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Connecting
Science,
Understanding
Complexity

IFISC
Institut de Física Interdisciplinària i Sistemes Complexos

Universitat de les Illes Balears
CSIC
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS

IFISC ANNUAL REPORT 2013





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PRESENTATION AND RESEARCH LINES

IFISC (Institute for Cross-Disciplinary Physics and Complex Systems) is a joint research Institute of the **University of the Balearic Islands (UIB)** and the **Spanish National Research Council (CSIC)** created in 2007 building upon the former Cross-Disciplinary Physics Department of 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 knowledge, 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

In the evolving scheme associated with the programmatic orientation of IFISC there is a unifying transverse line of exploratory research on Complex Systems: Statistical and Non-linear Physics. In addition, for the strategic plan 2010-13 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



Quantum physics: photons, electrons and information



Nonlinear optics and dynamics of Optoelectronic devices



Fluid dynamics, biofluids, and Geophysical fluids



Biological physics and nonlinear phenomena in ecology and physiology



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 main tool for intensive calculations is the Nuredduna system intended for High Throughput Computing. Nuredduna includes two IBM iDataplex clusters, one of them part of the Grid-CSIC initiative to promote e-science, that at the end of 2013 had 576 and 544 computational cores respectively. Other computational tools at IFISC include several servers 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 for the demonstration of chaos and bifurcation phenomena (including Chua, Mackey-Glass and Rössler oscillators), chaos synchronization, and the study of networks with delay-coupled nonlinear elements for information processing.

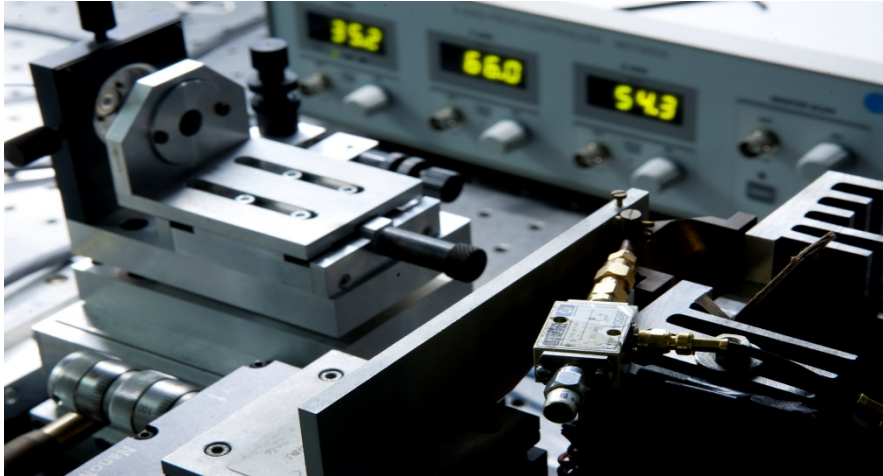
Quantum physics: photons, electrons and information

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 classical 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 Optics and Dynamics of Optoelectronic Devices

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 and in optical cavities filled with nonlinear media. Experimental studies include the utilization of complex laser dynamics for encrypted communication, key exchange, generation of random bit sequences and information processing.



PHOTONICS LAB

Since 2009 a Photonics Laboratory of high standards has been established. The lab is equipped with a Faraday cage for electromagnetic shielding and houses several experiments of delay-coupled lasers using the latest technology to characterize the laser 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 different spectrometers, and laser modulation can be implemented with arbitrary waveforms up to 9.6 GHz bandwidth.

Fluid dynamics, biofluids, and geophysical 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 formation, 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 modelling, plankton patchiness, Lagrangian coherent structures, etc. Numerical simulation as well as the output from satellite sensors are the main sources of data used here.

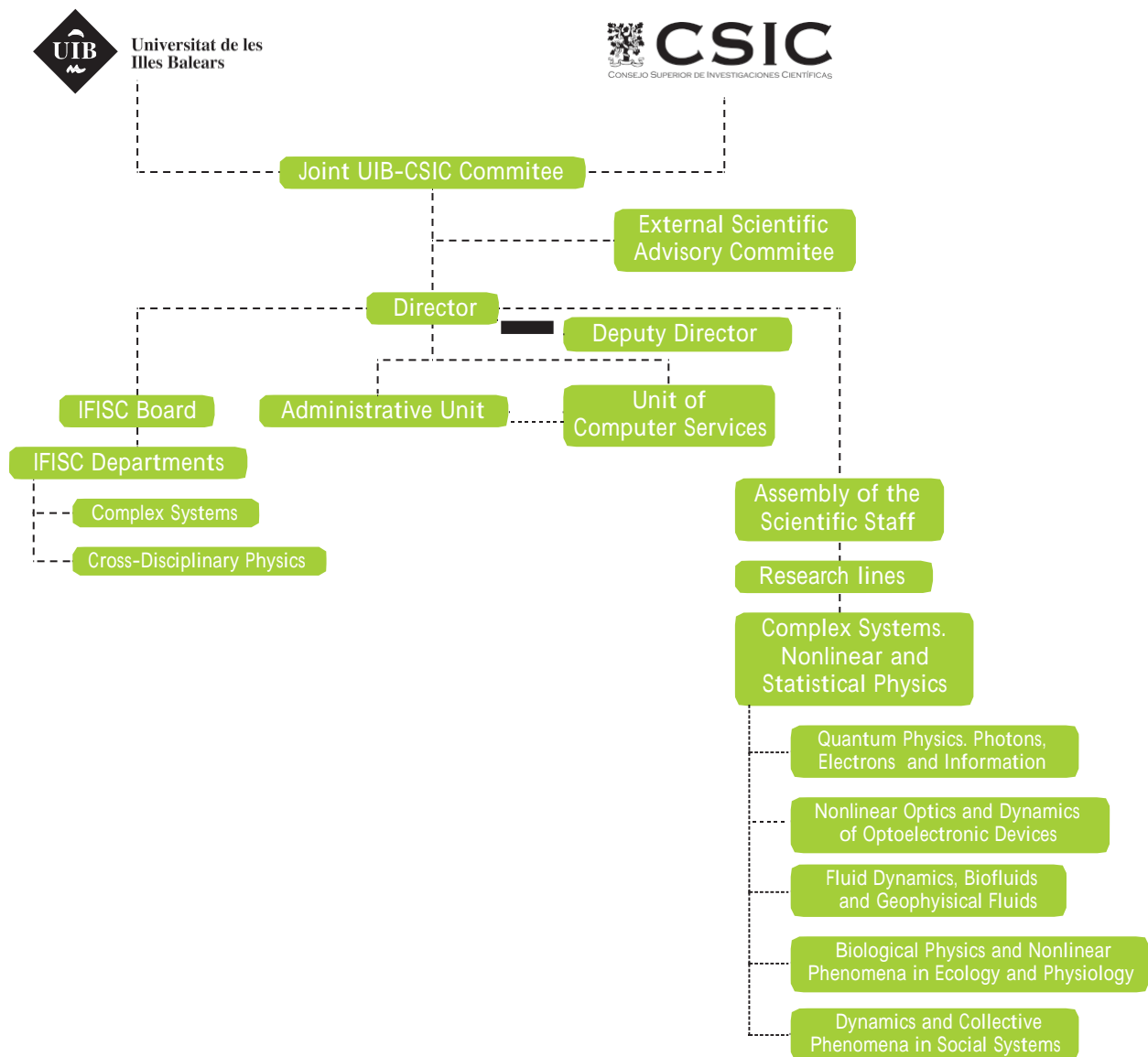
Biological physics and nonlinear phenomena in ecology and physiology

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.

1.2 STRUCTURE CHART



1.3 SOME REPRESENTATIVE RESEARCH RESULTS OF 2013

In the following we summarize some research results published during 2013. They are representative of the different research lines and thus illustrate the range of topics studied at IFISC

Discarding Power of Quantum Evolutions

Physical Review Letters 110, 010501

We introduce the discarding power of a unitary transformation, which assesses its capability to produce quantum discord, and analyze in detail the generation of discord by relevant classes of two-qubit gates. Our measure is based on the Cartan decomposition of two-qubit unitaries and on evaluating the maximum discord achievable by a unitary upon acting on classical-classical states at fixed purity. We find that there exist gates which are perfect discorders for any value of purity m , and that they belong to a class of operators that includes the $\sqrt{\text{SWAP}}$. Other gates, even those universal for quantum computation, do not possess the same property: the CNOT, for example, is a perfect disorder only for states with low or unit purity, but not for intermediate values. The discarding power of a two-qubit unitary also provides a generalization of the corresponding measure defined for entanglement to any value of the purity.

The primary aim of the science of quantum information is the exploitation of the quantum structure of nature for information processing and communication tasks. Among the quantum features of a physical system, entanglement is usually considered the prominent resource, providing speed-up in various quantum information and communication tasks. In the realm of mixed-state quantum information, however, instances are known where quantum advantages are obtained in the presence of little or no entanglement. In fact, quantum discord has been proposed as the source behind this enhancement, and some indications in this direction have been given. This body of recent knowledge represents a strong motivation to understand in quantitative terms how well quantum discord may be produced by a given operation. To this aim we focus on two-qubit systems and introduce the discarding power of (nonlocal) unitary gates, a quantity which allows us to investigate in detail the controlled production of symmetric discord. In particular, the main question we want to answer is the following: which is the maximum discord that a gate may produce acting on classical-classical states, i.e., states with zero discord? In this paper we find analytically the families of gates which are perfect discorders for any purity (to which the $\sqrt{\text{SWAP}}$ belongs), and also find that the class to which the CNOT gate belongs is perfect disorder for ranks 3 and 4, but not 2.

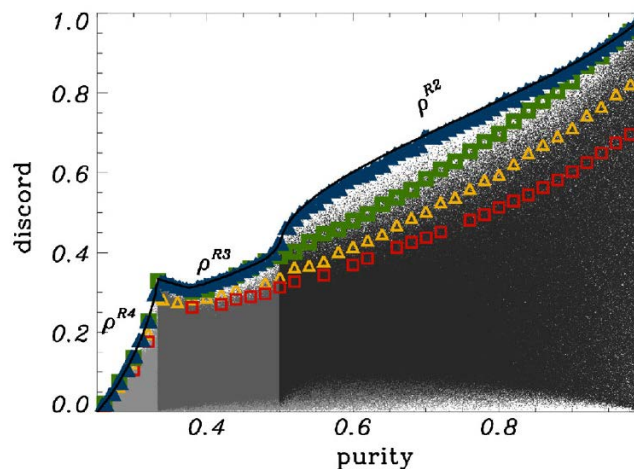
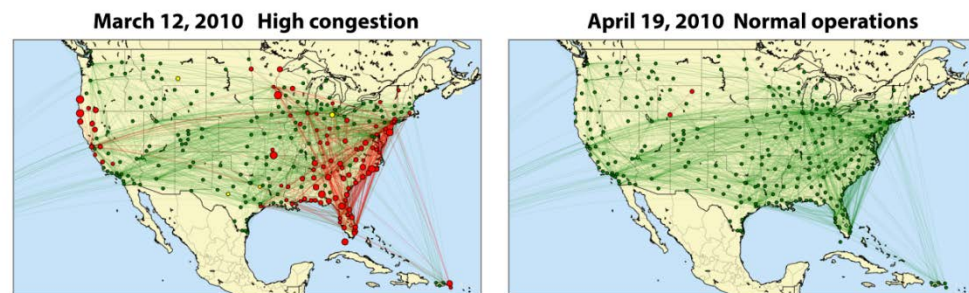


FIG1.- Discarding power for different families of unitaries. The blue triangles correspond to the perfect disorder for all purities, $\sqrt{\text{SWAP}}$, while the green squares correspond to the CNOT family, which is perfect disorder only for ranks 3 and 4. Other nonmaximal gates are shown (red, yellow), together with layers of gray dots corresponding to random states of two qubits (their discord vs purity).

Systemic delay propagation in the US airport network

Scientific Reports 3, 1159

The upsetting consequences of flight delays are well known to any traveler. What is less well understood is how these delays rise, propagate and eventually involve an important part of the airport network. In this, we analyze the dynamics of flight delays constrained to pre-established schedules that defines a baseline to assess the system performance. To do so, we develop a realistic agent-based model, using data records of all the flights of 2010, which reproduces the delay patterns observed in the real unfolding events. The model is fed with the schedule for all the commercial flights and with the initial delays of the day, which can appear as a consequence of technical or meteorological issues. The propagation of delays can be then reproduced by the model and confronted with the real flight performance data. The agreement was remarkable, being the model able to predict with an accuracy over 70% whether a large level of congestion was going to develop in the network or not. Furthermore, the simulations results indicate that there is no need to have a large-scale disruption to produce a high level of congestion. Even under normal operating conditions, internal factors, such as passenger and crew connectivity, can propagate and magnify the delays generating a high level of congestion throughout the network. Our model can thus explore the network resilience to these phenomena and assess different management tools to overcome this devastating problem.

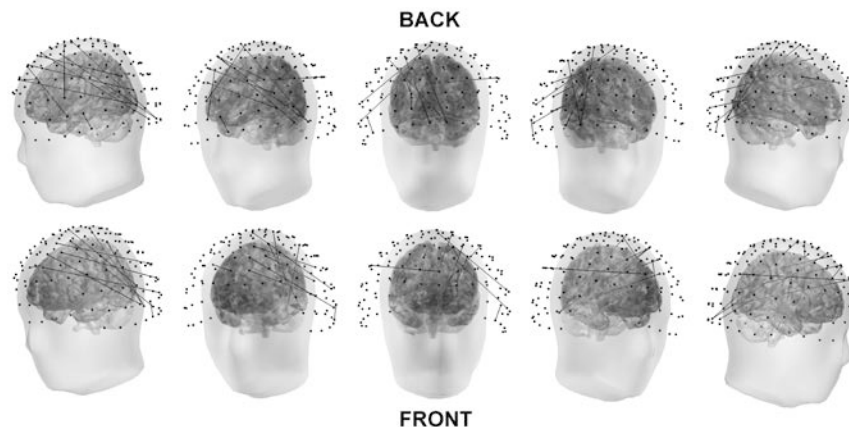


Dynamics of brain networks in the aesthetic appreciation

Proceedings of the National Academy of Sciences 110, 10454-10461

Neuroimage experiments have been essential to identify active brain networks. During cognitive tasks as, e.g., aesthetic judgments, such networks could include regions that belong to the Default Mode Network (DMN). In principle, the DMN activity should be interrupted during cognitive tasks demanding attention, as is the case for aesthetic judgments. In this paper experimental support is given for the hypothesis that aesthetic perception relies on the activation of two different networks - an Initial Aesthetic Network (IAN), that activates after 250 ms of the presentation of the stimulus, and a Delayed Aesthetic Network (DAN), that activates after 1000 ms of the presentation of the stimulus. Activation of the DMN is found to correspond mainly to the DAN. After the presentation of the image, an initial appraisal of aesthetic qualities occur. The individuals judge if the stimulus is beautiful or not-beautiful in a very short time, few hundreds of milliseconds. The general process that occurs is called "*aesthetic appreciation sensu stricto*". At this stage, the IAN activates. Other particular aspects such as judging whether the stimulus is interesting or original, how to rate it, the reasons for considering it attractive, and so forth, are performed later. We call these detailed processes "*aesthetic appreciation sensu lato*". At this stage the DAN activates.

