses (39 credits):

Complex networks (3 credits)	K. Klemm, Juan Fdez.-Gracia
Cooperative and critical phenomena (6 credits)	T. Sintes
	E. Hernández García
Dynamical systems and chaos (6 credits)	M. Matías, K. Klemm
Introduction to complex systems (3 credits)	M. San Miguel, E. Hernández-García, R. Zambrini
Pattern formation (3 credits)	D. Gomila
Scientific presentation and visualization (3 credits)	J. J. Ramasco
Stochastic processes (3 credits)	P. Colet, R. Toral
Stochastic simulation methods (6 credits)	R. Toral, P. Colet
Quantum physics for complex systems (6 credits)	L. Serra, R. Zambrini

Specific module courses (9 credits minimum)

Collective phenomena in social dynamics (3 credits)	M. San Miguel, J. J. Ramasco
Information theory (3 credits)	D. Sánchez
Modelling and dynamics of neural systems (3 credits)	C. Mirasso
Non equilibrium collective phenomena (3 credits)	C. López
Nonlinear photonics (6 credits)	I. Fischer; M.C. Soriano
Quantum and nonlinear optics (3 credits)	R. Zambrini
Quantum transport and quantum noise (3 credits)	R. López
Spatiotemporal dynamics (3 credits)	D. Gomila
Statistical physics in biological systems (3 credits)	T. Sintes
Systems biology (3 credits)	M. Matías
Turbulence and nonlinear phenomena in fluid flows (3 credits)	C. López

Master thesis (12 credits)   Resonsible: P. Colet

Other Postgraduate Courses tought in 2017

The following courses were also taught in the Master of Advanced Physics and Applied Mathematics, University of the Balearic Islands:

- **Cooperative and critical phenomena**
  Tomàs Sintes, Emilio Hernández-García

- **Stochastic simulation methods**
  Pere Colet, Raúl Toral

- **Scientific presentation and visualization**
  José J. Ramasco

- **Spintronics**
  Rosa López, Llorenç Serra, David Sánchez

Master in Human Evolution and Cognition, University of the Balearic Islands:

- **Neural networks**
  Claudio Mirasso

8

OUTREACH ACTIVITIES

8 OUTREACH ACTIVITIES

Conference Series
"Exploring Boundaries Between Disciplines X"

In 2017 the subject of the Conference Series was "From Biology to Social Networks: new challenges in the Complex Systems field".

PROGRAMME

MAY 24
Todos a una: sincronización en la naturaleza.

All in one: Synchronization in Nature.

Dr. Jordi García-Ojalvo, Universidad Pompeu Fabra, Barcelona, Spain

The social character of the human being causes us to be influenced by our peers and, consequently, that we adjust our behavior to that of the people around us. From couples who dance to citizens who vote, there are many cases of synchronization in society. But not only human beings, nor living beings in general, coordinate their behavior. The laws of synchronization also apply to inert matter, as we see in this conference, and have important consequences at such different levels as telecommunications, the applications of our cell phone, hospital infections and the behavior of our brain.

MAY 31
Ciencia ciudadana y complejidad: ¿Qué aporta la participación ciudadana a una investigación?

Citizen Science and Complexity: What does citizen participation contribute to an investigation?

Dr. Josep Perelló, Universidad de Barcelona, Spain.

Citizen science is an emerging practice that includes the participation of the non-expert in the development of scientific research. Contributions in projects to classify galaxies or solve molecular structures of proteins and viruses are well recognized. What is the role of collective intelligence in science? How can we contribute? What can participate and how does the research project change with our participation? All these aspects are discussed and more to give a broad vision about a more participatory science that often pursues an immediate social impact..
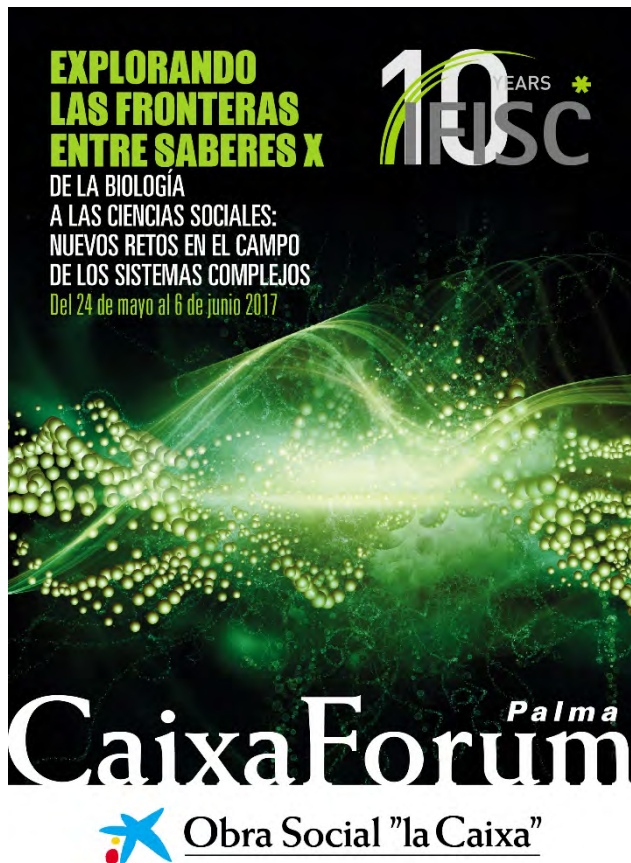
JUNE 6

Genes y genealogías: mitos y realidades sobre nuestra herencia

Genes and genealogies: myths and realities about our heritage

Dr. Susanna Manrubia, National Center of Biotechnology of CSIC, Madrid, Spain .

How important is our genetic heritage? To what extent does it condition us? Natural selection, Darwin's legacy, does not only apply to our biological inheritance, but also to our cultural heritage. From the multitude of ancestors that have crossed their genes to produce ours, we have also inherited the surnames we carry or the language we speak. In this talk we review some data about our cultural and biological characteristics, as individuals and as a population, in order to understand how certain regularities appear and, at the same time, undo some myths about the relevance of the inheritance.

IFISC organized the Conference Series in collaboration with Fundació La Caixa (Obra Social).

One more year and coinciding with the celebration of its 10 years, the Institute of Interdisciplinary Physics and Complex Systems (IFISC-CSIC / UIB) organized its **Open Doors Day** destined to university students of the University of the Balearic Islands with the objective of giving to know the research work carried out in the center as well as its training offers. It is an open activity to students of any degree (being of special interest to the students of last courses) with intellectual and scientific restlessness. Throughout the activity explained what the IFISC is and which are the lines of research of the center, emphasizing the interdisciplinary spirit of the institute.

The event took place on Monday, February 6th at 1:30 p.m., IFISC seminar room Montserrat Casas. The activity began with a presentation of the center, how the IFISC works and the different research lines: transport and information in quantum systems, nonlinear photonics, nonlinear dynamics in fluids, biocomplexity and collective phenomena in social and socio-technical systems. The Master's Degree in Complex Systems Physics imparted by the IFISC also was presented to the students, as well as the itineraries to be followed by those students interested in studying a doctorate. The presentation included visits to the photonics laboratory and computer facilities.

Afterwards an appetizer was offered to the participants, after which the **IFISC Poster Party** began, where the master and doctoral students and the postdoctoral researchers of the center presented their research in poster format. In a relaxed atmosphere, the students were able to see in firsthand what the young researchers of the Institute are working on.

It is a great opportunity for undergraduates to know what it means to dedicate themselves to research, as they will have the opportunity to chat directly with the IFISC researchers themselves as well as with doctoral students who can tell their personal experience and solve doubts.
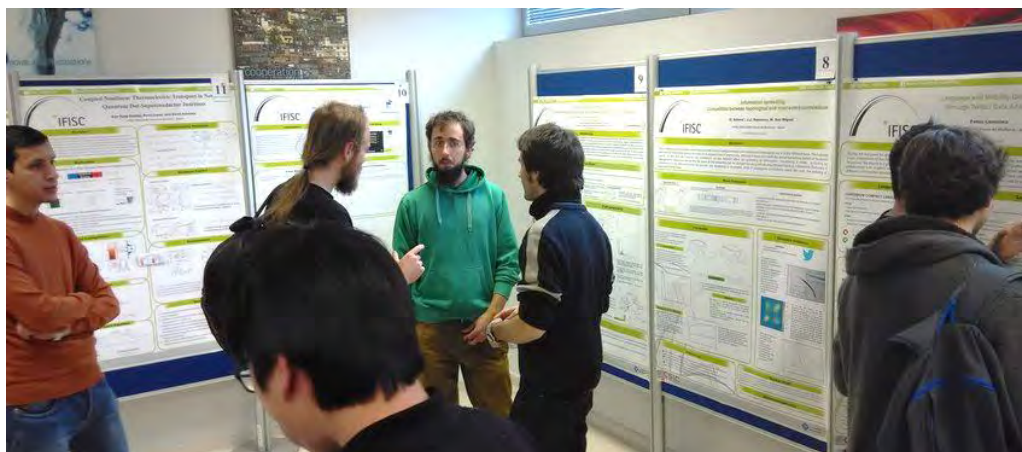
8.3 OTHER CONFERENCES AND EVENTS

Participation in "Pint of Science"

IFISC has participated for the first time in "Pint of Science" which is a festival that aims to deliver interesting and relevant talks on the latest science research in an accessible format to the public – mainly across bars and pubs. The festival provides a platform which allows people to discuss research with the people who carry it out and no prior knowledge of the subject is required. It is run mainly by volunteers and was established by a community of postgraduate and postdoctoral researchers in 2012.

During three consecutive days (May 15, 16 and 17) three scientists from our Institute (**IFISC**, UIB-CSIC) were in the iconic bar **Palma 80's Café** giving a dissemination talk about their work.

IFISC also participated in the Second "**Fira de la Ciència i la Tecnologia d'Inca**" (October 28-30).

Members of IFISC (Claudio R. Mirasso, Cristian Estarellas, Marcos Galletero and Adrián García) participated in the II Fira de la Ciència i la Tecnologia d'Inca (October 28-30). Both seniors and children were able to visit the IFISC stand in order to learn more about our institute and the importance of complex systems in the study of nature.

Among the experiments shown, the attendees highlighted the chaotic pendulum, the synchronization of metronomes, as well as the ferrofluid displays and an optical illusion with ambiguous cylinders. IFISC participation included the conference "¿Para qué sirve hoy en día la inteligencia artificial? " by Raúl Vicente, collaborating researcher at IFISC.

