IFISC ANNUAL REPORT

2015

Universitat de les Illes Balears

CSIC
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS

Instituto de Física Interdisciplinar y Sistemas Complejos

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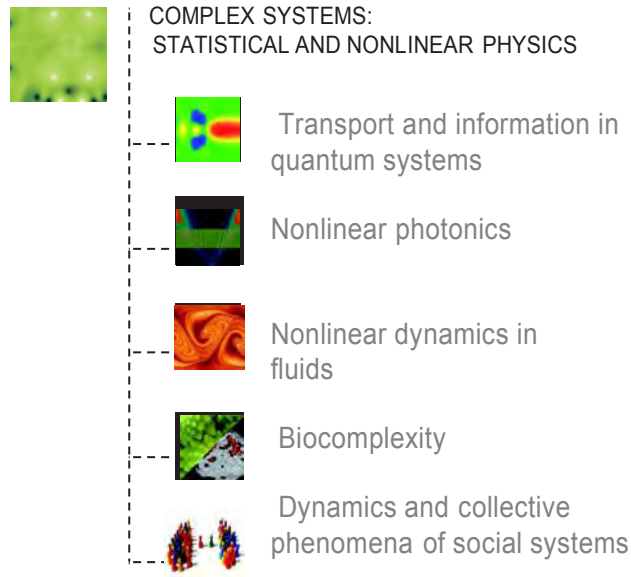# 1

PRESENTATION AND RESEARCH LINES

IFISC (Institute for Cross-Disciplinary Physics and Complex Systems) is a joint research In- stitute 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 IMEDEA (Mediterranean Institute for Advance Studies) dating from 1995. Its creation foresees that important avenues of scientific development occur at the borders of established fields. As statement of purpose it aims at developing **interdisciplinary** and **strategic** research from the established practices of physicists.

By **interdisciplinary** research we mean the general attitude of willing to transfer knowl-edge, concepts and methods across the borders between well established disciplines. By **strategic** research we mean focusing in advanced studies in fields with strong future potential, avoiding incremental research as well as the "basic-applied" polarization. We therefore search for windows of opportunity in emerging areas beyond the traditional subjects that defined Physics in the twentieth century.The backbone of IFISC'S research that unifies, percolates, and is the basis of the rest of activities is the study of generic phenomena in **Nonlinear Physics and Complex Systems**, with strong methodological components from Statistical Physics, Dynamical Systems, Computational Methods and Quantum Mechanics. From this source of concepts and ideas, the researchers face the challenge of cooperatively defining and updating specific research lines and projects within a flexible and changing framework.

1.1 IFISC RESEARCH LINES

IFISC has a unifying transverse line of exploratory research on Complex Systems: Statistical and Non-linear Physics. In addition, for the strategic plan 2015-17 IFISC has identified five lines with a subject defined by the system under study and representing cross-disciplinary interfaces of Physics with other established disciplines.

COMPLEX SYSTEMS:
STATISTICAL AND NONLINEAR PHYSICS

Transport and information in quantum systems

Nonlinear photonics

Nonlinear dynamics in fluids

Biocomplexity

Dynamics and collective phenomena of social systems

Complex systems. Nonlinear and statistical physics

Complex systems, a central paradigm at IFISC, are characterized by emergent and collective phenomena of many interacting units. Fundamental understanding of these systems comes from Statistical Physics together with the Theory of Dynamical Systems, which includes the study of chaos and the effect of fluctuations and random events on systems evolution. Generic phenomena under consideration include synchronization, phase transitions, nonequilibrium instabilities, spatiotemporal pattern formation, or dynamics and evolution of complex networks.

COMPUTING LAB

The Computing Services Unit manages IFISC computational resources. Those include two IBM iDataPlex clusters for intensive calculations and data management. The Nuredduna cluster with 48 dx360M4 nodes and a total of 576 computational cores and 1.8TB of RAM is configured for High Throughput Computing (HTC) and used for intensive calculations. The other cluster with 68 dx360M2 nodes and a total of 544 cores, 1TB of RAM and 96 TB of raw storage is used for grid computing, virtualization and data management. Big data handling is performed by using a MongoDb a non-relational data base which is distributed over 10 shards, each consisting of 3 servers replicating the data. Other computational tools at IFISC include several servers for specific tasks and a fully integrated network consisting on about 50 desktops and a similar number of laptops.

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

Very small systems (nanoscience) and light-matter interaction (quantum optics) share a common background in Quantum Physics. These are subjects of interest in fundamental research and also in view of new technologies, such as quantum devices and quantum computers. In particular, the possibility to overcome the limitations imposed by classi- cal physics leads to new ways to manage the information (quantum information). The research at IFISC focuses on the theoretical study of specific topics within these timely lines.

Charge and spin transport (nanoelectronics and spintronics) are studied in semiconductor nanostructures, including quantum dots and wires. The possibility to control photonic properties, such as quantum correlations and entanglement in light beams, are studied in nonlinear optical devices, cold atoms and lasers. General properties shared by these systems are studied in the context of quantum information.

Nonlinear Photonics

The general topic of this line is the study of the light-matter nonlinear interaction and its consequences and potential for applications in emerging photonics technologies. We study the complex dynamics and the generation of non-homogeneous spatial light distributions (pattern formation) in photonic sources such as semiconductor lasers, lasers with feedback loops, laser arrays and optical cavities filled with nonlinear media. Moreover, we experimentally study temporal and spatio-temporal complex laser dynamics and its utilization for encrypted communication, key exchange, generation of random bit sequences and 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.
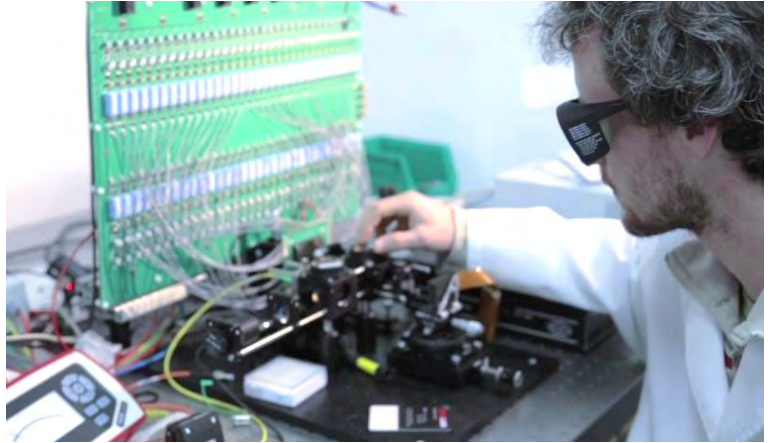
Nonlinear dynamics in fluids

Fluid flow is a natural process occurring in a huge range of scales, from blood capillaries to atmospheric weather systems. It is also widely spread in technological settings, being its understanding crucial to aircraft design or materials production, for example.

We concentrate in two research directions: on the one hand we study basic processes in fluid flows such as stirring, mixing, chemical or biological reactivity, instabilities, pattern forma- tion, motion of non-ideal tracers, etc. The point of view of chaotic advection is a convenient starting point, and Lyapunov methods are thoroughly used. On the other hand, we apply these concepts and methods to geophysical settings, mostly in ocean dynamics: transport and connectivity modelling, plankton patchiness, Lagrangian coherent structures, etc. Numerical simulations as well as observatons from satellite sensors are the main sources of data used here.

Biocomplexity

The general topic of this line is the study of some biological systems, mostly under the prism of modern Systems Biology, i.e. from the tenet that most observed behaviors in living systems stem from complex, emergent interactions among its constituents. Present research topics include modeling and simulation of neuronal systems, with special emphasis in stochastic effects and synchronization properties, population dynamics, phylogenetic networks and ecological structure and dynamics, including growth, aggregation processes and spatial effects, with special focus on clonal plants and savannahs. Methods of complex network analysis, stochastic simulations, and the theory of nonlinear dynamical systems, such as delayed coupled systems, are used thoroughly.

Dynamics and collective phenomena of social systems

Social systems are prominent examples of complex systems. Concepts, tools and models aiming at identifying generic mechanisms underlying collective phenomena in these systems are developed with the use of Game Theory, Statistical Physics, Agent Based Models and Complex Networks Theory. Cooperation, cultural conflicts and problems of social consensus are examples of phenomena under study. New emphasis is on data driven research on socio-technical systems, including the impact of ICT, and in particular online social networks.Topics addressed from this perspective include air transport networks, human mobility and city science.

1.2 STRUCTURE CHART
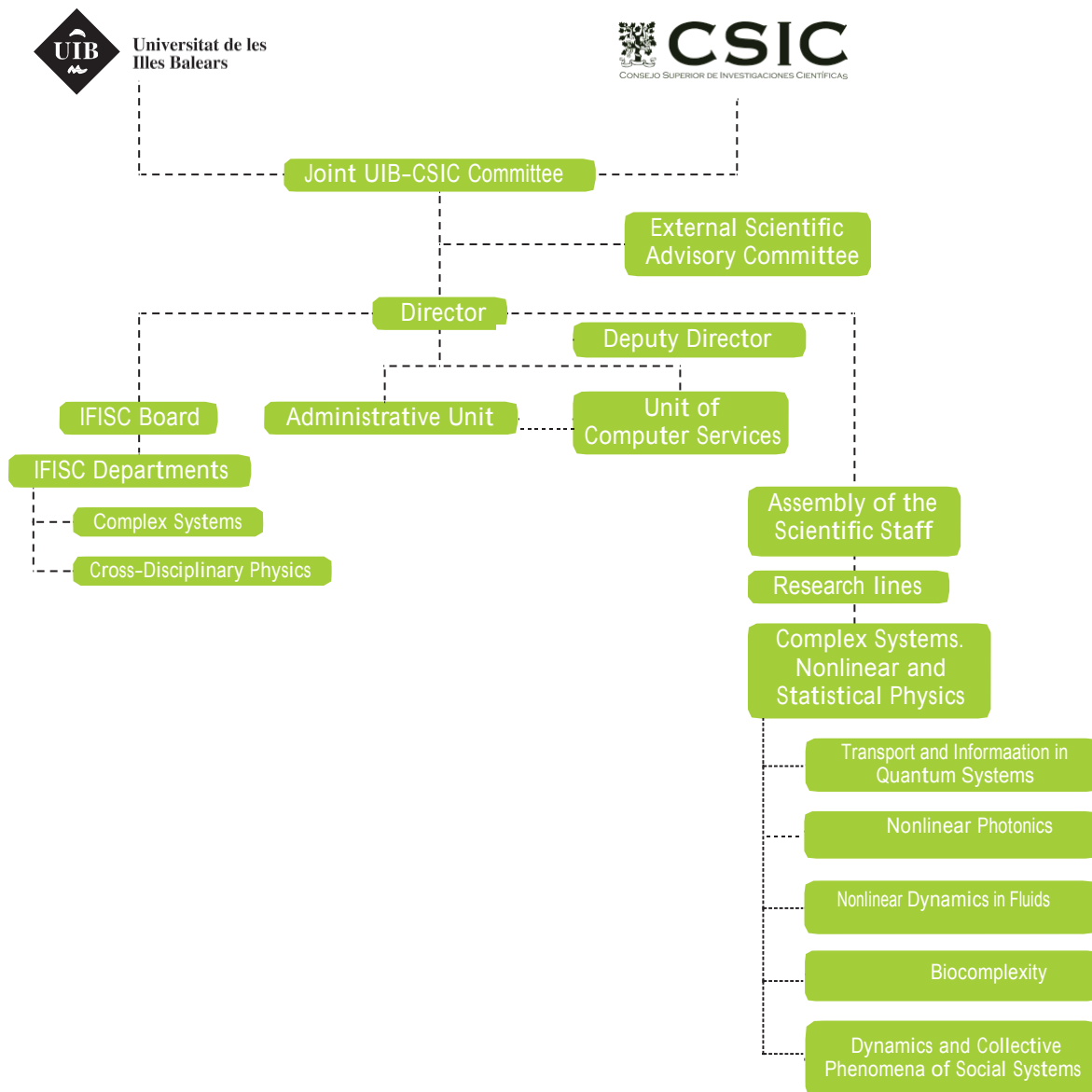
1.3 SOME REPRESENTATIVE RESEARCH RESULTS OF 2015

In the following we summarize some research results published during 2015. They are representative of the different research lines and thus illustrate the range of topics studied at IFISC

Theory for the spatio-temporal dynamics of domain walls close to a non-equilibrium Ising-Bloch transition

Gomila, Damià; Colet, Pere; Walgraef, Daniel
Physical Review Letters 114, 084101

Nonlinear systems can support more than one state for the same parameter values. If the system has two stable states the system is said to be bistable. Moreover in systems with spatial extension, parts of the system (domains) can be in one state and others in the other, leading to the formation domain walls. Understanding the dynamics and interaction of domain walls is very important, as they determine the spatiotemporal regimes in a large variety of dissipative systems in fields as diverse as chemistry, biology, material science, ecology or optics. Walls connecting two homogeneous states can be classified according to their symmetry with respect to the wall center as Ising, which are symmetric, and Bloch, which are not. Associated to their asymmetry, Bloch walls have a defined chirality. In systems whose dynamics does not minimize a potential, Bloch walls typically move with a velocity proportional to its chirality. The transition from a symmetric wall to a moving asymmetric one is known as non-equilibrium Ising-Bloch transition.

Furthermore if several domain walls are present in the system their interaction can lead to different dynamics. While the interaction of Ising walls is well understood, the interaction of Bloch walls has been much less studied. In this work we introduce a general theory explaining the dynamics of two domain walls in systems which are close a non-equilibrium Ising-Bloch transition. The fundamental model allows to understand the interplay between chirality χ and distance d predicting a universal scenario that includes stationary Ising and Bloch localized structures (dissipative solitons), drifting Bloch structures, oscillating Bloch localized structures (Fig. 1) and Bloch wall bouncing after a collision (Fig. 2).
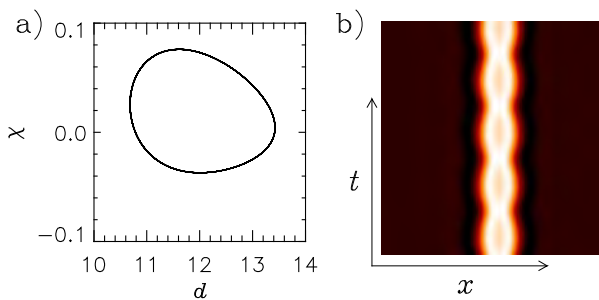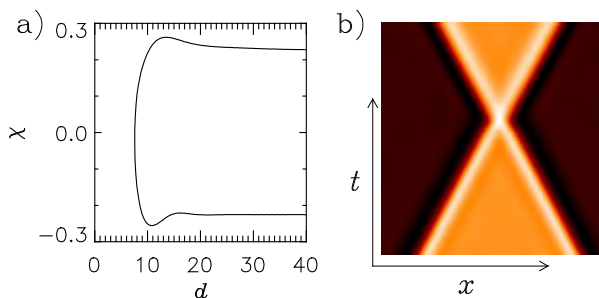

Fig. 1 Oscillating Bloch localized structure.

Fig. 2 Collision and bouncing of two Bloch walls.

Hardware photonic implementation of machine learning based on random mapping

Ortin, Silvia; Soriano, Miguel C.; Pesquera, Luis; Brunner, Daniel; San-Martín, Daniel; Fischer, Ingo; Mirasso, Claudio R.; Gutiérrez, José Manuel
A Unified Framework for Reservoir Computing and Extreme Learning Machines based on a Single Time-delayed Neuron
Scientific Reports 5, 14945

Extreme Learning Machines (ELMs) and Echo State Networks (ESNs) are two of the most popular machine learning techniques based on random mapping onto high dimensional state spaces. The ELMs were introduced as a simplification of feedforward neural networks whereas ESNs were inspired by recurrent neural networks. Although the two concepts were developed independently, both are based on the nonlinear and random mapping of the input onto a high-dimensional space to perform information processing. Traditional learning algorithms are very time-consuming since they optimize all system parameters. In contrast, random mappings are a trick to speed up supervised learning algorithms given that some of these parameters may not need to be optimized in practice. One can randomize a set of the parameters and quickly optimize over the rest using a simple learning technique, thus strongly simplifying the learning process.

In this article, a unified framework for these two machine-learning approaches, namely extreme learning machines (ELM) and echo state networks (ESN), is presented. The scheme is based on a recently proposed architecture for ESN consisting of a single nonlinear node subject to a recurrent self-feedback loop. This simple scheme enables the first implementation of ELMs and ESNs on identical hardware. The switching between the two approaches (ESNs and ELMs) is easily obtained by activating or deactivating one physical connection, as shown in the figure depicting the experimental setup. Consequently, the hardware implementation can be alternatively used as ELMs or ESNs almost effortlessly. Importantly, the unified framework facilitates a better understanding of the fundamental similarities between both approaches.
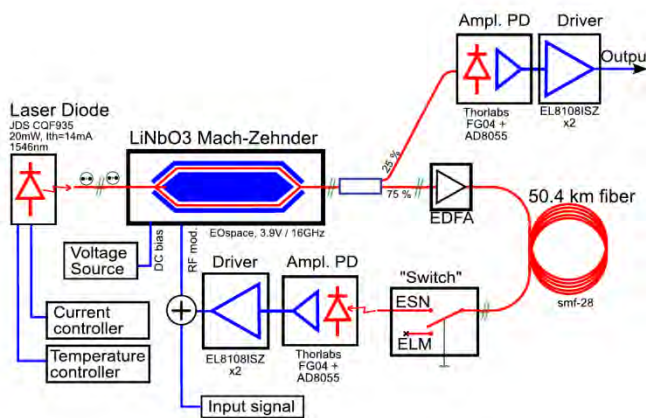

Figure. Experimental implementation of either an ELM or an ESN in photonic hardware. The nonlinear projection is provided by a Lithium-Niobate Mach-Zehnder modulator, modulating the intensity of a standard semiconductor laser-diode. Simply by using a fiber-switch, one can select the information injected into the modulator for the case of an ELM or an ESN.

This unified framework can be easily transferred from the optoelectronic system to other all-optical or electronic hardware implementations based on single nonlinear nodes with time-delayed feedback. Even though analog hardware-implementations are only emerging, they already demonstrate competitive performance. Especially all-optical implementations can lead the way to future, ultra-fast hardware systems of machine learning concepts with high energy efficiency.

Quantum Otto cycle with inner friction: finite-time and disorder effects

Alecce, Antonio; Galve, Fernando; Lo Gullo, Nicola; Dell´Anna, Luca; Plastina, Francesco; Zambrini, Roberta
New Journal of Physics 17, 075007 (1-14)

The study of thermodynamics in recent centuries has resulted in great progress in everyday human life, such as combustion engines and refrigerators, without which we would hardly imagine now the world. These processes make use of cycles in which a gas is compressed and expanded, in the engine of a car it is the air mixed with gasoline that pushes the piston, in a refrigerator it is another gas with specific properties for the task. These cycles exchange heat with the environment and ultimately result in a net work that we use to perform useful tasks.

The theoretical discussion of the thermodynamic properties of these cycles goes back almost to the origins of this discipline one and a half centuries ago, however advances in quantum physics and the ability to reduce industrial processes to the microscopic level have risen the interest on thermodynamics in the quantum regime during the last decade.

Our work, framed in this context focuses on translating a fundamental thermodynamic cycle, the Otto cycle, to quantum language. This cycle is behind the operation of internal combustion engines, consisting of adiabatic expansion/compression and thermalization with the environment (adjustment of the temperature to the outside temperature).

The concept of inner friction, by which such a quantum heat engine is unable to follow adiabatically its strokes and thus *dissipates useful* energy, is illustrated in an exact physical model where the working substance consists of an ensemble of *unavoidably misaligned* spins interacting with a magnetic field which is the driver of the Otto cycle. In a classical engine it could correspond for example to friction of pistons with their enclosing cylinders.
The effect of this static disorder under a finite-time cycle gives a new perspective of the concept of inner friction under realistic settings. We investigate the efficiency and power of this engine and relate its performance to the amount of *friction from misalignment* and to the temperature difference between heat baths. Finally we propose an alternative experimental implementation of the cycle where the spin is encoded in the degree of polarization of photons.
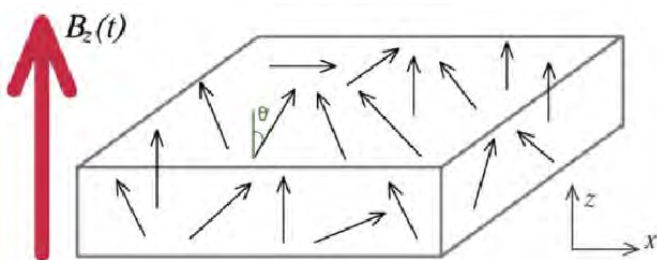
(Left) Misaligned spins (working substance of the engine) are driven by a magnetic field, which performs the cycle.