Our phase and amplitude correlation measurements from Magnetoencephalographic (MEG) time traces reveal minimal significant differences between beautiful and not beautiful appreciation in the IAN. On the contrary, significant differences are observed when comparing the DANs, with links extending from occipital and parietal to frontal regions in the left hemisphere when a beautiful condition is presented with respect to a not beautiful one. On the basis of the combined interconditions and interwindows analyses, it seems that, despite the moderate spatial accuracy of MEG signals at the sensors level, the DAN matches frontal, parietal, and temporal medial parts belonging to the DMN. Moreover, this coincidence takes place in the DAN, and only under the beautiful condition.

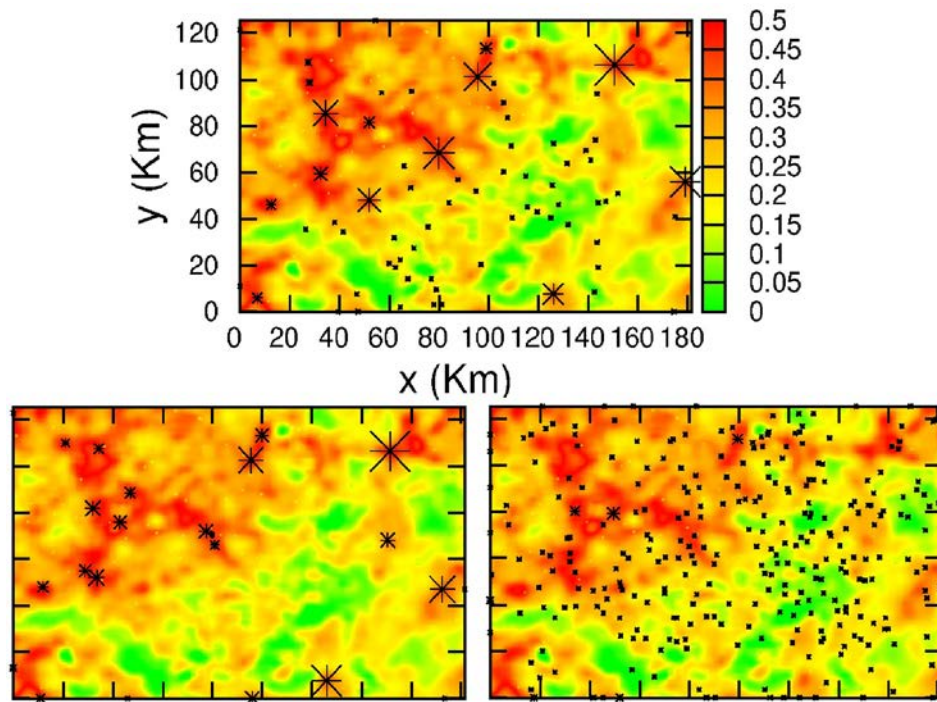


The figure represents the functional connectivity obtained with MEG during a aesthetic appreciation task of different visual stimuli. The larger activity that is generated when perceiving beautiful stimuli, as compared to not beautiful ones, during the late time window (DAN) is reflected by the pattern and larger number of sensors/links that are synchronized.

Optimal search of resources by sharing information: Mongolian gazelles as a case study

Physical Review Letters 110, 248106 (1-5)

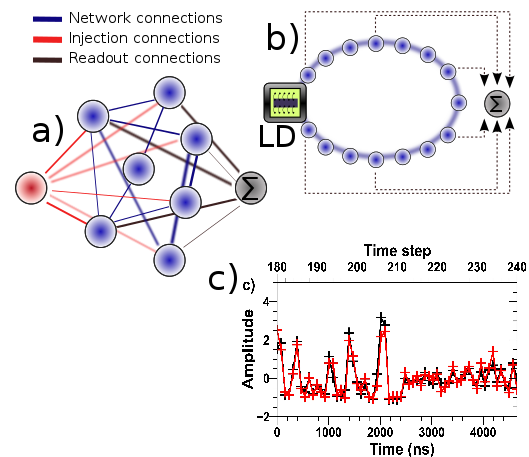
The figure shows the formation of groups of gazelles over a real map of vegetation spatial distribution obtained by satellite in the Steppe of Mongolia (the size of the stars is related to the size of the group at the position). Animals communicate vocally each other when they find good vegetation areas. In the plots it is shown the groups formed as a function of the range of the communication. The search is optimal when the receiving individual has an intermediate amount of information, i.e., communication over intermediate scales (left inferior panel) results in faster searches and all the individuals form groups in areas of good resources (red color). On the contrary, longer (upper plot) or shorter (right inferior panel) communication ranges mean an overabundance or lack, respectively, of information about the habitat and individuals perform less optimal searches, so that some animals move around low-quality areas.



Neuro-inspired all-optical information processing at Gigabyte/s data rates

Nature Communications 4, 1364

In every aspect of modern life, be it private communication, education, economy or science, information processing plays a central role. So far, electronic implementations of digital computation remain the only relevant information processing platform. In contrast, all-optical computing has inspired scientists for decades without achieving maturity. Still, expectations remain high. Too big is the potential gain in processing speed and parallelism or in energy efficiency. In our work, we demonstrate the implementation of ultra-fast neuro-inspired all-optical information processing [1]. A new, inherently parallel, neuro-inspired and attractively simple concept named Reservoir Computing (RC) allows for a fusion between machine learning and all-optical computation. The combination of both fields could prove the required push for all-optical computing to kick off.



In RC, the information to be processed is injected into a network of nonlinear nodes, inducing transient dynamical responses. The network is left unaltered and the output of the system, called classifier, is constructed from a linear weighted summation of the network's nonlinear nodes (Fig. 1 a). Injecting information, for which the answer is known, into the network allows to adjust the linear readout weights. It has been shown that in principle every mathematical transformation can be carried out by such a system.

In our experiment, we implemented the complex all-optical network using a semiconductor laser subject to delayed feedback. To that end, we employed our previously developed method utilizing the correspondence of delay and 1D-spatially extended systems (Fig.1 b). Information was injected optically at 5GSamples/s rates via an external injection laser. We evaluated the information-processing power of our system via standard benchmark tests. In the case of spoken digit recognition, our experiment outperformed every so-far reported technique, even machine-learning concepts implemented in digital electronic computers. We achieved nominal classification rates of 300'000 words/s, practically error-free. Also the speaker could be determined in parallel, based on the same induced transient response. Moreover, we were able to employ our system for a one-time-step prediction of a chaotic timeseries (Fig.1 c), exploiting the memory provided by the delayed feedback. Regardless of the noise present in the experiment, we achieved prediction errors smaller than 10%. The fast speed and good performance are promising for applications in ultra-fast control systems.

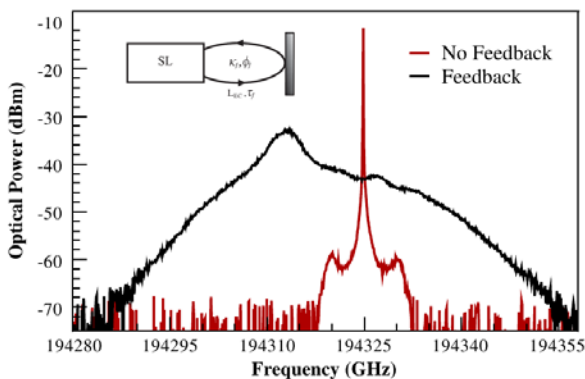
Due to the proof-of-concept nature of our system, parts of signal injection, training and readout rely on off-line methods based on classical computers. A complete hardware implemented version, however, should not face fundamental challenges and could, for instance, solve the spoken digit recognition task with less than 1% of the energy required by a standard desktop PC. The simplicity of our scheme could allow technological implementations in distributed networks and smart systems.

Complex Photonics: Dynamics and applications of delay-coupled semiconductor lasers

Reviews of Modern Physics 85, 421-470

Although considered a nuisance for a long time, the dynamical properties of semiconductor lasers due to delayed coupling now open interesting perspectives. In this article an overview is given of the properties of single and two delay-coupled lasers, as well as an extension to network motifs and small networks. A particular emphasis is put on emerging complex behaviors, deterministic chaos, synchronization phenomena, and application of these properties that range from encrypted communication and fast random bit sequence generators to bio-inspired information processing.

One particularity of semiconductor lasers is their extreme sensitivity to delayed optical feedback and optical coupling. In this article, a review is presented how this sensitivity, when first discovered, represented a nuisance. Starting from those first studies, semiconductor laser systems with delayed coupling have more and more been considered test-bed systems for the study of nonlinear dynamical systems with delayed coupling in general. During the past decade, the potential of delay-coupled semiconductor lasers and their complex emission properties have been discovered for conventional and novel applications, ranging from encrypted communication, sensing applications, and complex networks to photonic information processing.



Semiconductor lasers are extremely sensitive to optical feedback and optical coupling. As illustrated in the figure, the onset of instabilities in the emission of semiconductor lasers is linked to a dramatic bandwidth increase, i.e. a reduction in coherence length. Since the discovery of semiconductor lasers, these instabilities have fascinated scientists and have been employed successfully in a large number of practical applications, from chaos-based communications to random bit generation as well as bio-inspired information processing.

The developments described in this review article could contribute to the consolidation of a field we name 'complex photonics'. Complex photonics does not refer to how complicated and extended the technical implementations are. Instead, complex photonics targets the utilization of emerging behavior in networks and network motifs of (delay-) coupled nonlinear photonic systems. Here the term 'complexity' refers to the importance of such emerging behavior, comprising nonlinear dynamics, synchronization, and other complex phenomena that occur in networks. Altogether, the availability of high-quality telecommunication components, advances in technology, and the cross fertilization of photonics with other fields of science in which delay-coupled networks play a role, offer qualitatively new chances. A whole infrastructure of applications can be developed that might contribute to solving major issues in today's communication and IT systems, including privacy, computational efficiency, or power consumption. Ultimately, a new paradigm of functional complex photonics could emerge.

Conflict and Cooperation: Wars on editing Wikipedia articles

Physical Review Letters **110**: 088701 (2013)

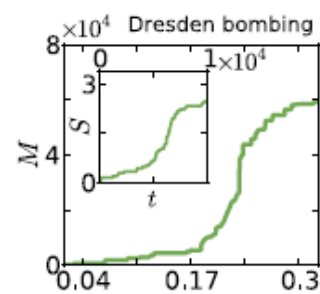
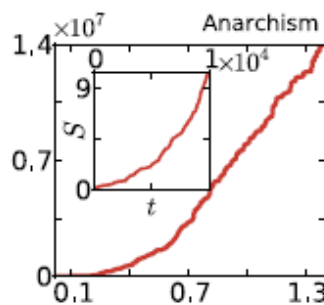


The process of conflict resolution in Wikipedia, an iconic, collaboratively edited encyclopedia, is described as the result of the competition between direct interactions among editors and their interactions with a globally shared medium, such as a Wikipedia article. Darwin himself wondered on the origin of the noble virtue of human cooperation being difficult to explain by natural selection. Today, information-communication technology has opened up unprecedented opportunities of solving complex tasks as a collective emergent phenomenon involving the cooperation of many individuals across the world. While this leads to a higher level of synergy, unavoidably conflicts of diverse opinions are generated, signalled in Wikipedia by an unusually high number of edits in an article.

Our model of how Wikipedia works reproduces key stylized features of conflict dynamics observed in real-world Wikipedia articles. For example, with a fixed number of editors forming one 'mainstream' and two opposing 'extremist' groups, consensus in the medium's content is only achieved after a long time and it may not correspond to the initial mainstream view. In the case of a dynamic environment where new editors replace older ones, periods of conflict and consensus can alternate indefinitely, depending on the rate of newcomers and the degree of controversy in the article's topic. The understanding of these mechanisms provided by our model opens the way for the improvement of the conditions for value production in collaborative environments.



Empirical controversy measure M as a function of the number of edits t for two different conflict scenarios in Wikipedia, corresponding to: (a) single conflict (Dresden bombing) (b) uninterrupted controversy (anarchism). Inset: Theoretical conflict measure $S(t)$ of the model



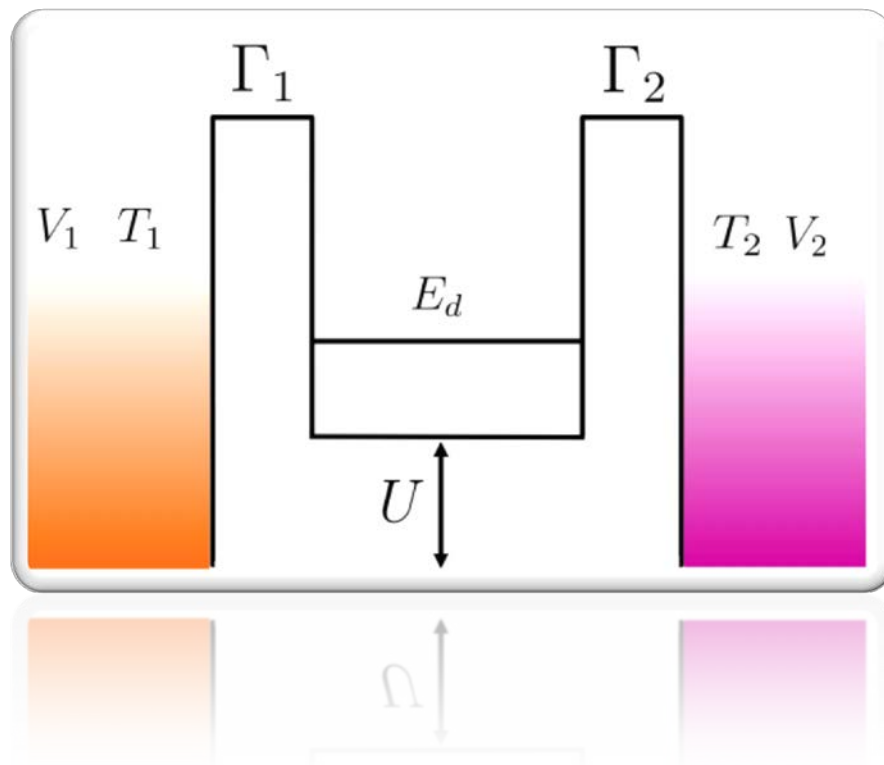
Scattering Theory of Nonlinear Thermoelectric Transport

Physical Review Letters 110, 026804(1-5)

Recent advances in nanoscale thermoelectric materials suggest not only major improvements over their existing macroscopic counterparts but also novel functionalities arising from the unique combination of quantum effects and strong confinement. However, most theoretical approaches have been limited to small applied fields. It is thus natural to explore the thermopower in quantum conductors beyond linear response using large thermal gradients.