Outreach Talk by Phillip Ball, Freelance Science Writer

November 28
Club de Opinión, Diario de Mallorca, C/ Puerto Rico, 15. Pol. De Levante, Palma de Mallorca

Title of the talk: **It's not quantum mechanics that's weird - it's us**

Philip Ball, physicist and chemist, was editor of the prestigious magazine Nature for more than 20 years, currently being the host of "Science Stories" on BBC Radio 4 and columnist for New Scientist, The Guardian and The New York Times, among others. From his books highlight "*H2O: Biography of the water*", "*The musical instinct*" and "*Critical mass*", winning work of the Aventis Prize granted by the Real Society of London to the best book of popular science in 2005.

In this talk Philip Ball reviewed some of the most relevant aspects of quantum mechanics, as well as some of its applications. The talk was offered in English with the possibility of simultaneous translation into Spanish.

This was the closing public event for the IFISC 10-years anniversary celebration. During the talk's presentation the work done at IFISC and its dissemination activities were highlighted.

¡La mecánica cuántica no es tan rara! Somos nosotros...

Philip Ball, escritor y divulgador científico
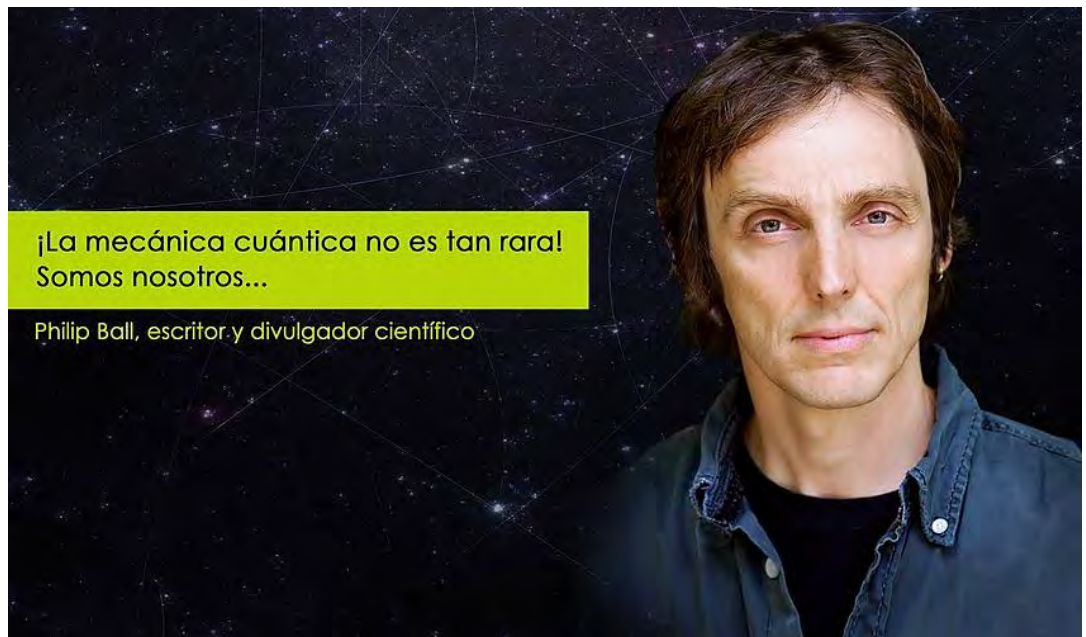
8.4 PRESS & MEDIA

IFISC research has received attention from newspapers and other media.

During 2017, IFISC activities produced 217 press releases and appearances in written and digital press (national and international), and 11 clips in radio and TV. See the full lists in the Appendix.

SOCIAL NETS IMPACT SUMMARY

TWITTER   **@IFISC_mallorca**

Total twits 2.687

Total Followers 1.281 (increasing 28% followers in 2017)

62% men / 38% women interested in science, technology and events

 Languages most used: Spanish (73%) and English (65%)

 Mostly located in Spain, Italy and US

FACEBOOK   **http://www.facebook.com/ifisc**

Facebook fans 911 (increasing 66% fans in 2017)

 62% men / 38% women

 Languages most used: Spanish (55%), English (15%), Portuguese (16%), Catalan (6%)

 Mostly Located in Spain, Mexico and Brazil

YOUTUBE   **http://www.youtube.com/user/IFISCseminars**

Visualizations 89.119 in 2017

YouTube subscribers: 532 in 2017

APPENDIX

APPENDIX

a.4. IFISC seminars and talks 2017

In the electronic version of this report, titles are hyperlinked to the recording of the seminar, if available. IFISC colloquia are already listed in page 50.

Jan 13
Sensitivity and robustness of larval connectivity diagnostics obtained from Lagrangian Flow Networks.
Pedro Monroy, IFISC.

Jan 18
Competition of simple and complex adoption on interdependent networks.
Agnieszka Czaplicka, IFISC.

Jan 25
Chimera states - mythological monsters from mathematics arise in the real world.
Erik A. Martens, University Of Copenhagen, Denmark.

Feb 01
Networks of unidirectionally coupled electromechanical oscillators / Resilience of power grids under delayed feedback control.
Murielle Vanessa Tchakui And Eric-Donald Dongmo, University Of Yaounde I, Cameroon.

Feb 15
Interaction between the US and European Airport Networks: Assessing the Impact of Intercontinental Flights.
Bruno Campanelli, IFISC.

Feb 16
Fractional spin and Josephson effect in time-reversal-invariant topological superconductors.
Liliana Arrachea, ICAS, UBA, Buenos Aires, Argentina.

Feb 22
Entropy production and thermodynamic power of the squeezed thermal reservoir.
Gonzalo Manzano, IFISC.

Feb 28
The probabilistic description of a changing climate.
Gabor Drotos, IFISC And MTA-ELTE Theoretical Physics Research Group. Budapest, Hungary.

Mar 03
Dynamics of Dissipative Localized Structures in Driven Nonlinear Optical Cavities.
Pedro Parra-Rivas, Vrije Universiteit Brussel, Belgium - IFISC.

Mar 08
A chiral Maxwell demon.
Rosa López, IFISC.

Mar 14
Canards and spike-adding phenomena in neural bursters (talk series Modelling in Neurosciences).
Mathieu Desroches (INRIA - Sophia Antipolis) France.

Mar 15
On the shape of semantic space - what can we infer from large-scale statistical properties of texts?.
Daniel Czegel, IFISC.

Mar 15
Stochastic model of nonlocal birth-death competitive dynamics with volume exclusion and its macroscopic description.
Nagi Khalil, IFISC.

Mar 22
Mathematics of RNA interference.
Konstantin Blyuss, University Of Sussex, UK.

Mar 29
The role of distributed time delays in the dynamical behaviour of coupled systems.
Yuliya Kyrychko, University Of Sussex, UK.

Apr 03
Monolithic subwavelength gratings for VCSELs: new concept of light confinement.
Tomasz Czyszanowski, Lodz University Of Technology, Poland.

Apr 05
Dynamical embeddings and dynamical modules in complex systems.
Renaud Lambiotte, Namur Center For Complex Systems, Belgium.

Apr 27
Emergent patterns in ecology: semi-arid ecosystems.
Juan Bonachela, University Of Strathclyde, Glasgow, UK.

May 04
Evolutionary Game Dynamics for Collective Decision Making in Structured and Unstructured Environments.
Dario Bauso, The University Of Sheffield, UK.

May 10
Deep Learning: Challenges and Opportunities.
Chris Van Den Broeck, Universiteit Hasselt, Diepenbeek, Belgium.

May 17
Complex Dynamic Brain Networks.
Steven Bressler, Florida Atlantic University, USA.

Jun 13
Effect of gravity on Schroedinger cat states: does the size really matter?.
Sabrina Maniscalco, Turku Centre For Quantum Physics, Finland.

Jun 14
The effect of Hieder´s Balance theory on the dynamics of epidemic models.
Meghdad Saeedian, Shahid Beheshti University, Iran.

Jun 22
Limiting the stroke of a Schmitt trigger with multiplicative noise.
Roberto Deza, IFIMAR (Universidad Nacional De Mar Del Plata And CONICET), Argentina.

Jun 22
Rogue waves formation in optics.
Majid Taki, Université Des Sciences Et Technologies De Lille, France.

Jun 26
Study of complex phenomena in neuronal circuits using mesoscopic models.
Claudio R. Mirasso, IFISC.

Jun 27
Majorana physics in hybrid nanowires.
Llorenç Serra, IFISC.

Jun 28
Non-conventional hysteretic cycles, energy harvesting: stochastic aspects.
Horacio S Wio, IFCA (CSIC-U. Cantabria) and IFISC.

Jun 29
Neuro-inspired optical information processing: concept and applications.
Ingo Fischer, IFISC.

Jul 06
Big Data and administrative records: a new way of counting population.
Diego Ramiro Fariñas, Department Of Population Studies IEGD-CCHS-CSIC, Spain.

Jul 24
Modelling Quorum Sensing Mechanisms in Bacterial Populations.
Víctor Buendía, IFISC.

Jul 27
Searching Chimera States in the Nonlocal Complex Ginzburg Landau Equation.
Pedro Parrado, IFISC.

Jul 31
Dynamics of attracting Brownian particles.
Adrian Garcia, IFISC.

Aug 07
Quantum control of trapped ions.
Joseba Alonso, ETH Zürich, Switzerland.

Sep 04
Power grid fluctuations and dynamic demand control.
Damià Gomila, IFISC.

Sep 11
Cooperative disease spreading in temporal networks.
Jorge P Rodríguez, IFISC.

Sep 13
Spatial networks in ecology.
Maxime Lenormand, Irstea, Montpellier, France.

Sep 14
Stochastic Binary-State Dynamics on Complex Networks.
Antonio Fernández Peralta, IFISC.

Sep 15
Exact Computation of Percolation Cluster Sizes in Finite Network.
Joan Pont Serra, IFISC.

Sep 25
Synchronization in a Neural Mass Model.
Ana Alonso, IFISC.

Sep 26
Improved detection of collective rhythms in multi-channel electroencephalography signals.
Alejandro Morán, IFISC.

Sep 27
Temperature dependent transport in artificial Kondo impurities and molecular junctions.
Miguel A. Sierra, IFISC.

Sep 28
Universality of the fundamental diagram in pedestrian dynamics.
Miguel Trigo, IFISC.

Sep 28
Multiple options noisy voter model: application to European elections.
Gianmarco Pisano, IFISC.