(Right) Ideal cycle (dashed yellow) versus the real one with friction (blue). The red lines correspond to isothermal lines.
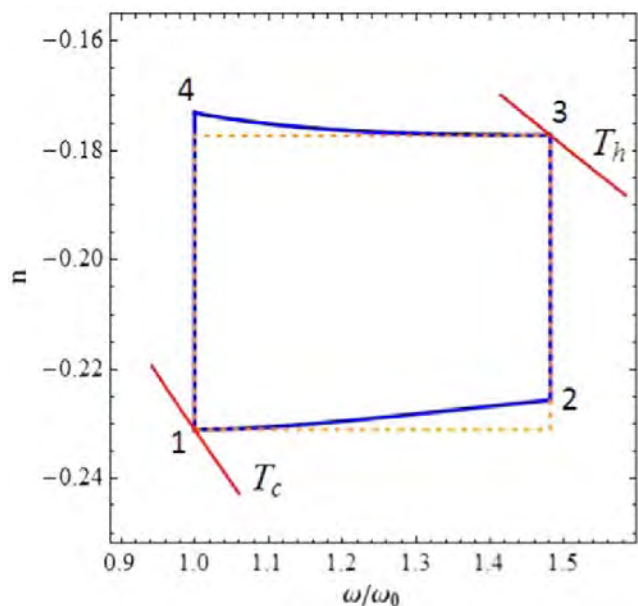
Seebeck effects in two-dimensional spin transitors

Alomar, M.Isabel; Serra, Llorenç; Sánchez, David
Physical Review B 91, 075418 (1-11)

The spin current is a key component in spintronics and the possibility of manipulating the electronic spin flow via spin-charge coupling potentials is what makes spintronics a fascinating branch of science. In semiconductor heterostructures lacking space inversion symmetry, the spin-orbit interaction is of the Rashba type. Importantly, the strength of the Rashba interaction can be tuned with an external electric field coupled to the heterostucture and, therefore, a spin-field effect transistor can be envisaged. Furthermore, in view of recent experiments that verify the generation of spin currents when a thermal gradient is applied, the study of thermolectric properties of spin transistors (Seebeck coefficients) has gained much interest. As a consequence, a new discipline termed spin caloritronics emerges in the study of spintronic effects caused by an applied temperature difference across the system.

Our work considers a two-dimensional semiconductor layer with a spatially modulated spin orbit interaction of strength α along the transport direction (see Figure). The quantum well originated in the central region of width ℓ is laterally coupled to two ferromagnetic reservoirs with a temperature difference ΔT. We also apply a bias voltage V across the junction in order to induce electronic transport.
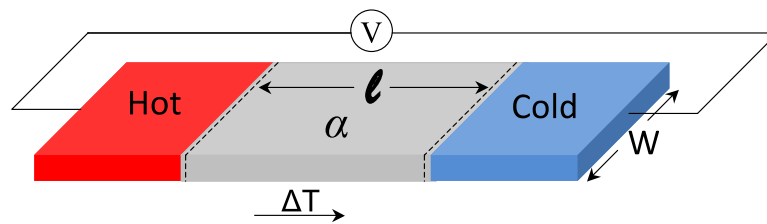
Based on a scattering theory valid for the ballistic regime of transport, we find that for normal contacts the charge thermopower S, measuring the voltage generated in response to ΔT, is strongly modulated by either the spin-orbit strength or the central region width. S is negative and varies as $1/E_F$ when the position of the Fermi level increases. In contrast, when we introduce ferromagnetic contacts, S becomes an oscillating function of E_F that changes sign. Crucially, for the case of magnetic leads the transmission for up and down spins differ and there arises a spin thermopower, i.e., a spin voltage bias created by ΔT. Moreover, we discuss the magneto-thermopower, which describes changes in the thermopower of a magnetic junction when inverting the leads' magnetic orientations from parallel to antiparallel configuration. These two magnitudes also oscillate with E_F and their sign changes depending on the position of the Fermi level.

In general, we demonstrate that a semiconductor two-dimensional electron system with inhomogeneous spin-orbit coupling offers quite remarkable capabilities for the generation of highly tunable thermoelectric properties. Our results may be also relevant for spin transistors built with two-dimensional electron systems other than semiconductor heterostructures: silicon, graphene or metal dichalcogenides.

Dynamical properties induced by state dependent delays in photonic systems

Martínez Llinás, Jade; Porte, Xavier; Soriano, Miguel C.; Colet, Pere; Fischer, Ingo
Nature Communications 6, 7425

In many dynamical systems and complex networks time delays appear naturally in feedback loops or coupling connections of individual elements. These delays have a strong effect on the dynamics and can induce oscillatory or chaotic behavior. Moreover, in a whole class of systems, including internet traffic, space communication, control theory, economics, turning processes, deep drilling, predator–prey systems and blood flow, these delay times can depend on the state of the system. Despite their relevance, the understanding of the impact in the dynamics of such state-dependent delays is quite limited with a particular lack of systematic experimental studies.

This work fills this gap by introducing a conceptually simple photonic system consisting of a semiconductor laser (LD) with two feedback loops with frequency-selective feedback mirrors and different delay times. The system is configured such that depending on the state of the system, in particular on the frequency ω of the emitted light at a given time, one or the other loop is activated. The figure shows the laser dynamics and its self-organized switching between the two loops with delay times τ_1 and τ_2. It depicts the dynamics in each of the delay loops, along with the contrast $C(t)$ between them.

This work establishes the basis for a whole new family of optical implementations based on easily configurable and tunable telecom devices and opens new perspectives for the study of systems with state dependent delay. Besides the fundamental interest, these configurations enable applications based on self-organized switching and can be used to control the dynamics either to stabilize a desired behavior or to interchange secure keys.
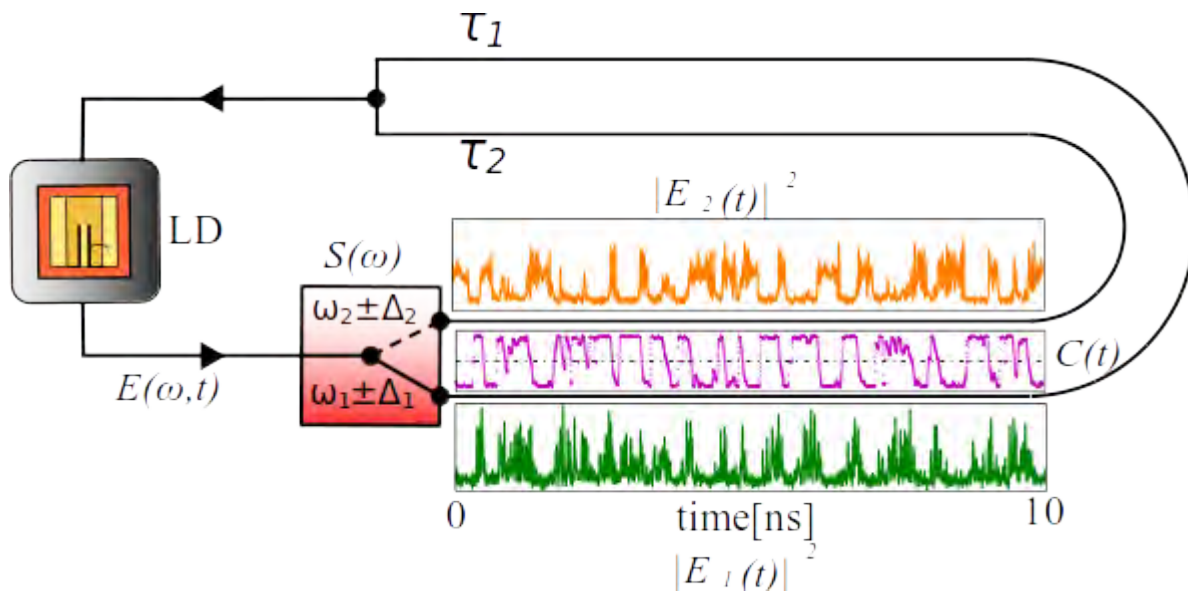
When lasers have a déjà vu: consistency properties of chaotic lasers

Oliver, Neus; Jüngling, Thomas; Fischer, Ingo
Consistency Properties of a Chaotic Semiconductor Laser Driven by Optical Feedback
Physical Review Letters 114, 123902

Ranging from communication to information processing systems, many technological applications of semiconductor lasers rely on a specific property: when you drive these lasers twice with the same input signal, you get twice the same response, or at least a similar one. This property is called *reliability* or *consistency* and is illustrated in Fig. 1.
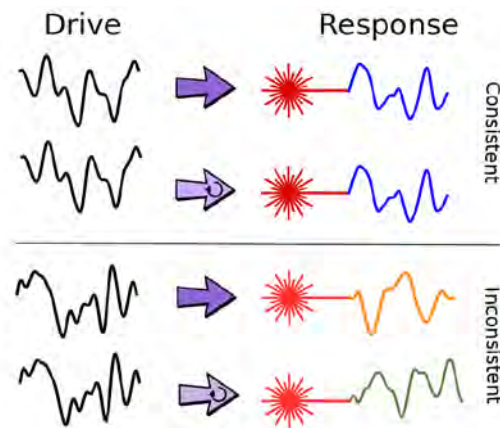
Fig. 1: Schematic illustration of a laser driven repeatedly with a complex optical waveform. Two conditions are shown, depending on laser parameters and injected signal. Top: Consistent response, the output to the same inputs is the same. Bottom: Inconsistent response, different outputs for the same inputs.

Surprisingly, this property is not found under all conditions. This paper presents the exploration of consistency properties in experiments on semiconductor lasers driven by chaotic optical signals. The chaotic drive is generated by a well-known mechanism, where the laser receives optical feedback via a fiber-optic loop. Only by varying the laser's pump current, the laser surprisingly undergoes transitions from consistent to inconsistent responses and back. The consistency properties are characterized by driving the laser twice with exactly the same optical signal, which was stored in an additional, much longer feedback loop. An example for the case of two consistent responses is shown in Fig. 2 a) and b). The time series are depicted as spatio-temporal representations.

Despite noise in the experiments, the visible structures are almost identical. In contrast, an example for the case of two inconsistent responses is given in Fig. 3 a) and b).

Moreover, a novel method is presented that solves the critical outstanding problem of extracting the key signature of consistency, the so-called sub-Lyapunov exponent, directly from the experiments. The fundamental properties and the developed method have relevance for the characterization and understanding of driven systems even beyond photonics, ranging from electrical and mechanical engineering to neural information processing in the brain.
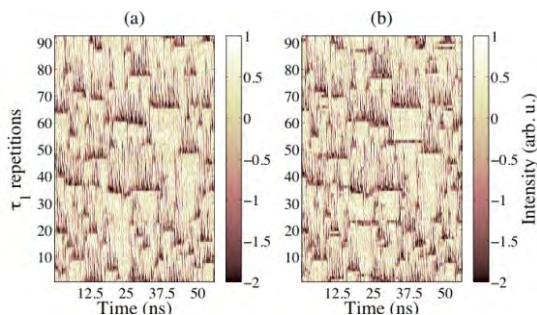

Fig.2. Spatio-temporal representation of the intensity output of the laser. a) original response to the complex optical drive, b) response to exact repetition of the same drive. The regime is highly consistent, meaning that the output patterns in (a) and (b) largely coincide.
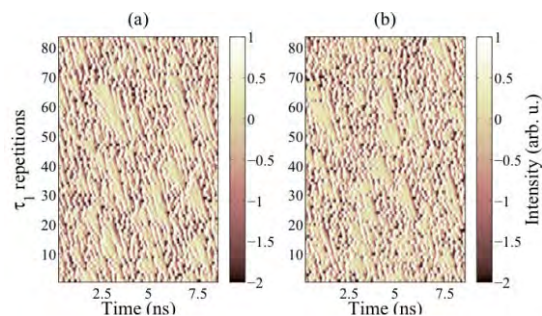

Fig.3. Spatio-temporal representation of the intensity output of the laser for different operating conditions than in Fig.2. The patterns in the original response (a) and in the response to the replica (b) are statistically the same, but do not match identically. The response is said to be inconsistent.

Barriers to oxygen in the ocean

Bettencourt, J.H.; López, C.; Hernández-García, E.; Montes, I.; Sudre, J.; Dewitte, B.; Paulmier, A.; Garçon, V.
Boundaries of the Peruvian Oxygen Minimum Zone shaped by coherent mesoscale dynamics
Nature Geoscience 8, 937-940

Between the 7% and 8% of the oceans' volume are zones with a very low content of oxygen and, therefore, there is practically no life there. This happens despite that, apparently, there are no walls in the sea that would prevent oxygen to enter these areas (by ocean currents, for example) from the surrounding waters. Now, a mechanism that prevents oxygen to fill up the oxygen-depleted (hypoxic) regions has been identified and studied, and applied to the large oxygen minimum zone permanently placed off the coasts of Peru.

Through the application of mathematical numerical models (realistic models of ocean circulation and biogeochemistry in the Peruvian area) and analyzing data with techniques of the physics of chaos, our studies show that eddies, acting as walls, are the responsible to keep oxygen out of these regions. This work also reveals that, paradoxically, the same swirls sometimes, sporadically and quickly, introduce water with high amounts of oxygen in these areas.
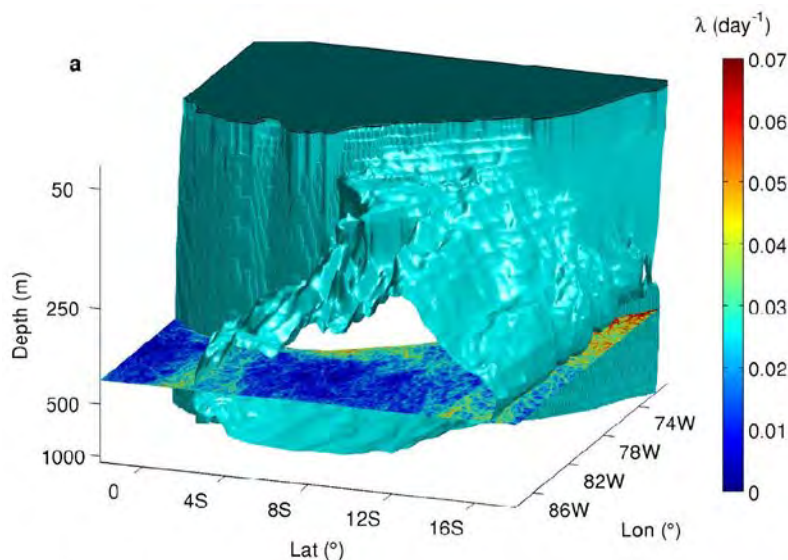

Figure: 20-micromolar isosurface of mean O2 concentration and mesoscale structures at 410 meters depth. Flat top shows the Peruvian coast.

Spatial Patterns of Interacting Moving Individuals

Martínez García, Ricardo; Murgui, Clara; Hernández García, Emilio; López, Cristóbal
Pattern Formation in Populations with Density-Dependent Movement and Two Interaction Scales
Plos One 10, e0132261 (1-14)

In biological systems, the interplay between negative and positive feedbacks is known to shape populations and give rise to instabilities and spatial patterns. Among individuals of the same species negative interactions arise for example from competition for common resources. Positive or facilitation effects can arise, for example, from mutual protection. In this work we have modelled interacting organisms that, like the case of mussels, tend to cluster at short distances as a defensive strategy, but that strongly disperse to optimize foraging if there is a high population pressure at large distances. Our model implements these interactions as mobility for the individuals which depend on the population density at two different spatial ranges. We find labyrinthic and spot patterns which resemble mussel's aggregations. In addition to the individual-based modelling we also derive a nonlinear diffusion description for the density, from which some analytic insight can be obtained. As a characteristic prediction of our models, we find a preferential accumulation of the organisms at the borders of the clusters, occurring because they arrive and stop at the boundaries of the low-mobility cluster regions after moving fast in the intercluster space.
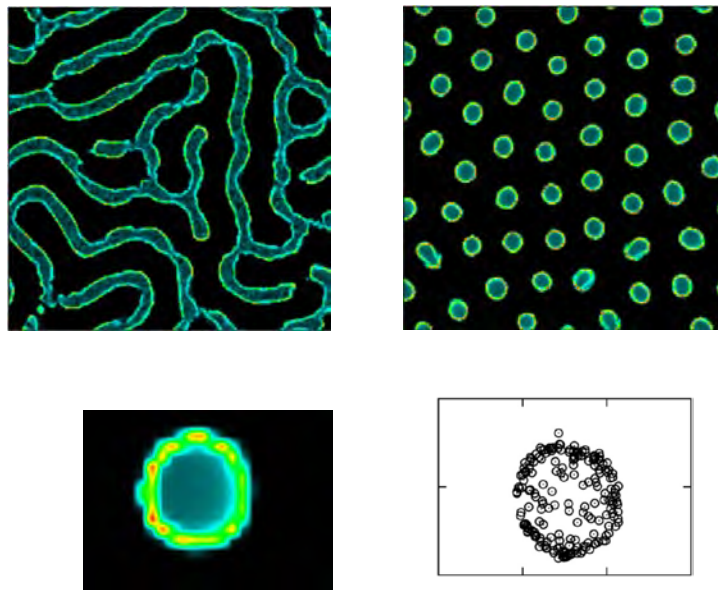
The figure shows different patterns obtained from the particle based model and from the corresponding nonlinear diffusion equation, showing also the enhanced density at the borders of the clusters.

Minimal approach to neuro-inspired information processing

Soriano, Miguel C.; Brunner, D.; Escalona-Moran, M.; Mirasso, Claudio R.; Fischer, Ingo
Frontiers in Computational Neurosicence 9, 68

To learn and mimic how the brain processes information has been a major research challenge for decades. Despite the efforts, little is known on how we encode, maintain and retrieve information. One of the hypothesis assumes that transient states are generated in our intricate network of neurons when the brain is stimulated by a sensory input. Based on this idea, powerful computational schemes have been developed. These schemes, known as machine-learning techniques, include artificial neural networks, support vector machine and reservoir computing, among others.

This review article concentrates on the reservoir computing (RC) technique using delay-coupled systems. Unlike traditional RC, where the information is processed in large recurrent networks of interconnected artificial neurons, here a minimal design is chosen, implemented via a simple nonlinear dynamical system subject to a self-feedback loop with delay. This design is not intended to represent an actual brain circuit, but aims at finding the minimum ingredients that allow developing an efficient information processor.
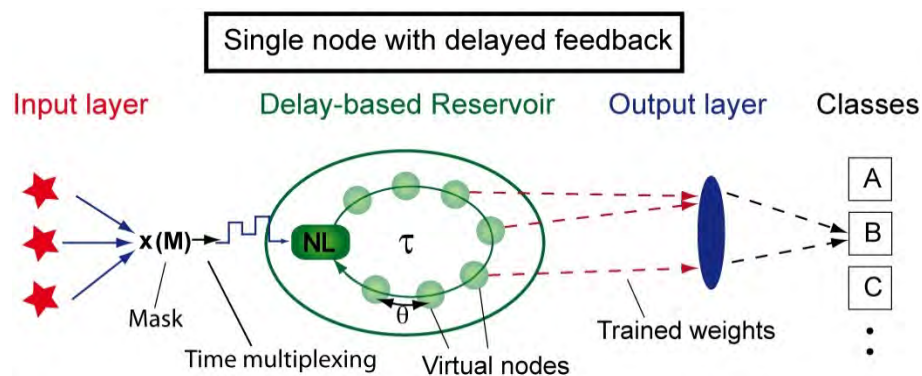
Figure. Schematic arrangement of reservoir computing based on a single nonlinear node with delay and time-multiplexing. Virtual nodes are defined as temporal positions along the delay line.

This simple scheme not only allows to address fundamental questions but also permits simple hardware implementations. By reducing the neuro-inspired reservoir computing approach to its bare essentials, it is demonstrated that nonlinear transient responses of the simple dynamical system enable the processing of information with excellent performance and at unprecedented speed. Different hardware implementations are specifically explored, and by that, the role of nonlinearity, noise, system responses, connectivity structure, and the quality of projection onto the required high-dimensional state space are identified. Besides the relevance for the understanding of basic mechanisms, this scheme opens direct technological opportunities that could not be addressed with previous approaches.

This cross-fertilization between neuroscience, machine learning and dynamical systems offers a promising path, not only to build better information-processing systems, but potentially to learn more about how our brains perform many tasks in such a successful manner.