We here formulate a scattering theory for phase-coherent transport in the presence of voltage and temperature differences. Our formalism is based on an expansion around the equilibrium state, allowing us to calculate the leading-order rectification terms both for voltage and temperature driven electric currents. Key to our approach is the determination of the non-equilibrium screening potential, which is crucial for a gauge-invariant nonlinear transport model. We find that while in the isothermal case interactions can be described with *particle injectivities*, in the isoelectric case charge pile-up in response to a pure thermal gradient is assessed with *entropic injectivities*.

To illustrate our model, we calculate the nonlinear thermoelectric response of a double-barrier quantum dot (see the Figure). Unlike the linear coefficient, which vanishes at zero temperature, the weakly nonlinear thermocurrent is finite at very low temperatures. Importantly, we find that the thermopower sensitivity includes spectroscopic information about the system's renormalized potential.



Lagrangian transport in a microtidal coastal area: the Bay of Palma, Mallorca Island, Spain

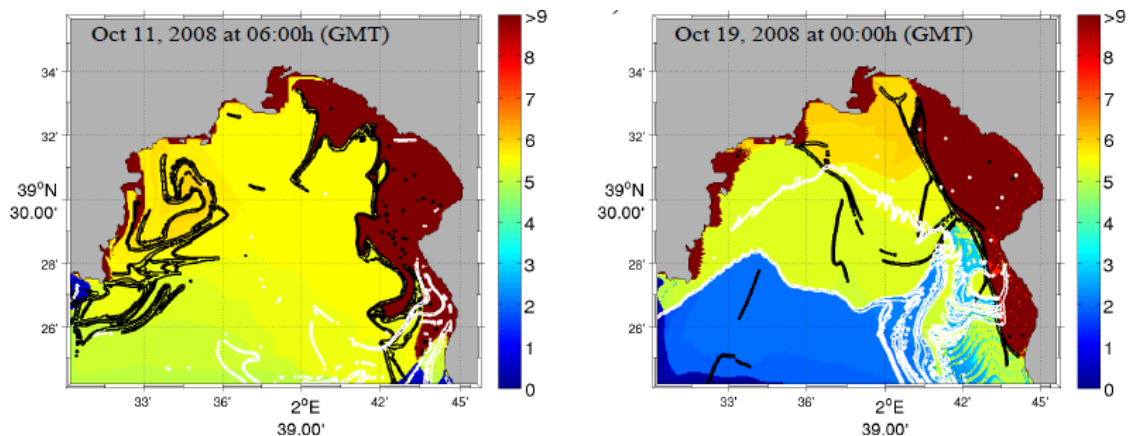
Nonlinear Processes in Geophysics 20, 921-933

Transport properties of ocean flows, such as dominant pathways, effective barriers to water flow, residence times, etc., are of major interest because of their economic and ecological importance. For example biogeochemical properties of water, and also physical ones such as temperature, are influenced by the intensity of mixing between fluid coming from different origins. Also, long residence times in semi-enclosed areas are usually associated to red tides and other biological extreme events.

The impact of fluid transport on water properties becomes stronger in the case of coastal flows, but this is also the most complex one, because of the influence of sea floor topography, coastline shape and of the direct driving at the surface by highly variable wind forcing.

Here we have analyzed the transport properties of water in the Bay of Palma, in Mallorca Island, by using velocity datasets obtained from the Regional Ocean Model System (ROMS) at a horizontal resolution of 300 m. We have identified wind forcing as the major driver of the fluid structures, and characterized the Bay flow at different seasons by means of residence times and Lyapunov lines which identify the major barriers to fluid transport.

As an example we show in the figure results for two different days in October for the surface layers of the sea. Brown-red colors indicate regions of the Bay of Palma in which water remains for 9 days or more, whereas green and blue tones identify regions with much faster interchanges. The black and white lines identify Lyapunov lines, clearly delimiting the different regions. Analysis of their motion provides important clues on how water in the different parts of the Bay move and mix.

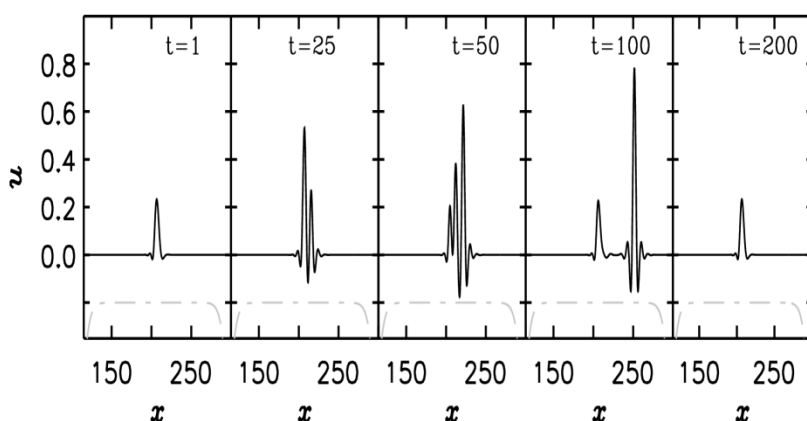


Dissipative soliton excitability induced by spatial inhomogeneities and drift

Physical Review Letters 110, 064103

In recent work we showed that localized structures (LS) (or dissipative solitons (DS)), localized elevations over a flat background, exhibit excitable behavior. In other words, a localized perturbation to a flat background that exceeds a certain threshold is able to recreate transiently a DS. While it has been highlighted that DS are potentially useful to store bits of information (1: elevation, 0: no elevation), in recent work we showed that one can build logical gates with excitable DS, that exhibit full logical functionality. Thus, one can use them to process information, not just to store it, a fact that is consistent with the known fact that neurons use excitability to process information. A drawback of this excitable regime is that it is not generic, as it requires an oscillatory instability regime of DS that has been only shown so far for Kerr media. In this work we show that a re-entry mechanism leading to excitability can be implemented by adding a defect and drift in a finite system. In this case, when a supra-threshold perturbation creates a DS on the defect, the drift pulls it out and drives it to the limits of the system, where the DS disappears and the system goes back to the original state. Thus, this mechanism makes excitability common place in systems displaying DS when a defect and drift are introduced. Moreover, we show that excitability appears through a number of different mechanism depending on the size of the defect and the intensity of the drift. The scenario has been analyzed in the case of the general Swift-Hohenberg Equation (SHE) in the regime where DS appear, and also tested for the Lugiato-Lefever equation, a commonly used model of nonlinear cavities. The SHE derives from a generalized potential, and a general principle states that such systems, also known as gradient, cannot exhibit temporal oscillations, and this speaks for the generality of the suggested mechanism, as exhibiting oscillations is a typical requirement for excitability.

The physical mechanism behind excitability in this new scheme is the competition between the defect, that induces pinning of the localized state, and the drift, that tries to pull away the localized state. This leads to different pinning-unpinning transitions, where unpinning is the equivalent of an oscillatory regime (a train of solitons or soliton tap), while pinning corresponds to a steady state (flat background). Excitability corresponds to the transient unpinning under the effect of a supra-threshold perturbation. Interestingly, there are several types of pinning-unpinning transitions, that lead to different excitability regimes, known in the field as Types I and II. Continuing the analogy with excitable neurons, the first corresponds to the ubiquitous integrator neurons (described in simple terms by the well known integrate and fire model), while Type II are resonator neurons, that respond only to a narrow band of excitation. In more technical terms, we have reported transitions involving a SNIC bifurcation (that leads to Type I excitability) and also both a subcritical and a supercritical Hopf bifurcations (that lead to Type II excitability). Fig. 1 shows an excitable excursion mediated by a subcritical Hopf bifurcation. The present work, that shows that a generic defect and drift mechanism leads to excitable of DS opens an avenue for possible applications of excitable DS



in to process information, as it allows its implementation for any system exhibiting static DS.

Fig. 1 One of the three possible excitable excursions of the fundamental solution is shown. It can be seen that a supra-threshold perturbation elicits a moving DS that at some point is absorbed by the boundary. In particular, the excitability mediated by a subcritical Hopf is shown.

Temporal Networks: Slowing Down Diffusion by Long Lasting Interactions

Phys. Rev. Lett. 111, 188701

The interactions between the elements of a system are ultimately responsible for the ability of complex systems to show coordinated activity patterns as synchronization or consensus. The specific form of interaction networks determines the critical properties of collective phenomena as the nature of transitions and critical points.

In many systems the interactions between the units that form a complex system occur in a specific sequence. For example, through phone calls we interact with our family, friends, or colleagues. The precise sequence in which we make calls determines the flow of information. If we talk first with Alicia and then with Luis, information can travel from Alicia to Luis, but never from Luis to Alicia. However, many works consider interaction networks that aggregate all interactions in a time window and therefore assuming that they are all accessible simultaneously. The question is whether dynamic processes develop substantially differently in aggregate complex networks than when considering specific sequences.

We have analyzed the implications of temporal sequences of interactions in diffusive processes. In particular we compare diffusive processes whose interactions are described by a sequence of links in contrast to interactions extracted from aggregate interactions in complex networks. The spectrum of the Laplacian informs us on the timescales of diffusive processes. Therefore we compare the first non-zero eigenvalue of the Laplacian matrix of temporal networks compared to the corresponding aggregated complex network. First, we show that the spectrum of the ensemble average of a temporal network has identical eigenmodes but with smaller eigenvalues than the corresponding aggregate network. In large networks, the expected temporal dynamics is a time-rescaled version of the aggregate dynamics. Even for single sequential realizations, diffusion is slower in temporal networks. Finally we show that the discrepancies between individual realizations and averages are due to the noncommutability of interactions.

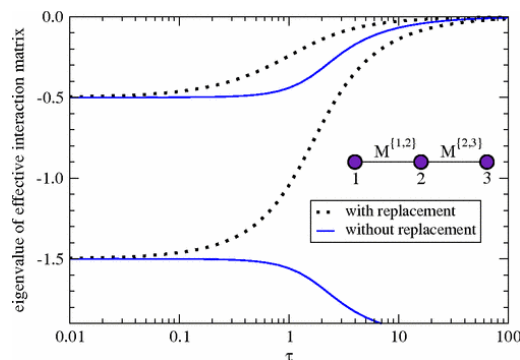


Figure. Dependence of the spectrum of interaction matrices on the temporal duration τ of a link: we show two non-zero eigenvalues of a network with three nodes connecting by two links. Dotted curve: temporal sequence with link replacement; solid line: random sequence without link replacement

2

PERSONNEL

2.1 PERMANENT SCIENTIFIC STAFF

MONTERRAT CASAS	University Full Professor UIB (passed away March 30)
PERE COLET	CSIC Research Professor
VÍCTOR M. EGUÍLUZ	CSIC Tenured Scientist
INGO FISCHER	CSIC Research Professor
DAMIÀ GOMILA	CSIC Tenured Scientist
EMILIO HDEZ.-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
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 2013.

	Montserrat Casas	Pere Colet	Damià Gomila	Ingo Fischer	Emilio Hernández-García	Cristóbal López	Rosa López	Victor M. Eguluz	Manuel Matias	Claudio Mirasso	David Sánchez	Maxi San Miguel	Llorenç Serra	Tomàs Sintes	Raül Toral	Roberta Zambrini
Complex Systems. Nonlinear and Statistical Physics	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Quantum Physics: Photons, Electrons and Information	X		X				X				X		X			X
Non Linear Optics and Dynamics of Optoelectronic Devices		X	X	X						X						X
Fluid Dynamics, Biofluids and Geophysical Fluids					X	X								X		
Biological Physics and Nonlinear Phenomena in Ecology and Physiology				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

Marie Curie Contract

JUAN JOSÉ CERDÀ

UIB lecturer

MARINA DIAKONOVA

Postdoctoral Contract Project FISICOS

FERNANDO GALVE CONDE

JAE-CSIC Postdoctoral Contract

THOMAS JÜNGLING

Postdoctoral Contract Project
FISICOS

HIDEYUKI KATO

Japanese Government
Fellowship

ERNESTO M. NICOLA

JAE-CSIC Postdoctoral Contract

MAXIME LENORMAND

Postdoctoral Contract Project
EUNOIA

JONG SOO LIM

Postdoctoral Contract Consolider CPAN

DANIEL A. LÜSEBRINK

Postdoctoral Contract Project FISICOS

ANTONIO PÉREZ

Postdoctoral Contract Project MODASS

JOSÉ JAVIER RAMASCO

Ramon y Cajal Postdoctoral Contract

VINCENT ROSSI

Postdoctoral Contract Project ESCOLA

MIGUEL C. SORIANO

UIB lecturer

PAULA TUZÓN

Postdoctoral Contract Project
FISICOS

RUGGERO VASILE

Postdoctoral Contract Project
FISICOS

DANIELE VILONE

Postdoctoral Contract Project
FISICOS

JORDI ZAMORA MUNT

Postdoctoral Contract Project
FISICOS

2.4 PHD STUDENTS

MARIA ISABEL ALOMAR	UIB Assistant Professor
JOÃO BETTENCOURT	FCT Fellowship, Portugal
JULIAN BUENO MORAGUES	FPI Fellowship Project TRIPHOP
BRUNO CAMPANELLI	Contract Project TREE
ADRIÁN CARRO PATIÑO	UIB Fellowship
MIGUEL A. ESCALONA-MORÁN	Fellowship Project
PHOCUS JUAN FERNÁNDEZ GRACIA	Govern Balear Fellowship
LUIS FERNÁNDEZ LAFUERZA	JAE-CSIC Fellowship
PABLO FLEURQUIN	Fellowship European Project COMPLEXWORLD
GERARDO GÓMEZ	FPI Fellowship, EVOCOG group
PRZEMYSŁAW GRABOWICZ	JAE CSIC Fellowship
ISMAEL HERNÁNDEZ	FPI Fellowship Project FISICOS
KONSTANTIN HICKE	Govern Balear Fellowship
GONZALO MANZANO PAULE	Fellowship Project FISICOS
JADE MARTÍNEZ	Govern Balear Fellowship
RICARDO MARTÍNEZ	JAE-CSIC Fellowship
FERNANDA MATIAS	CNPQ Brasil Fellowship
NEUS OLIVER	JAE-CSIC Fellowship
JAVIER OSCA COTARELO	UIB Fellowship
PEDRO JOSÉ PARRA RIVAS	PIE-CSIC + FISICOS Project
XAVIER PORTE PARERA	FPI Fellowship Project DECODICA VÍCTOR M.
RODRÍGUEZ	Contract European LINC Project
MARIE R. POPIEL	UIB Collaboration Fellowship
ENRICO SER GIACOMI	Contract European LINC Project

2.5 TECHNICAL AND ADMINISTRATIVE SUPPORT

INMA CARBONELL	Administration Unit Head
DANIEL PALOU VAN ENGELEN	Lab Technician
DAVID DE LA MONTAÑA GUTIÉRREZ	Computing Lab Technician
MARTA OZONAS	Secretary
ROSA CAMPOMAR	Outreach
RUBÉN TOLOSA	Computing Lab Technician
MARIA ANTÒNIA TUGORES PONS	GridCSIC Technician
NEUS VERDERA	Secretary replacement