Sep 29
Financial contagion in the interbank market.
Patrick Sánchez, IFISC.

Sep 29
Field theory for recurrent mobility.
Alex Molas, IFISC.

Oct 04
Influence of a patient transfer network of US inpatient facilities on the incidence of nosocomial infections.
Juan Fernandez Gracia, IFISC.

Oct 09
Spin and charge transport in thermally and ac driven nanodevices.
Maria Isabel Alomar, IFISC.

Oct 10
A simplified model for clonal growth plants.
Daniel Ruiz-Reynés, IFISC.

Oct 11
Complex diffusion and complex geometries: from superfluids and fractal nanowires to demographics and human mobility networks.
Alberto Hernando De Castro, SThAR And EPFL, Switzerland.

Oct 25
Quantum thermoelectrics for ac driven quantum systems.
Maria Florencia Ludovico, U. Of Buenos Aires, Argentina.

Oct 31
The new IFISC website and intranet.
The IFISC Web Team.

Nov 03
Modelling of the dentate gyrus circuit.
Cristian Estarellas Martin, IFISC.

Nov 14
Dynamical Coulomb blockade of thermal transport.
Guillem Rosselló, IFISC.

Nov 15
Phenomenological versus microscopic approaches in the control of open quantum systems.
Gian Luca Giorgi, Institut UTINAM, Université De Franche-Comté, Besançon, France.

Nov 15
Cluster Crystals: Equilibrium and Non-equilibrium.
Cristobal López, IFISC.

Nov 22
Dynamics of Interacting diseases.
Sandro Meloni, BIFI: Institute For Biocomputation And Physics Of Complex Systems, Zaragoza, Spain.

Nov 29
Wider horizons: how to communicate science beyond your peers.
Philip Ball, Science Writer, Radio Host And Columnist, UK.

Dec 04
Complexity in ferroic materials: a way towards domain boundary engineering.
Ekhard Salje, Cambridge University, UK.

Dec 13
Towards Optical Reservoir Computers: Implementing and training a large scale photonic recurrent neural network
Julian Bueno, IFISC.

Dec 14
Electric network: benefits and limits of control in Braess' paradox
Eder Batista Tchawou, IFISC.

Dec 19
The construction of confidence
Mariano Sigman, Laboratorio De Neurociencia, Universidad Di Tella, Italy.

Dec 20
IFISC-10years: Present and future of IFISC.
IFISC members

a.5. Publications

In the electronic version of this report, titles are hyperlinked to the summary and PDF file of the publications

a.5.1 ISI Publications

Optimal run-and-tumble-based transportation of a Janus particle with active steering
Mano, Tomoyuki; Delfau, Jean-Baptiste; Iwasawa, Junichiro; Sano, Masaki
Proceedings of the National Academy of Sciences of the USA (PNAS) 114, E2580-E2589

The Ecology of Human Mobility
Meekan, Mark G.; Duarte, Carlos M.; Fernández-Gracia, Juan; Thums, Michele; Sequeira, Ana M.M.; Harcourt, Rob; Eguíluz, Víctor M.
Trends in Ecology & Evolution 32, 198-210

Fairy circle landscapes under the sea
Ruiz-Reynés, D.; Gomila, D.; Sintes, T.; Hernández-García, E.; Marbà, N.; Duarte, C.M.
Science Advances 3, e1603262 (1-8)

The Arctic Ocean as a dead end for floating plastics in the North Atlantic branch of the Thermohaline Circulation
Cózar, Andrés; Martí, Elisa; Duarte, Carlos M.; García-de-Lomas, Juan; van Sebille, Erik; Ballatore, Thomas J.; Eguíluz, Victor M.; González-Gordillo, J. Ignacio; Pedrotti, Maria L.; Echevarría, Fidel; Troublè, Romain; Irigoien, Xabier
Science Advances 3, e1600582

Reversal of Thermoelectric Current in Tubular Nanowires
Erlingsson, S. I.; Manolescu, A.; Nemnes, G. A.; Bardarson, J. H.; Sánchez, D.
Physical Review Letters 119, 036804 (1-6)

Advances in photonic reservoir computing
Van der Sande, G.; Brunner, D.; Soriano, M. C.
Nanophotonics 6, 561-576

Plant survival and keystone pollinator species in stochastic coextinction models: role of intrinsic dependence on animal-pollination
Traveset, Anna; Tur, Cristina; Eguíluz, Víctor M
Scientific Reports 7, 6915

Fragmentation transitions in a coevolving nonlinear voter model
Min, Byungjoon; San Miguel, Maxi
Scientific Reports 7, 12864

Joint effect of ageing and multilayer structure prevents ordering in the voter model
Artime, Oriol; Fernández-Gracia, Juan; Ramasco, José J.; San Miguel, Maxi
Scientific Reports 7, 7166

Influence of a patient transfer network of US inpatient facilities on the incidence of nosocomial infections
Fernández-Gracia, Juan; Onnela, Jukka-Pekka; Barnett, Michael L.; Eguíluz, Victor M.; Christakis, Nicholas A.
Scientific Reports 7, 2930

Big data analyses reveal patterns and drivers of the movements of southern elephant seals
Rodríguez, Jorge P.; Fernández-Gracia, Juan; Thums, Michele; Hindell, Mark A.; Sequeira, Ana M. M.; Meekan, Mark G.; Costa, Daniel P.; Guinet, Christophe; Harcourt, Robert G.; McMahon, Clive R.; Muelbert, Monica; Duarte, Carlos M.; Eguíluz, Víctor M.
Scientific Reports 7, 112

Encryption key distribution via chaos synchronization
Keuninckx, L.; Soriano, M. C.; Fischer, I.; Mirasso, C. R.; Nguimdo, R. M.; Van der Sande, G.
Scientific Reports 7, 43428

Microscopic description for the emergence of collective dissipation in extended quantum systems
Galve, Fernando; Mandarino, Antonio; Paris, Matteo G. A; Benedetti, Claudia; Zambrini, Roberta
Scientific Reports 7, 42050 (1-10)

In-gap corner states in core-shell polygonal quantum rings
Sitek, Anna; Tolea, Mugurel; Nita, Marian; Serra, Llorenç; Gudmundsson, Vidar; Manolescu, Andrei
Scientific Reports 7, 40197 (1-8)

Online games: a novel approach to explore how partial information influences human random searches
Martinez-Garcia, Ricardo; Calabrese, Justin M.; Lopez, Cristobal
Scientific Reports 7, 40029

Layered social influence promotes multiculturality in the Axelrod model
Battiston, Federico; Nicosia, Vicenzo; Latora, Vito; San Miguel, Maxi
Scientific Reports 7, 1809

Dynamics on networks: competition of temporal and topological correlations
Artime, Oriol; Ramasco, José J.; San Miguel, Maxi
Scientific Reports 7, 41627

Analysing Human Mobility Patterns of Hiking Activities through Complex Network Theory
Lera, Isaac; Pérez Lopez, Toni; Guerrero, Carlos; Eguíluz, Victor M.; Juiz, Carlos
PLOS ONE 12, e0177712

Dynamical and quantum effects of collective dissipation in optomechanical systems
Cabot, Albert; Galve, Fernando; Zambrini, Roberta
New Journal of Physics 19, 113007 (1-15)

Active cluster crystals
Delfau, Jean Baptiste; Lopez, Cristobal; Hernandez-Garcia, Emilio
New Journal of Physics 19, 095001 (1-9)

Opinion competition dynamics on multiplex networks
Amato, Roberta; Kouvaris, Nikos; San Miguel, Maxi; Diaz-Guilera, Albert
New Journal of Physics 19, 123019

Multi-ion sensing of dipolar noise sources in ion traps
Galve, Fernando; Alonso, J. ; Zambrini, R.
Physical Review A 96, 033409

Coexistence of stable dark- and bright-soliton Kerr combs in normal-dispersion resonators
Parra-Rivas, Pedro; Gomila, Damià; Gelens, Lendert
Physical Review A 95, 053863 (1-8)

Quantum synchronization as a local signature of super and subradiance
Bellomo, B.; Giorgi, G. L.; Palma, G. M., Zambrini, R.
Physical Review A 95, 043807 (1-11)

Majorana states in prismatic core-shell nanowires
Manolescu, Andrei; Sitek, Anna; Osca, Javier; Serra, Llorenç; Gudmundsson, Vidar; Stanescu, Tudor D.
Physical Review B 96, 125435 (1-13)

Fate of the spin-1/2 Kondo effect in the presence of temperature gradients
Sierra, M. A.; López, R.; Sánchez, D.
Physical Review B 96, 085416 (1-14)

Chiral Maxwell demon in a quantum Hall system with a localized impurity
Rosselló, Guillem; López, Rosa; Platero, Gloria
Physical Review B 96, 075305 (1-5)

Dynamical Coulomb blockade of thermal transport
Rosselló, Guillem; López, Rosa; Sánchez, Rafael
Physical Review B 95, 235404 (1-9)

Effects of dynamic-demand-control appliances on the power grid frequency
Tchawou Tchuisseu, E.B.; Gomila, D.; Brunner, D.; Colet, P
Physical Review E 96, 022302 (1-10)

From synchronous to one-time delayed dynamics in coupled maps
Anteneodo, Celia; Gonzalez-Avella, Juan Carlos; Vallejos, Raul O.
Physical Review E 95, 062213

Stochastic thermodynamics for Ising chain and symmetric exclusion process
Toral, R.; Van den Broeck, C.; Escaff, D.; Lindenberg, K.
Physical Review E 95, 032114

Front interaction induces excitable behavior
Parra-Rivas, P.; Matias, M.A.; Colet, P.; Gelens, L.; Walgraef, D.; Gomila, D.
Physical Review E 95, 020201(R)

Conditions for reservoir computing performance using semiconductor lasers with delayed optical feedback
Bueno, Julian; Brunner, Daniel; Soriano, Miguel C.; Fischer, Ingo
Optics Express 25 (3), 2401-2412

Semiconductor laser linewidth reduction by six orders of magnitude via delayed optical feedback
Brunner, Daniel; Luna, Raimon; Delhom I Latorre, Adrian; Porte, Xavier; Fischer, Ingo
Optics Letters 42, 163 - 166

Time-scale independent permutation entropy of a photonic integrated device
Toomey, J.P.; Argyris, A.; McMahon, C.; Syvridis, D.; Kane, D.M.
Journal of Lightwave Technology 35 (1), 88-95