# Uncovering the spatial structure of mobility networks

Louail, Thomas; Lenormand, Maxime; Picornell, M.; García Cantu, O.; Herranz, R.; Fria-Martinez, E.; Ramasco, Jose J.; Barthelemy, M.
Nature Communications 6, 6007

The extraction of a clear and simple footprint of the structure of large, weighted and directed networks is a general problem that has many applications. An important example is given by origin-destination matrices that contain the complete information on commuting flows in cities, but are difficult to analyze and compare. We propose here a versatile method to extract a coarse-grained signature of mobility networks, under the form of a 2×2 matrix that separates the flows into four categories. The method is based on the detection of the most relevant centers of activity for the origin and destination of the flows, the so-called hotspots.
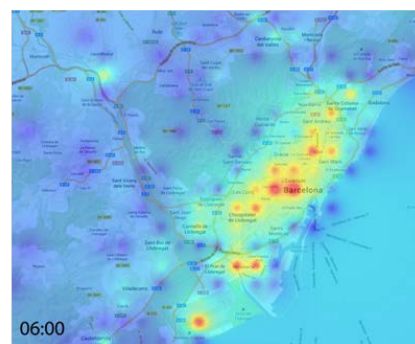
Hot spots of activity in the city of Barcelona at 1 am and 6 am, obtained from mobile phone data

In the case of the cities the residential hotspots are areas that concentrate a good part of the housing of the local resident population, while the working hotspots include industrial and business zones. The flows are then divided by the category of the origin and destination areas: from hotspot to hotspot I, from hotspot to other D, from other to hotspot C and from other to other R. We apply this method to origin-destination matrices extracted from mobile phone data recorded in thirty-one Spanish cities. We show that these cities essentially differ by their proportion of two types of flows: integrated (between residential and employment hotspots) and random flows, whose importance increases with city size. Finally the method allows determining categories of networks, and in the mobility case to classify cities according to their commuting structure.
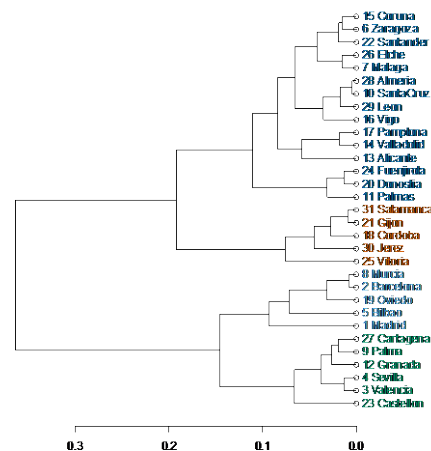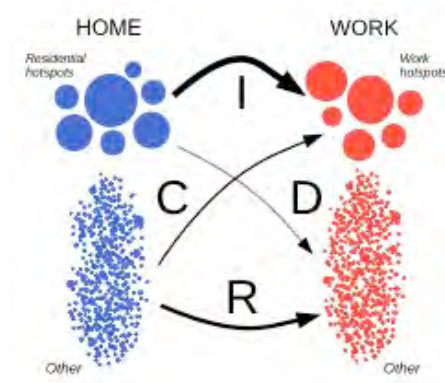
Mobility fluxes and classification of cities

On the left, the main categories of mobility fluxes depending on category of the origin and destination area (hotspots or other). On the right, the classification of the Spanish cities according to the structure of their commuting flows.

Influence of sociodemographic characteristics on human mobility

Lenormand, Maxime; Louail, T; Cantu-Ros, O.G.; Picornell, M.; R. Herranz, R.; Murillo Arias, J.; Barthelemy, M.; San Miguel, Maxi; Ramasco, Jose J.
Scientific Reports 5, 10075

Human mobility has been traditionally studied using surveys that deliver snapshots of population displacement patterns. The growing accessibility to ICT information from portable digital media has recently opened the possibility of exploring human behavior at high spatio-temporal resolutions. Mobile phone records, geolocated tweets, check-ins from Foursquare or geotagged photos, have contributed to this purpose at different scales, from cities to countries, in different world areas. Many previous works lacked, however, details on the individuals' attributes such as age or gender. In this work, we analyze credit-card records from Barcelona and Madrid and by examining the geolocated credit-card transactions of individuals living in the two provinces, we find that the mobility patterns vary according to gender, age and occupation. Differences in distance traveled and travel purpose are observed between younger and older people,

but, curiously, either between males and females of similar age. Given that the differences are most acute between ages 30 and 45, this could be related to children care. While mobility displays some generic features, here we show that sociodemographic characteristics play a relevant role and must be taken into account for mobility and epidemiological modelization.
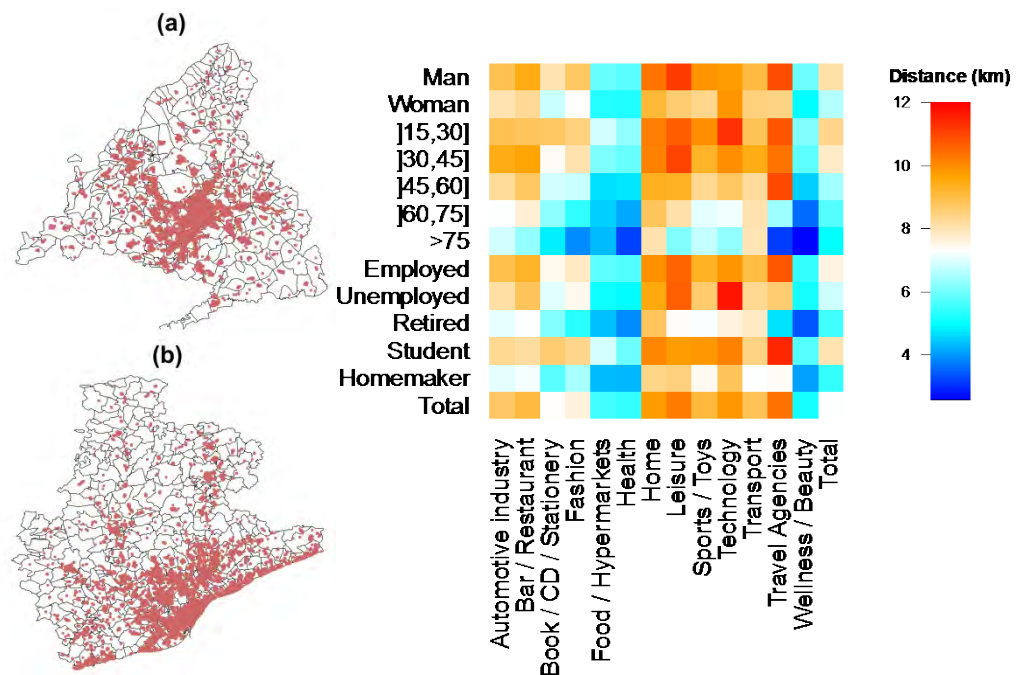
Figure. Maps of the locations of businesses in the provinces of Madrid (a) and Barcelona (b). On the right, histogram of the trips per category of person and travel purpose.

Human diffusion and city influence

Lenormand, Maxime; Gonçalves, B.; Tugores, Antonia; Ramasco, Jose J.
Journal of the Royal Society Interface 12, 20150473

The study of competition and interactions between cities has a long history in fields such as Geography, Spatial Economics and Urbanism. This research has taken traditionally as basis information on finance exchanges, sharing of firm headquarters, number of passengers transported by air or tons of cargo dispatched from one city to another. One can define a network relying on each of these indicators and identify the so-called World Cities, those with a higher level of centrality as the global economic or logistic centers. In most of these analyses, London and New York rank as the most central cities in terms of economic influence and transport network centrality. In this work, we take a radically different approach to measure quantitatively the influence of a city in the world. We use a Twitter database containing 20 millions of geo-located tweets worldwide recorded during a period of 1000 days to measure and compare the influence of 58 cities. The aim here is to search for an answer to the questions raised by the following thought experiment: an announcement with a particular message is displayed in the most centric place of a city. People seeing it, whether tourist or locals, will later travel throughout the world. Which would be the city most efficient as source for these travels? Understating as "efficient" to be able to spread further or more extensively the message by personal user movements. We consider the displacements of users visiting each city. The urban areas are ranked according to the area covered and the radius traveled by these users. Rome, Paris and Lisbon appear consistently as the cities attracting most diverse visitors. If only urban residents are taken into account, New York and London are recovered as the most central cities.
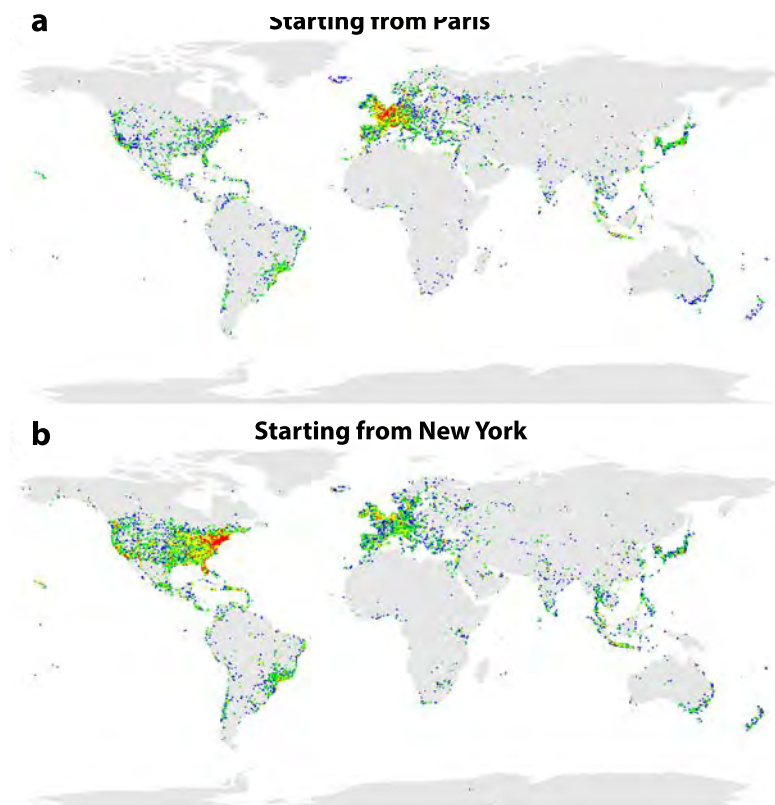
Figure. Spread of visitors after visiting Paris or New York. The colors are: red, 1 day after visiting the city; in yellow, between 1 and 10 days; in green, between 10 and 100 days; and in blue, more than 100 days.

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
DAVID SÁNCHEZ	University Professor UIB, Academic Secretary
LLORENÇ SERRA	University 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 2015.

	Pere Colet	Damià Gomila	Ingo Fischer	Emilio Hernández-García	Cristóbal López	Rosa López	Víctor M. Eguíluz	Manuel Matías	Claudio Mirasso	David Sánchez	Maxi San Miguel	Llorenç Serra	Tomàs Sintes	Raúl Toral	Roberta Zambrini
Complex Systems. Nonlinear and Statistical Physics	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Transport and Information in Quantum Systems		X				X				X		X			X
Non-Linear Photonics	X	X	X						X						X
Nonlinear Dynamics in Fluids				X	X								X		
Biolcomplexity			X	X	X		X	X	X				X	X	
Dynamics and Collective Phenomena of Social Systems	X			X			X				X			X	

2.2. ASSOCIATED STAFF

DANIEL WALGRAEF   FNRS, Belgium

2.3 POSTDOCTORAL RESEARCH ASSOCIATES

DANIEL BRUNNER	PIE CSIC Postdoctoral Contract
DOMENICO BULLARA	Postdoctoral Contract Project INTENSE@COSYP
MIGUEL C. SORIANO	Postdoctoral Contract Balear Government
JUAN JOSÉ CERDÀ	Postdoctoral Contract Balear Government
AGNIESZKA CZAPLICKA	Postdoctoral Contract Project INTENSE@COSYP
JEAN-BAPTISTE A. DELFAU	Postdoctoral Contract Project INTENSE@COSYP
MARINA DIAKONOVA	Postdoctoral Contract Project INTENSE@COSYP
FERNANDO GALVE CONDE	JAE-CSIC Postdoctoral Contract
GIANLUCA GIORGI	Postdoctoral Contract Project QuProCS
SUN-YONG HWANG	Postdoctoral Contract Project TIQS and Korean NRF
THOMAS JÜNGLING	Postdoctoral Contract Project GABA
NAGI KHALIL	UIB Lecturer
FABIO LAMANNA	Postdoctoral Contract Project EUNOIA
MAXIME LENORMAND	Postdoctoral Contract Balear Government
THOMAS LOUAIL	Postdoctoral Contract Project EUNOIA
SILVIA ORTIN	Postdoctoral Contract Project INTENSE@COSYP
ANTONIO PÉREZ LÓPEZ	Juan de la Cierva Contract UIB
JOSÉ JAVIER RAMASCO	Ramon y Cajal Fellow Tenure Track Contract
VINCENT ROSSI	Postdoctoral Contract Project ESCOLA
AMIR HOSSEIN SHIRAZI	Postdoctoral Contract Project INTENSE@COSYP

2.4 PHD STUDENTS

MARIA ISABEL ALOMAR	UIB lecturer
ORIOL ARTIME	Contract Project INTENSE@COSYP
MOHAMED EL ARBI BASSALAH	ERASMUS Fellowship
ALEIX BASSOLAS	Contract Project INTENSE@COSYP
JULIAN BUENO MORAGUES	FPI Fellowship Project TRIPHOP
BRUNO CAMPANELLI	Contract Project TREE
ADRIÁN CARRO PATIÑO	FPU Fellowship
MIGUEL A. ESCALONA-MORÁN	Contract Project PHOCUS
JUAN FERNÁNDEZ GRACIA	Contract Project INTENSE@COSYP
ANTONIO FERNÁNDEZ PERALTA	FPU Fellowship
PABLO FLEURQUIN	European Project COMPLEXWORLD
GERARDO GÓMEZ	FPI Fellowship, EVOCOG group
GONZALO MANZANO	FPI Fellowship - MINECO
JADE MARTÍNEZ	Balear Government Fellowship
PEDRO MONROY	FPI Fellowship Project ESCOLA
NEUS OLIVER	JAE-CSIC Fellowship
JAVIER OSCA COTARELO	UIB Predoctoral Fellowship
PEDRO J. PARRA RIVAS	FWO Fellowship Brussels
MARIE R. POPIEL	Fellowship La Caixa
XAVIER PORTE PARERA	FPI Fellowship Project DECODICA
VÍCTOR M. RODRÍGUEZ	Contract LINC Project
JORGE P. RODRIGUEZ	FPU Fellowship
DANIEL RUIZ REYNÉS	Contract Project INTENSE@COSYP
ENRICO SER-GIACOMI	Contract LINC Project
MIGUEL A. SIERRA	Govern Balear Fellowship
EDER B. TCHAWOU TCHUISSEU	FPI Fellowship Project INTENSE@COSYP

2.5 TECHNICAL AND ADMINISTRATIVE SUPPORT

INMA CARBONELL	Administration Unit Head
DANIEL PALOU VAN ENGELEN	Lab Technician
MARTA OZONAS	Secretary
ROSA CAMPOMAR	Outreach until July
GEMMA CASABÓ	Outreach since September
RUBÉN TOLOSA	Computing Lab Technician
JOSEP C. PORQUER	Computing Lab Technician until March
EDUARD SOLIVELLAS	Computing Lab Technician since April
MARIA ANTÒNIA TUGORES PONS	Data Mining Engineer

IFISC people - Winter Solstice 2015

2.6 VISITORS

LONG-TERM VISITORS
(more than one month)

VERONICA MARTIN	Univ. de la Republica, Uruguay. Jan - March
FRANCESCO D´OVIDIO	LOCEAN-IPSL, Paris, France. October
JUAN FERNÁNDEZ GRACIA	Harvard University, MA, USA. Nov. – Dec.
SOFIA KANTOROVICH	University of Vienna..Sept – Oct.
KONSTANTIN KLEMM	Nazarbayev Univ., Kazakhstan. May - June
JONG SOO LIM	School of Physics, Korea.Oct. – Nov.
RICARDO MARTINEZ GARCIA	Princeton University, USA. July
NAOKI MASUDA	University of Bristol, UK. May – June
PEDRO A. SANCHEZ ROMERO	Univ. of Vienna, Austria. Sept. – Oct.
FLORA SOUZA BACELAR	Federal University of Bahia, Brazil . May - Dec

SHORT-TERM VISITORS
(Less than one month)

RUGGERO VASILE	Ambrosys GmbH, Postdam, Germany. Jan
BERTA VERD	Centre Regulació Genòmica, BCN, Spain. Jan.
ERNESTO PEREDA	Universidad de La Laguna, Tenerife. Jan
JUAN C. GONZÁLEZ AVELLA	Univ. Federal do Rio Grande, Brazil. Jan
RUBEN MORENO BOTE	Foundation Sant Joan de Déu, BCN. Spain. Feb
ADRIAN JACOBO	Rockefeller University, New York, USA. Feb
HAIBO QIU	Xi'an University, China. March
CHRIS VAN DEN BROECK	Universiteit Hasselt, Diepenbeek, Belgium. March
CORNELIA DENZ	Univ. Münster, Germany. April
CHRISTIAN DIETRICH	Univ. Münster, Germany. April
JAN DANCKAERT	Vrije University, Brussels. April
WOLFGANG ELSÄSSER	Technische Universität Darmstadt, Germany. April
ULRICH KRAUSE	Universität Bremen, Germany. April
MASSIMO LAMANNA	CERN, Geneva, Switzerland. April
THOMAS ERNEUX	Univ. Libre De Bruxelles, Belgium. April
ANTONIO MANDARINO	Univ. de la Callabria, Cosenza, Italy. April
SANTIAGO CANALS	Instituto Neurociencias, Alicante, Spain. April
SIMONE LORETI	Univ. of Surrey, UK. May
ATTILA SZILVA	Uppsala University, Sweden. May
PEDRO SERENA	Instituto Ciencia Materiales Madrid (CSIC). May
RAUL VICENTE	University of Tartu (Estonia). May
ANA SIQUEIRA	Univ. Western, Australia. June
GORKA MUÑOZ GIL	Univ Autónoma de Barcelona, Spain. July
ANTONIO PEREZ SERRANO	Universidad Politécnica de Madrid. Spain. July
VITALIE EREMEEY	Universidad Diego Portales, Santiago, Chile. July
IGNACIO DEZA	Univ. Politécnica de Cataluña, Spain. July
ALIREZA VALIZADEH	IASBS, Zanjan, Iran. Sept.
JAVIER ARGÜELLO	Univ. Complutense Madrid, Spain. Nov
RICARDO CHACON	Universidad de Extremadura, Badajoz, Spain. Nov.
THIJS BECKER	University Hasselst, Belgium. Dec
JAN YPERMAN	University Hasselst, Belgium. Dec

2.7 MASTER AND COLLABORATION STUDENTS

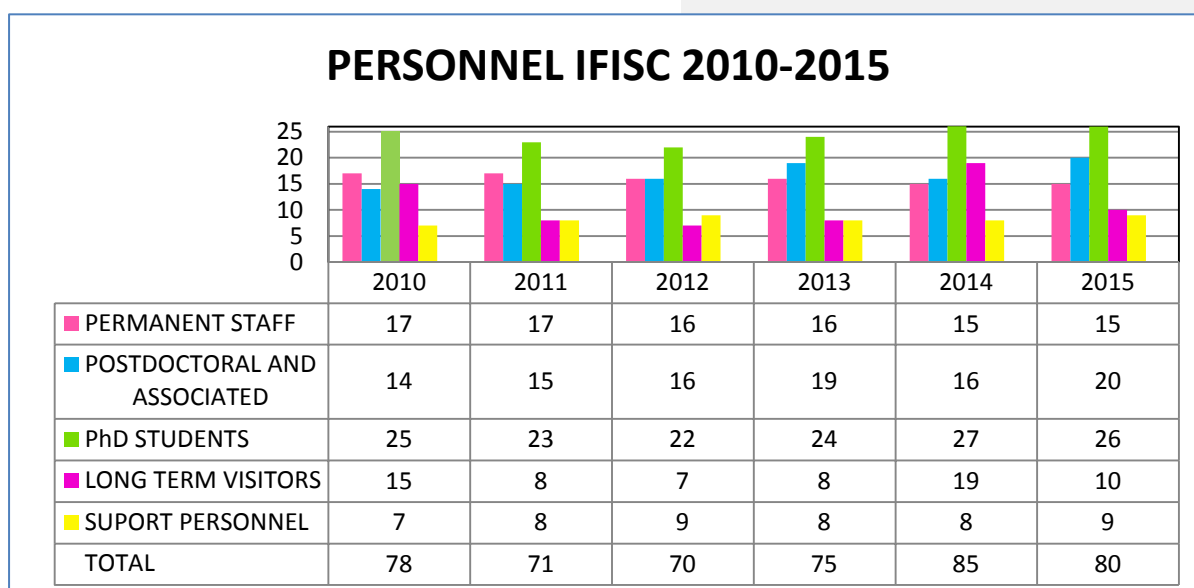In addition to the IFISC personnel, Master and Collaboration students have been also involved in IFISC research:

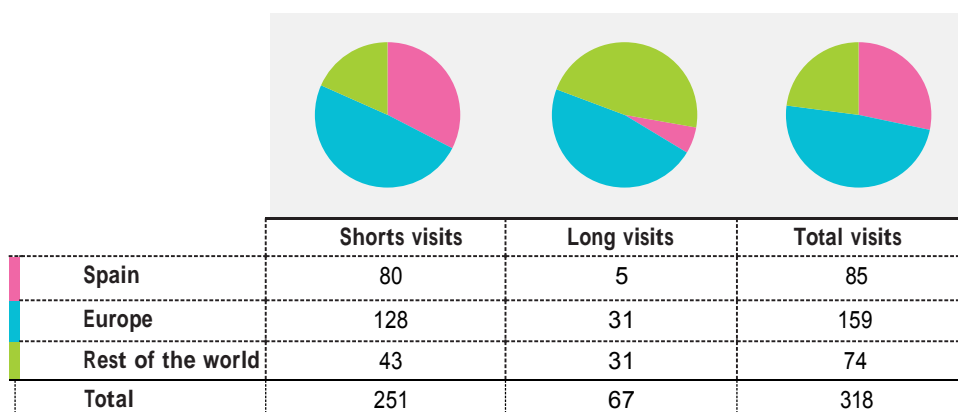|	
KEVIN BERLEMONT	Ecole Normale Supérieure de Cachan, Fance
HELENE OLIVIER	Ecole Normale Supérieure de Cachan, France.
NURIA ARGUIMBAU	IFISC Master
ENTELA BUZI	IFISC Master
DANIEL CZEGEL	IFISC Master
REBECA DE LA FUENTE	IFISC Master
CRISTIAN ESTARELLAS	IFISC Master
ADRIAN GARCÍA	IFISC Master
YASMINA MARÍN	IFISC Master
PEDRO PARRADO	IFISC Master
FRANCESCA SCHÖNSBERG	IFISC Master
CARMEN CABRERA	SURF@IFISC Fellowship
ALEJANDRO HERMOSO	SURF@IFISC Fellowship
ANTONIO RAMOS	SURF@IFISC Fellowship
ALBERT CABOT	SURF@IFISC Fellowship and IFISC Master
XAVIER HOFFMANN	SURF@IFISC Fellowship and IFISC Master
CLAUDIA PAYRATÓ	SURF@IFISC Fellowship and IFISC Master

2.8 SUMMARY OF IFISC HUMAN RESOURCES

HUMAN RESOURCES IFISC 2015

	Total	Male	Female
Permanent staff	15	13	2
Associated staff	1	1	0
Postdoctoral fellows	20	17	3
PhD students	26	22	4
Long-term visitors	10	7	3
Support personnel	9	4	5
Total	81	64	17

PERSONNEL IFISC 2010-2015

	2010	2011	2012	2013	2014	2015
PERMANENT STAFF	17	17	16	16	15	15
POSTDOCTORAL AND ASSOCIATED	14	15	16	19	16	20
PhD STUDENTS	25	23	22	24	27	26
LONG TERM VISITORS	15	8	7	8	19	10
SUPORT PERSONNEL	7	8	9	8	8	9
TOTAL	78	71	70	75	85	80

VISITING SCIENTISTS AT IFISC 2010-2015

	Shorts visits	Long visits	Total visits
Spain	80	5	85
Europe	128	31	159
Rest of the world	43	31	74
Total	251	67	318

3

RESEARCH PROJECTS AND FUNDING

**DURING 2015 IFISC HAS RECEIVED FUNDING VIA THE ACTIVE
RESEARCH PROJECTS LISTED BELOW. IN BRIEF:**

• European Commission Framework Program projects: **6**
• Spanish National Plan: **6**
• Collaboration Networks: **5**
• Research Contracts: **4**

• Grand total budget of active projects in 2015: **2.717.608 €**
• Grand total budget of European Commission active projects in 2015: **1.297.479** €
• Budget of EC-funded active projects in 2015: **47,7 %** of total

**BUDGET FIGURES FOR THE PERIOD 2010-2015 ARE SUMMARIZED
IN THE FOLLOWING TABLE**
**(With budget of a project assigned to the year it is granted. The Annualized total for three-
year projects in one year is one third of the budged granted in that year and in the two
previous years):**

BUDGET IFISC'S RESEARCH PROJECTS 2010-2015 (IN €)
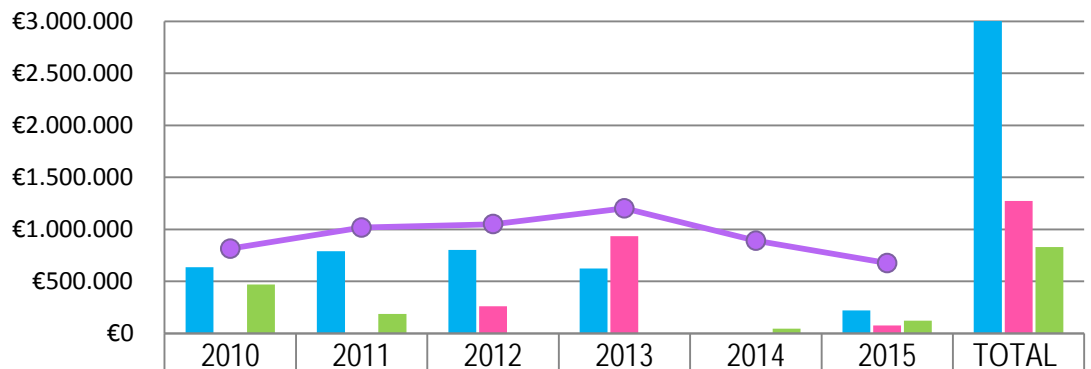
	2010	2011	2012	2013	2014	2015	TOTAL
European Commission	€635.489	€789.228	€803.952	€625.349	€0	€219.875	€3.073.893
Spanish National Plan for Science	€0	€0	€261.360	€934.830	€0	€77.000	€1.273.190
Other Funding	€470.279	€188.700	€0	€0	€47.250	€123.813	€830.042
Annualized total	€814.172	€1.017.758	€1.049.669	€1.201.140	€890.914	€676.039	

3

RESEARCH PROJECTS AND FUNDING

3.1 RESEARCH PROJECTS FUNDED BY THE EUROPEAN COMISSION

TREE

Data-driven modelling of network-wide extension of the Tree of Reactionary delays in ECAC area. European Comission and Eurocontrol. RTD Project. IFISC Principal Investigator: José J. Ramasco. (2013-2016). Budget: 270.000

INSIGHT

Innovative policy modelling and governance tools for sustainable post-crisis urban development. FP7-ICT-2013-10 proposal 611307. European Union STREP Project. IFISC Principal Investigator: José J. Ramasco. (2013-2016). UIB Budget: 274.820 € and CSIC Budget: 80.530 €

LINC

Learning about interacting networks in climate. [FP7-PEOPLE-2011-Marie Curie Initial training Network (ITN), PITN- GA-2011-289447] European Commission. IFISC Principal Investigator: Emilio Hernández-García (2011-2015) Budget: 502.162 €.

PhD ComplexWorld

Analysis of air transportation using complex networks. Subproject of SESAR. European Commission-SESAR Joint Undertaking-Eurocontrol. Contract 10-220210-C4. Principal Investigator: Maxi San Miguel. (2011-2015) Budget: 120.000 €.

LASAGNE

Multi-layer spatiotemporal generalized networks. [FP7-ICT-2011-8. Proposal 318132]. IFISC Principal investigator: Maxi San Miguel. (2012-2015). UIB Budget: 205.282 €. CSIC Budget: 104.912 €.

QuProCS

Quantum Probes for Complex Systems. H2020; H2020-FETPROACT-2014 Proposal: 641277. STREP Project. PrIncipal Investigator: Roberta Zambrini. 2015-2016. Budget: 219.875 €

3.2 RESEARCH PROJECTS OF THE SPANISH NATIONAL PLAN FOR SCIENCE

MODASS

Modeling and analysis of social systems. [FIS2011-24785].
Principal investigator: Víctor M. Eguíluz. (2012-2015) Budget: 77.440 €

INTENSE@COSYP

Complex systems physics: Information, technology, society and ecology. [FIS2012-30634].
Principal investigator: Maxi San Miguel. (2013-2015) Budget: 498.420 €.

ESCOLA

Lagrangian coherent structures in the ocean dynamics. [CTM2012-39025-C02-01].
Principal investigator: Cristóbal López. (2013- 2015) Budget: 157.950 €.

TRIPHOP

Towards brain-inspired efficient photonic information processing.
[TEC2012-36335]. Principal investigator: Ingo Fischer. (2013-2015) Budget: 278.460 €.

NOMAQ

Non-Markovian quantum evolutions in structured enviroments.
[FIS2014-60343-P]. Principal Investigator: Roberta Zambrini. 2015-2016. Budget: 27.000 €

SET@QT

Espintrónica, Energía y Topología en el Transporte Cuántico.
[FIS2014-52564]. Project of MICINN. Principal Investigator: Rosa López. 2015-2017. Budget: 50.000€

3.3 OTHER IFISC RESEARCH PROJECTS

CONSISTENCY

Consistency in Semiconductor Lasers and its Applications. Proyecto Intramural Especial. CSIC. 201450E061. Ingo Fischer. (2014-2015). Budget: 99.000 €

Eighties

Experimental information for the Geographical and Historical study of urban Territories with Complexity Science. French National Research Network on Complex Systems. Principal Investigator: Thomas Louail. 2015-2016. Budget: 2.500 €

HYDROGENCONNECT

Hydrodynamic networks, population Genetics and oceanic connectivity for the design of Marine Protected Areas in the Mediterranean Sea. ENVIMED Project (France). Principal Investigator: Vincent Rossi. 2015-2016. Budget: 17.700 €

3
RESEARCH PROJECTS AND FUNDING

3.4 RESEARCH PROJECTS WITH PARTICIPATION OF IFISC MEMBERS

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)

FIS2014-REDT — **Red de Física Estadística de no Equilibrio y sus Aplicaciones Multidisciplinares**. MINECO. [FIS2014-57117-REDT]. Network of Excellence. IFISC Principal Investigator: David Sánchez. (2014-2016)

QTD — **Thermodynamics in the Quantum Regime**. COST 1209 Project. IFISC Principal Invesigator: Roberta Zambrini. 2013-2017

COMSOTEC — **Sistemas Complejos Socio-tecnológicos**. FIS2015-71795-REDT. Red de Excelencia. MINECO. 2015-2017. IFISC Principal Investigator: Maxi San Miguel. Budget: 30.000 €.

RICE — **Quantum Information Network in Spain**. FIS2014-53592-REDT. IFISC Principal Investigator: Roberta Zambrini. 2015-2016.

3.5 OTHER PUBLIC FUNDING

Govern Balear Institutos — **Agreement between Balear Government and UIB** for the Universitary Institute´s management of the 2014-2015 academic period. IFISC Principal Investigator: IFISC Director. (2014-2015) UIB Budget: 16.000 €

3.6 RESEARCH CONTRACTS

Xarion Collaboration

XARION Laser Acoustics GmbH (Vienna). Research Cooperation Agreement. IFISC Principal Investigators: Ingo Fischer and Claudio Mirasso. (2014-2015) Budget: 31.250 €

Logitravel

Logitravel Contract. Principal Investigator: Maxi San Miguel. 2015. Budget: 12.813 €.

Red Eléctrica

Il·lumina´t: Exhibition on the International year of light and light-based technologies. Agreement with Red Electrica Española. FUEIB. Principal Investigator: Claudio Mirasso. 2015-2016. Budget: 20.000 €

NUUBO

ECG classification using reservoir computing. Research Cooperation Agreement. Principal Investigator: Miguel C. Soriano. 2015-2016. Total Budget: 75.000 €

3

RESEARCH PROJECTS AND FUNDING

4

IFISC
SEMINARS

Coordinators:

Rosa López, Ingo Fischer (from March) and Manuel Matías (until March)

DURING 2015 A TOTAL OF **57** SEMINARS HAVE BEEN GIVEN
AT IFISC

This amounts to more than one seminar per week on average. The full listing can be found in **http://ifisc.uib-csic.es/seminars/** and in the Appendix of this Report.

Seminars are broadcasted live and recorded. You can watch and retrieve them at **http://ifisc.uib-csic.es/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 2015 and for the previous years:

PROCEDENCE OF SPEAKERS AT IFISC SEMINARS 2015
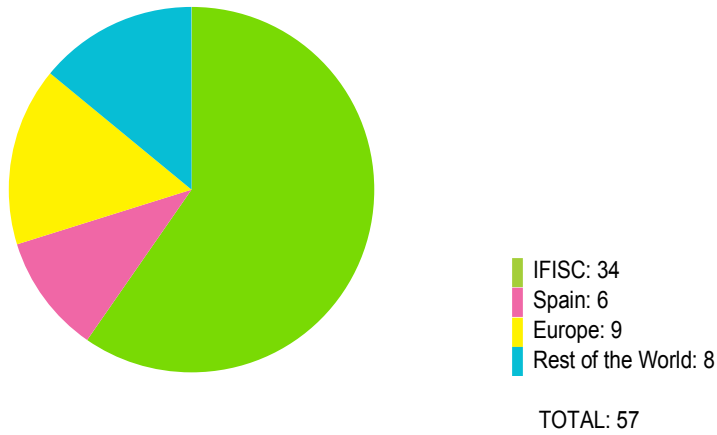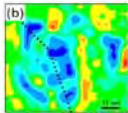
IFISC: 34
Spain: 6
Europe: 9
Rest of the World: 8
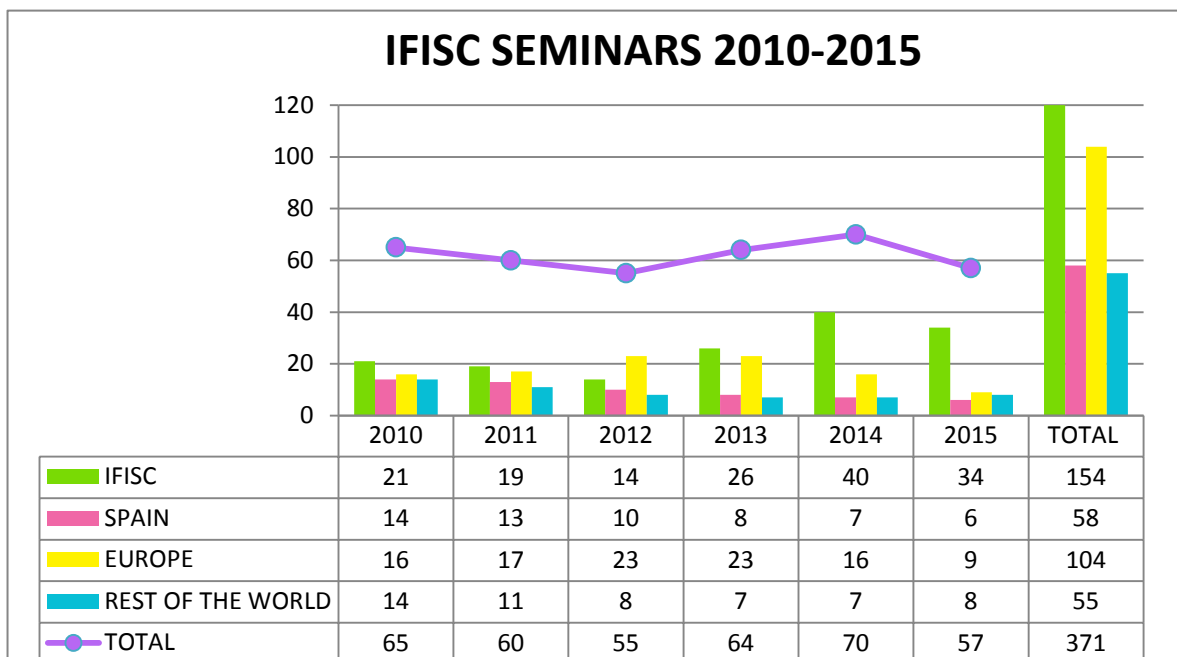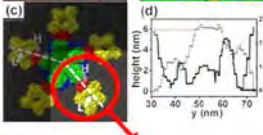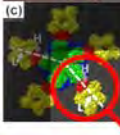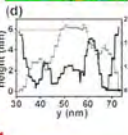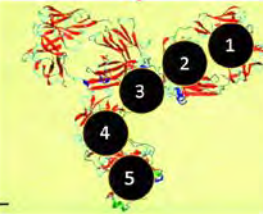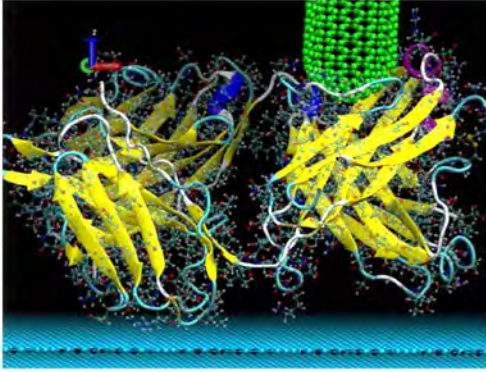
TOTAL: 57

IFISC SEMINARS 2010-2015

IFISC SEMINARS 2010-2015

	2010	2011	2012	2013	2014	2015	TOTAL
IFISC	21	19	14	26	40	34	154
SPAIN	14	13	10	8	7	6	58
EUROPE	16	17	23	23	16	9	104
REST OF THE WORLD	14	11	8	7	7	8	55
TOTAL	65	60	55	64	70	57	371
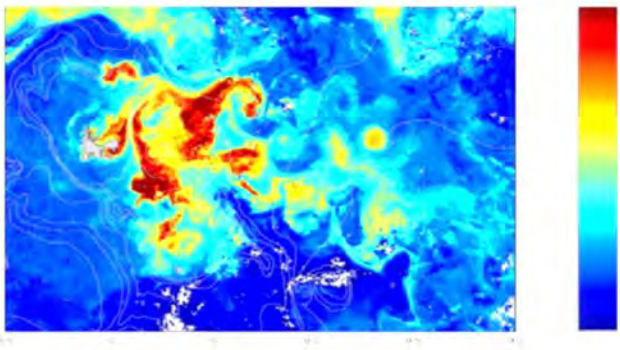
5
PUBLICATIONS

IFISC RESEARCH RESULTS HAVE ORIGINATED THE FOLLOWING PUBLICATIONS DURING 2015:

- Papers in journals indexed in the Journal Citation Reports: **66**
- Other publications: **6**

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 2010-2015 IFISC has published 1 paper in Reviews of Modern Physi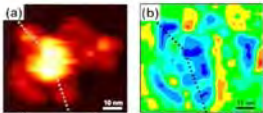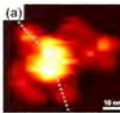cs, 1 paper in Science, 2 papers in PNAS, 5 papers in Nature Communications, 1 paper in Nature Geophysics, and 29 papers in Physical Review Letters.