2.6 VISITORS

LONG-TERM VISITORS (more than one month)

JAMES GUNTON	Lehigh University, Bethlehem, Pennsylvania, USA. April – May
BRUNO GONÇALVES	Centre de Physique Théorique, Campus de Luminy, Aix-Marseille Université, France. September
SUN-YONG HWANG	Pohang University of Science and Technology, Korea. April – June
CARLOS M. FERNÁNDEZ KONSTANTIN KLEMM	Universidad Autónoma de Madrid, Spain. June Bioinformatics, Institute of Computer Science, Leipzig University, Germany. February – May, October
SABRINA MANISCALCO ANGEL PLASTINO	Heriot-Watt University, Edinburgh, UK. June Universidad Nacional de La Plata, Argentina, July
FEDERICO VÁZQUEZ	CONICET, La Plata, Argentina. September- October



SHORT-TERM VISITORS
 (Less than one month)

ANNA CHMIEL	Faculty of Physics, Warsaw University of Technology, Poland. January
PENÉLOPE HERNÁNDEZ	Universidad de Valencia, Spain. January
GONZALO ORCINA	Universidad de Valencia, Spain. January
LUIS L. BONILLA	Universidad Carlos III, Madrid, Spain. January
CHARLES N. DE SANTANA	IMEDEA (CSIC-UIB) and LINC Global. Spain. February
ROBERT WHITNEY	CNRS, Grenoble, France. February
S. DHARMAPURI	Humboldt, Berlin, Germany. February
CHRISTIAN V. DEN BROECK	Universiteit Hasselt, Diepenbeek, Belgium. March and November
PASCAL SIMON	Universidad Paris Sud, France. March
RAMÓN AGUADO	Instituto de Materiales de Madrid, Spain. March
HYADÉE LUGO	Dept. Fundamentos de Análisis Económico, UCM, Spain. March
YICHAO ZHANG	LMAH, University of Normandy, Le Havre, France. March
STEPHAN LEHNER	Institute of Air Transportation Systems, German Aerospace Center (DRL), Hamburg, Germany. April
ALESSANDRO VESPIGNANI	Northeastern University, Boston, USA. May
LUCAS LAMATA	Universidad del País Vasco, Spain. May
SERGIO ALONSO	Physikalisch-Technische Bundesanstalt, Berlin, Germany. May
RUEDI STOOP	Institute of Neuroinformatics, Universität Zurich, Germany. May
JUSTIN CALABRESE	Conservation Ecology Center, Smithsonian Conservation Biology Institute, USA. June
LENDERT GELENS	Vrije Universiteit, Brussels, Belgium. June
THOMAS LOUAIL	CEA Saclay, Paris, France. July
JAN DANCKAERT	Max Planck Institute, Brussels, Belgium. July
ERNEST MONTBRIÓ	Universitat Pompeu Fabra, Barcelona, Spain July
MATTEO BRUNELLI	Queen's University Belfast. UK. July
JUAN M. LÓPEZ	Instituto de Física de Cantabria (CSIC-UC), Santander, Spain. September
DIEGO PAZÓ	Instituto de Física de Cantabria (CSIC-UC), Santander, Spain. September
FRANCESCO PLASTINA	Università della Calabria, Cosenza, Italy. September
JUAN M. PARRONDO	Universidad Complutense, Madrid, Spain. September
HENRY D.I. ABARBANEL	University of California San Diego, USA. September
MARC SANTOLINI	Laboratoire de Physique Statistique, Ecole Normale Supérieure, Paris, France. October
DAAN LENSTRA	Cobra Research Institute, Eindhoven University of Technology. The Netherlands. October
TOMASZ CZYSZANOWSKI	Institute of Physics, Technical University of Lodz, Poland. December
RUBÉN REQUEJO	Statistical Physics Group, Universitat Autònoma de Barcelona, Spain. December
THOMAS ERNEUX	Optique Nonlineaire Theorique, Université Libre de Bruxelles. Belgium. December

2 PERSONNEL

2.7 MASTER AND COLLABORATION STUDENTS

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

VICENTE ARJONA
ORIOL ARTIME
FRANCESS BONNÍN
ANTONIO FERNÁNDEZ
DIMITRA GEORGOPOULOU
DIOGENIS KIZIRIDIS
RAIMON LUNA
DANIEL MAJORAL
CLARA MIRALLES
CLARA MURGUI
IRENE RECUERDA
ALEJANDRO RODRÍGUEZ
JORGE P. RODRÍGUEZ
DANIEL RUIZ
MIGUEL A. SIERRA
JUAN SITGES
EILEEN OTTE
ANNIKA UPHOFF



2.8 IN MEMORIAM

Montse Casas (1955-2013)

On March 30, 2013, our colleague Prof. Montse Casas passed. Prof. Casas was member of IFISC since its creation, and also Rector of the University of the Balearic Islands in the period 2007-2013.

In 1977, Prof. Casas graduated in Physics from the Autonomous University of Barcelona (UAB), where she also obtained the PhD degree in 1981. After stays and positions in the Centre d'Études Nucleaires de Saclay and in the UAB, she became Associate Professor in the University of the Balearic Islands (UIB) in 1985, and Full Professor in 1994.

During the earlier stages of her career her research focused in experimental studies of cosmic radiation and environmental radioactivity. Later she developed theoretical studies on nuclear structure and in many-body quantum systems such as Helium-3 and -4, and metallic aggregates. After 1992 she became increasingly devoted to information theory, both from a classical and quantum perspective, and quantum entanglement problems.

More than 200 papers collect the scientific insights of Prof. Casas. IFISC researchers are proud to have had her as member of the Institute, but we will also remember Montse by her humanity and friendship.



Montse Casas in memoriam: Fisher information, supersymmetry and variable mass July 19, 2013



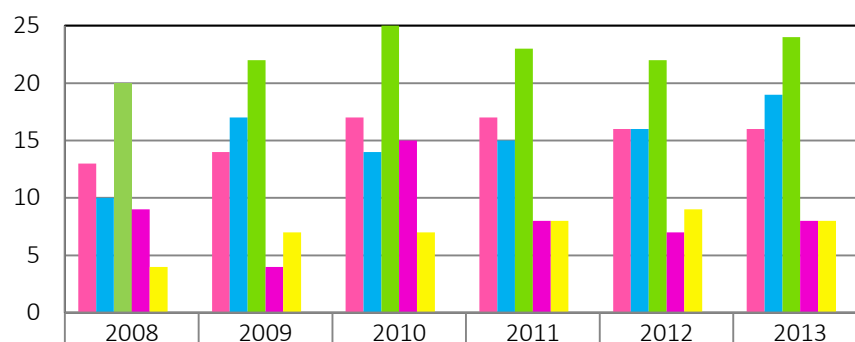
As a tribute to the memorie of Prof. Casas a scientific Colloquium was organized on July 19. The speaker was Prof. Angel Plastino, from Universidad de La Plata, Argentina, who was a close collaborator of Montse for more than 20 years, collaboration that has yielded around 90 papers. The title of the conference was *Montse Casas in memoriam: Fisher information, supersymmetry and variable mass*. After that conference, IFISC Seminar Room is named *Montse Casas' Seminar Room*.

2.9 SUMMARY OF IFISC HUMAN RESOURCES

HUMAN RESOURCES IFISC 2013

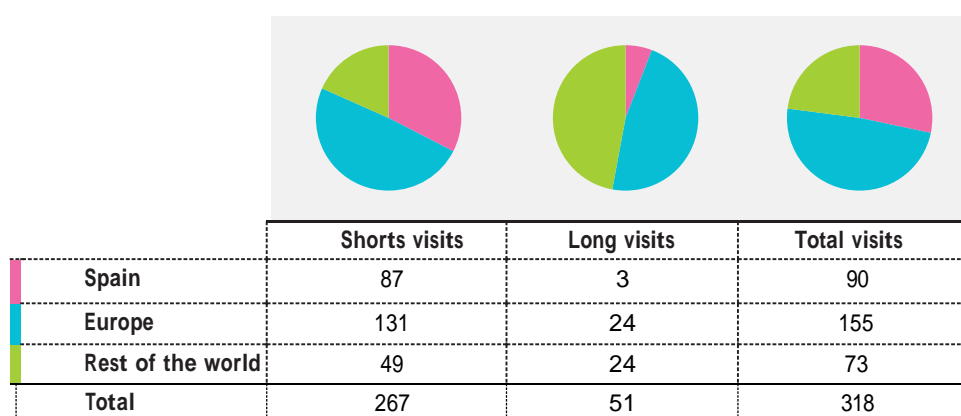
	Total	Male	Female
Permanent staff	16	13	3
Associated staff	1	1	0
Postdoctoral fellows	18	16	2
PhD students	24	19	5
Long-term visitors	8	7	1
Support personnel	8	3	5
Total	75	59	16

PERSONNEL IFISC 2008-2013



PERMANENT STAFF	13	14	17	17	16	16
POSTDOCTORAL AND ASSOCIATED	10	17	14	15	16	19
PHD STUDENTS	20	22	25	23	22	24
LONG TERM VISITORS	9	4	15	8	7	8
SUPPORT PERSONNEL	4	7	7	8	9	8
TOTAL	56	64	78	71	70	75

VISITING SCIENTISTS AT IFISC 2008-2013



3

RESEARCH PROJECTS AND FUNDING

DURING 2013 IFISC HAS RECEIVED FUNDING VIA THE ACTIVE RESEARCH PROJECTS LISTED BELOW. IN BRIEF:

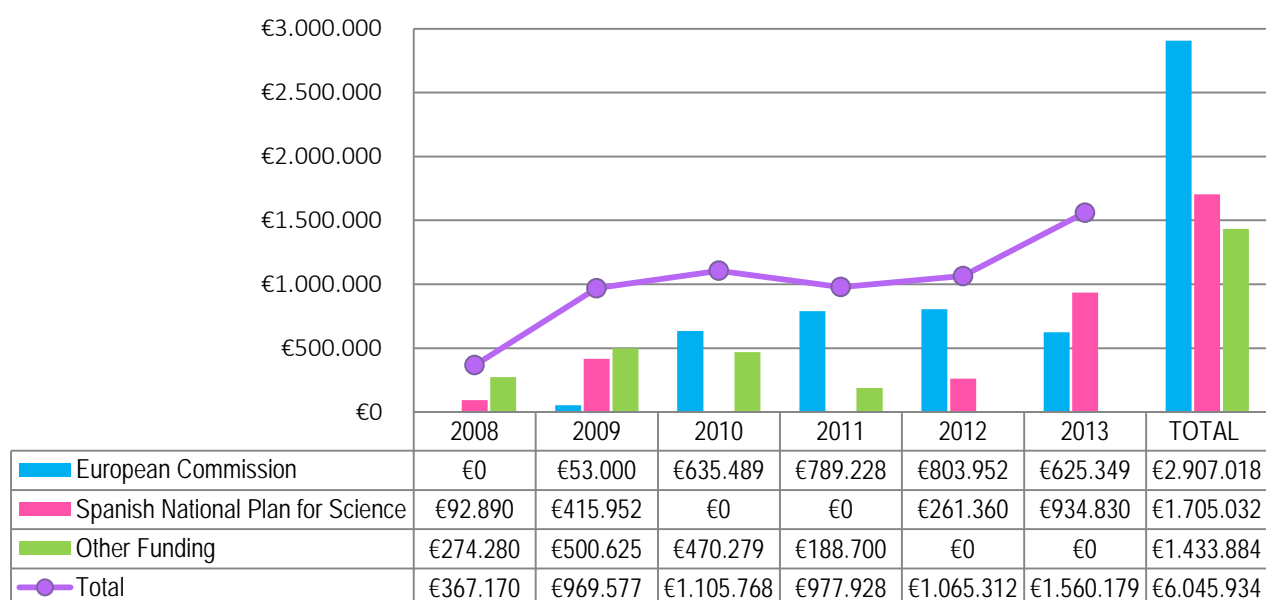
- European Commission Framework Program projects: **9**
- Spanish National Plan: **6**
- Regional Balear Government: **3**

SUMMING UP THE BUDGET OF THE ACTIVE PROJECTS IN 2013 WE GET:

- Grand total budget of active projects in 2013: **3.486.719 €**
- Grand total budget of European Commission active projects in 2013: **2.218.529 €**
- Budget of EC-funded active projects in 2013: **63,63 %** of total

BUDGET FIGURES FOR THE PERIOD 2008-2013 ARE SUMMARIZED IN THIS TABLE (WITH BUDGET OF A PROJECT ASSIGNED TO THE YEAR IT IS GRANTED):

BUDGET IFISC'S RESEARCH PROJECTS 2008-2013 (IN €)



3.1 RESEARCH PROJECTS FUNDED BY THE EUROPEAN COMMISSION

TREE	Data-driven modelling of network-wide extension of the Tree of Reactionary delays in ECAC area. European Commission 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. Code: 611307. European Union. STREP Project. IFISC Principal Investigator: José J. Ramasco. (2013-2016). Total Budget UIB and CSIC: 355.350 €
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 €
NANOCTM	Nanoelectronics concepts. Theory and modelling. [234970] Marie Curie Initial Training Network (ITN). Principal Investigator: Colin Lambert from Lancaster University, UK. IFISC Participating Scientists: David Sánchez y Rosa López. (2010-2013)
NOVALIS	A novel architecture for a photonics liquid state machine. [275840] Marie Curie Intra-European Fellowships for career development. European Commission. Principal Investigator: Daniel Brunner. (2011-2013) Budget: 167.066 €
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 €
EUNOIA	Evolutionary user-centric networks for intraurban accessibility. [Number 318367- STREP]. Principal investigator and European Coordinator: Maxi San Miguel. (2012-2014). UIB Budget: 452.581 € CSIC Budget: 41.177 €
KNOWeSCAPE	Analyzing the dynamics of information and knowledge landscapes. COST ACTION TD1210. European coordinator: Andreas Schamhorst. IFISC coordinator: Maxi San Miguel. (2012-2017).
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 €

3.2 RESEARCH PROJECTS OF THE SPANISH NATIONAL PLAN FOR SCIENCE

FISICOS	Física interdisciplinar y de sistemas complejos. [FIS2007-60327] Principal Investigator: Maxi San Miguel. Deputy Principal Investigator: Raúl Toral. (2007-2013) Budget: 1.318.900 €
TIQS	Transport and information in quantum systems. [FIS2011-23526]. Principal investigator: Llorenç Serra. (2012-2014). Budget: 183.920 €
MODASS	Modeling and analysis of social systems. [FIS2011-24785]. Principal investigator: Víctor M. Eguíluz. (2012-2014) 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 €

3.3 OTHER IFISC RESEARCH PROJECT

PIEModelizació	Modelización computacional en sistemas complejos. [201050E119] Proyecto Intramural Especial. CSIC. Principal Investigator: Pere Colet. (2010-2013)
-----------------------	---

3.4 RESEARCH PROJECTS WITH PARTICIPATION OF IFISC MEMBERS

RiaFormosaFCT

Genética paisajística duma lagoa costeira: una abordagem empírica e de modelação usanda a erva marinha zostera nolti in ria Formosa.