Dynamical leaps due to microscopic changes in multiplex networks
Diakonova, M; Ramasco, J.J.; Eguiluz, V.M.
Europhysics Letters 117, 48004

Role of dynamical injection locking and characteristic pulse events for low frequency fluctuations in semiconductor lasers
Hicke, K.; Brunner, D.; Soriano, M. C.; Fischer, I.
Chaos 27, 114307

Anticipated and zero-lag synchronization in motifs of delay-coupled systems
Mirasso, C. R.; Carelli, P., Pereira, T.; Matias, F; Copelli, M.
Chaos 27, 114305

On the role of the entorhinal cortex in the effective connectivity of the hippocampal formation
López-Madrona, V.; Matias, F.; Pereda, E.; Canals, S.; Mirasso, C.
Chaos 27, 047401

Introduction to Focus Issue: Complex network perspectives on flow systems
Donner, Reik V. ; Hernandez-Garcia, Emilio; Ser-Giacomi, Enrico
Chaos 27, 035601 (1-5)

Clustering coefficient and periodic orbits in flow networks
Rodriguez-Mendez, V.; Ser-Giacomi, E.; Hernandez-Garcia, E.
Chaos 27, 035803 (1-9)

Nonlocal birth-death competitive dynamics with volume exclusion
Khalil, Nagi; Lopez, Cristobal; Hernandez-Garcia, Emilio
Journal of Statistical Mechanics: Theory and Experiment 2017, 063505 (1-21)

Equilibria, information and frustration in heterogeneous network games with conflicting preferences
Mazzoli, Mattia; Sanchez, Angel
Journal of Statistical Mechanics: Theory and Experiment 2017, 113403 (1-23)

Power grid enhanced resilience using proportional and derivative control with delayed feedback
Dongmo, Eric Donald; Colet, Pere; Woafo, Paul
European Physical Journal B 90, 6 (1-10)

Current distributions in stripe Majorana junctions
Osca, Javier; Serra, Llorenç
The European Physical Journal B 90, 90:28(1-7)

Nonlinear electric and thermoelectric Andreev transport through a hybrid quantum dot coupled to ferromagnetic and superconducting leads
Hwang, S.-Y. ; Sánchez, D.; López, R.
European Physical Journal B 90, 189 (1-7)

Interaction of solitons and the formation of bound states in the generalized Lugiato-Lefever equation
Parra-Rivas, Pedro; Gomila, Damià; Colet, Pere; Gelens, Lendert
European Physical Journal D 71, 198 (1-13)

Theory and applications of the Lugiato-Lefever Equation
Chembo, Y.K.; Gomila, D.; Tlidi, M.; Menyuk, C.R.
European Physical Journal D **71**, 299

Lagrangian Flow Network approach to an open flow model
Ser-Giacomi, E.; Rodriguez-Mendez, V.; Lopez, C.; Hernandez-Garcia, E.
European Physical Journal - Special Topics 226, 2057-2068

On the importance of the convergence to climate attractors
Drotos, Gabor; Bodai, Tamas; Tel, Tamas
European Physical Journal - Special Topics 226, 2031-2038

Transitions from trees to cycles in adaptive flow networks
Martens, Erik A.; Klemm, Konstantin
Frontiers in Physics 5, 62 (1-10)

Risk of coinfection outbreaks in temporal networks: a case study of a hospital contact network
Rodríguez, Jorge P.; Ghanbarnejad, Fakhteh; Eguíluz, Víctor M.
Frontiers in Physics 5, 46

Characterization of the structure and cross-shore transport properties of a coastal upwelling filament using three-dimensional finite-size Lyapunov exponents
Bettencourt, J.H.; Rossi, V.; Hernandez-Garcia, E.; Marta-Almeida, M.; Lopez, C.
Journal of Geophysical Research: Oceans 122, 7433-7448

Modeling the dynamical sinking of biogenic particles in oceanic flow
Monroy, Pedro; Hernandez-Garcia, Emilio; Rossi, Vincent; Lopez, Cristobal
Nonlinear Processes in Geophysics 24, 293-305

Sensitivity and robustness of larval connectivity diagnostics obtained from Lagrangian Flow Networks
Monroy, Pedro; Rossi,Vincent; Ser-Giacomi,Enrico; López, Cristóbal; Hernández-García,Emilio
ICES Journal of Marine Science 74, 1763-1779

Scattering properties and internal structure of magnetic filament brushes
Pyanzina, Elena S.; Sánchez, Pedro A.; Cerdà, Joan J. ; Sintes, Tomas; Kantorovich, Sofia S.
Soft Matter 13, 2590-2602

Complex between cationic like-charged polyelectrolytes/surfactants systems
Bassalah, Mohamed E. A.; Cerdà, J.J.; Sintes, Tomas; Aschi, Adel; Othman, Tahar
European Polymer Journal 96, 55-68

Topological suppression of magnetoconductance oscillations in normal-superconductor junctions
Osca, Javier; Serra, Llorenç
Physica Status Solidi B , 1700135

Automated Detection of Epileptic Biomarkers in Resting-State Interictal MEG Data
Soriano, M. C.; Niso, G.; Clements, J.; Ortín, S.; Carrasco, S.; Gudín, M.; Mirasso, C. R.; Pereda, E.
Frontiers in Neuroinformatics 11, 43

Reservoir Computing with an Ensemble of Time-Delay Reservoirs
Ortín, Silvia ; Pesquera, Luis
Cognitive Computation 9 , 327–336

Crowdsourcing the Robin Hood effect in cities
Louail, Thomas; Lenormand, Maxime; Murillo Arias, Juan; Ramasco, Jose J.
Applied Network Science 2, 11

a.5.2 Other publications in journals

Viewpoint: Reservoir Computing Speeds Up
Soriano, Miguel C.
Physics 10, 12

a.5.3 Book Chapters and Others

Language choice in a multilingual society: A view from Complexity Theory
San Miguel, Maxi; Loureiro-Porto, Lucia
Complexity in language: Developmental and evolutionary perspectives, Eds. Salikoko Mufwene, C. Coupe and F. Pellegrino , 187-217

Epidemic Threshold in Temporally-Switching Networks
Speidel, L; Klemm, K; Eguíluz, VM; Masuda, N
Temporal Network Epidemiology. (Edited by Masuda, N. and Holme, P.) 161-177

Quantum correlations and synchronization measures
Galve, F; Giorgi, G.L.; Zambrini, R.
Lectures on General Quantum Correlations and their Applications, Edited by F. Fernandes Fanchini, D. de Oliveira Soares Pinto, G. Adesso , 393-420

Spread of pathogens in the patient transfer network of US hospitals
Fernández-Gracia, Juan; Onnela, Jukka-Pekka; Barnett, Michael; Eguiluz, Victor M.; Christakis, Nicholas
Social, Cultural, and Behavioral Modeling. SBP-BRiMS 2017. Lecture Notes in Computer Science 10354, 271-280

Dialectometric analysis of language variation in Twitter
Donoso, G.; Sanchez, D.
Proceedings of the Fourth Workshop on NLP for Similar Languages, Varieties and Dialects (VarDial) , 16-25

Photonic information processing at 20GS/s rates based on semiconductor lasers with delayed optical feedback
Bueno, Julián; Brunner, Daniel; Soriano, Miguel C.; Fischer, Ingo
2017 Lasers and Electro-Optics Europe & European Quantum Electronics Conference (CLEO/Europe-EQEC)

Improving detection in optical communications using all-optical reservoir computing
Argyris, A.; Bueno, J.; Soriano, M.C.; Fischer, I.
2017 Lasers and Electro-Optics Europe & European Quantum Electronics Conference (CLEO/Europe-EQEC), IEEE

A complex network of 1600 holographically coupled opto-electronic oscillators: Network dynamics and utilisation for reservoir computing
Brunner, D.; Jacquot, M.; Larger, L.; Fischer, I.
2017 Lasers and Electro-Optics Europe & European Quantum Electronics Conference (CLEO/Europe-EQEC), IEEE

Photonic Networks for Neuromorphic Computing
Brunner, D.; Fischer, I.; Jacquot, M.; Larger, L.
in Frontiers in Optics 2017, OSA Technical Digest , Optical Society of America, paper FTh2E.3

**New Data Sources to Study
Airport Competition**
*Gallotti, Riccardo; Fuster, Marc;
Ramasco, Jose J.*
Procs.of the 7th SESAR Innovation
Days

a.6. Communications to conferences and talks in other centers

a.6.1 Invited talks in conferences and workshops

Zambrini, Roberta
**Entropy production and
thermodynamic power of the
squeezed thermal reservoir.**
*Fifth Quantum Thermodynamics
Conference, Oxford, UK.*
March 13

Ramasco, Jose J.
**Real time numerical forecasting
of global epidemic spread.**
Demography Today, Madrid, Spain.
April 24

Soriano, Miguel C.
**Recent advances in photonic
reservoir computers: a brain-
inspired computing paradigm.**
II Ibersinc Meeting, Madrid, Spain.
April 25

Toral, Raul
**Heterogeneity in stochastic
processes with applications to
agent-based models.**
*Conference on Applied Statistical
Mechanics of the Center for
Nonlinear Studies (CNLS), Los
Alamos, New Mexico, USA.*
May 01

Toral, Raul
**Constructive effects induced by
diversity.**
*Session in homage to J. D. Gunton
in the Conference on Applied
Statistical Mechanics of the Center
for Nonlinear Studies (CNLS) at
Los Alamos, Santa Fe, New
Mexico, USA.*
May 05

Zambrini, Roberta
**Quantum synchronization as a
local signature of super and
subradiance.**
*Quantum 2017 From Foundations
of Quantum Mechanics to Quantum
Information and Quantum
Metrology and Sensing, Torino,
Italy.*
May 08

Gomila, Damià
Patterns vs localized states.
*2017 SIAM Conference on
Applications of Dynamical Systems,
Utah, USA.*
May 21

Fischer, Ingo
**Ultra-fast Reservoir Computing
with Semiconductor Lasers:
Concept, Conditions and
Applications.**
*Workshop on Dynamical Systems
and Brain Inspired Computing in
Brussels, Belgium.*
May 31

López, Cristóbal
**Lagrangian Flow Networks: A
new tool to study geophysical
flows.**
*Symposium on Recent Advances in
Nonlinear Dynamics and Complex
Structures: Fundamentals and
Applications. Oldenburg, Germany.*
June 01

Fischer, Ingo
**Employing Complex Photonics
for Neuro-inspired Information
Processing.**
*Crossroads in Complex Systems
Conference, Palma de Mallorca,
Spain.*
June 08