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

IFISC PUBLICATIONS 2010-2015
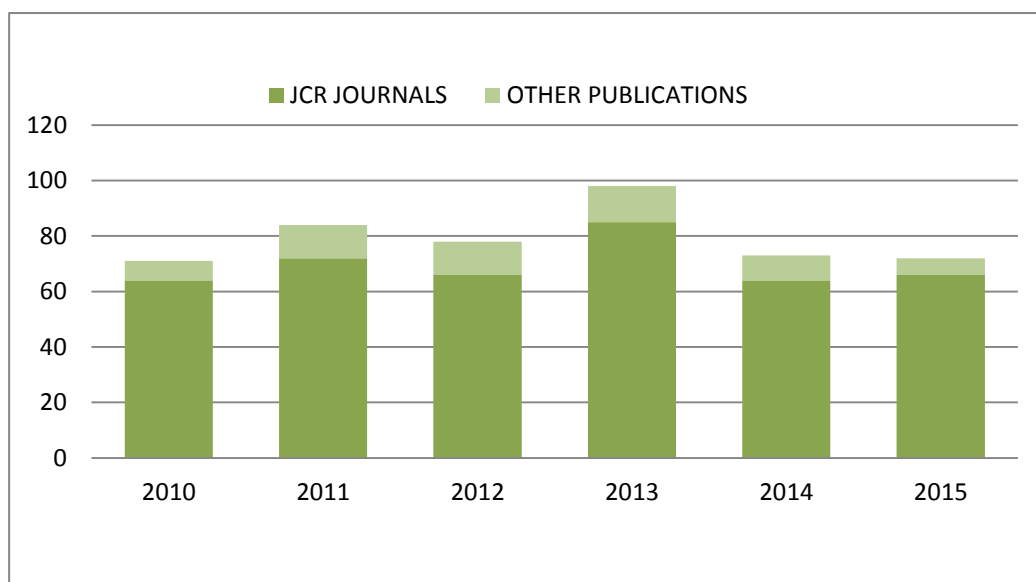
		2010	2011	2012	2013	2014	2015	TOTAL
	JCR Journals	64	72	66	85	64	66	417
	Other Publications	7	12	12	13	7	6	59
	TOTAL	71	84	78	98	71	72	476

JOURNALS WITH THE LARGEST NUMBER OF PUBLICATIONS

IFISC PUBLICATIONS	2010	2011	2012	2013	2014	2015	TOTAL
Physics journals							
Physical Review E	5	11	11	9	14	12	62
Physical Review B	5	5	2	8	7	7	34
Physical Review Letters	4	6	4	8	3	4	29
Physical Review A	4	4	3	5	5	2	23
Physica A	3	2	3	2	2	0	12
New Journal of Physics	2	0	3	2	3	1	11
Multidisciplinary journals							
Plos One	1	7	4	0	5	6	23
Scientific Reports	0	0	3	4	2	3	12
Nature Communications	0	1	0	1	0	3	5
IEEE journals	4	4	1	4	0	3	16
Other non-physics journals	10	8	10	13	13	8	62

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

Biosciences:

Journal of Theoretical Biology, Journal of the Royal Society Interface, Neuroimage, Interface Focus, PLoS Computational Biology, Ecological Complexity, BMC Systems Biology, BMC evolutionary Biology, BMC Medicine, Biophysical Journal, Macromolecular Theory and Simulations, Macromolecules, Theoretical Ecology, The American Naturalist, Ecography, Frontiers in Computational Neuroscience, Frontiers in Human Neuroscience, Journal of Heredity, Physiological Reports, Journal of Applied Ecology, Journal of Physiology Paris, Theoretical Biology and Medical Modelling.

Geosciences:

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

Social and sociotechnical systems:

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

Data science:

Computing and Informatics, EPJ Data Science, Journal of Machine Learning Research.

5 PUBLICATIONS

6

CONFERENCES AND WORKSHOPS

6
CONFERENCES AND WORKSHOPS

2ⁿᵈ Quantum Thermodynamics Conference

APRIL 19 - 24
IN UIB CAMPUS, PALMA DE MALLORCA, SPAIN.
SCIENTIFIC ORGANIZERS: Eric Lutz (University of Erlangen-Nürnberg), Nicolas Brunner (Institute for Theoretical Physics University of Geneva), Jochen Gemmer (University of Osnabrück, Germany), Juan M.A. Parrondo (University Complutense of Madrid), Killian Singer (University of Mainz, Germany), Roberta Zambrini (IFISC, Spain), Rosa López (IFISC, Spain), David Sánchez (IFISC, Spain), Llorenç Serra (IFISC, Spain) and Fernando Galve (IFISC, Spain).

This conference followed the **First Quantum Thermodynamics Conference** in Potsdam/Berlin in January 2014 and is funded by COST action 1209 **Quantum Thermodynamics**. This 2nd edition was hosted by **IFISC**,

The 2nd Quantum Thermodynamics Conference is meant to be a reference for researchers working in thermodynamics in the quantum regime, in connection with quantum information theory and statistical physics. Two keynote, several invited and contributed talks as well as a poster session were scheduled, promoting young scientists. Time for discussions and workgroup meetings were allocated during the week.

Web site: **http://ifisc.uib-csic.es/qtd2/**

6.2 COMMUNICATIONS TO SCIENTIFIC CONFERENCES 2015

• Invited talks: **34**
• Oral Communications: **50**
• Posters: **54**
• Total: **138**

Full listing in the Appendix of this Report.

PRESENTATIONS AT CONFERENCES AND WORKSHOPS 2010-2015

CONFERENCES AND WORKSHOPS 2010-2015

	2010	2011	2012	2013	2014	2015	TOTAL
INVITED TALKS	22	25	31	24	33	34	169
ORAL TALKS	28	32	53	41	29	50	233
POSTERS	32	31	48	35	33	54	233
TOTAL	82	88	132	100	95	138	635
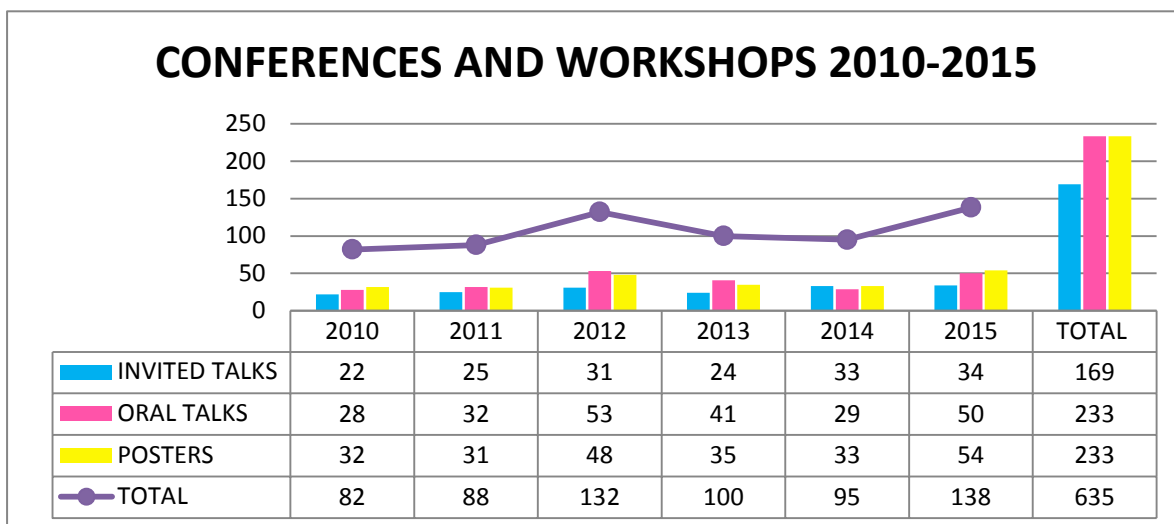
6.3 SCIENTIFIC COMMITTEES AND ORGANIZATION OF CONFERENCES AND WORKSHOPS

San Miguel, Maxi
Member of C3 Commission of Statistical Physics of IUPAP.
2011-2016

San Miguel, Maxi
Member of Steering Committee of the Conference on Complex Systems (CCS).
2012-2015

Hernández-García, Emilio
Scientific and organizing committee of the Conference on Complex Networks and Climate Variability, Vienna.
2015

Zambrini, Roberta; López, Rosa; Sánchez, David; Serra, Llorenç
Organization of the Second Quantum Thermodynamics Conference, Mallorca.
April 19-14

Ramasco, JJ; Lenormand, M.
Organizers of Urbannet 2015. NetSci 2015 satellite on mobility and urban systems, Zaragoza, Spain.
June 2

Fischer, Ingo
Scientific Committee member for 12th IFAC Workshop on Time Delay Systems June 28-30, 2015, University of Michigan, Ann Arbor, MI, USA.
June 28-30

Rossi, Vincent
Organization of the international HYDROGENCONNECT Workshop 2015, Mallorca.
June 29-30

Colet, Pere
Member of the Scientific Committee of the V Gefenol Summer School on Statistical Physics of Complex and Small Systems, Barcelona, Spain.
July 6-17

Hernandez-Garcia, E.; Ser-Giacomi, E.
Members of the Scientific Committee of CONFLOW 2015: Complex network perspectives on flow systems, Potsdam, Germany.
September 21-22

Fischer, Ingo
Scientific Committee member for European Semiconductor Laser Workshop 2015, Madrid.
September 24-25

Claudio Mirasso
School on Fundamentals of Complex Networks and Applications to Neuroscience, Sao Paulo, Brazil.
Sept 28 to October 16

Ramasco, José J.
Symposium in urban systems. Satellite of the conference CCS 2015 hold in Tempe, Arizona, US.
October 1

Toral, Raul
Member of the scientific committee of the FISES 2015, Badajoz.
October 5-7

San Miguel, Maxi
Member of Program Committee of de IEEE-Complex Networks 2015, Bangkok.
November 23-2

Ramasco, José J.
Member of Program Committee of Net-works (2013-2015), NetSci2015, Complenet2015, PAAMS 2015, Sesar Innovation Days 2015 and SocInfo2015.

6 CONFERENCES AND WORKSHOPS

7

OTHER ACTIVITIES

7 OTHER ACTIVITIES

7.1 MASTER THESIS

Arjona, Vicente
Current and heat fluctuations in mesoscopic systems
Supervisor: Sánchez, David
March 19

Georgopoulou, Dimitra
Multi-Strain Competition in Finite Size Communities
Supervisor: Ramasco, Jose J.
March 26

Majoral, Daniel
Time learning in one cerebellar Purkinje cell
Supervisor: Mirasso, Claudio
July 3

Fernández Peralta, Antonio
Statistical mechanics of multilayer networks
Supervisor: Toral, Raúl
September 8

Sitges Riera, Juan
Rheological properties of a single magnetic filament. A Langevin dynamics study.
Supervisors: Sintes, T.; Cerdà, J. J.
September 22

Cestnik, Rok
Models of mobility.
Supervisor: Eguíluz, V.M.
September 29

Alfaras Espinàs, Miquel
Photonic Reservoir Computing: The role of the Mach-Zehnder modulator
Supervisors: Fischer, Ingo; Soriano, Miguel C.
October 19

Rosselló, Guillem
Inelastic effects on thermoelectric transport through Coulomb systems
Supervisor: López, Rosa
November 11

7.2 PHD THESIS

Escalona Moran, Miguel Angel
Computational Properties of delay-coupled systems
Supervisor: Mirasso, Claudio
September 18

Porte, Xavier
Complex dynamics of delay-coupled lasers: fundamentals and applications
Supervisors: Ingo Fischer, Miguel C. Soriano
November 30

Oliver, Neus
Complex dynamics of photonic delay systems: a story of consistency and unpredictability
Supervisor: Fischer, Ingo
December 16

Ser Giacomi, Enrico
A complex network theory approach to oceanic and atmospheric transport phenomena
Supervisors: Hernandez-García, Emilio; López, Cristóbal
December 21

7.3 AWARDS

Maxi San Miguel, IFISC´s Director, received the Senior Scientist Award of the Complex Systems Society during the Conference on Complex Systems 2015 in Tempe (Arizona, USA), Septemeber 2015. The award recognizes outstanding contributions relevant to the progress of complexity science. The award statement indicates that "Maxi San Miguel has been a key player in the interdisciplinary research of complex systems and a source of inspiration in the transfer of knowledge by defining new lines of research beyond the pre-set fields".

7
OTHER ACTIVITIES

Javier Argüello received the 24th Arquímedes Award of the Education, Culture and Sports Ministery, in the area of Experimental, Exact and Enviromental Sciences. His work *"Asymmetries of heat in nanoconductors: the role of incoherence and inelasticity"* was done at IFISC, funded by one of the IFISC Summer Undergraduate Research Fellowships (SURF). SURF Fellowships give every year the opportunity to 6 young students to get into the scientific research world with the best academic results.

7.4 MEMBERS OF EDITORIAL BOARD OF SCIENTIFIC JOURNALS

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

Member of the the Editorial Board of EPJ Data Science.
San Miguel, Maxi

Editor of Frontiers in Physics.
Ramasco, JJ

Member of the editorial board of PLoS ONE.
Ramasco, JJ

Member of the editorial board of Scientific Reports.
Ramasco, JJ

7.5 OTHER COMMITTEESS

Ramasco, José J.
Elected member of the council of the Complex Systems Society.
2013-2016

Colet, Pere
Member of the Comite Asesor en Física y Matemáticas de la Comisión Nacional Evaluadora de la Actividad Investigadora.
2014-2015

Fischer, Ingo
International Collaborator of the Graduate Training in Wireless Intelligent Sensor Networks (WISeNet), Duke University, U.S.
2015

7

OTHER ACTIVITIES

7.6 RESEARCH STAYS IN OTHER CENTERS

Instituto de Neurociencias de Alicante, Spain.
Marie Popiel
April 30 to January 19

Femto-st Institute, Besançon, France.
Research stay with Prof. Laurent Larger.
Oliver, Neus
May 1-30

Centre de Physique Théorique, Universite de Aix-Marseille-Toulon. Marseille, France.
Ramasco, JJ
July 1-30

Standford University
Research stay at the Geballe Laboratory for Advanced Materials
Rosa Lopez and David Sanchez
July 1 to September 30

Chemistry Department UCSD, San Diego, USA.
Collaboration with Prof. K. Lindenberg.
Toral, Raul
July 27 to August 15

Universidad Complutense de Madrid.
Sierra, Miguel A
September 9-29

Departamento de Física, Universidad Federal de Pernambuco, Brasil.
Stay within the Program Investigadores Visitantes Extranjeros, Brasil.
Claudio Mirasso
September 28 to October 27

IFCA (Instituto de Física de Cantabria), Spain.
Ortin, Silvia
October 19

SYSCO2 team at LEGOS laboratory, Toulouse, France.
Rossi, Vincent
November/11 to November/29

Mainz University, Germany.
Stay at the University of Mainz funded by Obra Social La Caixa.
Alomar, M. I.
November 15 to December 18

Robert Koch-Institute. Berlin, Germany.
Rodríguez, Jorge P.
November 25-27

Humboldt-Universität zu Berlin, Germany.
Colet, Pere
December 15-18

7. 7 IFISC MASTER

IFISC Master in *Physics of Complex Systems*

In October 2012 IFISC started a new 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 2015-2016 Master syllabus:
Structural module courses (39 credits):

Complex networks (3 credits)	V. M. Eguíluz
Cooperative and critical phenomena (6 credits)	M. San Miguel, T. Sintes E. Hernández García
Dynamical systems and chaos (6 credits)	M. Matías, D. Gomila
Introduction to complex systems (3 credits)	M. San Miguel, E. Hernández-García, R. Zambrini
Pattern formation (3 credits)	E. Hernández-García
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)   P. Colet

Other Postgraduate Courses tought in 2015

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

- **Cooperative and critical phenomena**
  Maxi San Miguel, Tomàs Sintes

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

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

7.8 OTHER

IFISC provided practical training to a computer technician student from the center IES Emilio Darder (FP intermediate level).
From March to April.

8

OUTREACH ACTIVITIES

8

OUTREACH ACTIVITIES

Conference Series
"Exploring Boundaries Between Disciplines VIII"

In 2015 the subject of the Conference Series was "¿Está el científico? Que se ponga. Afrontando los retos de una sociadad compleja".

PROGRAMME

MAY 14
La Nanotecnología: el futuro está aquí.
Nanotechnology: future is here

Rosa López (IFISC) and Pedro Serena (ICMM-CSIC)
Thi talk was about nanomaterials such as graphene and nanotubes, discovering their basic properties and the most amazing applications. It also reviewed how ideas developed by researchers come to market and hence the user. Finally, the risks and benefits of Nanotecnology and its current impact on Spain and the world were addressed.

MAY 21
Big Data: Sociedad y Movilidad Humana
Big Data: Society and Human Mobility

Maxi San Miguel (IFISC), Joan Serras (University College, London) and Ovidio Andrés (Representative Adviser of the online travel agency Logitravel)
The development of models and analysis tools allows to study the evolution of cities and to simulate the management of urban services, contributing to improve human mobility, and its influence on opinion-forming processes and cultural changes. In this talk massive data management was discussed with emphasis on the benefits this can bring to society and human mobility.

MAY 28

El Poder de la Luz: de los faros de Mallorca al cerebro fotónico.
The Power of Light: from the LightHouses of Mallorca to the photonic brain.

Ingo Fischer (IFISC) and Yanne Chembo (CNRS, Besançon),

This presentation addressed the importance of light as a tool and its relevance for future applications. As a promising example, the design of photonic computers inspired by the functioning of the human brain were discussed.

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

8 OUTREACH ACTIVITIES

IFISC organized on February 13th an Open Day, addressed mostly to undergraduate and master students. The attendees received information on the different IFISC research lines, visited the photonics and nonlinear dynamics laboratories and the computational facilities. They were also informed about the IFISC Master in Complex Systems and the opportunites to conduct a PhD degree at IFISC. The event was made to coincide with the **Carnival Poster Party**, where young IFISC researchers presented their different works by several posters in a party environment.

8.3 OTHER CONFERENCES AND EVENTS

IFISC celebrates the Year of Light with an illuminating exhibition:

IL·LUMINA´T

IFISC organized, thanks to the financial support of the "Red Eléctrica de España", the exhibition "Il·lumina't" to celebrate the year 2015 as the International Year of Light by the United Nations. The show had a lot of success, with more than 4.200 visits. In fact, its duration was extended twice because of the massive attendance (it was supposed to end by December 6th and it finally ended by January 3rd).

"Il·lumina´t" was organized in one of the most important places of the cultural environment of Palma de Mallorca, the 'Casal Solleric'. The exhibition included laser graffiti artistic projections on the front wall of the building.

A comic about the exhibition was produced and is available in catalan and Spanish at:

http://ifisc.uib-csic.es/presentations/downfile.php?fid=388

http://ifisc.uib-csic.es/presentations/downfile.php?fid=389

8.4 PRESS & MEDIA

IFISC research has received attention from newspapers and other media.

During 2015, IFISC activities produced 65 press releases and appearances in written and digital press, and 8 clips in radio and TV. See the full lists in the Appendix.

Ilumínate con la luz de la ciencia en el Casal Solleric

Ovidio Andrés (Logitravel) y Maxi San Miguel (CSIC).

Logitravel facilitará datos turísticos al CSIC para que sean investigados

Maxi San Miguel, en nombre del Consejo Superior de Investigaciones Científicas (CSIC), y Ovidio Andrés, presidente de Logitravel, firmaron ayer un convenio de colaboración que permitirá el intercambio de información y el de-

sarrollo de proyectos de investigación científica y tecnológica. Logitravel ofrecerá acceso a los datos de movilidad turística obtenidas a través de su proyecto Smyland para que puedan ser analizadas por el CSIC.