[PTDC/MAR/099887/200] Projecto de Investigaçao Cientifica e Desenvolvimento Tecnologico. Fundação para a Ciencia e a Tecnologia (FCT Portugal). Coordinator: Filipe Alberto. IFISC Participating Scientists: Emilio Hernández-García and Víctor M. Eguíluz. (2010-2013)

3.5 OTHER FUNDING

GrupCompetitiu FESC

Grupo de Física Experimental de sistemas complejos. Govern Balear.. Principal Investigator: Ingo Fischer. (2011-2014) Budget:36.000 €.

GrupCompetitiu GFI

Grupo de Física interdisciplinar. Govern Balear. Principal Investigator: Maxi San Miguel (2011-2014) Budget: 36.000 €.

FISICOSPT

Project Technician. [PTAT2008-00895].Spanish Government. Principal Investigator: Maxi San Miguel (2008-2013). Budget: MICINN: 78.000 €and Balear Government: 29.400 €

3

RESEARCH PROJECTS AND FUNDING

4

IFISC SEMINARS

Coordinators:

Rosa López and Manuel Matías

DURING 2013 A TOTAL OF **64** SEMINARS HAVE BEEN GIVEN AT IFISC, INCLUDING THE COLLOQUIUM:

19-07-2013

MONTSE CASAS IN MEMORIAM: FISHER INFORMATION, SUPERSYMMETRY AND VARIABLE MASS

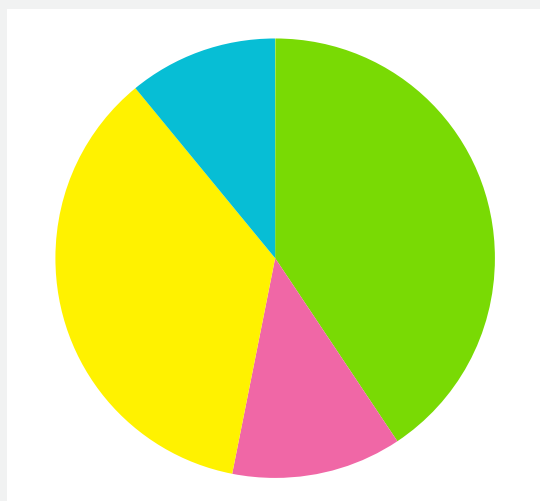
Angel Plastino, Universidad Nacional La Plata, Argentina

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 2013 and for the previous years:

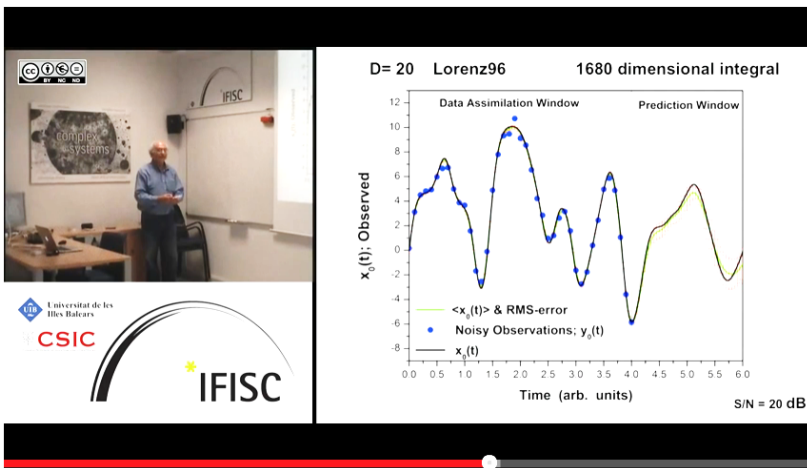
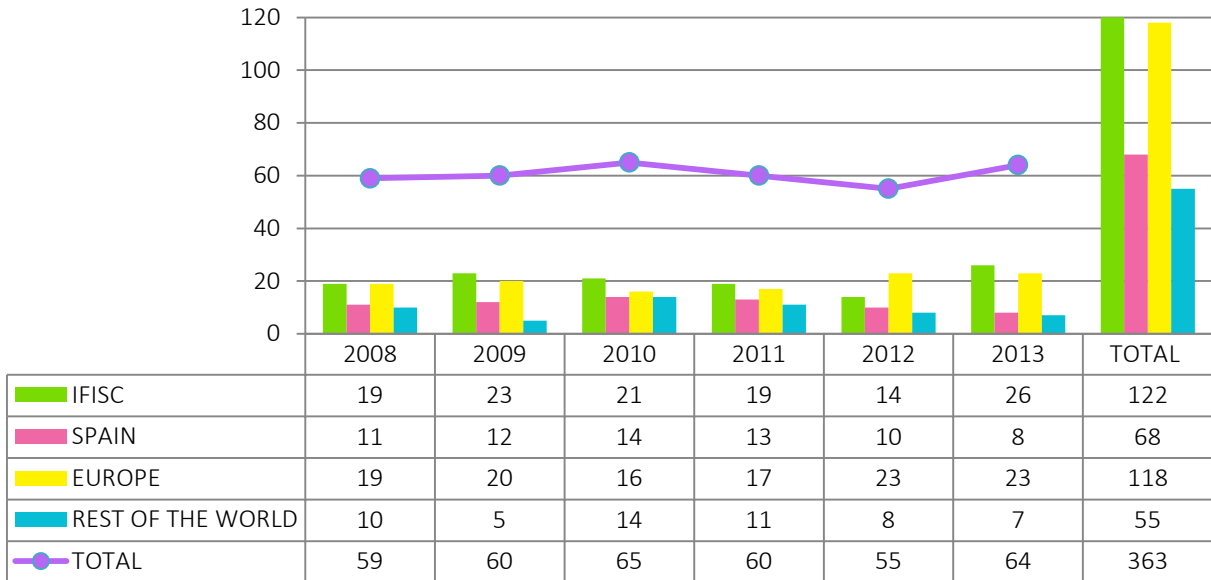
IFISC SEMINARS 2013



IFISC: 26
Spain: 8
Europe: 23
Rest of the World: 7

TOTAL: 64

IFISC SEMINARS 2008-2013



Seminars

[Seminar's list](#) Sizes: [Small](#) - [Large](#) - [Huge](#)

By James D. Gunton, Lehigh University, Bethlehem (PA), USA on 2013-04-17 14:30:00

[Some topics in self-assembling systems](#)

Janus Particles

Pierre de Gennes in his Nobel acceptance speech proposed studying Janus particles. Some clever chemists eventually accepted the challenge!

- Two faced colloidal particles
- Can be made in various shapes, patch sizes, etc.
- Hydrophobic/Hydrophilic, charged/uncharged
- magnetic

http://nylenmitch.files.wordpress.com/2011/02/1_-_documents-and-settings_jkm194_local-settings_application-data_mozilla_firefox_profiles_3hy2ho3.jpg

5

PUBLICATIONS

IFISC RESEARCH RESULTS HAVE ORIGINATED THE FOLLOWING PUBLICATIONS DURING 2013:

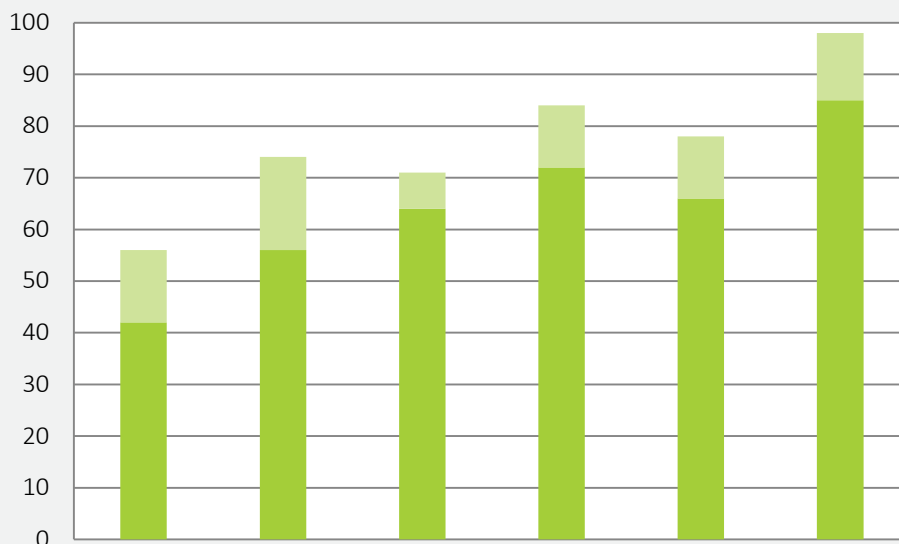
- Papers in journals indexed in the Journal Citation Reports: **85**
- Papers in other journals: **3**
- Book chapters: **7**

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 compromise 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 2007-2013 IFISC has published 1 paper in Reviews of Modern Physics, 2 papers in Science, 7 papers in PNAS, and 33 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 2008-2013



	2008	2009	2010	2011	2012	2013	TOTAL
JCR Journals	42	56	64	72	66	85	385
Other Publications	14	18	7	12	12	13	76
TOTAL	56	74	71	84	78	98	461

JOURNALS WITH THE LARGEST NUMBER OF PUBLICATIONS

<i>IFISC PUBLICATIONS</i>	<i>2008</i>	<i>2009</i>	<i>2010</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>TOTAL</i>
<i>Physical Review E</i>	9	4	5	11	11	9	49
<i>Physical Review A</i>	5	7	4	4	3	5	28
<i>Physical Review Letters</i>	3	2	4	6	4	8	27
<i>Physical Review B</i>	1	2	5	5	2	8	23
<i>European Physical Journal</i>	1	7	5	2	6	2	23
<i>IEEE</i>	1	4	4	4	1	4	18
<i>Physica A</i>	0	1	3	3	3	2	12
<i>Europhysics Letters</i>	1	1	2	2	2	2	10
<i>Non-Physics Journals (excluding IEEE Journals)</i>	8	12	12	16	15	19	82

6

CONFERENCES AND WORKSHOPS

6

CONFERENCES AND WORKSHOPS



THEfoDA meeting. Son Bernadinet, Mallorca, Spain



EUNOIA meeting, Brussels, Belgium

6.1 IFISC WORKSHOPS

** The names of the workshops are linked to the website.*

IWSOS 2013:
7th International
Workshop on
Self-organizing
systems

MAY 09-10
IN UIB CAMPUS, PALMA DE MALLORCA, SPAIN.
SCIENTIFIC ORGANIZERS: MAXI SAN MIGUEL, HERMANN DE MEER,
PERE COLET.

This edition aims to be highly multidisciplinary and innovative on its focus and format. Its novelties will be introduced in the coming weeks through this website, which will progressively updated with the relevant scientific and practical information.

THEfoDA:
Theory and
mechanisms of
social
interactions in
the big data era

MAY 06-08
IN SON BERNADINET, MALLORCA, SPAIN.
SCIENTIFIC ORGANIZERS: ANXO SANCHEZ (UC3M).
LOCAL ORGANIZERS: MAXI SAN MIGUEL (IFISC).

This meeting is intended to discuss whether and how the theoretical approach to the mechanisms at work in social contexts can inform and benefit from the availability of big data, and to explore new directions in which theory can guide data mining in order to obtain new insights that can lead to breakthroughs in the social sciences. Especially important questions in this regard touch upon the modeling of incentives, trust, emotions, meaning... To advance in understanding and promoting the interaction of theory and big data, leading experts from different fields and backgrounds will meet for a two-day intensive workshop to share their ideas on these issues.

EUNOIA:
Workshop on
Urban
Development and
Global Systems
Science

FEBRUARY 13-14
IN BRUSSELS, BELGIUM
SCIENTIFIC ORGANIZERS: MAXI SAN MIGUEL AND JOSÉ RAMASCO (IFISC).

The workshop consists in a series of round table discussions on specific topics. Each round table will start with one or two 5 min framework presentations by the participants that will act as discussion leaders for this round table. The presentations are aimed only to provide the relevant list of questions to be discussed and ignite the subsequent debate.

6.2 SCHOOLS

Third Summer School on Statistical Physics of Complex and Small Systems

SEPTEMBER 02-13

IN IFISC, CAMPUS UNIVERSITY OF THE BALEARIC ISLANDS, PALMA DE MALLORCA, SPAIN. SCIENTIFIC ORGANIZERS: J.M.PARRONDO, P. COLET, J. GÓMEZ-GARDENES, J.A. WHITE, A. CORRAL AND M.A. RODRÍGUEZ.

While the traditional basic body of knowledge of Statistical Physics is well described in textbooks and typically at an undergraduate or master level, the applications to Complex and Small Systems are well beyond the scope of those textbooks. The Summer School on these topics aims at bridging the gap between the master level and the necessities of PhD students and young postdocs working on these fields.

Lecturers:

- Horacio Wio, Instituto de Física de Cantabria (CSIC-UC), Spain.
- C. van den Broeck, Universiteit Hasselt, Belgium.
- Christoph Dellago, University of Vienna, Austria.
- Rodolfo Cuerno, Universidad Carlos III de Madrid, Spain.
- Susanna Manrubia, Centro de Astrobiología (INTA-CSIC), Spain.
- Antonio Politi, University of Aberdeen, United Kingdom.
- Roger Guimerà, Universitat Rovira i Virgili, Spain



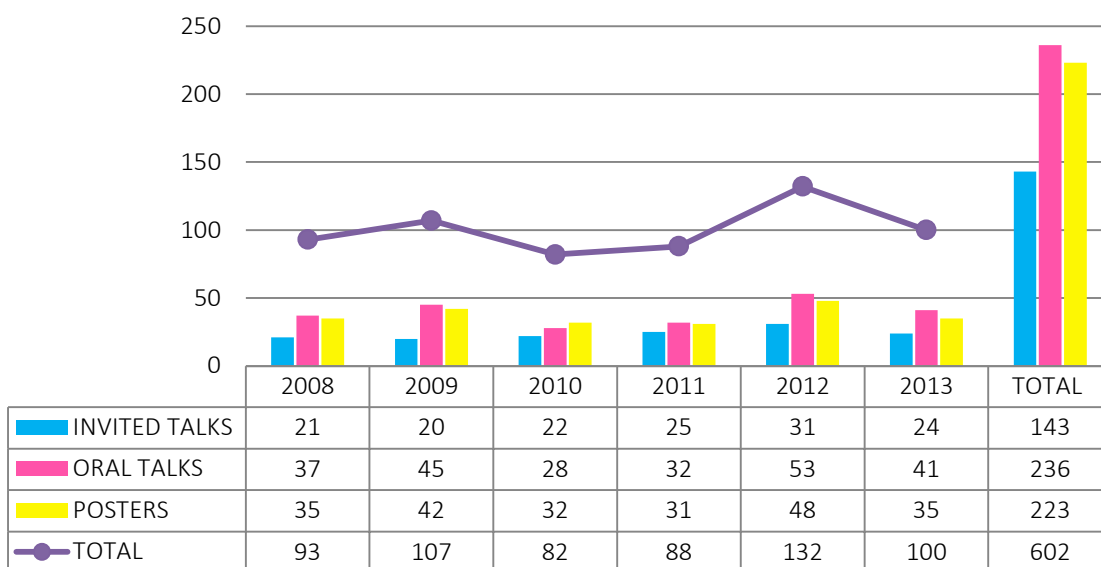
Third Summer School on Statistical Physics of Complex and Small Systems

6.3 COMMUNICATIONS TO SCIENTIFIC CONFERENCES 2013

- Invited talks: **24**
- Oral Communications: **41**
- Posters: **35**
- Total: **100**

They are listed in the Appendix of this Report.