Mirasso, Claudio
**Modeling Complex Phenomena
in Neuronal Circuits.**
*Crossroads in Complex Systems,
Palma de Mallorca, Spain.*
June 06

Drotos, Gabor
**The Dynamics and its Parameter
Dependence of Radiative-
convective Equilibrium in
ECHAM6.3.**
*XXXVII Dynamics Days Europe
2017, Szeged, Hungary.*
June 05

Sánchez, D.
**Periodic Energy Transport and
Entropy Production in Quantum
Systems.**
*Crossroads in Complex Systems,
Palma de Mallorca, Spain.*
June 07

Fischer, Ingo
**Applications of neuro-inspired
photonic information processing
using semiconductor lasers.**
*Workshop on Pattern Dynamics in
Nonlinear Optical Cavities -
PDNOC-2 at University of
Auckland, New Zealand.*
June 06

Eguíluz, Victor M.
**Crossroads of marine mega
fauna movement**.
*Crossroads in Complex Systems,
Palma de Mallorca, Spain.*
June 08

Hernández-García, Emilio
**Stretching fields in the ocean:
Transport and coherent
structures.**
*EarthFlows2017 workshop on
Interface Dynamics in Geophysical
Flows. Oslo, Norway.*
June 15

López, Cristóbal
**Lagrangian Flow Networks: A
new tool to study marine
ecosystems.**
*EarthFlows2017 workshop on
Interface Dynamics in Geophysical
Flows, Oslo, Norway.*
June 15

Fischer, Ingo
**Neuro-Inspired Optical
Information Processing:
Concepts and Applications.**
*VII Gefenol Summer School on
Statistical Physics of Complex and
Small Systems, Palma de Mallorca,
Spain.*
June 19

Mirasso, Claudio
**Study of complex phenomena in
neuronal circuits using
mesoscopic models.**
*VII GEFENOL Summer School on
Statistical Physics of Complex and
Small Systems, Palma de Malloca,
Spain.*
June 19

Zambrini, Roberta
Quantum synchronization and decoherence.
CEWQO2017, 24th Central European Workshop on Quantum Optics, DTU, Lingby, Denmark .
June 26

Serra, Llorenç
Current distributions and conductance oscillations in stripe Majorana junction.
Frontiers in Quantum and Mesoscopic Thermodynamics, Prague, Czech Republic.
July 09

Sánchez, D.
Cotunneling drag effect in double quantum dots.
Frontiers of Quantum and Mesoscopic Thermodynamics. Prague, Czech Republic.
July 10

Toral, Raul
Role of heterogeneity in stochastic agent-based models.
SigmaPhi, International Conference on Statistical Physics, Corfu, Greece.
July 10

Zambrini, Roberta
Quantum synchronization.
School and conference ICE4, Madrid (IFF-CSIC), Spain.
July 11

San Miguel, Maxi
Collective social phenomena: simple models and/or big data.
XXXVI Reunión Bienal de RSEF, Santiago de Compostela, Spain.
July 17

Toral, Raul
Individual and network heterogeneity in agent-based models.
30th Marian Smoluchowski Symposium, Cracovia, Poland.
September 03

Gallotti, Riccardo
Why human mobility is not a Levy flight.
Workshop "Current status and future directions of Levy walk research". London, UK.
September 10

Sánchez, D.
Heat and entropy in ac-driven quantum electronic systems.
International Workshop on Quantum Information, Quantum Control, and Quantum Devices. Bilbao, Spain.
September 13

Hernández-García, Emilio
Lyapunov lines and flow networks: impact of ocean transport on biological dynamics.
VIII Escola de Física da Universidade Federal da Bahia, Salvador, Brazil.
September 14

Toral, Raul
The biased-voter model.
Conference on Complex Systems, Cancun. Mexico.
September 17

Ramasco, Jose J.
Immigrant community integration in world cities.
Conference on Complex Systems CCS 2017, Cancun, Mexico.
September 17

López, Cristóbal
Cluster Crystals: Equilibrium and non-equilibrium.
Thermodynamics and Statistical Mechanics of Small Systems, Universita di Roma "La Sapienza", Roma, Italy.
September 18

San Miguel, Maxi
What can we learn from simple models of social behavior?: Imitation, contagion, innovation spreading.
Computational Social Science and Complexity Satellite of the Conference on Complex Systems 2017, Cancun, Mexico.
September 20

Hernández-García, Emilio
Clustering together with your competitors: Cluster crystals in passive and active matter.
ENFE 2017, II Encontro Nacional de Fisica Estatistica, Ilheus, Brasil.
September 20

Fischer, Ingo
Information processing in telecommunication systems.
Lake Como School of Advanced Studies on Complexity In Nonlinear Photonics, Italy.
September 25

Argyris, Apostolos
Signal restoration in optical communications using photonic information processing.
Workshop on Dynamical Systems and Brain-inspired Information Processing, Konstanz, Germany .
October 05

Fischer, Ingo
Do we need a new information processing paradigm ?.
Transdisciplinary Seminar at Yukawa Institute at Kyoto university, Japan.
October 19

Fischer, Ingo
The surprising properties of delay-dynamical systems and how you can exploit them.
Tutorial at Nonlinear Dynamics Workshop at Tokyo University of Science, Japan.
October 21

Fischer, Ingo
Using delay-coupled lasers for non-algorithmic photonic information processing.
Tutorial at Nonlinear Dynamics Workshop at Tokyo University of Science, Japan.
October 21

Mirasso, Claudio
Information Processing with neuro-inspired systems.
Memory meeting, Instituto de Neurociencias de Alicante, Spain.
October 23

Hernandez-Garcia, Emilio
Competing but close together: Cluster crystals in passive and active matter.
XV Latin American Workshop on Nonlinear Phenomena. La Serena, Chile.
November 06

Sánchez, D.
Analysing Language Variation through Big Data: The Case of Twitter and Google Book.
Poplang (Population effects on languages): Modelling population dynamics and language transmission from the perspective of language learning, contact and change. Lyon, France.
November 20

Colet, Pere
Frequency Combs Shaped by Eckhaus Instabilities.
IFISC and FEMTO-ST collaborative workshop, Besançon, France.
November 23

Fischer, Ingo
Photonic reservoir computing.
IFISC and FEMTO-ST collaborative workshop, Besançon, France.
November 23

Ramasco, Jose J.
Global mobility studied via ICT data: Applications for tourism.
*International Symposium" Empowering tourism destinations' sustainability through innovation",
UNWTO, Kasane, Botswana.*
December 07

Ramasco, Jose J.
Crosschecking different sources of information.
UNWTO Network of Observatories (INSTO), Madrid, Spain.
December 13

a.6.2 Other talks in conferences and workshops

Tchawou Tchuisseu, Eder B.; Gomila, Damià; Colet, Pere
Effects of interacting dynamic demand controlled appliances on the power grid frequency stabilizatinon.
Rencontre des Jeunes Chercheurs Africains en Paris, France.
December 01

Speidel, Leo; Klemm, Konstantin; Eguiluz, Victor M.; Masuda, Naoki
Epidemic threshold in temporally-switching networks.
DPG Spring Meeting, Dresden, Germany.
March 19

Rodríguez, Jorge P.; Ghanbarnejad, F.; Eguíluz, Víctor M.
Cooperative spreading diseases in temporal networks.
8th Conference on Complex Networks, CompleNet'17, Dubrovnik, Croacia.
March 21

Khalil, Nagi; Toral, Raul; San Miguel, Maxi
Modelo ruidoso del votante con fanáticos.
Fises17, XXI Reunion de Fisica Estadistica. Sevilla, Spain.
March 30

Ruiz-Reynés, Daniel; Gomila, Damià; Sintes, Tomás; Hernández-García, Emilio; Marbà, Núria; Duarte, Carlos M.;
Pattern formation in Posidonia Oceanica meadows.
Fises17, XXI Reunion de Fisica Estadistica. Sevilla, Spain.
March 30

Sánchez, D.
Dialectometric analysis of language variation in Twitter.
Fourth Workshop on NLP for Similar Languages, Varieties and Dialects. Valencia, Spain.
April 03

Gallotti, Riccardo
Biases and errors in the temporal sampling of random movements.
Netmob 2017. Milan, Italy.
April 05

Manzano, Gonzalo; Horowitz, Jordan; Parrondo, Juan M. R.
Fluctuation theorems for quantum maps.
QuProCS II meeting. Palma de Mallorca, Spain.
April 06

Cabot, Albert.
Spontaneous synchronization and asymptotic entanglement in coupled optomechanical systems dissipating into a common bath.
QuProCS II meeting. Palma de Mallorca, Spain.
April 06

Galve, F.
A 2-ions probe for anomalous heating.
QuProCS II meeting, Palma de Mallorca, Spain.
April 06

Giorgi, G.-L.
Synchronization as a local signature of super and subradiance.
QuProCS II meeting, Palma de Mallorca, Spain.
April 06

Monroy, Pedro; Rossi, Vincent; Ser-Giacomi, Enrico; López, Cristóbal; Hernández-García, Emilio
Connectivity diagnostics in the Mediterranean obtained from Lagrangian Flow Networks; global patterns, sensitivity and robustness.
EGU General Assembly, Vienna, Austria.
April 22

Ramasco, Jose J.
Immigrant community integration in world cities.
Third Meeting of the Spanish Community for the Study of Complex Systems COMSOTEC, Madrid, Spain.
April 26

Bassolas, Aleix; Gallotti, Riccardo; Lamanna, Fabio; Lenormand, Maxime; Ramasco, José Javier
Scaling in the recovery of cities from special events.
Third Meeting of the Spanish Community for the Study of Complex Systems COMSOTEC, Madrid, Spain.
April 26

Toral,Raúl
The biased-voter model - how persuasive a small group can be?.
Third Meeting of the Spanish Community for the Study of Complex Systems COMSOTEC, Madrid, Spain.
April 26

Gallotti, Riccardo
The emergence of income inequality in a randomly varying landscape.
Third Meeting of the Spanish Community for the Study of Complex Systems COMSOTEC, Madrid, Spain.
April 27

Galve, F.
Microscopic origins of collective dissipation in extended systems.
Quantum Torino 2017, Italy.
May 07

Fernández Peralta, Antonio; Toral, Raúl
Stochastic Binary-State Dynamics on Complex Networks.
Lake Como School on Complex Networks: Theory, Methods and Applications III. Italy.
May 15