Ellas se encargan de la compra familiar

Tras analizar 40 millones de pagos hechos con tarjeta bancaria, investigadores del IFISC concluyen que las mujeres compran más artículos para el hogar y los hombres invierten en coches, bares y tecnología

8 OUTREACH ACTIVITIES

SOCIAL NETS IMPACT SUMMARY

TWITTER

Total twits 1.659

Total Followers 833 (increasing 63% followers on 2015)

66% men / 34% women interested in science, technology, politics and events

 Languages most used: Spanish and English

 74% located in Spain / 8% EUA and UK

FACEBOOK

Facebook +18% followers on 2015 (549 fans on December the 31th)

66% men / 34% women between 17 and 44 years old (77% of them)

 Languages most used: Spanish, English, Portuguese, Catalan

 Mostly Located in Spain, Mexico and Brazil

APPENDIX

APPENDIX

a.4. IFISC seminars and talks 2015

In the electronic version of this report, titles are hyperlinked to the recording of the seminar, if available

Jan 9
Sinking of inertial particles in fluid flows
Pedro Monroy, IFISC

Jan 14
Two approaches to Quantum Thermodynamics: Small Thermal Machines and Fluctuation Theorems
Gonzalo Manzano, Universidad Complutense, Madrid and IFISC

Jan 19
A damped oscillator governs posterior gap gene patterning in Drosophila melanogaster
Berta Verd, Centre de Regulació Genòmica (CRG), Barcelona, Spain

Jan 21
New tricks to an old dog: advances on the assessment of synchronization from time series in reconstructed state spaces
Ernesto Pereda, Universidad de La Laguna, Tenerife, Spain

Jan 28
Stabilization of the power grid fluctuations using smart devices
Damià Gomila, IFISC

Jan 29
Emergence and persistence of communities in coevolutionary networks
Juan Carlos González-Avella, Instituto de Física, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil

Feb 4
Individual and collective behavior of artificial swimmers: "Janus particles"
Jean-Baptiste Delfau, IFISC

Feb 11
Rethinking the logistic approach for population dynamics of mutualistic interactions
Jose J. Ramasco, IFISC

Feb 18
Information-limiting correlations
Rubén Moreno-Bote, Foundation Sant Joan de Déu, Barcelona, Spain

Feb 25
A reaction-diffusion model of hair-bundle morphogenesis
Adrian Jacobo, Rockefeller University, New York, USA

March 4
The sub-Lyapunov exponent of chaotic delay systems
Thomas Jüngling, IFISC

March 10
Measure synchronization goes quantum
Haibo Qiu, Xi'an University, China

March 12
Statistical mechanics of learning
Chris van den Broeck, Universiteit Hasselt, Diepenbeek, Belgium

March 19
Current and heat fluctuations in mesoscopic systems
Vicente Arjona, IFISC

March 25
Living on the edge, Majoranas in nanowires
Javier Osca, IFISC

March 26
Strain competition in finite size communities
Dimitra Georgopoulou, IFISC

April 1
Reservoir Computing With A Spatially Extended Network Of Semiconductor Lasers
Christian Dietrich, IFISC and Univ. Münster, Germany

April 14
New configuration of the disk servers
Rubén Tolosa, IFISC

April 15
Semiconductor superluminescent diodes: Unique first and second order coherence properties - a renascence of the Hanbury-Brown & Twiss experiment
Wolfgang Elsäßer, Institute of Applied Physics and Center of Smart Interfaces, Technische Universität Darmstadt, Germany

April 28
Swarms and Opinions by Positive Dynamical Systems
Ulrich Krause, Universität Bremen, Germany

April 29
Big-data services at CERN
Massimo Lamanna, CERN, Geneva, Switzerland

May 6
Universal distribution from magnetic nanograins to financial markets in terms of random matrix theorem
Attila Szilva, Department of Physics and Astronomy, Uppsala University, Sweden

May 14
Adsorption of biomolecules on graphene : experimentation supercomputing (roundtrip)
Pedro Serena, Instituto de Ciencia de Materiales de Madrid (CSIC), Spain

May 14
Presentation of new IFISC research projects and contracts
R. Zambrini, R. Lopez, M. C. Soriano and D. Brunner, IFISC

May 27
DeepMind or how machines learnt to play videogames
Raúl Vicente, University of Tartu, Estonia

June 3
Trees of Reactionary Delay: Addressing the Dynamical Robustness of the US Air Transportation Network
Pablo Fleurquin, IFISC

June 10
Turing patterns without diffusion: how immobile pigment cells can color the skin of zebrafish
Domenico Bullara, IFISC

June 17
Modelling Reactionary Delays in the European Airport Network
Bruno Campanelli, IFISC

June 24
Theory for the spatio-temporal dynamics of domain walls close to a nonequilibrium Ising-Bloch transition
Damià Gomila, IFISC

July 3
The role of ecology in the evolution of multicellularity
Ricardo Martínez García, Princeton University, USA

July 3
Time Learning in one cerebellar Purkinje cell
Daniel Majoral López, IFISC

July 15
A Mathematical Model for the Effect of Anti-angiogenic Therapy in the Treatment of Cancer Tumours by Chemotherapy
Flora Bacelar, Federal University of Bahia, Brazil

July 22
Longitudinal Multimode Dynamics in Monolithically Integrated Master Oscillator Power Amplifiers
Antonio Pérez-Serrano, CEMDATIC - ETSI Telecomunicación, Universidad Politécnica de Madrid, Spain

July 23
Quantum Correlations and Critical Phenomena in Cavity QED Networks
Vitalie Eremeev. Facultad de Ingeniería, Universidad Diego Portales, Santiago, Chile

Sept 8
Statistical Mechanics of Multilayer Networks
Antonio Fernández Peralta, IFISC

Sept 9
How communication delay affects the collective behavior of neural networks
Alireza Valizadeh, Institute for Advance Studies in Basic Sciences (IASBS), Zanjan, Iran

Sept 17
Complex movement patterns of southern elephant seals
Jorge P. Rodríguez, IFISC

Sept 18
Computational Properties of Delay-Coupled Systems
Miguel Ángel Escalona Morán, IFISC

Sept 22
Rheological properties of a single magnetic filament: a Langevin dynamics study
Juan Sitges Riera, IFISC

Sept 24
Complex networks of time-series: what does it reveal more than local interactions?
Amirhossein Shirazi, IFISC

Sept 29
Models of mobility
Rok Cestnik, IFISC

Sept 30
Studying connectivity and the structure of marine populations with Lagrangian Flow Networks
Vincent Rossi, IFISC

Oct 13
Pattern formation in posidonia meadows
Dani Ruiz, IFISC

Oct 14
Magnetic soft matter in analytical theory and simulation
Sofia Kantorovich, University of Vienna

Oct 19
Photonic Reservoir Computing: The role of the Mach-Zehnder modulator
Miquel Alfaras Espinàs, IFISC

Oct 21
Dynamical mean field theory and its application to a high-temperature superconductivity problem
Jong Soo Lim, School of Physics, Korea Institute for Advanced Study, Korea

Oct 27
Drifting forests and planktonic seals: disentangling end-to-end relations in the Southern Ocean
Francesco d'Odivio, LOCEAN-IPSL, Paris, France

Oct 28
Granular gases as an example of complex system
Nagi Khalil, IFISC

Oct 29
Nonlinear thermoelectric effects in quantum dots in the Kondo regime
Miguel A. Sierra, IFISC

Nov 11
Impulse-Induced Optimum Signal Amplification in Scale-Free Networks
Ricardo Chacon, Universidad de Extremadura, Badajoz, Spain

Nov 12
Dynamical response of interacting quantum capacitors in the Coulomb Blockade regime
Maria Isabel Alomar Bennassar, IFISC

Nov 18
Magnetic Filaments, an overview of current research
Joan Josep Cerdà, IFISC

Nov 24
How to quantify hierarchy?
Daniel Czegel, IFISC

Nov 30
Complex dynamics of delay-coupled semiconductor lasers: fundamentals and applications
Xavier Porte, IFISC

Dec 2
Consistency and memory properties of an all-optical reservoir computing system
Julian Bueno, IFISC

Dec 15
Optimization of Dynamic Demand Control algorithms including interactions among smart appliances
Eder Batista Tchawou, IFISC

Dec 16
Complex dynamics in photonic delay systems: a story of consistency and unpredictability
Neus Oliver, IFISC

Dec 21
A complex network theory approach to oceanic and atmospheric transport phenomena
Enrico Ser Giacomi, IFISC

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 Book

Métodos de variable compleja
Sánchez, D.
Edicions UIB

a.5.2 JCR Publications

Boundaries of the Peruvian Oxygen Minimum Zone shaped by coherent mesoscale dynamics
Bettencourt, J.H.; López, C.; Hernández-García, E.; Montes, I.; Sudre, J.; Dewitte, B; Paulmier A.; Garçon, V.
Nature Geoscience **8**, 937-940

Dynamical properties induced by state-dependent delays in photonic systems
Martínez-Llinàs, Jade; Porte, Xavier; Soriano, Miguel C.; Colet, Pere; Fischer, Ingo
Nature Communications **6**, 7425

Uncovering the spatial structure of mobility networks
Louail, T; Lenormand, Maxime; Picornell, M; García Cantú, O; Herranz, R; Fría-Martinez, E; Ramasco, Jose J; Barthelemy, M
Nature Communications **6**, 6007

Pigment cell movement is not required for generation of Turing patterns in zebrafish skin
Bullara, D; De Decker, Y.
Nature Communications **6**, 6971

Synchronization of Heterogeneous Oscillators by Noninvasive Time-Delayed Cross Coupling
Jüngling, Thomas; Fischer, Ingo; Schöll, Eckehard; Just, Wolfram
Physical Review Letters **115**, 194101 (1-5)

Experimental Phase-Space Tomography of Semiconductor Laser Dynamics
Brunner, Daniel; Soriano, Miguel C.; Porte, Xavier; Fischer, Ingo
Physical Review Letters **115**, APS, 053901

Consistency Properties of a Chaotic Semiconductor Laser Driven by Optical Feedback
Oliver, Neus; Jüngling, Thomas; Fischer, Ingo
Physical Review Letters **114**, 123902 (1-5)

Theory for the spatio-temporal dynamics of domain walls close to a nonequilibrium Ising-Bloch transition
Gomila, Damià; Colet, Pere; Walgraef, Daniel
Physical Review Letters **114**, 084101 (1-5)

Self-Organized Near-Zero-Lag Synchronization Induced by Spike-Timing Dependent Plasticity in Cortical Populations
Matias, F. S.; Carelli, P. V.; Mirasso, C. R.; Copelli, M.
PLoS ONE **10**, e0140504 (1-18)

Markets, herding and response to external information
Carro, Adrián; Toral, Raúl; San Miguel, Maxi
PLOS ONE **10**, e0133287

Pattern Formation in Populations with Density-Dependent Movement and Two Interaction Scales
Martínez-García, Ricardo; Murgui, Clara; Hernández-García, Emilio; López, Cristóbal
Plos One **10**, e0132261 (1-14)

Characterization of Monoclonal Gammopathy of Undetermined Significance by Calorimetric Analysis of Blood Serum Proteome
Barceló, Francisca; Cerdà, Joan J.; Gutiérrez, Antonio; Teresa Jimenez-Marco; M. Antonia Durán; Andrés Novo; Teresa Ros; Antonia Sampol; Portugal, José
Plos One 10, e0120316 (1-15)

Information Recovery In Behavioral Networks
Squartini, Tiziano; Ser-Giacomi, Enrico; Garlaschelli, Diego; Judge, George
Plos One **10**, e0125077 (1-11)

Bayesian decision making in human collectives with binary choices
Eguíluz, V.M. ; Masuda, N.; Fernández-Gracia, J.
Plos One **10**, e0121332

A Unified Framework for Reservoir Computing and Extreme Learning Machines based on a Single Time-delayed Neuron
Ortín, Silvia; Soriano, Miguel C.; Pesquera, Luis; Brunner, Daniel; San-Martín, Daniel; Fischer, Ingo; Mirasso, Claudio R.; Gutiérrez, José Manuel
Scientific Reports **5**, 14945

Influence of sociodemographic characteristics on human mobility
Lenormand, Maxime ; Louail, T; Cantu-Ros, O G; Picornell, M; R Herranz, R; Murillo Arias, J ; Barthelemy, M; San Miguel, Maxi; Ramasco, Jose J
Scientific Reports **5**, 10075

Learning and coordinating in a multilayer network
Lugo, Haydee; San Miguel, Maxi
Scientific Reports **5**, 7776

Human diffusion and city influence
Lenormand, M; Gonçalves, B; Tugores, A; Ramasco, J J
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Quantum Otto cycle with inner friction: finite-time and disorder effects
Alecce,Antonio;Galve,Fernando; Lo Gullo,Nicola;Dell'Anna,Luca;Plastina,Francesco;Zambrini,Roberta
New Journal of Physics **17**, 075007 (1-14)

A symbolic information approach to determine anticipated and delayed synchronization in neuronal circuit models
Montani, F.; Rosso, O.; Matias, F. S.; Bressler, S. and Mirasso, C. R.
Philosophical Transactions of the Royal Society. A **373**, 20150110

Hybrid synchronization in coupled ultracold atomic gases
Qiu, Haibo; Zambrini, Roberta; Polls, Artur; Martorell, Joan; Juliá-Díaz, Bruno
Physical Review A 92, 043619 **92**, 043619 (1-11)

Quantum Darwinism and non-Markovian dissipative dynamics from quantum phases of the spin-1/2 XX model
Giorgi, Gian Luca ; Galve, Fernando; Zambrini, Roberta
Physical Review A **92**, 022105 (1-7)

Time dependent heat flow in interacting quantum conductors
Guillem Rosselló, Rosa López, Jong Soo Lim
Physical Review B **92**, 115402

Electron localization and optical absorption of polygonal quantum rings
Sitek, Anna; Serra, Llorenç; Gudmundsson, Vidar; Manolescu, Andrei
Physical Review B **91**, 235429 (1-10)

Majorana states and magnetic orbital motion in planar hybrid nanowires
Osca, Javier; Serra, Llorenç
Physical Review B **91**, 235417 (1-8)

Heat asymmetries in nanoscale conductors: The role of decoherence and inelasticity
Argüello-Luengo, Javeir; Sánchez, David; López, Rosa
Physical Review B **91**, 165431 (1-8)

Cross thermoelectric coupling in normal-superconductor quantum dots
Hwang, S.-Y.; Lopez, R.; Sanchez, D.
Physical Review B **91**, 104518 (1-6)

Seebeck effects in two-dimensional spin transistors
Alomar, M. I.; Serra, L.; Sánchez, D.
Physical Review B **91**, 075418 (1-11)

Shiba states and zero-bias anomalies in the hybrid normal-superconductor Anderson model
Zitko, Rok; Lim, Jong-Soo; López, Rosa; Aguado, Ramón
Physical Review B **91**, 045441

Stochastic thermodynamics for linear kinetic equations
Van den Broeck,C.;Toral,R.
Physical Review E **92**, 012127

Anticipated synchronization in coupled complex Ginzburg-Landau systems
Ciszak, M.; Mayol, C.; Mirasso,C.R.; Toral,R.
Physical Review E **92**, 032911

Nonequilibrium potential and fluctuation theorems for quantum maps
Manzano, Gonzalo; Horowitz, Jordan M. ; Parrondo, Juan MR
Physical Review E **92**, 032129(1-9)

Most probable paths in temporal weighted networks: An application to ocean transport
Ser-Giacomi, Enrico; Vasile, Ruggero; Hernandez-Garcia, Emilio; Lopez, Cristobal
Physical Review E **92**, 012818 (1-6)

The transition between strong and weak chaos in delay systems: Stochastic modeling approach
Jüngling, Thomas; D'Huys, Otti; Kinzel, Wolfgang
Physical Review E **91**, 062918 (1-10)

Determining the sub-Lyapunov exponent of delay systems from time series
Jüngling, Thomas; Soriano, Miguel C.; Fischer, Ingo
Physical Review E **91**, 062908 (1-9)

Synchronization of tunable asymmetric square-wave pulses in delay-coupled optoelectronic oscillators
Martínez-Llinàs, Jade; Colet, Pere; Erneux, Thomas
Physical Review E **91**, 032911 (1-14)

Reservoir computing with a single time-delay autonomous Boolean node
Haynes, Nicholas D.; Soriano, Miguel C.; Rosin, David P.; Fischer, Ingo; Gauthier, Daniel J.
Physical Review E **91**, 020801(R)(1-5)

Noise in Coevolving Networks
Diakonova, Marina; Eguiluz, Victor M.; San Miguel, Maxi
Physical Review E **92**, 032803

Optimal recruitment strategies for groups of interacting walkers with leaders
Martínez-García, Ricardo, López, Cristóbal; Vazquez, Federico
Physical Review E 91, 022117

Anomalous scaling in an age-dependent branching model
Keller-Schmidt, S.; Tugrul, M.; Eguiluz, V.M.; Hernandez-Garcia, E.; Klemm, K.
Physical Review E **91**, 022803 (1-6)

Descending from infinity: Convergence of tailed distributions
Van den Broeck,Christian;Harbola,Upendra;Toral,Raul;Lindenberg,Katja
Physical Review E **91**, 012128

Thermoelectric effect in the Kondo dot side-coupled to a Majorana mode
Khim, H.; Lim, Jong-Soo; López, R.; Lee, M.
European Physical Journal B **88**, 151 (1-10)

Quantum point contacts as heat engines
Pilgram, S.; Sánchez, D.: López, R.
Physica E **74**, 447-450

In-phase, out-of-phase and T/4 synchronization of square waves in delay-coupled non-identical optoelectronic oscillators
Martínez-Llinàs, Jade; Colet, Pere
Optics Express **23 (19)**, 24785-24799

Studying an Agulhas ring's long-term pathway and decay with finite-time coherent sets
Froyland, G.; C. Horenkamp; V. Rossi; E. van Sebille
Chaos **25**, 083119

Dominant transport pathways in an atmospheric blocking event
Ser-Giacomi, Enrico; Vasile, Ruggero; Recuerda, Irene; Hernandez-Garcia, Emilio; Lopez, Cristobal
Chaos **25**, 087413 (1-10)

Flow networks: A characterization of geophysical fluid transport
Ser-Giacomi, Enrico; Rossi, Vincent; Lopez, Cristobal; Hernandez-Garcia, Emilio
Chaos **25**, 036404 (1-18)

Minimal approach to neuro-inspired information processing
Soriano, M. C.; Brunner, D.; Escalona-Moran, M.; Mirasso, C. R.; Fischer, I.
Frontiers in Computational Neuroscience **9**, 68

Reconfigurable semiconductor laser networks based on diffractive coupling
Brunner, Daniel; Fischer, Ingo
Optics Letters **40**, OSA, 3854-3857

Electromagnetic absorption of quasi-1D Majorana nanowires
Osca, Javier; Serra, Llorenç
Physica Status Solidi (c) **12**, 12 (1409-1411)

Supramolecular Magnetic Brushes: The Impact of Dipolar Interactions on the Equilibrium Structure
Sánchez, P. A.; Pyanzina, E. S.; Novak, E. V.; Cerdà, J.J.; Sintes, T.; Kantorovich, S. S.
Macromolecules **48**, 7658-7669

The effect of links on the interparticle dipolar correlations in supramolecular magnetic filaments e effect of links on the interparticle dipolar correlations in supramolecular magnetic filaments
Sánchez, Pedro A.; Cerdà, Joan J. Cerdà; Sintes, Tomàs; Ivanov, Alexey O.; Kantorovich, Sofia S.
Soft Matter **11**, 2963-2972

Negative tunneling magneto-resistance in quantum wires with strong spin-orbit coupling
Seungju, Han; Serra, Llorenç; Choi, Mahn-Soo
Journal of Physics: Condensed Matter **27**, 255001 (1-6)

Electromagnetic absorption of semiconductor 2D Majorana nanowires
Ruiz, Daniel; Osca, Javier; Serra, Llorenç
Journal of Physics: Condensed Matter **27**, 125302 (1-9)

Dragging in mutualistic networks
Pastor, J. M.; Garcia-Algarra, J.; Iriondo, J. M.; Ramasco, J. J.; Galeano, J.
Networks and Heterogeneous Media (AIMS) **10**, 37-52

A simple and bounded model of population dynamics in mutualistic networks
Pastor, J. M.; Garcia-Algarra, J.; Galenao, J. ; Iriondo, J. M.; Ramasco, J. J.
Networks and Heterogeneous Media (AIMS) **10**, 53-70

Assessing coupling dynamics from an ensemble of time series
Gómez-Herrero, G.; Wu, W.; Rutanen, K.; Soriano, M. C.; Pipa, G.; Vicente, R.
Entropy **17**, 1958-1970

Exploring the potential of phone call data to characterize the relationship between social network and travel behavior
Picornell, M.; Ruiz, T.; Lenormand, M.; Ramasco, J.J.; Dubernet, T.; Frías-Martínez, E.
Transportation **42**, 647-668

A scattering model of 1D quantum wire regular polygons
Estarellas, Cristian; Serra, Llorenç
Superlattices and Microstructures **83**, Elsevier, 184-192

Impact of substrate interactions on the phase behavior of Y-shaped molecules
Ruth, D.P.;Toral, R.;Holz, D.;Rickman, J.M.;J.D. Gunton
Thin Solid Films **597**, 188-192

Spatial patterns of competing random walkers
Hernandez-Garcia, E.; Heinsalu, E., Lopez, C.
Ecological Complexity **21**, 166-176

Diversification and biodiversity dynamics of hot and cold spots
Melián, C.J.; Seehausen, O.; Eguíluz, V.M.; Fortuna, M.A.; Deiner, K.
Ecography **38**, 393-401

Constructive effects of diversity in a multi-neuron model of the homeostatic regulation of the sleep-wake cycle
Patriarca, Marco; Hernandez-Garcia, Emilio; Toral, Raul
Chaos, Solitons and Fractals **81, part B**, 567–574

Photonic delay systems as machine learning implementations
Hermans, M.; Soriano, M. C.; Dambre, J.; Bienstman, P.; Fischer, I.
Journal of Machine Learning Research **16**, 2081-2097

Delay-based Reservoir Computing: Noise Effects in a Combined Analog and Digital Implementation
Soriano, Miguel C.; Ortín, Silvia; Keuninckx, Lars; Appeltant, Lennert; Danckaert, Jan; Pesquera, Luis; Van der Sande, Guy
IEEE Transactions on Neural Networks and Learning Systems **26**, 388-393

Digital Implementation of a Single Dynamical Node Reservoir Computer
Alomar, M. L.; Soriano, M. C.; Escalona-Moran, M.; Canals, V.; Fischer, I.; Mirasso, C. R.; Rossello, J. L.
IEEE Transactions on Circuits and Systems II: Express Briefs **62**, 977-981