CONFERENCES AND WORKSHOPS 2008-2013



6.4 SCIENTIFIC COMMITTEES AND ORGANIZATION OF CONFERENCES AND WORKSHOPS

San Miguel, M; Ramasco, JJ
 Organization of the Forum on Urban Development and Global System Science, Brussels, Belgium.
 February 13 - 14

San Miguel, M.
 Organizer of the workshop Theory and mechanisms of social interactions in the big data era, Mallorca, Spain.
 May 6 - 8

Colet, P.; San Miguel M.
 Organization of the 7th International Workshop on Self-Organizing Systems, IWSOS 2013, Palma de Mallorca, Spain.
 May 9 - 10

Hernandez-Garcia, E.
 Convener of the session "Complex networks in climate dynamics" in Dynamics Days Europe 2013, Madrid, Spain.
 June 7

Hernandez-Garcia, E.
 Member of the scientific committee "Física de los Sistemas Complejos". XXXIV Reunión Bienal de la Real Sociedad Española de Física, Valencia, Spain.
 July 17 - 18

Colet, Pere
 Organizer of the Third Gefenol Summer School on Physics of Complex and Small System, Palma de Mallorca, Spain.
 September 2 – 13

Ramasco, JJ; Garcia-Cantu O; Serret, A
 Urbannet'13. Satellite workshop of the ECCS 2013 organized in Barcelona, Spain.
 September 18

San Miguel, Maxi
 Organizer of Satellite meeting of ECCS 13. European Conference on Complex Systems, Global Computing for our Complex Connect World. Barcelona, Spain.
 September 19

Fischer, I.
 Local Organizer of the workshop Experimental Reservoir Computing, Besancon, France.
 October 14 – 15

Ramasco, JJ
 Member of the scientific committee of Net-works.
 December 13

Toral, R.
 Scientific Committee of FisEs, Congreso de Física Estadística
 2011-2015

7

OTHER ACTIVITIES

7.1 MASTER THESIS

Fleurquin, Pablo
Systemic delay propagation in transportation networks
Supervisors: Ramasco, J.J. and Eguíluz, Víctor M.
March 22

Bueno, Julián
Semiconductor laser dynamics under polarized rotated optical delay feedback and frequency detuning
Supervisors: Mirasso, Claudio R.; Soriano, Miguel C.
September 6

Hernández Nicolau, Javier
Spin thermoelectric effects in Resonant Tunnelling Diodes
Supervisor Sánchez, David
September 26

Oscá, Javier
Majorana zero modes in smooth 1d junctions and cylindrical nanowires
Supervisors Serra, Llorenç and Lopez, Rosa
December 14

7.2 PHD THESIS

Hernández Carrasco, Ismael
Horizontal Transport and Mixing and their connection with Dynamical and Biological Processes in the Ocean.
Supervisors: López, Cristóbal and Hernández-García, Emilio
May 28

7.3 AWARDS

Martinez-Garcia, Ricardo.
Award Santander-UIB to the best PhD students at UIB.
September 25

7.4 MEMBERS OF EDITORIAL BOARD OF SCIENTIFIC JOURNALS**Guest Editor for Philosophical Transactions of the Royal Society A 371.**

Special Issue Title: Dynamics, control and information in delay-coupled systems.
Fischer, I.

Guest Editors for Nonlinear Processes in Geophysics

Special Issue 147. Title: Nonlinear dynamics in oceanic and atmospheric flows: theory and observations.

Hernández-García, E. and López, C.

Subdirector de la Revista Española de Física.

Hernandez-Garcia, E.

Member of the Editorial Advisory Board of the journal Ecological Complexity.

Hernandez-Garcia, E.

Member of the the Editorial Board of EPJ Data Science.

San Miguel, M.

Member of the editorial board of Frontiers in Physics.

Ramasco, JJ

Member of the editorial board of PLoS ONE.

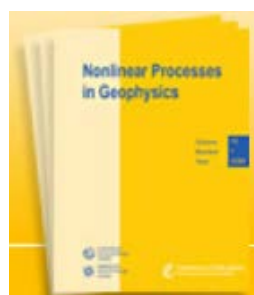
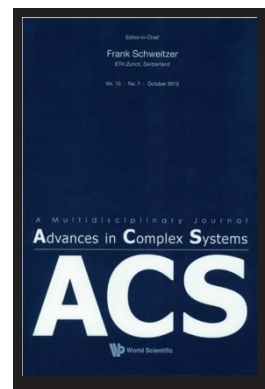
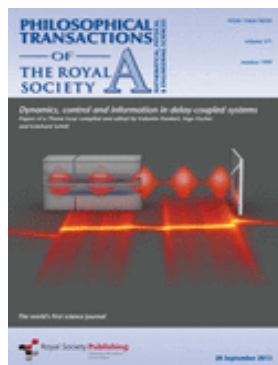
Ramasco, JJ

Member of the editorial board for Nature Scientific Reports.

Ramasco, JJ

Associate Editor of Advances in Complex Systems.

Eguíluz, Víctor M.



7.5 RESEARCH STAYS IN OTHER CENTERS

Nano-photonics group, Basel University, Switzerland.

Brunner, Daniel
October 9 - 11

Institut für Physik, Humboldt Universität, Berlin, Germany.

Hernandez-Garcia, E.
November 21

Utrecht University, Germany.

Ser-Giacomi, Enrico.
October 1 to November 1

University of Würzburg Würzburg, Germany.

Group of Prof. Wolfgang Kinzel.
Jüngling, Thomas
December 9 - 20

Laboratory of Computational Neuroscience, École polytechnique fédérale de Lausanne, Switzerland.

Matias, Fernanda
January 21 - 25

Institute of Physics, Humboldt University at Berlin, Berlin, Germany.

Matias, Manuel A.
June 24 - 30

Vrije Universiteit Brussel, Belgium.

Matias, Manuel A.
July 12 - 16

Technische Universität Darmstadt, Germany.

Semiconductors optics group of Prof. Wolfgang Elsaesser. FPI Program.
Porte, Xavier
July 2 to September 30

Kavli Institute for Theoretical Physics. University of California, Santa Barbara., USA.

Participation in a Research Program of Spintronics: Progress in Theory, Materials, and Devices.
Sanchez, David
September 27 to November 29

Applied Quantum Mechanics group - Dipartimento di Fisica dell'Università degli Studi di Milano, Italy.

Zambrini, Roberta
June 26 - 28

Universty of Calabria, Arcavacata, Italy.

Zambrini, Roberta
December 2 - 6

7. 6 POSTGRADUATE COURSES

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 2013-2014 Master syllabus:

Structural module courses:

Complex networks (3 credits)	V. M. Eguíluz Cooperative and
critical phenomena (5 credits)	M. San Miguel, T. Sintes
Dynamical systems and chaos (6 credits)	M. Matías, P. Colet 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 (5 credits)	R. Toral, P. Colet
Quantum physics for complex systems (6 credits)	L. Serra, R. Zambrini

Specific module courses (12 credits minimum)

Collective phenomena in social dynamics (3 credits)	M. San Miguel, J. J. Ramasco
Information theory (3 credits)	R. López
Modelling and dynamics of neural systems (3 credits)	C. Mirasso
Non equilibrium collective phenomena (3 credits)	C. López
Nonlinear photonics (6 credits)	I. Fischer
Quantum and nonlinear optics (3 credits)	R. Zambrini
Quantum transport and quantum noise (3 credits)	D. Sánchez
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 (11 credits)

Other Postgraduate Courses Taught in 2013

Master in Physics, University of the Balearic Islands

- **Cooperative and critical phenomena. Applications**
Victor M. Eguíluz, Maxi San Miguel, Tomàs Sintes
- **Nonlinear dynamical systems and spatio temporal complexity**
Pere Colet
- **Stochastic simulation methods**
Pere Colet, Raúl Toral
- **Introduction to statistical and nonlinear physics**
Pere Colet, Cristóbal López, Maxi San Miguel, Tomàs Sintes
- **Nonlinear phenomena in biology**
Claudio Mirasso, Cristóbal López, Tomàs Sintes, Raúl Toral
- **Introduction to quantum systems**
David Sánchez, Rosa López
- **Electronic properties of nanostructures**
Llorenç Serra Crespi, David Sánchez, Rosa López

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

- **Computational Models of Social Evolution**
Victor M. Eguíluz

7.7 OTHER

IFISC provided practical training to one *computer technician* students from the center IES Emilio Darder (FP intermediate level). April 4 to June 6

8

OUTREACH ACTIVITIES

8.1 CONFERENCE SERIES

Conference Series “Exploring Boundaries Between Disciplines VI”

In 2013 the subject of the Conference Series was Creativity and humor to disseminate science.

PROGRAMME

THURSDAY, MAY 16, | 7:30 PM

Diálogos complejos: un recorrido por las ciencias. *Complex dialogs: a tour through sciences*

CAMILO JOSÉ CELA CONDE, FULL PROFESSOR (UIB), INTERVIEWED JORGE WAGENSBERG, SCIENTIFIC DIRECTOR OF FUNDACIÓ LA CAIXA

THURSDAY, MAY 23 | 7:30 PM

Protón: la historia de una partícula inmortal...o casi *Proton: the story of an immortal particle...or almost*

DISCURSHOW: DISSEMINATION, SCIENTIFIC RIGOR AND ENTERTAINMENT BY XURXO MARIÑO, PROFESSOR OF PHYSIOLOGY, A CORUÑA UNIVERSITY, AND VICENTE DE SOUZA, ACTOR

EXPLORANDO LAS FRONTERAS ENTRE SABERES VI
CREATIVIDAD Y HUMOR PARA DEVULGAR LA CIENCIA
DEL 16 AL 30 DE MAYO DE 2013

JUEVES 16 DE MAYO - 19.30 H
"DIÁLOGOS COMPLETOS: UN RECORRIDO POR LAS CIENCIAS"
CAMILO JOSÉ CELA-CONDE ENTREVISTA A JORGE WAGENSBERG

Un sistema complejo es, por ejemplo, la red social Facebook, un organismo, o el cerebro... es decir, un sistema formado por muchas partes que se comunican entre sí y que dan lugar a nuevos comportamientos, denominados emergentes, que no pueden explicarse a partir de las propiedades individuales.

De las propiedades y características de muchos de esos sistemas se hablará en la entrevista que llevará a cabo Camilo José Cela-Condé a Jorge Wagensberg.

INSCRIPCIÓN:
Precio por conferencia: 4 €
50% de descuento clientes "La Caixa"
Plazas limitadas

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08027 Palma
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Servicio de atención al visitante
Tel: 971 77 85 12
Fax: 971 72 21 20
dencia@obrasocial.lacaixa.es/palmapalms@lacaixa.cat

Obra Social "la Caixa"
IFISC

Camilo José Cela-Condé, Catedrático de Filología, (UIB)
Jorge Wagensberg, Director Científico Fundación "la Caixa"

JUEVES 23 DE MAYO - 19.30 h
PROTON: LA HISTORIA DE UNA PARTÍCULA INMORTAL... O CASI
 DISCURSHOW: DIVULGACIÓN, RIGOR Y DIVERTIMIENTO A CARGO DE XURJO MARIÑO + VICENTE DE SOUZA

El Discursshow es una novedosa y original actividad de difusión de la ciencia desarrollada por el científico y divulgador Xurxo Mariño en colaboración con el actor Vicente de Souza. A medida que avanza la obra y el teatro, el discursshow es una conferencia de divulgación teatralizada.

En este Discursshow, Proton viaja por la historia del Universo, y explica cómo se van desarrollando la materia, los átomos, las estrellas... para al cabo de 9000 millones de años encontrar el Sol, el Sistema Solar y el planeta Tierra. Y, una vez en la Tierra, se centra en el ser humano y su evolución.

Xurxo Mariño, Profesor de Fisiología en la Universidade da Coruña
 Vicente Souza, actor

JUEVES 30 DE MAYO - 19.30 h
¿POR QUÉ TODO EL MUNDO PARECE LELO, MENOS YO Y ALGUNOS DE MIS AMIGOS?
 (O... DE CÓMO LA SOCIEDAD NOS IDIOTIZA, EN TRES ACTOS)

CAFÉ CIENTÍFICO CON BARTOLO LUQUE, JAVIER MATEOS Y ROBERTO MALO

Diálogo científico a tres, en tres actos:

Acto 1: De la mano de la psicología, la sociología y la neurociencia descubriremos bajo qué circunstancias nuestra capacidad crítica y de decisión fallan estrepitosamente (o que ni siquiera seamos conscientes).

Acto 2: De cómo, gracias a ellos, los publicistas, los medios de comunicación distorsionan y los sucesos distorsionan distorsionan hasta convertirnos en idiotas convencidos.

Acto 3: Y finalmente, qué podemos hacer para contrarrestarlo.

Bartolo Luque, Departamento Matemática Aplicada y Estadística, E.T.S.I. Aeronáutica, UPM
 Francisco Javier Mateos, escritor y actor, director de Aleen Formación y Comunicación
 Roberto Malo, escritor y actor

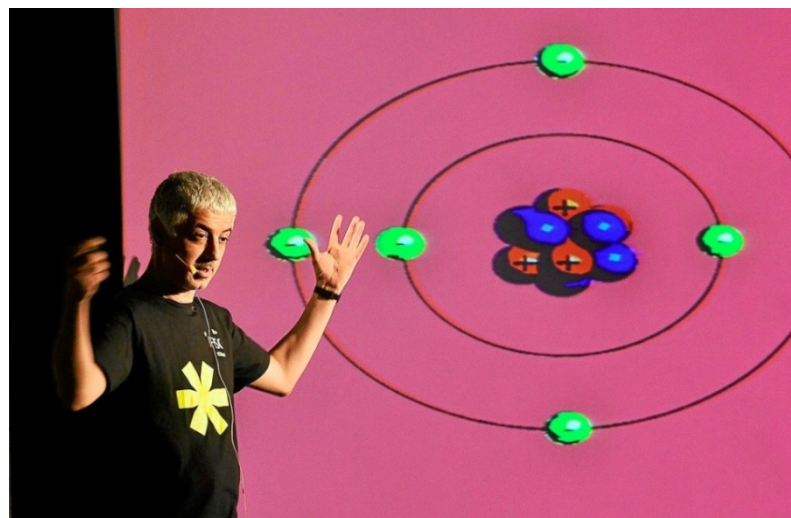
THURSDAY, MAY 30 | 7:30 PM

¿Por qué todo el mundo parece lelo menos yo y algunos de mis amigos? (o, de cómo la sociedad nos idiotiza, en tres actos)

Why everyone seems stupid but me and my friends? (or, how society stultifies us, in three acts)

SCIENTIFIC “CAFÉ” WITH BARTOLO LUQUE, PROFESSOR AT THE DEPARTMENT OF APPLIED MATHEMATICS AND STATISTICS, UNIVERSIDAD POLITÉCNICA DE MADRID, JAVIER MATEOS, WRITER, ACTOR AND DIRECTOR OF ALEEN FORMACION Y COMUNICACIÓN, AND ROBERTO MALO, WRITER AND ACTOR.