Tchawou Tchuisseu, Eder B.; Gomila, Damià; Colet, Pere
Dynamics Demand Control applied to the electric power grid network.
Young Researchers at the Crossroads. Palma de Mallorca, Spain.
June 02

Cabot, Albert.
Dynamical and quantum effects of collective dissipation in optomechanical systems.
Young Researchers at the Crossroads. Palma de Mallorca, Spain.
June 02

Monroy, Pedro
Connectivity diagnostics in the Mediterranean obtained from Lagrangian Flow Networks; sensitivity and robustness.
Young Researchers at the Crossroads, Palma de Mallorca, Spain.
June 02

Campanelli, Bruno; Ramasco, José J.
Modelling Delay Propagation in Airport Networks.
Young Researchers at the Crossroads, Palma de Mallorca, Spain.
June 02

Galve, F.
Geometric Aspects of Extended Quantum Dissipative Systems.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Gomila, D.
Pattern formation and Fairy Circles in Posidonia Oceanica Meadows
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Rossi, V.
Lagrangian Flow Network: Theory and Applications
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 06

Ramasco, Jose J.
Immigrant Community Integration in World Cities
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 08

Manzano, Gonzalo; Galve, Fernando; Zambrini, Roberta; Parrondo, Juan M. R.
Entropy production and thermodynamic power of the squeezed thermal reservoir.
14th Granada Seminar, Spain.
June 20

Galve, F.
Microscopic origins of collective dissipation in extended systems.
14th Granada Seminar, Spain.
June 20

Argyris, Apostolos; Bueno, Julián; Soriano, Miguel Cornelles; Fischer, Ingo;
Improving Detection in Optical Communications Using All-optical Reservoir Computing.
European Conference on Lasers and Electro-Optics and European Quantum Electronics Conference (CLEO®/Europe-EQEC) 2017. Munich, Germany.
June 25

Gallotti, Riccardo
Modeling movements and decisions as random walks.
CCS 2017 Warm-Up workshop. Cancun, Mexico.
September 15

Mazzoli, Mattia; Maggiora, Marco; Pellegrino, Jacopo
A multi-agent system approach to the 2016 USA presidential campaign: the news spread about Donald Trump.
CCS 2017 Warm-Up. Cancun, Mexico.
September 15

Gallotti, Riccardo
Modelling decision times in game theory experiments.
Conference on Complex Systems CCS 2017, Cancun, Mexico.
September 17

Gallotti, Riccardo
Biases and errors in the temporal sampling of random movements.
Conference on Complex Systems CCS 2017, Cancun, Mexico.
September 17

Gallotti, Riccardo
Estimating aviation passengers flows and airports catchment areas from geo-located tweets.
Conference on Complex Systems CCS 2017, Cancun, Mexico.
September 17

Artime, Oriol
Joint effect of ageing and multilayer structure prevents ordering in the voter model.
Conference on Complex Systems CCS 2017, Cancun, Mexico.
September 17

Bassolas, Aleix; Gallotti, Riccardo; Lamanna, Fabio; Lenormand, Maxime; Ramasco, José Javier
Scaling in the recovery of cities from special events.
Conference on Complex Systems CCS 2017, Cancun, Mexico.
September 17

Bassolas, Aleix; Cantú-Ros, Oliva; Ramasco, José Javier
ICT technologies for urban simulation and the application of toll policies.
Conference on Complex Systems CCS 2017, Cancun, Mexico.
September 17

Tugores, Antònia
City attractiveness seen through Twitter.
PyConES 2017, Cáceres, Spain.
September 22

Soriano, Miguel Cornelles; Niso, Guiomar; Clements, Jillian; Ortín, Silvia; Carrasco, Sira; Gudín, María; Mirasso, Claudio; Pereda, Ernesto;
On the use of functional connectivity patterns to distinguish healthy and epileptic patients from interictal MEG data.
Coupling and Causality in Complex Systems. University of Cologne, Germany.
September 26

Rodríguez, J.P.; Ghanbarnejad, F.; Eguíluz, V.M.
Coinfection in the space: cooperative disease spreading in geometric and contact networks.
COSTNET17. Palma de Mallorca, Spain.
October 25

Artime, Oriol
Ageing and multiplexity in the voter model.
COSTNET17. Palma de Mallorca, Spain.
October 25

Gallotti, Riccardo
New data sources to study airport competition.
Sesar Innovation Days 2017. Belgrade, Serbia.
November 28

Sánchez, D.
Language Variation in Twitter: Machine learning and dialectometry approaches.
Geographic Information Systems and Social Networks: Consequences for the Study of Linguistic Variation. Barcelona, Spain.
November 30

a.6.3 Poster presentations

Delfau, J-B; Lopez, C.; Hernandez-Garcia, E.
Active cluster crystals.
Fises17, XXI Reunion de Fisica Estadistica (Sevilla) Spain.
March 30

Khalil, N.; Lopez, C.; Hernandez-Garcia, E.
Nonlocal birth-death competitive dynamics with volume exclusion.
Fises17, XXI Reunion de Fisica Estadistica (Sevilla) Spain.
March 30

Khalil, Nagi
Heat flux of a granular gas with homogeneous temperature.
Fises17, XXI Reunion de Fisica Estadistica (Sevilla) Spain.
March 30

Parra-Rivas, P.; Matias, M.A.; Colet, P.; Gelens, L.; Walgraef, D.; Gomila, D.
Front interaction induces excitable behavior.
Fises17, XXI Reunion de Fisica Estadistica (Sevilla) Spain.
March 30

Rodríguez, J.P.; Ghanbarnejad, F.; Eguíluz, V.M.
Cooperative spreading diseases in temporal networks.
Fises17, XXI Reunion de Fisica Estadistica (Sevilla) Spain.
March 30

Rodríguez, J.P.; Fernández-Gracia, J.; Thums, M.; Hindell, M.A.; Sequeira, A.M.M.; Meekan, M.G.; Costa, D.P.; Guinet, C.; Harcourt, R.G.; McMahon, C.R.; Muelbert, M.; Duarte, C.M.; Eguíluz, V.M.
Movement patterns of southern elephant seals from individual to collective scales.
Fises17, XXI Reunion de Fisica Estadistica. Sevilla, Spain.
March 30

Artime, Oriol
Dynamics on networks: competition of temporal and topological correlations.
Fises17, XXI Reunion de Fisica Estadistica. Sevilla, Spain.
March 30

Dongmo, Erik D.; Gomila, Damia; Colet, Pere; Woafo, Paul
Power grid stability under proportional and derivative control.
Fises17, XXI Reunion de Fisica Estadistica. Sevilla, Spain.
March 30

Fernández Peralta, Antonio; Toral, Raúl; Carro, Adrian; San Miguel, Maxi
Stochastic Pair Approximation.
Fises17, XXI Reunion de Fisica Estadistica. Sevilla, Spain.
March 30

Tchawou Tchuisseu, Eder Batista; Gomila, Damià; Colet, Pere
Effects of Interacting Dynamic Demand Controlled Appliances on the Frequency Grid Stabilization.
Fises17, XXI Reunion de Fisica Estadistica. Sevilla, Spain.
March 30

Martínez-Llinàs, Jade; Colet, Pere
In-phase, out-of-phase and T/4 synchronization of square waves in delay-coupled non-identical optoelectronic oscillators.
Fises17, XXI Reunion de Fisica Estadistica. Sevilla, Spain.
March 30

Tchakui, Murielle V.; Colet, Pere; Woafo, Paul
Analyzing the amplification of signals in chains of unidirectionally coupled MEMS.
Fises17, XXI Reunion de Fisica Estadistica. Sevilla, Spain.
March 30

Parra-Rivas, Pedro; Gomila, Damià; Matías, Manuel Alberto; Colet, Pere; Gelens, Lendert
Competition between drift and spatial defects leads to soliton oscillatory and excitable dynamics.
Fises17, XXI Reunion de Fisica Estadistica. Sevilla, Spain.
March 30

Lusebrink, D.; Sanchez, P.A.; Kantorovich, S.S.; Cerda, J.J.; Sintes, T.
Behavior of magnetic filaments under the simultaneous action of a flow and an external magnetic field.
Fises2017, XXI Reunion de Fisica Estadistica. Sevilla, Spain.
March 30

Fernandez-Gracia, J.; Onnela, J-P.; Barnett, M.L.; Eguiluz, V.M.; Christakis, N.A.
Influence of a patient transfer network of US inpatient facilities on the incidence of nosocomial infections.
Fises2017, XXI **Reunion** *de Fisica Estadistica. Sevilla, Spain.*
March 30

Toral, R.; Carro, A.; San MIguel, M.
Dinámica acoplada de nodos y enlaces: un modelo para competición de lenguas.
Fises2017. XXI Reunion de Fisica Estadistica. Sevilla, Spain.
March 30

Cerdà, J.J.; *Sanchez*, P.; Kantorovich, S.; Sintes, T.
Nanoparticle separators and nanoactuators using magnetically active polymer brushes.
Fises2017, XXI Reunion de Fisica Estadistica. Sevilla, Spain.
March 30

Rossi, Vincent; Monroy, Pedro; López, Cristobal; Hernández-García, Emilio
Modeling the dynamical sinking of biogenic particles in eastern-boundary upwelling systems.
EGU General Assembly in Vienna, Austria.
April 22

Rosselló, Guillem; López, Rosa; Platero, Gloria
Chiral Maxwell demon in a quantum Hall system with a localized impurity.
Majorana states in condensed matter: towards topological quantum computation. Alcúdia, Spain.
May 14

Sierra, Miguel A.; López, Rosa; Sánchez, David
Thermoeletric effects in Kondo-correlated quantum dots.
Majorana states in condensed matter. Alcúdia, Spain.
May 14

Osca, J.; Serra, L.
Topological suppression of magnetoconductance oscillations in NS junctions.
Majorana statesin condensed matter. Alcudia, Spain.
May 14

Alomar, M.I.; Sanchez, D.
Interaction effects in ac-driven mesoscopic capacitors.
Majorana states in condensed matter. Alcudia, Spain.
May 24