Electrocardiogram Classification using Reservoir Computing with Logistic Regression
Escalona-Moran, M. A.; Soriano, M. C.; Fischer, I.; Mirasso, C. R.
IEEE Journal of Biomedical and Health Informatics **19**, 892-898

a.5.3 Other publications in journals

Comparing and modeling land use organization in cities
Lenormand, M; Cantú-Ros, OG; Picornell, M;Louail, T; Herranz, R;Barthelemy, M;Frías-Martínez, E; San Miguel, M; Ramasco, JJ
Royal Society Open Science **2**, 150449

Nonlinear Heat Conduction in Coulomb-blockaded Quantum Dots
Sierra, M. A.; Sánchez, D.
Materials Today: Proceedings **2**, 483-490

Time-dependent current of interacting quantum capacitors subjected to large amplitude pulses
Alomar, M. I.; Lim, J. S.; Sánchez, D.
Journal of Physics: Conference Series **647**, 012049 (1-4)

Quasi-particle current in planar Majorana nanowires
Osca, Javier; Serra, Llorenç
Journal of Physics: Conference Series **647**, 012063 (1-4)

Slowing down of linear consensus dynamics on temporal networks: some theoretical extensions
Masuda, N.; Klemm, K.; Eguíluz, V.M.
IFAC-PapersOnLine **48**, 187-192

Opinion dynamics within a virtual small group: the stubbornness effect
Guazzini, A; Cini, A; Bagnoli, F; Ramasco, JJ
Frontiers in Physics **3**, 65

a.5.4 Book Chapters and Others

Persistence in Voting Behavior: Stronghold Dynamics in Elections
Perez, Toni; Fernandez-Gracia, Juan; Ramasco, Jose J.; Eguiluz, Victor M.
Social Computing, Behavioral-Cultural Modeling, and Prediction.
Lecture Notes in Computer Science **9021**, Springer, 173-181

Thermopower of a graphene monolayer with inhomogeneous spin-orbit interaction
Alomar, M. I.; Sánchez, D.
Dynamical Systems, Differential Equations and Applications.
AIMS Proceedings, 2015 (Eds.: Manuel de Leon, Wei Feng, Zhaosheng Feng, Xin Lu, J.M. Martell, Javier Parcet, Daniel Peralta-Salas and Weihua Ruan), 1-9

TREE model: a tool to explore delay reduction scenarios in the ECAC area
Campanelli, Bruno; Fleurquin, Pablo; Ciruelos, Carla; Arranz, Andres; Eguiluz, V.M.; Ramasco, J.J.
Proceedings of the Fifth SESAR Innovation Days, Bologna, Italy

Modelling delay propagation trees for scheduled flights
Campanelli, B.; Ciruelos, C.; Arranz, A.; Etxebarria, I.; Peces, S.; Fleurquin, P.; Eguiluz, V.M. ; Ramasco, J.J.
Proceedings of the 11th USA/Europe Air Traffic Management R&D Seminar, Lisbon, Portugal

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

a.6.1 Invited talks in conferences and workshops

Fischer, Ingo
New perspectives on semiconductor lasers with delayed feedback: dynamics, similarity properties and applications in information processing.
PQE-2015, the 45th Winter Colloquium on the Physics of Quantum Electronics, Snowbird, Utah, USA.
January 4-8

Ramasco, JJ
Spatial Structure of Cities.
NetSci X. Rio de Janeiro, Brasil.
January 14-16

Zambrini,Roberta
Minimal model for synchronization.
Quantum Cybernetics and Control Workshop, QCC2015, Nottingham, UK.
January 19-23

Rossi, V.
Linking basin-scale connectivity, oceanography and population dynamics for the management of marine ecosystems in the Mediterranean sea.
Ateliers de Modélisation de l'Atmosphère 2015 / Session modélisation climatique régionale intégrée, Toulouse, France.
January 20

San Miguel, Maxi
Data for Human mobility. Implications in electoral processes.
Journees a la memoire de Pierre Glorieux, Lille, France.
January 23

Sánchez, David.
Out-of-equilibrium thermoelectric and heat transport in quantum dots.
First Meeting of the Network "Nonequilibrium Statistical Physics and its multidisciplinary applications". Barcelona, Spain
April 29

Fischer, Ingo
Delays in Physical Systems: Nuisance, Challenges and Opportunities.
Short Thematic Program on Delay Differential Equations: Delay-Differential equations in physical sciences and engineering, Toronto, Canada
May 11-15

Zambrini,Roberta
Minimal model for synchronization.
Spanish Quantum Information Workshop, University of the Basque Country, Bilbao, Spain.
June 1-3

Ramasco, JJ
A radiography of human mobility using ICT data.
NetSci satellite "Structure and Mobility of Crime". Zaragoza, Spain.
June 1

Ramasco, JJ
Spatial structure of cities.
NetSci satellite "At the Crossroads: Lessons and Challenges in Computational Social Science" , Zaragoza, Spain.
June 2

Toral, Raul
Sampling of Rare Events by Brownian Dynamics Simulations.
ZCAM Workshop on Advanced Modeling of Materials. Zaragoza, Spain.
June 5

Mirasso, Claudio
Reconciling information directionality with negative time lag in neuronal circuits.
Recent Advances in Bioinformatics and Neuroscience. Madrid, Spain
June 9

Ramasco, JJ
Ecological systems: modeling population dynamics under predation and mutualism.
Econet 15 school, University of Umea in Norrbyn, Sweden.
June, 14-19

San Miguel, Maxi
Is the voter model a model for voters?".
Physics meets the Social Sciences, 25th Granada Seminar.Granada, Spain
June 15-19

Toral, Raul
Stochastic effects in the dynamics of opinion formation.
25 years of Granada Seminar: Physics Meets the Social Sciences, Almuñécar, Granada, Spain.
June, 15-19

Ramasco, JJ
Modeling delay propagation for scheduled flights.
Satellite meeting on Complexity Science and Transportation Systems\' 15 of the Lipari School on Complex Systems, Lipari, Sicily, Italy.
July 15

Colet, Pere
Collective firing induced by noise or diversity and detuning induced synchrony in multilayer coupled nonlinear oscillators.
Dynamics of Coupled Oscillators: 40 years of the Kuramoto Model, Dresden, Germany.
July 27-31

San Miguel, Maxi
Network fragmentation transitions: The Voter model.
at International workshop on Advanced Computational and Experimental Techniques in Nonlinear Dynamics, Cusco, Peru.
August 3-14

Fischer, Ingo
Towards Reservoir Computing with Autonomous Boolean Networks and beyond.
George Boole Mathematical Sciences Conference: Complex and Boolean Networks, Cork, Ireland
August 24-26

Fischer, Ingo
State-dependent delay dynamics in a semiconductor laser system.
XXXV Dynamics Days Europe 2015, UK.
September 6-10

Soriano, Miguel Cornelles
Consistency and chaos synchronization in delay-coupled semiconductor lasers.
XXXV Dynamics Days Europe. Exeter, UK.
September 6-10

Rossi, V.
Studying connectivity processes and the structural complexity of marine populations using Lagrangian Flow Network: a case study of the European hake in the western Mediterranean Sea.
MarCo annual meeting, Montpellier, France.
September 16

Mirasso, Claudio
Reconciling causal influence and negative time lag in neuronal circuits.
International Conference on System Level Approaches to Neural Engineering, Barcelona, Spain
September 21

San Miguel, Maxi
Senior Scientific Award Keynote: What can we learn from simple models of social interaction?.
Conference on Complex Systems 2015, Phoenix, Arizona, USA.
September 28 – October 2

Fischer, Ingo
High-Speed Neuro-Inspired Information Processing Using Semiconductor Lasers.
VI Workshop on Physics and Technology of Semiconductor Lasers, Kraków, Poland.
October 11-15

Mirasso, Claudio
Zero lag and anticipated synchronization in neuronal circuits.
School on Fundamentals of Complex Networks and Applications to Neuroscience. Sao Paulo, Brazil
October 12

San Miguel, Maxi
Big Data Analysis of Human Mobility.
5th International M-tourism day: Big Data for Tourism 2015, Palma-Niza.
October 13

Mirasso, Claudio
Processing with neuro-inspired delaybased nonlinear systems.
School on Fundamentals of Complex Networks and Applications to Neuroscience. Sao Paulo, Brazil
October 14

Fischer, Ingo
Towards Reservoir Computing using Autonomous Boolean Networks.
Workshop on Dynamical systems and brain-inspired information processing 2015, Besancon, France
November 2-3

Bueno, Julian
Consistency and memory properties of an all-optical information processing scheme.
Workshop on Dynamical systems and brain-inspired information processing 2015, Besancon, France
November 2-3

Gomila, Damià
Noise fluctuations in Kerr frequency combs.
Nonlinear phenomena in optics: theory and experiments Besançon, France.
November 4-5

Ramasco, JJ
Spatial structure of Cities.
Third CIVITAS DYN@MO Summer University, Palma, Spain.
November 4-6

San Miguel, Maxi
Big Data and Human Mobility. The EUNOIA Project.
Third CIVITAS DYN@MO Summer University, Palma de Mallorca, Spain.
November 4-6

Fischer, Ingo
Neuro-Inspired Information Processing Using Nonlinear Systems with Delayed Feedback.
CeNoS-Kolloquium, Münster, Germany.
December 8

a.6.2 Other talks in conferences and workshops

Manzano, G; Horowitz JM; Parrondo JMR
Fluctuation theorems for quantum maps.
XII GISC Workshop. Madrid, Spain.
February 20

Carro, Adrián; Toral, Raúl; San Miguel, Maxi
Markets, herding and response to external information.
DPG Spring Meeting 2015. Berlin, Germany.
March 15-20

Diakonova, Marina
Noise in Coevolving Networks.
DPG, Spring Meeting 2015, Berlin, Germany.
March 15

Fleurquin, Pablo
Analysis of air transportation using complex networks.
Complexity and Data Science, Brussels.
April 7-8

Ser-Giacomi, Enrico
Lagrangian Flow Networks.
Conference on Complex Networks and Climate Variability, Vienna, Austria.
April 11

Rossi, V.; Dubois, M.; Ser-Giacomi, E.; Arnaud-Haond, S.; Lopez, C.; Hernandez-Garcia, E.
Linking basin-scale connectivity, oceanography and population dynamics for the management of marine ecosystems in the Mediterranean sea.
Conference on Complex Networks and Climate Variability, Vienna, Austria.
April 11

Rodriguez-Mendez, V.; Hernandez-Garcia, E.; Eguiluz, Victor M.; Ramasco, Jose J.
Percolation-based precursors of transitions in dynamical systems.
European Geophysical Union General Assembly 2015. Vienna, Austria.
April 13

Rossi, V.; Dubois, M.; Ser-Giacomi, E.; Arnaud-Haond, S.; Lopez, C.; Hernandez-Garcia, E.
Linking basin-scale connectivity, oceanography and population dynamics for the management of marine ecosystems in the Mediterranean sea.
European Geosciences Union General Assembly 2015. Vienna, Austria.
April 15

Hernandez-Garcia, E.; Ser-Giacomi, E.; Vasile, R.; Lopez, C.
Dominant transport pathways in oceanic and atmospheric flows.
European Geophysical Union General Assembly 2015. Vienna, Austria.
April 17

Hwang, Sun-Yong; Lopez, Rosa; Sanchez, David
Coupled Nonlinear Thermoelectric Transport in Normal-Quantum Dot-Superconductor Junctions.
2nd Quantum Thermodynamics Conference, Palma de Mallorca, Spain.
April 19-24

Manzano, G; Horowitz JM; Parrondo JMR
Fluctuation theorems and quantum mutual information.
Second Quantum Thermodynamics Conference. Palma de Mallorca, Spain.
April 23

López, Cristóbal
Spatial patterns of interacting particle systems with competitive or repulsive inter- actions.
First Meeting of the Network "Nonequilibrium Statistical Physics and its multidisciplinary applications. Barcelona, Spain.
April 28

Serra, Llorenç
Optical absorption of semiconductor 2D Majorana nanowires.
Spring Meeting of the European Materials Research Society (EMRS), Lille, France.
May 11-15

Lenormand, Maxime
Comparer et modéliser l'utilisation des sols dans les aires métropolitaines espagnoles.
Douzièmes Rencontres de Théo Quant, Besançon, France.
May 20-22

Diakonova, Marina
Networks with Coevolution and Noise.
NetSci, Zaragoza, Spain.
June 1 - 5

Lenormand, Maxime
Functional Network of the City.
NetSci 2015, Zaragoza, Spain.
June 1-5

Bassolas, Aleix; Lenormand, Maxime;San Miguel, Maxi; Ramasco, José Javier
Breaking strong disorder in multilayer networks.
NetSci 2015, Zaragoza, Spain. Physics of multilayered interconnected networks II Satellite.
June 1-5

Bassolas, Aleix; Lenormand, Maxime; San Miguel, Maxi;Ramasco, José Javier
Jamming transition in transport networks.
NetSci 2015, Zaragoza, Spain. Urbannet Satellite.
June 1-5

Ramasco, JJ
Human diffusion and city influence.
NetSci 2015, Zaragoza, Spain.
June 1-5

Perez, Toni; Zamora, Jordi; Eguiluz, Victor
A web-based platform for analysing decision making choices from a collective guessing game.
International Conference on Computational Social Science. Helsinki, Finland.
June 8

Ramasco, JJ
Human diffusion and city influence.
International Conference on Computational Social Science ICCSS 2015, Helsinki, Finland.
June 8-12

Perez, Toni; Fernandez-Gracia, Juan; Ramasco, Jose Javier; Eguiluz, Victor
Persistence in collective behavior: stronghold dynamics in elections.
International Conference on Computational Social Science. Helsinki, Finland.
June 10

Brunner, D.; Soriano, M. Cornelles; Porte, X.; Fischer, I.
Experimental phase-space tomography of semiconductor laser dynamics.
CLEO/Europe-EQEC 2015, Munich, Germany.
June 21-25

Ciruelos, Carla; Arranz, Andres; Etxebarria, Izaro; Peces, Sara; Campanelli, Bruno; Fleurquin, Pablo; Eguiluz, V.M.; Ramasco, J.J.
Modelling Delay Propagation Trees for Scheduled Flights.
11th USA-EUROPE Air Traffic Management R\&D Seminar, Lisbon, Portugal.
June 23-26

Czaplicka, Agnieszka; Toral, Raúl; San Miguel, Maxi;
Competition of simple and complex adoption on multi-layer networks.
Mathematics and Physics of Multilayer Complex Networks in Dresden, Germany.
July 6-8

Delfau,J.B.; Molina, J.; Sano, M.
Emergence of polar states in numerical simulations of confined spherical swimmers.
Symposium BIFD15 in Paris, France.
July 15-17

Giorgi, Gian Luca; Galve, Fernando, Zambrini, Roberta
Quantum Darwinism and non-Markovian dissipative dynamics from quantum phases of the spin-1/2 XX model.
Non Markovian Quantum Dynamics. Cortona, Italy.
August 24-28

Bassolas, Aleix; Lenormand, Maxime;San Miguel, Maxi; Ramasco, José Javier
Jamming transition in transport networks.
First Meeting of the Spanish Community for the Study of Complex Systems COMSOTEC, Santander, Spain.
September 9-11

Carro, Adrián; Toral, Raúl; San Miguel, Maxi
Markets, herding and response to external information.
First Meeting of the Spanish Community for the Study of Complex Systems COMSOTEC, Santander, Spain.
September 9-11

Artime, Oriol; Ramasco, José Javier; San Miguel, Maxi
Information spreading in networks: Competition between topological and temporal networks.
First Meeting of the Spanish Community for the Study of Complex Systems COMSOTEC, Santander, Spain.
September 9-11

Carro, Adrián; Toral, Raúl; San Miguel, Maxi
Coupled dynamics of node and link states: A model for language competition.
First Meeting of the Spanish Community for the Study of Complex Systems COMSOTEC, Santander, Spain.
September 9-11

Ramasco, JJ
Comparing and modeling land use organization in cities.
First Meeting of the Spanish Community for the Study of Complex Systems COMSOTEC, Santander, Spain.
September 9-11

Carro, Adrián; Toral, Raúl; San Miguel, Maxi
Network effects on an agent-based market model with herding behavior.
Econophysics Colloquium 2015. Prague.
September 14-16

Czaplicka, Agnieszka; Toral, Raúl; San Miguel, Maxi;
Competition of simple and complex adoption on multi-layer networks.
LASAGNE Conference, University of Barcelona, Spain.
September 17-18

Diakonova, Marina
Irreducibility of Multilayer Network Dynamics: the Case of the Voter Model.
LASAGNE Conference, University of Barcelona, Spain.
September 17

Bassolas, Aleix; Lenormand, Maxime; San Miguel, Maxi; Ramasco, Jose J.
A multilayer approach to urban transport networks.
LASAGNE Conference, University of Barcelona, Spain.
September 17-18

López, C; Hernández-García; E; Ser-Giacomi, E; Recuerda, I; Rossi, V; Vassile, R
Lagrangian flow networks: applications to geophysical flows.
Conflow 2015: complex network perspectives on flow systems. Potsdam, Germany.
September 21-22

Ser-Giacomi, Enrico; Vasile, Ruggero; Lopez, Cristobal; Hernandez-Garcia, Emilio
Most probable paths in time-dependent flow networks.
Workshop CONFLOW 2015: Complex network perspectives on flow systems, Potsdam, Germany
September 21

Hernandez-Garcia, E.; Ser-Giacomi, E.; Rossi, V.; Lopez, C.
Lagrangian flow networks: dispersion, mixing and coherence trough connectivity measures.
Workshop CONFLOW 2015: Complex network perspectives on flow systems, Potsdam, Germany
September 21

Delfau, J.-B.
Towards a better understanding of the individual and collective behaviors of metallodieletric swimmers.
Workshop "Active liquids" at the Lorentz center, Leiden.
September 21-25

Rossi, V.; Dubois, M.; Ser-Giacomi, E.; Monroy, Pedro; Hernandez-García, E.; López, C.
Lagrangian Flow Network: a new tool to evaluate connectivity and understand the structural complexity of marine populations.
ICES ASC 2015, Copenhagen, Denmark.
September 22

Brunner, Daniel; Soriano, M. Cornelles; Porte, Xavier; Fischer, Ingo
Experimental characterization of semiconductor laser dynamics by phase-space tomography.
ESLW 2015, European Semiconductor Laser Workshop, Madrid, Spain.
September 24-25

Porte, Xavier; Martínez-Llinàs, Jade; Soriano, Miguel Cornelles; Fischer, Ingo; Colet, Pere
State-Dependent Delay Dynamics in Semiconductor Lasers.
ESLW 2015, European Semiconductor Laser Workshop, Madrid, Spain.
September 24-25

Hernandez-Garcia, E.; Lopez, C.; Delfau, J-B.; Martinez-Garcia, R.; Heinsalu, E.
Birth, death, diffusion and repulsion: A variety of pattern forming instabilities arising from non-local interactions.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5

Bullara, Domenico
Turing patterns without diffusion: how immobile pigment cells can color the skin of zebrafish.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5

Gomila, D.; Colet, P.; Walgraef, D.
Theory for the spatio-temporal dynamics of domain walls close to a nonequilibrium Ising-Bloch transition.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5-7

Parra-Rivas, P.; Gomila, D.; Gelens, L.; Knobloch, E.
Dynamics of dark solitons in the Lugiato-Lefever equation with normal dispersion.
Workshop: WASTOS15, Waves, Solitons and Turbulence in Optical Systems Berlin, Germany.
October 12-14

Louail, Thomas; Lenormand, Maxime; Picornell, Miguel; Garcia Cantu Ros, Oliva; Herranz, Ricardo; Frias-Martinez, Enrique; Ramasco, Jose Javier; Barthelemy, Marc
Uncovering the spatial structure of mobility networks.
Rencontres nationales du réseau national des systèmes complexes (RNSC annual meeting). Lehavre, France.
November 4

Tchawou Tchuisseu, Eder Batista; Gomila, Damià; Colet, Pere
Effects of dynamic demand control appliances on the grid frequency stabilization.
The fourth edition of the CPS international Conference on High Level Physics and Solutions to real life problems in developing countries. Yaoundé, Cameroun,
November 24-28

Parra-Rivas, P.; Gomila, D.; Gelens, L.; Knobloch, E.
Dark solitons in the Lugiato-Lefever equation with normal dispersion.
XV international workshop on Instabilities and Nonequilibrium Structures, Valparaiso, Chile.
December 7-11

a.6.3 Poster presentations

Hwang, Sun-Yong; Lopez, Rosa; Sanchez, David
Weakly nonlinear thermoelectric transport in N-QD-SC junctions.
Winter School on Physics of Small Quantum Systems: Thermal and Topological Phenomena, Helsinki, Finland.
January 12-16