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



8.2 OTHER CONFERENCES AND EVENTS

HIGH SCHOOL STUDENTS VISITING IFISC

High School students from Balearic Islands visited IFISC in the 4th UIB Summer Scientific and Technical Campus. June 24.

OPENING SCIENCE

IFISC (CSIC-UIB), in collaboration with the institutional delegation of CSIC in the Balearic Islands and the University of the Balearic Islands, coordinated the scientific and informative course "Opening Science". This course was an initiative of Obra Social La Caixa and it developed in Palma de Mallorca. The aim was to promote the citizen's participation and the social communication of science from responsible innovation perspective as driven by the Horizonte 2020 Programme of the European Commission.

Addressed to scientists, journalists, professors and university students, the course was conducted by specialists working in public research organisms, universities, mass media and public institutions in charge of the scientific politics with a large experience in outreach.

Coordinator: Claudio Mirasso (IFISC, CSIC-UIB). Collaborator: Rosa M. Rodriguez (delegation of CSIC in the Balearic Islands)

OPEN DAYS @ IFISC

IFISC organized on February 21st, 2013 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 labs as well as the Computational facilities. They were also informed about the IFISC Master in Complex Systems and the opportunities to conduct a PhD degree at IFISC.

TALK IN THE IES MANACOR

Joan José Cerdà gave a talk about the Soft Matter in January 18 within the Programme of spreading science and research to secondary and high schools.

8.3 PARTICIPATION IN THE BALEARIC SCIENCE AND TECHNOLOGY WEEK (SCIT13)

During the Balearic Science and Technology Week, November 4-15, IFISC organized two workshops to approach local students to the IFISC Activities related to Cross-disciplinary Physics and complex systems:

- **Optics Workshop: Discovering rainbow secrets** - OSA-IFISC Activity organized by Neus Oliver, Xavier Porte and Konstantin Hicke.

The IFISC-OSA student chapter organized a second edition of the Workshop for students of high school. With the example of rainbows, participants were introduced into the nature of light and fundamental concepts in optics, including light waves, refraction, diffraction, and polarization.

Through experiments and hands-on activities, the students learned how a rainbow develops and how its characteristics are influenced by the environmental conditions. While investigating the rainbow, the participants learned the basic principles and underlying concepts related to it.

After an introductory presentation of the Optical Society of America, OSA, and a general visit to the Institute, there was a theoretical session followed by a hand-on activity. The students participated in some experiments as: "Selective Reflection and Liquid Crystals", "Experiments with Polarization" and "The Rainbow-Peephole and Diffraction." The whole activity lasted for about 3 hours.



Workshop on Scientific Computation: a perspective from the cross-disciplinary Physics –
organized by Miguel Cornelles Soriano, Antonia Tugores and Pere Colet.

Through this activity IFISC aimed to present part of its research work starting with a visit to its computational facilities. It was followed by a workshop on scientific computation. The activity included examples of complex systems with several numerical experiments that allowed students to learn how supercomputers are used in science.



8.4 PRESS & MEDIA

IFISC research has gotten attention from newspapers and other media.

During 2013, IFISC activities produced 71 press releases and appearances in written press, and 13 clips in radio and TV. See the full lists in the Appendix.

Investigadores nanométricos

Dos investigadores del IFISC (CSIC-UIB) proponen un marco teórico para estudiar los efectos combinados de la temperatura y los campos eléctricos en sistemas nanométricos. **Por Elena Soto**



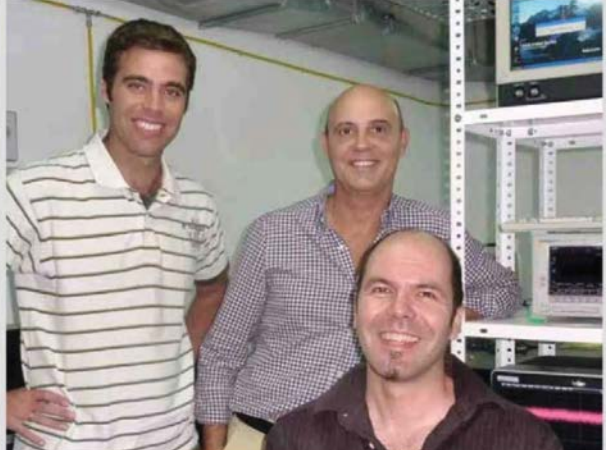
Sistemas que almacenarán la energía en el futuro

Con los nuevos desarrollos tecnológicos en electrónica, los sistemas de almacenamiento de energía en el futuro serán más eficientes y tendrán una mayor capacidad de almacenamiento. Los investigadores del IFISC (CSIC-UIB) proponen un marco teórico para estudiar los efectos combinados de la temperatura y los campos eléctricos en sistemas nanométricos.



Rosa López y David Sánchez, investigadores del IFISC, han publicado recientemente un artículo en la revista *Physical Review Letters* en el que tratan cuestiones sobre los fundamentos teóricos de los conductores en estado nanométrico.

Concretamente, se estudia primero en un sistema que puede ser considerado como un sistema de transporte de electrones. Los investigadores han desarrollado un modelo teórico que permite estudiar los efectos combinados de la temperatura y los campos eléctricos en sistemas nanométricos.

EMISORES DE LUZ LÁSER CAÓTICA, TECNOLOGÍA NOVEDOSA



Miquel Cornelles Soriano, Claudio Mirasso e Ingo Fischer, investigadores del IFISC (CSIC-UIB). / UIB

Fotónica. A la izquierda, un investigador observa un osciloscopio. A la derecha, mesa de trabajo con láseres de semiconductor. Ambas imágenes pertenecen al laboratorio del IFISC, donde se llevan a cabo los ensayos.

RECERCA

Investigadors de l'IFISC desenvolupen un model per predir la congestió aèria

► La recerca ha estat publicada a la revista 'Scientific Reports' ► Els responsables de la investigació han estudiat més de sis milions de vols comercials de 300 aeroports operats l'any 2010 als Estats Units

MAK
news

Un equip d'investigadors de l'Institut de Física Interdisciplinària i Sistemes Complexos (IFISC, CSIC-UIB) ha analitzat els factors que influeixen en el desenvolupament dels retards aèris.

L'estudi determina que els retards generats originalment per causes meteorològiques o tècniques es poden propagar i amplificar al llarg del dia fins a afectar una part important de la setmana abans. També s'ha identificat que les connexions entre vols dels passatgers i les tripulacions són la causa principal de la propagació dels retards.

El treball és obra de l'equip d'Investigadors Complexos per Pablo Fernández, José J. Ramasco i Víctor M. Eguiluz i s'ha publicat recentment a la revista *Scientific Reports*.

Problema dels retards

Els retards aèris són un problema que té un impacte econòmic notable, tant per a les companyies com per als passatgers. Per dur a terme l'estudi, l'equip de l'IFISC ha recollit informació individualitzada de cada un dels més de sis milions de vols comercials operats l'any 2010 en els gairebé 300 aeroports dels Estats Units a partir de les dades de la Federal Aviation Administration (FAA), l'organisme encarregat de regular



Els investigadors de l'IFISC autors de l'estudi.

El model podria servir en un futur per desenvolupar sistemes de planificació dels vols més eficients

Realitzat civils de l'Elia. Els investigadors han tingut accés a la matricula de cada avió comercial i als horaris de sortida i arribada programats i reals de cada vol.

L'equip també ha estat treballant en la programació diària de les diferents línies aèries i han introduït aquesta informació en un model

realista per simular l'evolució de la congestió similar als utilitzats per monitoritzar l'expansió de malalties. El model és capaç de reproduir els retards observats i de predir el nivell de congestió esperable en el sistema dia a dia durant tot l'any seguit.

Amb el model es veu que la congestió és un fenomen col·lectiu en el qual el factor més determinant són les connexions dels passatgers i de les tripulacions. Es troba, a més, que la congestió pot ser generada per motius interns a l'organització del sistema

no té per què prevenir necessàriament el desenvolupament extern com el mal temps i els conflictes laborals.

El model desenvolupat podria servir en un futur per desenvolupar sistemes de planificació dels vols més eficients i reduir els retards aèris.

Aquest estudi ha tingut un impacte notable i ja se n'han fet més edicions digitals de la revista *Discover*, el diari britànic *Daily Mail*, el blog especialitzat *MIT Technology Review*, entre d'altres publicacions.

APPENDIX

a.4. Ifisc seminars and talks 2013

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

Jan 09

Modeling Interactions in neural populations.

Miguel Escalona-Moran, IFISC.

Jan 16

Scaling and correlations in dynamic of e-communities.

Anna Chmiel, Faculty Of Physics, Warsaw University Of Technology, Poland.

Jan 16

Nonequilibrium Transport Measurement of Andreev Bound States Near the 0- π Transition in a Superconductor-Carbon Nanotube-Superconductor Junction.

Jong Soo Lim, IFISC.

Jan 23

Majorana modes in semiconductor nanowires.

Llorenç Serra, IFISC.

Jan 30

Dynamics of defects and ripples in graphene.

Luis L. Bonilla, Instituto Gregorio Millán, Escuela Politécnica Superior, Universidad Carlos III De Madrid, Leganés, Spain

Feb 05

Topological properties and robustness of polar food webs: assessing the vulnerability of polar ecosystems to global changes using a complex network approach.

Charles N. De Santana (IMEDEA (CSIC-UIB) And LINCGlobal), Spain.

Feb 06

Nanoscale Thermoelectricity : Cooling, Catastrophes and Carnot.

Robert Whitney, CNRS, Grenoble, France.

Feb 13

Searching with communication: the case of the Mongolian gazelle.

Ricardo Martínez, IFISC.

Feb 19

Anticipated Synchronization in Neuronal Circuits.

Fernanda S. Matias, IFISC.

Feb 26

Stochastic thermodynamics: a short introduction.

Christian Van Den Broeck, Universiteit Hasselt, Diepenbeek, Belgium.

Mar 05

1D topological superconductors and Majorana fermions in quantum wires.

Pascal Simon, Université Paris Sud, France.

Mar 07

Stochastic thermodynamics: a short introduction (II).

Christian Van Den Broeck, Universiteit Hasselt, Diepenbeek, Belgium.

Mar 15

Focusing light on Gold Nanoparticles.

Jochen Feldmann, Nanosystems Initiative Munich, Ludwig-Maximilians-Universität, Munich, Germany.

Mar 19

Modeling and Random Diffusion of Weighted Networks.

Yichao Zhang, LMAH, University Of Normandy, Le Havre, France.

Mar 26

Discarding power of quantum evolutions.

Fernando Galve, IFISC.

Apr 10

Dynamics of lasers with delayed optical feedback: novel techniques and new dynamical regimes.

Daniel Brunner, IFISC.

Apr 17

Some topics in self-assembling systems.

James D. Gunton, Lehigh University, Bethlehem (PA), USA.

Apr 24

Function-Structure Interdependence in Air Transportation.

Stephan Lehner, Institute Of Air Transportation Systems, German Aerospace Center (DLR), Hamburg, Germany.

Apr 29

Efficient data storage.

Pere Colet, Rubén Tolosa And Antònia Tugores, IFISC.

Apr 30

Moving to the light (and other short stories).

Idan Tuval, IMEDEA, Spain.

May 06

Footprints in the Sand: The Digital Traces of Social Behavior.

Michael W. Macy, Cornell University, USA.

May 09

Modeling and forecast of socio-technical systems in the data-science age.

Alessandro Vespignani, Northeastern University, Boston, USA.

May 15

Thermodiffusion in colloidal suspensions.

Daniel Lüsebrink, IFISC.

May 22

A Universal Model of Commuting Networks.

Maxime Lenormand, IFISC.

May 24

Quantum Simulations with Trapped Ions.

Lucas Lamata, Universidad Del País Vasco (UPV/EHU), Spain.

May 28

Horizontal Transport and Mixing and their connection with Dynamical and Biological Processes in the Ocean.

Ismael Hernández Carrasco, IFISC.

May 30

Reasons for why the brain wiring's might use more than one decay scale.

Ruedi Stoop, Institute Of Neuroinformatics, Universität Zürich / ETH Zürich, Switzerland.

May 31

Two mechanisms of Pattern formation in models of the interior of living cells.

Sergio Alonso, Physikalisch-Technische Bundesanstalt, Berlin, Germany.

Jun 05

Non-Markovianity as a resource for quantum technologies.

Sabrina Maniscalco, Heriot-Watt University, Edinburgh, UK.

Jun 12

Diffusion and entropy production in multi-networks.

Janusz A. Holyst, Center Of Excellence For Complex Systems Research, Warsaw University Of Technology, Poland.

Jun 18

Instabilities of Localized Structures in Dissipative Systems with Delayed Feedback.

Svetlana Gurevich, WW Universität Münster, Germany.

Jun 26

Data-driven modeling of systemic delay propagation in the air transport network.

Pablo Fleurquin, IFISC.

Jun 27

Advancing movement ecology: A collaboration between ecologists and physicists.

Justin M. Calabrese, Conservation Ecology Center, Smithsonian Conservation Biology Institute, USA.

Jul 02

Dynamics and applications of delay-coupled semiconductor lasers.

Miguel Cornelles Soriano, IFISC.

Jul 10

Lagrangian studies of the ocean circulation.

Vincent Rossi, IFISC.

Jul 12

Consequences of street networks and accessibility patterns on the spatial organization of cities: a computational study.

Thomas Louail, CEA Saclay, Paris, France.

Jul 17

Anomalous diffusion in crowded environments: Models and tools.

Igor Sokolov, Institut Für Physik, Humboldt Universität Zu Berlin, Germany.

Jul 30

How to write and publish a physics paper.

David Sánchez, IFISC.

Sep 05

The Twitter of Babel: Mapping World Languages through Microblogging Platforms.

Bruno Gonçalves, Centre De Physique Théorique, Campus De Luminy, Aix-Marseille Université, France.

Sep 06

Presentation of new IFISC Research Projects.

Jose Ramasco And Roberta Zambrini, IFISC.

Sep 06

Semiconductor laser dynamics under polarized rotated optical delay feedback and frequency detuning.

Julián Bueno, IFISC.

Sep 09

Competitive patterns of interacting random walkers.

Emilio Hernández-García, IFISC.

Sep 10

Fluctuations and scaling in condensed-matter physics.

Juan M. López, Instituto De Física De Cantabria (CSIC-UC), Santander, Spain.

Sep 11

Systemic delay propagation in the US airport network.

José J. Ramasco, IFISC.

Sep 12

Collective phenomena in populations of oscillators.