Delfau, J-B.; Hernandez-Garcia, E.; Lopez, C.
Active cluster crystals in systems of self-propelled particles.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Hernandez-Garcia, E.; Ser-Giacomi, E.; Monroy, P.; Rodriguez-Mendez, V.; Rossi, V.; Lopez, C.
Network description of fluid transport: Lagrangian Flow Networks.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Khalil, N.; Lopez, C.; Hernandez-Garcia, E.
Model of nonlocal birth-death competition with volume exclusion.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Monroy, P.; Rossi, V.; Ser-Giacomi, E.; Lopez, C.; Hernandez-Garcia, E.
Connectivity measures in the Mediterranean sea from Lagrangian Flow Networks: patterns, sensitivity and robustness.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Khalil, Nagi; Toral, Raul; San Miguel, Maxi
Zealots in the mean field noisy voter model.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Bueno, Julian; Brunner, Daniel; Soriano, Miguel Cornelles; Fischer, Ingo;
Photonic Information Processing at 20GS/s rates based on Semiconductor Lasers with Delayed Optical Feedback.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Manzano, Gonzalo; Horowitz, Jordan; Parrondo, Juan M. R.
Fluctuation theorems for quantum maps.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Cabot, A.; Galve, F.; Zambrini, R.
Spontaneous synchronization and asymptotic entanglement in coupled optomechanical systems dissipating into a common bath.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Fernandez-Gracia, J.; Onnela, J-P.; Barnett, M.L.; Eguiluz, V.M.; Christakis, N.A.
Influence of a patient transfer network of US inpatient facilities on the incidence of nosocomial infections.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Artime, Oriol
Dynamics on networks: competition of temporal and topological correlations.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Manzano, Gonzalo; Galve, Fernando; Zambrini, Roberta, Parrondo, Juan M. R.
Entropy production and thermodynamic power of the squeezed thermal reservoir.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Parra-Rivas, Pedro; Gomila, Damià; Matías, Manuel A.; Colet, Pere; Gelens, Lendert
Competition between drift and spatial defects leads to soliton oscillatory and excitable dynamics.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Argyris, Apostolos; Bueno, Julian; Soriano, Miguel Cornelles; Fischer, Ingo;
Photonic reservoir computing for post-processing optical communication signals.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Gallotti, Riccardo; Louf, Remi; Luck, Jean-Marc; Barthelemy, Marc
Tracking Random Walks.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Ruiz-Reynés, Daniel; Gomila, Damià; Sintes, Tomás; Hernández-García, Emilio; Marbà, Núria; Duarte, Carlos M.;
Growth direction distribution in patterns of Posidonia Oceanica.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Rodríguez, J.P.; Ghanbarnejad, F.; Eguíluz, V.M.
Cooperative spreading diseases in temporal networks.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Rodríguez, J.P.; Fernández-Gracia, J.; Thums, M.; Hindell, M.A.; Sequeira, A.M.M.; Meekan, M.G.; Costa, D.P.; Guinet, C.; Harcourt, R.G.; McMahon, C.R.; Muelbert, M.; Duarte, C.M.; Eguíluz, V.M.
Movement patterns of southern elephant seals from individual to collective scales.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Rosselló, Guillem; López, Rosa; Platero, Gloria
Chiral Maxwell demon in a quantum Hall system with a localized impurity.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Bassolas, Aleix; Gallotti, Riccardo; Lamanna, Fabio; Lenormand, Maxime; Ramasco, José Javier
Scaling in the recovery of cities from special events.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Min, Byungjoon; San Miguel, Maxi
Coevolving nonlinear voter model.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Sierra, Miguel A.; López, Rosa; Sánchez, David
Thermoelectric effects in Kondo-correlated quantum dots.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Bruno Campanelli; José Ramasco
Seeing The Forest For The Trees: Disentangling Delay Propagation Propagation In Airport Networks Through Delay Propagation Trees.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Tckakui, Murielle V.; Colet, Pere; Woafo, Paul
Analyzing the amplification of signals in chains of unidirectionally coupled MEMS.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Dongmo, Eric D.; Gomila, Damià; Woafo, Paul; Colet, Pere
Power grid stability under proportional and derivative control.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Tchawou Tchuisseu, Eder Batista; Gomila, Damià; Colet, Pere
Effects of DDC on the Synchronization of the Electric Power Grid Network.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Parra-Rivas,Pedro; Matías, Manuel A.; Colet, Pere; Gelens, Lender; Walgraef, Daniel; Gomila, Damià
Front interaction induces excitable behavior.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Fernández Peralta, Antonio; Toral, Raúl; Carro, Adrian; San Miguel, Maxi
Stochastic Pair Approximation.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Drotos, G.; Bodai, T.; Tel, T.
Convergence to attractors in the climate system.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Parra-Rivas, P.; Gomila, D.; Knobloch, E.; Coen, S.; Gelens, L.
Bright and dark localized structures in the Lugiato-Lefever equation.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Osca, J.; Serra, L.
Topological suppression of magnetoconductance oscillations in NS junctions.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Lusebrink, D.; Sanchez, P.A.; Kantorovich, S.S.; Cerda, J.J.; Sintes, T.
Conformational properties of a magnetic filament under flow and an external magnetic field.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Wio, H.S.; Peña Rossello, J.I.; Deza, R.R. Hanggi, P.
Enhancing energy harvesting by coupling monostable oscillators.
Crossroads in Complex Systems, Palma de Mallorca, Spain.
June 05

Drotos, Gabor; Lopez, Cristobal; Hernandez-Garcia, Emilio; Monroy, Pedro
Non-inertial Mechanisms for Clustering of Settling Particles.
XXXVII Dynamics Days Europe 2017, Szeged, Hungary.
June 05

Tchawou Tchuisseu, Eder B.; Gomila, Damià; Colet, Pere
Effects of Interacting Dynamic Demand Controlled Appliances on the Power grid frequency stabilization.
CoNDyNet-Conference: Dynamics in Power Systems: From Science to industry. Postdam, Germany.
June 12

Tchawou Tchuisseu, Eder B.;
Gomila, Damià; Colet, Pere
**Effects of DDC on the
synchronization of the electric
power grid network.**
*VII GEFENOL Summer School on
Statistical Physics of Complex
Systems, Palma de Mallorca,
Spain.*
June 19

Bassolas, Aleix; Gallotti, Riccardo;
Lamanna, Fabio; Lenormand,
Maxime; Ramasco, José Javier
**Scaling in the recovery of cities
from special events.**
*VII GEFENOL Summer School on
Statistical Physics of Complex
Systems, Palma de Mallorca,
Spain.*
June 19

Monroy, P.; Rossi, V.; Ser-Giacomi,
E.; Lopez, C.; Hernandez-Garcia,
E.
Connectivity measures in the
Mediterranean sea from
Lagrangian flow networks: patterns,
sensitivity and robustness.
*VII GEFENOL Summer School on
Statistical Physics of Complex
Systems, Palma de Mallorca,
Spain.*
June 19

Fernandez-Peralta, A.; Carro, A.;
Toral, R.; San Miguel, M.
Stochastic Pair Approximation.
*VII GEFENOL Summer School on
Statistical Physics of Complex
Systems, Palma de Mallorca,
Spain.*
June 19

Estarellas, C.; Mirasso, C.
How does neural density affect
dynamics?.
*VII GEFENOL Summer School on
Statistical Physics of Complex
Systems, Palma de Mallorca,
Spain.*
June 19

Bueno, Julian; Brunner, Daniel;
Soriano, Miguel Cornelles; Fischer,
Ingo
**Photonic Information Processing
at 20GS/s rates based on
Semiconductor Lasers with
Delayed Optical Feedback.**
*CLEO®/Europe-EQEC 2017,
Munich, Germany.*
June 25

Cabot, Albert.
**Dynamical and quantum effects
of collective dissipation in
optomechanical systems.**
*School and Conference ICE4,
Madrid, Spain.*
July 10

Galve, F.
**Microscopic origins of collective
dissipation in extended systems.**
*Quantum Optics to Quantum
Technology. Royal Society of
London, UK.*
July 11

Cabot, Albert.
**Dynamical and quantum effects
of collective dissipation in
optomechanical systems.**
*Nanotechnology meets quantum
information II. Summer school, San
Sebastián, Spain.*
July 24

Rosselló, Guillem; López, Rosa;
Platero, Gloria
**Chiral Maxwell demon in a
quantum Hall system with a
localized impurity.**
*Mesoscopic transport and quantum
coherence. Espoo, Finland.*
August 05

Sierra, Miguel A; López, Rosa
Sánchez, David;
**Thermoelectric Kondo effect in
quantum dots beyond linear
response.**
*28th International Conference on
Low Temperature Physics.
Gothenburg, Sweden.*
August 09

Sierra, Miguel A.; Saiz-Bretín, M.;
Domínguez-Adame, F.; Sánchez,
David
**Bound states in the continuum in
interacting double quantum dots:
Thermoelectric effects.**
*28th International Conference on
Low Temperature Physics.
Gothenburg, Sweden.*
August 09

Drotos, Gabor; Becker, Tobias;
Mauritsen, Thorsten; Stevens,
Bjorn
**Parameter dependence of the
dynamics of radiative-convetive
equilibrium in MPI-ESM.**
*Fourth International Conference on
Earth System Modelling. Hamburg,
Germany.*
August 28

Eder Batista;
**Effects of DDC on the
synchronization of the electric
power grid network.**
*Summer School on Complex Socio-
Technical Systems. Palma de
mallorca, Spain.*
September 04

Bassolas, Aleix; Gallotti, Riccardo;
Lamanna, Fabio; Lenormand,
Maxime; Ramasco, José Javier
**Scaling in the recovery of cities
from special events.**
*Summer School on Complex Socio-
Technical Systems Palma de
Mallorca, Spain.*
September 04

Argyris, Apostolos; Bueno, Julian;
Fischer, Ingo;
**Post-processing of Long-haul
and Ethernet Optical
Transmission Signals Using
Photonic Reservoir Computing.**
*43rd European Conference of
Optical Communication 2017,
Gothenburg, Sweden.*
September 17

López-Madrona, Victor J.; Pereda,
Ernesto; Mirasso, Claudio; Canals,
Santiago
**Trtiads of Synchronized Theta
Cycles Boost Cross-Frequncy
Coupling During Novelty
Exploration.**
*17 Congreso de la Sociedad
Española de Neurociencias,
Alicante, Spain.*
September 27

Khalil, Nagi
**Zealots in the mean-field noisy
voter model.**
*COSTNET17 conference, Palma
de Mallorca, Spain.*
October 25

Raducha T., Gubiec T.
**Predicting Language diversity
with complex networks.**
*COSTNET17 conference, Palma
de Mallorca, Spain.*
October 25

Artime, Oriol
**Dynamics on networks:
competition between temporal
and topological correlations.**
*COSTNET17 conference, Palma
de Mallorca, Spain.*
October 25