Rodriguez, Jorge P.; Eguiluz, Victor
Heterogeneity in synchronizing networks of mobile particles.
DPG Spring Meeting 2015. SOE (Physics of Socio-economic Systems Division). Berlin, Germany.
March 15-20

Lenormand, Maxime
Measuring global and regional influence of cities using geolocated tweets.
NetMob 2015, Boston, USA.
April 7-10

Ser-Giacomi, E.; Hernández-García, E.; López, C.; Rossi, V.; Vasile, R.
Lagrangian Flow networks: a new way to characterize transport and connectivity in geophysical flows.
Conference on Complex Networks and Climate Variability, Vienna, Austria.
April 11-12

Tupikina, L.; Molkenthin, N.; Hernández-García, E.; López, C.; Marwan, N.; Kurths, J.
Time-dependent flow-networks.
Conference on Complex Networks and Climate Variability, Vienna, Austria.
April 11-12

Ser-Giacomi, Enrico; Hernandez-Garcia, Emilio; Lopez, Cristóbal; Vasile, Ruggero; Rossi, Vincent
Flow networks: a new way to characterize transport and connectivity in geophysical flows.
European Geosciences Union General Assembly 2015, Vienna, Austria.
April 13

Tupikina, L.; Molkenthin, N.; Hernández-García, E.; López, C.; Marwan, N.; Kurths, J.
Time-dependent flow-networks.
European Geosciences Union General Assembly 2015, Vienna, Austria.
April 13-14

Osca, Javier; Ruiz, Daniel; Serra, Llorenç
Optical absorption of 2D Majorana nanowires.
2nd Quantum Thermodynamics Conference. Palma de Mallorca, Spain.
April 19-24

Alecce, Antonio; Galve, Fernando; Lo Gullo, Nicolino; Zambrini, Roberta; Plastina, Francesco; Dell´Anna, Luca.
Quantum Otto Cycle with Inner Friction.
2nd Quantum Thermodynamics Conference. Palma de Mallorca, Spain.
April 19-24

Sierra, Miguel A.; Sánchez, David.
Nonlinear thermoelectric transport in Coulomb-blockaded quantum dots.
Second Quantum Thermodynamics Conference. Palma de Mallorca, Spain.
April 19-24

Alomar, M.I.; Serra, Ll.; Sánchez, D.
Seebeck effects in Two-Dimensional Electron Gases.
2nd Quantum Thermodynamics Conference. Palma de Mallorca, Spain.
April 19-24

Parra-Rivas, P.; Gomila, D.; Matias, M.A.; Gelens, L.; Colet, P.
Effects of inhomogeneities and drift on the dynamics of temporal solitons in fiber cavities and microresonators.
18th Annual workshop IEEE Photonics Benelux Chapter, Mons, Belgium.
May 22

Bassolas, Aleix; Lenormand, Maxime;San Miguel, Maxi; Ramasco, José Javier
Breaking strong disorder through multilayer networks.
International School and Conference on Network Science - NetSci 2015, Zaragoza, Spain.
June 1-5

Artime, Oriol; Ramasco, José Javier; San Miguel, Maxi
Information spreading in networks: Competition between topological and temporal networks.
International School and Conference on Network Science - NetSci 2015, Zaragoza, Spain.
June 1-5

Czaplicka, Agnieszka; Toral, Raúl; San Miguel, Maxi;
Competition of simple and complex adoption on multi-layer networks.
*International School and Conference on Network Science - NetSci 2015, Zaragoza, Spain.*June 1-5

Carro, Adrián; Toral, Raúl; San Miguel, Maxi
Coupled dynamics of node and link states: A model for language competition.
ICCSS'15, International Conference on Computational Social Science. Helsinki, Finland.
June 8-11

Carro, Adrián; Toral, Raúl; San Miguel, Maxi
Markets, herding and response to external information.
ICCSS'15, International Conference on Computational Social Science. Helsinki, Finland.
June 8-11

Zamora-Munt, J.; Matias, Manuel A.; Colet, P
Interplay between internal time scales and network topology in coupled nonlinear oscillators.
Granada Seminar 2015, "Physics meets the Social Sciences", La Herradura. Granada, Spain.
June 15-19

Brunner, D.; Fischer, I.
Diffractively coupled networks of semiconductor lasers.
CLEO/Europe-EQEC 2015, Munich, Germany.
June 21-25

Oliver, Neus; Jüngling, Thomas; Brunner, Daniel; Pons, Antonio J.; Tiana-Alsina, Jordi; Buldú, Javier; Torrent, M. Carme; García-Ojalvo, Jordi; Fischer, Ingo.
Consistency properties of a chaotic laser to input pulse trains.
European Conference on Lasers and Electro-Optics and the European Quantum Electronics Conference (CLEO/EQEC), Munich, Germany.
June 21-25

Porte, Xavier; Martínez-LLinàs, Jade; Soriano, Miguel Cornelles; Colet, Pere; Fischer, Ingo
External-cavity semiconductor laser with state-dependent delay.
CLEO Europe EQEC 2015, Munich, Germany.
June 21-25

Parra-Rivas, P.; Gomila, D.; Leo, L.; Coen, C.; Gelens, L.
Third-order chromatic dispersion stabilizes Kerr frequency combs.
CLEO/Europe-EQEC 2015 Munich, Germany.
June 21-25

Martínez-Llinàs, Jade; Colet, Pere; Erneux, Thomas
Tuning Synchronized Square-wave Pulses With Optoelectronic Oscillators.
CLEO/Europe-EQEC 2015, Munich, Germany.
June 21-25

Gomila, Damià; Colet, Pere; Coillet, Aurélien; Chembo, Yanne K.
Noise Fluctuations in Kerr Frequency Combs.
CLEO/Europe-EQEC 2015, Munich, Germany.
June 21-25

Osca, Javier; Serra, Llorenç
Majorana states in presence of orbital motion in planar hybrid nanowires.
EDISON19, 19th International Conference on Electron Dynamics in Semiconductors, Optoelectronics and Nanostructures. Salamanca, Spain.
June 29 – July 2

Osca, Javier; Ruiz, Daniel, Serra, Llorenç
Optical absorption of 2D Majorana nanowires.
EDISON19, 19th International Conference on Electron Dynamics in Semiconductors, Optoelectronics and Nanostructures. Salamanca, Spain.
June 29 – July 2

Alomar, M. I.; Lim, J. S.; Sánchez, David
Dynamical response of interacting quantum mesoscopic capacitors.
EDISON19, 19th International Conference on Electron Dynamics in Semiconductors, Optoelectronics and Nanostructures. Salamanca, Spain.
June 29 – July 2

Hwang, Sun-Yong; Lopez, Rosa; Sanchez, David
Spin-Thermoelectric Transport in Quantum Spin Hall Systems Beyond Linear Response.
20th International Conference on Magnetism, Barcelona, Spain.
July 5-10

Ruiz, D.; Gomila, D.; Sintes, T.; Hernández-García, E.
Continuous model for clonal growth plants.
V Summer School on Statistical Physics of Complex and Small Systems. Centre de Recerca Matemàtica. Barcelona, Spain.
July 6-17

Matias, F.; Gollo, L.; Carelli, P.; Copelli, M.; Mirasso, C.
Reconstructing the directionality of coupling between cortical populations with negative phase lag.
Computational Neuroscience Meeting, Praga, República Checa.
July 20

Matias, F.; Millan A.;Martinez Otero, M.; Canals, S.; Carelli, P.; Copelli, M.; Mirasso, C.
On the basic mechanisms of anticipated synchronization in neuronal circuits.
Computational Neuroscience Meeting, Praga, República Checa.
July 20

Czaplicka, A.; Toral, R.; San Miguel, M.
Competition of simple and complex contagions on multi-layer networks.
Conference on Complex Systems 2015, Phoenix Arizona, USA.
September 28 - October 2

Monroy, P.; López, C.; Hernández-García, E.; Rossi, V.
Sinking of Inertial Particles in Ocean Flows.
FisEs, XX Congreso de Física Estadística, Badajoz, Spain.
October 5 -7

Manzano, G; Horowitz, JM; Parrondo, JMR
Adiabatic and Non-adiabatic entropy production in quantum evolutions.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5-7

Delfau, J.B.; Mano, T.; Sano, M.
Individual and collective behaviors of artificial swimmers: "Janus particles".
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5 -7

Rodriguez-Mendez, Victor; Hernandez-Garcia, E.; Eguiluz M. Victor; Ramasco J. Jose.
Network-based precursors for critical transitions.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5-7

Sintes, T.; Lusebrink, D.; Cerda, J. J.; Sanchez, P. A.
Magnetic filaments in a fluid flow.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5-7

Gomila, D.; Colet, P.
Noise fluctuations in Kerr frequency combs.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5-7

Cerdà, Joan J.; Sintes, Tomàs; Sánchez, Pedro.
Magnetic Brushes: a numerical study of their phase diagram.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5-7

Carro, Adrián; Toral, Raúl; San Miguel, Maxi
Network effects on an agent-based market model with herding behavior.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5-7

Carro, Adrián; Toral, Raúl; San Miguel, Maxi
Coupled dynamics of node and link states: A model for language competition.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5-7

Carro, Adrián; Toral, Raúl; San Miguel, Maxi
Markets, herding and response to external information.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5-7

Parra-Rivas, P.; Gomila, D.; Leo, F.; Coen, S.; Gelens, L.
Third-order chromatic dispersion stabilizes Kerr frequency combs.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5-7

Martínez-Llinàs, Jade; Porte, Xavier; Soriano, Miguel Cornelles; Fischer, Ingo; Colet, Pere
Theoretical Analysis of Semiconductor Lasers with State-Dependent Delay.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5-7

Tchawou Tchuisseu, Eder Batista; Gomila, Damià; Colet, Pere
Effects of dynamic demand control appliances on the grid frequency stabilization.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5-7

Lenormand, Maxime; Tugores, Antónia; Colet, Pere; Ramasco José Javier
Tweets on land transportation networks.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5-7

Martínez-Llinás, Jade; Porte, Xavier; Soriano, Miguel C.; Colet, Pere; Fischer, Ingo
State-Dependent Delay Dynamics in Photonic Systems.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5-7

Carro, Adrian; Toral, Raul; San Miguel, Maxi
Network effects on an agent-based market model with herding behavior.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5-7

Carro, Adrian; Toral, Raul; San Miguel, Maxi
Coupled dynamics of node and link states: A model for language competition.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5-7

Carro, Adrian; Toral, Raul; San Miguel, Maxi
Markets, herding and response to external information.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5-7

Ser-Giacomi, E.; Hernandez-Garcia, E.; Clopez, C.; Rossi, V.; Vasile, R.
Lagrangian flow networks: a new paradigm to characterize transport phenomena.
FisEs2015, XX Congreso de Fisica Estadistica. Badajoz, Spain.
October 5-7

Manzano, G; Horowitz, JM; Parrondo, JMR
Adiabatic and Non-adiabatic entropy production in quantum evolutions.
Third Conference on Quantum Thermodynamics. Porquerolles, France.
October 11-16

Rossi, V.; Monroy, P.; Lopez, C.; Hernandez-Garcia, E.
Modeling the dynamical sinking of biogenic particles in the ocean.
Workshop LEFE-CYBER sur la modélisation.Marseille, France.
November 16-17

Campanelli, Bruno; Fleurquin, Pablo; Ciruelos, Carla; Arranz, Andres; Eguiluz, V.M.; Ramasco, J.J.
TREE Model: a Tool to Explore Delay Reduction Scenarios in the ECAC Area.
Fifth SESAR Innovation Days, Università di Bologna, Italy.
December 1-3

a.6.4 Seminar talks in other research centers

Matias, Manuel A.
Formation of localized structures in bistable systems through nonlocal spatial coupling.
Institute of Physics, Humboldt University, Berlin, Germany.
November, 27

Hernandez-Garcia, Emilio
Lyapunov exponents in the sea: On the impact of ocean transport on biological dynamics.
Departament de Física i Enginyeria Nuclear, Universitat Politècnica de Catalunya, Terrassa, Spain.
February, 25

San Miguel, Maxi
Complex Systems, Social Phenomena and Big Data.
IN3, , Universitat Oberta de Cataluña, Spain.
March, 20

Lenormand, Maxime
Foraging in cities.
Quanturb Seminar, Paris, France.
April, 15

Sierra, Miguel A
Nonlinear current and heat in thermally biased quantum dots.
Universidad Complutense de Madrid, Spain.
June, 26

Lenormand, Maxime
Toward a better understanding of cities using geolocated data.
LISC Seminar, Clermont-Ferrand, France.
July, 16

Zambrini,Roberta
Complex phenomena in structured environments.
Colloquium der Theoretischen Physik at the Institute for Theoretical Physics II, University of Erlangen-Nuremberg.
October, 27

Porte, Xavier
Complex Dynamics of Delayed Feedback Semiconductor Lasers: Similarity and Autocorrelation Properties.
Institute of Solid State Physics in the Technical University of Berlin, Germany.
November, 09

Louail, Thomas
Crowdsourcing the Robin Hood effect in cities.
"Systèmes commplexes en sciences sociales" at l'Ecole des Hautes Etudes en Sciences Sociales (EHESS), Paris, France.
December 18

a.8. Press & Media

Titles are hyperlinked to he corresponding PDF file, or the audio/video clip

a.8.1 Written and Digital Media

Según Twitter, hay dos superdialectos del español. Esta fue la noticia más leída de Sinc en 2014.
Diario Digital de León.
January 5

Diez noticias de ciencia que triunfaron en 2014.
Diario Nueva Tribuna.
January 5

"Nature Communications" recoge un nuevo enfoque para la planificación urbanística propuesto por los investigadores del IFISC (CSICUIB).
Nota prensa UIB
January 26

Com ens movem a Palma? El telèfon ho diu.
Ara Balears.
January 31

Das Lasergehirm.
Die Inselzeitung.
February 11

Las redes cerebrales de la moral.
Diario El Mundo de Baleares.
February 17

Becas SURF IFISC 2015.
El Mundo "Baleopolis".
March 17

Científicos mallorquines abordan cuestiones fundamentales de los sistemas no lineales con extensión espacial.
Salut i Força.
April 6

Investigadores del IFISC publican un estudio sobre termodinámica en la prensa científica internacional.
Salut i Força.
April 6

Y la luz se hizo ciencia.
Baleopolis (El Mundo Baleares).
April 7

Del vapor a la cuántica.
Baleopolis El Mundo del Baleares.
April 21

Lo inesperado mueve la ciencia.
Baleopolis (El Mundo Baleares).
May 5

¿Está el científico? Pues que se ponga.
Baleopolis. El Mundo de Baleares.
May 12

El "big data" mejora la planificacion urbana.
Entrevista Baleopolis "El Mundo Baleares".
May 26

La historia de la luz todavía no ha acabado de contarse.
Baleopolis (El Mundo Baleares).
June 2

Les dones destinen més doblers a la família que a elles mateixes.
ARA Balears.
June 7

Los tópicos de género frente al "big data".
Baleopolis (El Mundo Baleares).
June 9

El portal de viajes Logitravel colaborador del CSIC.
El Economista.
June 10

Grupo Logitravel e IFISC firman un acuerdo en el manejo de grandes cantidades de datos.
Europa Press.
June 10

CSIC y Logitravel suscriben acuerdo de colaboración en manejo de "Big Data".
ABC. es.
June 10

Logitravel facilitará datos turísticos al CSIC para que sean investigados.
Ultima Hora.
June 11

Logitravel llega a un acuerdo con el CSIC para el manejo de Big Data.
Agent Travel.
June 11

Analizarán ahora la movilidad turística gracias a Logitravel.
Diario de Mallorca.
June 13

L'IFISC i el grup Logitravel signen un acord.
ARA Balears.
June 14

Ellas se encargan de la compra familiar.
Diario de Ibiza.
June 15

"Big Data" de la ciencia a la gestión turística.
Baleopolis "El Mundo Baleares".
June 16

Reunió d'experts sobre connectivitat marina.
Ara Balears.
June 27

Conectividad marina, una ayuda en la conservación del Mediterráneo.
Baleopolis (El Mundo Baleares).
July 30

Bits con ritmo cardíaco.
El Mundo, Baleópolis.
September 15

Seguiment de la Diada de Catalunya amb tuits geolocalitzats.
Vilaweb.
September 16

Seguiment de la Diada de Catalunya amb tuits geolocalitzats.
El Pais
September 16

Ciudades a vista de Twitter.
El Mundo, Baleópolis.
September 30

La sociedad de sistemas complejos premia al doctor en física del IFISC Maxi San Miguel.
Ultima Hora.
October 2

El cómic se adentra en el circo.
Diario de Mallorca.
October 5

Maxi San Miguel, premio de la Complex System Society 2015.
Blog Investigación y ciencia.
October 6

Premio Científico Senior 2015.
Real Sociedad Española de Física.
October 7

Twitter camiba la jerarquía de las ciudades.
territorio. es.
October 7

2015 CSS scientific and service awards unveild at CSS'15.
Complex Systems Society.
October 7

Complex System Society names 2015 senior scientist at ASU conference.
Arizona State University.
October 7

Los remolinos del mar actúan como una barrera frente al oxígeno.
Agencia SINC.
November 4

Los remolinos separan en los océanos las aguas ricas y pobres en oxígeno.
Eldiario. es.
November 4

"Ser físico es una actitud"
(entrevista a Maxi San Miguel).
Baleópolis, El Mundo.
November 10

Muros Invisibles en el mar.
El Mundo, B@leópolis.
November 17

Els remolins, les parets del mar.
Ara Balears.
November 17

En las zonas oceánicas con poco oxígeno, los remolinos actúan como barreras naturales.
Geoinnova. com.
November 17

Los remolinos separan en los océanos las aguas ricas y pobres en oxígeno.
terra. es.
November 17

Los remolinos separan en los océanos las aguas ricas y pobres en oxígeno.
EFE.
November 17

Los remolinos actúan como barreras naturales en las zonas oceánicas con poco oxígeno.??
Agencia Iberoamericana para la difusión de la Ciencia y la Tecnología.
November 17

Eddies separate waters rich in oxygen from the poor.
oronegro. mx.
November 17

Los remolinos hacen de barreras al oxígeno en el océano.
econoticias. com.
November 17

Los remolinos del mar actúan como una barrera frente al oxígeno.
explora. es.
November 17

Los remolinos actúan como barreras naturales en zonas oceánicas con poco oxígeno.
Geología de ingenieros de minas UNAB Concepción.
November 17

Los remolinos separan las aguas ricas y pobres en el océano.
EFE verde.
November 17

Los remolinos, responsables de la falta de oxígeno en determinadas zonas oceánicas.
lainformacion. com.
November 17

Los remolinos, responsables de la falta de oxígeno en determinadas zonas oceánicas.
teinteressa. es.
November 17

Un estudio descubre que los remolinos actúan como barreras naturales en zonas oceánicas con poco oxígeno.
eltiempo. com.
November 17

La exposición "Il·lumina't" abre sus puertas ante el público mallorquín.
Blog "Entre línieas".
December 17

El Casal Solleric acull "Il·lumina't", per commemorar l'any internaional de la llum.
bonart. com.
December 17

La UIB i Red Eléctrica desenvolupen una exposició sobre la llum en el marc de l'Any Internacional de la Llum.
passamallorca. com.
December 17

Prorrogan hasta el 3 de enero la muestra "Il·lumina't" en el Casal Solleric.
Diario de Mallorca.
December 17

El Solleric prorroga "Il·lumina't" hasta el 3 de enero por el éxito de público.
Última Hora.
December 17

Luz y Ciencia.
Última Hora.
December 17

Año Internacional de la Luz 2015.
luz. es.
December 17

Ilumínate con la luz de la ciencia en el Casal Solleric.
El Mundo, Bale@polis.
December 17

El IFISC trabaja en una pionera investigación sobre el uso del suelo.
Diario de Mallorca.
December 23

a.8.2 Radio and TV

Superdialectos del español.
Informativo nacional RTVE.
March 29

Interview to Roberta Zambrini about the Conference Termodinámica Cuántica.
"Es Faristol" IB3 Ràdio.
April 20

Interview to Claudio Mirasso about Ciclo Explorando las fronteras entre saberes.
La Ventana de Baleares. Cadena SER.
May 1

Interview to Yanne Chembo about Ciclo Explorando las fronteras entre saberes.
A Vivir que son dos días Baleares (SER).
May 30

Report and interview to Maxi San Miguel about the study of mobility with credit cards.
IB3 ràdio.
October 15

Balears fa ciencia, talk about "il·lumina't" with Maxi San Miguel, Miquel Alfaràs and Eduardo Maynau.
IB3ràdio.
November 28