Bassolas, Aleix; Gallotti, Riccardo; Lamanna, Fabio; Lenormand, Maxime; Ramasco, José Javier
Scaling in the recovery of cities from special events.
COSNET17 Conference, Palma de Mallorca, Spain.
October 25

Pont Serra, Joan; Klemm, Konstantin
Exact Computation of Percolation Cluster Sizes in Finite Networks.
COSTNET17 conference, Palma de Mallorca, Spain.
October 25

Pflüger, Moritz
Establishing a Complex Network of VCSELs by Diffractive Coupling.
IFISC and FEMTO-ST collaborative workshop. Besançon, France.
November 23

Fischer, Ingo
Photonic reservoir computing in telecommunication systems.
Saitama University, Japan.
October 20

Manzano, Gonzalo
Quantum fluctuation theorems for arbitrary environments: adiabatic and non-adiabatic entropy production.
Group of Applied Physics (GAP) at the University of Geneva, Switzerland.
November 02

Drotos, Gabor
Inhomogeneities and caustics in passive particle sedimentation in incompressible flows.
Statistical Physics, Institute for Theoretical Physics, Eotvos Lorand University, Budapest, Hungary.
December 29

a.6.4 Seminars and talks in other research centers

Serra, Llorenç
Majorana states in nanowires.
School of Science and Engineering, Reykjavik, Iceland.
February 10

Fischer, Ingo
Can we teach lasers how to perform brain-inspired information processing?.
Fascination of Science Lecture Series of Massey University, New Zealand.
June 13

Drotos, Gabor
Non-inertial mechanisms for clustering of settling particles.
Statistical Physics, Institute for Theoretical Physics, Eotvos Lorand University, Budapest, Hungary.
June 14

Drotos, Gabor
On the importance of the convergence to climate attractors.
Max Planck Institute for Meteorology, Hamburg, Germany.
June 20

a.8. Press and Media

Some of the titles are linked to the document or media clip

a.8.1 Press and digital Media

La força i la veu del veí, a la nostra butxaca
Ara Balears
January 21

Viewpoint: Reservoir Computing Speeds Up
Physics
February 6

La saga de Harry Potter y la red de mundo pequeño
El mundo, Baleópolis
February 21

La fira Experimenta de l'IES Manacor acosta milers d'estudiants de Mallorca a la ciència i la tecnologia
Ara Balears
February 21

La feria "Experimenta" del IES Manacor acerca la ciencia y la tecnología a todo el público
Diario de Mallorca
February 22

La saga de Harry Potter y la red de mundo pequeño
El diari de la UIB
February 22

Un algoritmo creado por alumnos de la UIB analiza las redes sociales en Harry Potter o El Señor de los Anillos
Ibeconomia
El Economista
February 22

Un algoritmo diseñado por españoles desentraña las estructuras sociales de "Harry Potter" y "El Señor de los Anillos"
SIGLO XXI
La Información
La Voz Libre
Bolsamanía
Cuatro
Informativos Telecinco
February 22

Un algoritmo desentraña las estructuras sociales de "Harry Potter" y "El Señor de los Anillos"
PressDigital
February 22

Alumnos de la UIB crean un algoritmo que analiza las redes de Harry Potter
Mallorcadiario.com
February 22

Un algoritmo español se convierte en el manual de instrucciones de "Harry Potter" y "El Señor de los Anillos"
El Economista
February 22

"Harry Potter" y "El Señor de los Anillos", "mundos pequeños" según un algoritmo de alumnos de la UIB
Europa Press
February 22

La UIB y Red Eléctrica unen esfuerzos para apoyar el décimo aniversario del IFISC
Economía de Mallorca
February 22

Un algoritmo creado por alumnos analiza las redes sociales en Harry Potter
Faro de Vigo
February 23

Tecnología que detecta cambios fisiológicos
El Día
February 23

La UIB y Red Eléctrica Colaboran en el aniversario del IFISC
Última Hora
February 23

Lernen, wie das Gehirn Information verarbeitet
Mallorca Magazin
March 10

El caos com a eina d'encriptació
El diari de la UIB
March 13

El debate: expertos reclaman una cuarta revolución industrial "humana"
Diario de Mallorca
March 14

Señales caóticas como herramienta de encriptación
El Mundo, Baleópolis
March 21

Un artículo del IFISC seleccionado entre los más relevantes del 2016 por <<New Journal of Physics>>
El diari de la UIB
March 22

Un artículo del IFISC (UIB-CSIC), seleccionado entre los más relevantes del 2016 para "New Journal of Physics"
La Información
El Economista
Europa Press
March 23

Un artículo del IFISC, de los más relevantes del 2016 para New Journal of Physics
Mallorca Confidencial
March 23

Un artículo de investigadores del IFISC, destacado por 'New Journal of Physics'
Última Hora
March 23

Señales caóticas para cifrar mensajes
Agencia SINC
March 28

VUB demonstreert vernieuwend encryptiesysteem
Emerce
March 30

El New Journal of Physics publica un artículo sobre la pérdida de precisión en la formación de la opinión
Salut i Força
April 3

Colloquia of Excellence
El diari de la UIB
April 5

El Ártico también acumula plásticos, que llegan desde Estados Unidos a Europa
El Periódico de México
La Vanguardia
El Periódico
EFE Futuro
April 19

El Ártico también acumula plásticos, que llegan desde las costas de EEUU o Europa
Proceso Digital
April 20

El Ártico acumula plásticos desde EE.UU. o Europa
El Nuevo Diario
April 22

El Ártico acumula plásticos, que llegan desde las costas de EU o Europa
24 Horas
April 23

El plástico el principal contaminante del Ártico
La Verdad Noticias
April 25

Un estudio internacional propone el caos para cifrar mensajes
CSIC
May 9

El caos para la criptografía
Catalunya Vanguardista
May 09

Investigadores proponen un nuevo sistema de cifrado de mensajes basado en el caos que podría aplicarse a la electrónica
Europa Press
El Periódico
El Economista
Informativos Telecinco
Siglo XXI
La Información
La Voz Libre
Bolsamanía
Cuatro
EcoDiario
May 10

Un estudio internacional propone el caos para cifrar mensajes
NCYT
DICYT
Te Interesa
Asturias Mundial
Madrimasd
May 10

Cuándo el caos es la mejor solución
One Magazine
May 10

Investigadores proponen un nuevo sistema de cifrado de mensajes basado en el caos que podría aplicarse a la electrónica
Noticias Mallorca
La Vanguardia
May 10

La UIB-CSIC colabora con otros investigadores en un nuevo sistema de cifrado de mensajes basado en el caos
Ibeconomía
May 10

Codificar mensajes a partir del caos
El Ilustrador digital
May 10

La ciencia se cuela este lunes en el Palma 80's Café
Europa Press
Innovaticias
May 14

El CSIC propone usar el caos como método para el cifrado de mensajes
TIC Beat
May 14

Pint of Science prepara la seva primera edició a Palma
El diari de la UIB
May 15

El Palma 80's Café ofrece tres charlas abiertas de científicos para divulgar la ciencia esta semana
20 minutos
Ibeconomía
EcoDiario
La Vanguardia
Europa Press
May 15

Análisis de Big Data para caracterizar el movimiento animal
El diari de la UIB
May 16

Nueva propuesta para el sistema de cifrado de mensajes basado en el caos
CSO Computer World
May 17

"Big data" para seguir el movimiento de los elefantes marinos
Agencia SINC
May 17

Sortir de canyes per aprendre ciència
Ara Balears
May 19

Deu anys de l'IFISC i del cicle Explorant les Fronteres entre Sabers
El diari de la UIB
May 22

Un encuentro de expertos en computación cuántica
El Mundo, Baleópolis
May 23

El teletrabajo incrementaría el uso del coche, según un estudio
ABC Motor
May 30

Materiales híbridos, una revolución
El Mundo
May 30

Impacto que podría tener el teletrabajo en la reducción del tráfico en Madrid
Crónica Norte
May 31

Actes commemoratius del desè aniversari de l'IFISC (CSIC-UIB)
El diari de la UIB
June 2

Congrés internacional Crossroads in Complex Systems
El diari de la UIB
June 2

El IFISC y el IAS celebran sus aniversarios
CSIC
June 6

Genealogia i genètica, dos llegats divergents
Ara Balears
June 9

"Tots els individus sentim una tensió entre pertànyer a un grup i individualitzar-nos"
Ara Balears
June 10

El IFISC toma altura, Diez años de investigación avanzada en la Universidad
Diario de Mallorca, La Almudaina
June 11

El Ártico también acumula plásticos, que llegan desde EE.UU. o Europa
Telemadrid
Noticanarias
June 12

En la frontera de la física y la biología
El Mundo, Baleópolis
June 13

Entrevista TenTIC con Antònia Tugores del IFISC(UIB-CSIC)
Dr. TIC
June 14

Un algorithme joue les Robin des bois
Le Monde
June 21

Meetings: Majoranas in Majorca
Physics
June 21

VII GEFENOL Summer School on Statistical Physics of Complex Systems
El diari de la UIB
June 22

¿Y si el caos fuese la única salida para proteger nuestros datos?
Nobbot
June 22

Robin Hood, de l'arc a les dades massives (big data)
El diari de la UIB
June 27

Cómo el 'Big data' puede emular a Robin Hood redistribuyendo la riqueza comercial
Última Hora
Menorca
June 27

Could You Help Rewire Income Disparity?
National Public Radio, USA
June 27

Robin Hood anima a comprar en otros barrios para reducir la desigualdad en la ciudad
Agencia SINC
Mirada crítica
June 29

Robin Hood anima a comprar en otros barrios para reducir la desigualdad
Biovedruna
June 30

'Robin Hood', comprar en los barrios para poner fin a la desigualdad en la ciudad
ileón
July 2

'Robin Hood', comprar en los barrios para poner fin a la desigualdad en la ciudad
Salamanca 24 horas
Burgos Noticias
July 3

Robin Hood y Big Data para combatir la desigualdad
Nobbot
July 3

Robin Hood en la era del Big Data
El Mundo, Baleópolis
July 4

'Robin Hood', comprar en los barrios para poner fin a la desigualdad en la ciudad
Zamora 24 horas
July 4

Summer School on Complex Socio-Technical Systems
El diari de la UIB
July 11

Robin Hood anima a comprar en otros barrios para reducir la desigualdad
New Business, El Mundo Empresarial
July 11

Do you want fries with that? Data shows Americanization of English is rising
The Guardian
July 13

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