Diego Pazó, Instituto De Física De Cantabria (CSIC-UC), Santander, Spain.

Sep 18

The effect of temperature on the speed of biological processes.

Federico Vázquez, CONICET, La Plata, Argentina.

Sep 25

Building Networks from the Bottom Up.

Henry D. I. Abarbanel, UC San Diego, USA.

Oct 02

Mobility and flow effects across biological scales.

Emilio Hernández-García, IFISC.

Oct 09

Exploring chaotic semiconductor lasers for high speed random bit generation.

Neus Oliver, IFISC.

Oct 16

Temporal networks: slowing down diffusion by long lasting interactions.

Konstantin Klemm, Bioinformatics, Institute Of Computer Science, Leipzig University, Germany.

Oct 22

Deciphering Gene Regulatory Networks using DNA sequence.

Marc Santolini, Laboratoire De Physique Statistique, Ecole Normale Supérieure, Paris, France.

Oct 24

Full Rate-Equation Description of Multi-mode Semiconductor Lasers.

Daan Lenstra, Cobra Research Institute, Eindhoven University Of Technology, The Netherlands.

Oct 25
Suppression of Relaxation Oscillation Dynamics in Semiconductor Lasers with External Optical Feedback.
 Daan Lenstra, Cobra Research Institute, Eindhoven University Of Technology, The Netherlands.

Oct 30
Human mobility, social networks and big data.
 Maria Antònia Tugores, IFISC.

Nov 06
Predictability and control of extreme events in semiconductor lasers and coupled electronic circuits.
 Jordi Zamora-Munt, IFISC.

Nov 13
The efficiency of small machines.
 Chris Van Den Broeck, Universiteit Hasselt, Diepenbeek, Belgium.

Nov 19
Griffiths phases, Lifshitz tails and Anderson localization in the brain activity.
 Miguel Angel Muñoz, Instituto Carlos I De Física Teórica Y Computacional, Universidad De Granada, Spain.

Nov 27
Self-organization in thin films: a continuous approach.
 Daniel Walgraef, IFISC.

Dec 03
Single mode emission of VCSEL arrays.
 Tomasz Czyszanowski, Institute Of Physics, Technical University Of Lodz, Poland.

Dec 04
Majorana zero modes in smooth 1d junctions and cylindrical nanowires.
 Javier Osca, IFISC.

Dec 04
Stability analysis for delay systems: From steady states to hyperchaos.
 Thomas Jüngling, IFISC.

Dec 11
Square-wave delay dynamics in photonic systems.
 Thomas Erneux, Optique Nonlinéaire Théorique, Université Libre De Bruxelles, Belgium.

Dec 16
Introducing physical constraints in models of social and biological evolution.
 Rubén Requejo, Statistical Physics Group, Universitat Autònoma De Barcelona, Spain.

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 JCR Publications

Complex photonics: Dynamics and applications of delay-coupled semiconductor lasers
 Soriano, M. C.; Garcia-Ojalvo, J.; Mirasso, C. R.; and Fischer, I.
 Reviews of Modern Physics 85, 421-470

Dynamics of brain networks in the aesthetic appreciation
 Cela-Conde C. J.; García-Prieto J.; Ramasco, J. J.; Mirasso, C. R.; Bajo, R.; Munar, E.; Flexas, A.; Del Pozo, F.; and Maestú, F.
 Proceedings of the National Academy of Sciences of the USA (PNAS) 110, 10454-10461

Parallel photonic information processing at gigabyte per second data rates using transient states
 Brunner, D; Soriano, M. C.; Mirasso, C. R.; Fischer, I.
 Nature Communications 4, 1364

Discording power of quantum evolutions
 Galve, F.; Plastina, F.; Paris, M. G. A.; Zambrini, R.
 Physical Review Letters 110, 010501 (1-5)

Transport Measurement of Andreev Bound States in a Kondo-Correlated Quantum Dot
 Kim, Bum-Kyu; Ahn, Ye-Hwan; Kim, Ju-Jin; Choi, Mahn-Soo; Bae, Myung-Ho; Kang, Kicheon; Lim, Jong Soo; López, Rosa; Kim, Nam
 Physical Review Letters 110, 076803 (1-5)

Optimizing the search for resources by sharing information: Mongolian gazelles as a case study.
 Martínez-García, Ricardo; Calabrese, Justin M.; Mueller, Thomas; Olson, Kirk; López, Cristóbal.
 Physical Review Letters 110, 248106 (1-5)

Temporal Networks: Slowing Down Diffusion by Long Lasting Interactions

Masuda, N.; Klemm, K.; Eguíluz, V.M.
Physical Review Letters 111, 188701

Opinions, Conflicts and Consensus: Modeling Social Dynamics in a Collaborative Environment

Török, János; Iñiguez, Gerardo; Yasserli, Taha; San Miguel, Maxi ; Kaski, Kimmo; Kertész, János
Physical Review Letters 110, 088701 (1-5)

Scattering Theory of Nonlinear Thermoelectric Transport

Sánchez, D.; López, R.
Physical Review Letters 110, 026804 (1-5)

Dissipative soliton excitability induced by spatial inhomogeneities and drift

Parra-Rivas, Pedro; Gomila, Damià; Matías, Manuel A.; Colet, Pere
Physical Review Letters 110, 064103 (1-5)

Clustering determines who survives for competing Brownian and Levy walkers

Heinsalu, Els; Hernandez-Garcia, Emilio; Lopez, Cristobal
Physical Review Letters 110, 258101 (1-5)

Proposal for a local heating driven spin current generator

Hwang, S.-Y.; Lim, J. S.; Lopez, R.; Lee, M.; Sanchez, D.
Applied Physics Letters 103, 172401 (1-3)

Vegetation pattern formation in semiarid systems without facilitative mechanisms

Martínez-García, Ricardo; Calabrese, Justin M.; Hernández-García, Emilio; López, Cristóbal
Geophysical Research Letters 40, 6143-6147

Interaction network based early warning indicators for the Atlantic MOC collapse

van der Mheen, M.; Dijkstra, H.A.; Gozolchiani, A.; den Toom, M.; Feng, Q.; Kurths, J.; Hernandez-Garcia, E.
Geophysical Research Letters 40, 2714-2719

On the effect of heterogeneity in stochastic interacting-particle systems

Lafuerza, Luis F.; Toral, Raul
Scientific Reports 3, 1189 (1-8)

Systemic delay propagation in the US airport network

Fleurquin, Pablo; Ramasco, Jose J; Eguíluz, Victor M
Scientific Reports 3, 1159

Synchronization, quantum correlations and entanglement in oscillator networks

Manzano, Gonzalo; Galve, Fernando; Giorgi, Gian Luca; Hernandez-Garcia, Emilio; Zambrini, Roberta
Scientific Reports 3, 1439 (1-6)

Single-neuron criticality optimizes analog dendritic computation

Gollo, L. L.; Kinouchi, O.; Copelli, M.
Scientific Reports 3, 3222

Emergence of Majorana modes in cylindrical nanowires

Lim, Jong Soo; López, Rosa; Serra, Llorenç
Europhysics Letters 103, 37004 (1-6)

Synchronisation and scaling properties of chaotic networks with multiple delays

D'Huys, Otti; Zeeb, Steffen; Jüngling, Thomas; Heiligenthal, Sven; Yanchuk, Serhiy; Kinzel, Wolfgang
Europhysics Letters 103, 10013

Relation between delayed feedback and delay-coupled systems and its application to chaotic lasers

Soriano, Miguel C.; Flunkert, Valentin; Fischer, Ingo
Chaos 23, 043133

Cross-shelf variability in the Iberian Peninsula Upwelling System: Impact of a mesoscale filament

Rossi, Vincent; Garçon, V.; Tassel, J.; Romagnan, J-B; Stemmann, L.; Jourdin, F.; Morin, P.; Morel, Y.
Continental Shelf Research 59, 97-114

Multi-decadal projections of surface and interior pathways of the Fukushima Cesium-137 radioactive plume

Rossi, Vincent; VanSebille, Erik; SenGupta, Alex; Garçon, Véronique; England, Matthew
Deep-Sea Research I 80, 37-46

Stabilization of Periodic Orbits near a subcritical Hopf Bifurcation in Delay-Coupled Networks

Choe, C.-U.; Jang, H.; Flunkert, V.; Dahms, T.; Hövel, P.; Schöll, E.
Dynamical Systems: An International Journal 28, 1-19

Snaking states on a cylindrical surface in a perpendicular magnetic field

Manolescu, Andrei; Rosdahl, Tomas Orn; Erlingsson, Sigurdur I.; Serra, Llorenç; Gudmundsson, Vidar
European Physical Journal B 86, 445 (1-12)

The noisy Hegselmann-Krause model for opinion dynamics

Pineda, Miguel; Toral, Raul; Hernandez-Garcia, Emilio
European Physical Journal B 86, 490 (1-10)

Fast random bit generation using a chaotic laser: approaching the information theoretic limit

Oliver, Neus; Soriano, Miguel C.; Sukow, David W.; Fischer, Ingo
IEEE Journal of Quantum Electronics 49, 910-918

Low-Frequency Fluctuations in Semiconductor Ring Lasers With Optical Feedback

Mashal, L.; Nguimdo, R. M.; Van der Sande, G.; Soriano, M. C.; Danckaert, J.; Verschaffelt, G.
IEEE Journal of Quantum Electronics 49, 790-797

Information Processing Using Transient Dynamics of Semiconductor Lasers Subject to Delayed Feedback

Hicke, K.; Escalona-Moran, M. A.; Brunner, D.; Soriano, M. C.; Fischer, I.; Mirasso, C. R.
IEEE Journal of Selected Topics in Quantum Electronics 19, 1501610

High-speed optical vector and matrix operations using a semiconductor laser

Brunner, Daniel; Soriano, Miguel C.; Fischer, Ingo
IEEE Photonics Technology Letters 25, 1680-1683

Discord –entanglement interplay in the thermodynamic limit: the XY model

Battle, J.; Plastino, A.; Plastino, A.R.; Casas, M.;
International Journal of Quantum Information 11, 135003 (1-13)

Agent-based models of language competition

Castello, Xavier; Loureiro-Porto, Lucia; San Miguel, Maxi
International Journal of the Sociology of Language 221, 21-51

Assessing the CO2 capture potential of seagrass restoration FISICOSs

Duarte, C.M.; Sintes, T.; Marbà, N.
Journal of Applied Ecology 50, 1341-1349

Effects of the dipolar interaction on the equilibrium morphologies of a single supramolecular magnetic filament in bulk

Sanchez, P.A.; Cerdà, Joan J.; Sintes, Tomas; Holm, Christian;
Journal of Chemical Physics 139, 044904

Microstructure of bidisperse ferrofluids in a thin layer

Minina, E.S; Muratova, A.B; Cerdà, J.J; Kantorovich, S. S.
Journal of Experimental and Theoretical Physics 116, 424-441

Sea surface transport in the Western Mediterranean Sea: a Lagrangian perspective

Sayol, JM; Orfila, J; Simarro, G; Lopez, C; Renault, L.; Galan, A; Conti, D.
Journal of Geophysical Research 118, 1-14

On the factors influencing the development of sporadic upwelling in the Leeuwin Current system

Rossi, Vincent; Feng, Ming; Pattiaratchi, Charitha; Roughan, Moninya; Waite, Anya
Journal of Geophysical Research - Oceans 118, 1-14

Linking synoptic forcing and local mesoscale processes with biological dynamics off Ningaloo Reef

Rossi, Vincent; Feng, Ming; Pattiaratchi, Charitha; Roughan, Moninya; Waite, Anya
Journal of Geophysical Research - Oceans 118, 1211-1225

Observation of laser vortex solitons in a self-focusing semiconductor laser

Jimenez, J.; Noblet, Y; Paulau, P.V.; Gomila, D.; Ackemann, T.
Journal of Optics 15, 044011 (1-10)

Entanglement and the speed of evolution of two interacting qubits

Zander, C.; Borrás, A.; Plastino, A.R.; Plastino, A.; Casas, M.;
Journal of Physics A 46, 095302 (1-19)

Characterization of coherent structures in three-dimensional turbulent flows using the finite-size Lyapunov exponent

Bettencourt, Joao; Lopez, Cristobal; Hernandez-Garcia, Emilio;
Journal of Physics A 46, 254022 (1-20)

The geometric approach to quantum correlations: computability versus reliability

Tufarelli, Tommaso; MacLean, Tom; Girolami, Davide; Vasile, Ruggero; Adesso, Gerardo
Journal of Physics A: Mathematical and Theoretical 46, 275308 (1-15)

The Role of Noise and Initial Conditions in the Asymptotic Solution of a Bounded Confidence, Continuous-Opinion Model

Carro, Adrián; Toral, Raúl; San Miguel, Maxi
Journal of Statistical Physics 151, 131-149

Spatial patterns in mesic savannas: the local facilitation limit and the role of demographic stochasticity.

Martínez-García, Ricardo; Calabrese, Justin M.; López, Cristóbal
Journal of Theoretical Biology 333, 156-165

Noise and fluctuation relations of a spin diode

Lim, J. S.; Lopez, R.; Sanchez, D.
Nanoscale Research Letters 8, 246 (1-4)

Nonlinear thermovoltage and thermocurrent in quantum dots

Fahlvik Svensson, S.; Hoffmann, E. A.; Nakpathomkun, N.; Wu, P. M.; Xu, H. Q.; Nilsson, H. A.; Sanchez, D.; Kashcheyevs, V.; Linke, H.
New Journal of Physics 15, 105011 (1-14)

Magnetic-field asymmetry of nonlinear thermoelectric and heat transport

Hwang, Sun-Yong; Sánchez, David; Lee, Minchul; López, Rosa
New Journal of Physics 15, 105012 (1-17)

A mathematical model for the effect of anti-angiogenic therapy in the treatment of cancer tumours by chemotherapy

Pinho, Suani T.R.; Souza Bacelar, Flora; Andrade, Roberto F.S.; Freedman, H.I.
Nonlinear Analysis: Real World Applications 14, 815-828

Lagrangian transport in a microtidal coastal area: the Bay of Palma, island of Mallorca, Spain

Hernández-Carrasco, Ismael; López, Cristóbal; Orfila, Alejandro; Hernández-García, Emilio
Nonlinear Processes in Geophysics 20, 921-933

Spectral properties and synchronization scenarios of two mutually delay-coupled semiconductor lasers

Arroyo-Almanza, D. A.; Pisarchik, A. N.; Fischer, I.; Mirasso, C. R.; Soriano, M. C.
Optics Communications 301-302, 67-73

Optoelectronic reservoir computing: tackling noise-induced performance degradation

Soriano, Miguel C.; Ortín, Silvia; Brunner, Daniel; Larger, Laurent; Mirasso, Claudio R.; Fischer, Ingo; Pesquera, Luis
Optics Express 21, 12-20

Introduction: Dynamics, control and information in delay-coupled systems: an overview

Flunkert, Valentin; Fischer, Ingo; Schöll, Eckehard
Philosophical Transactions of the Royal Society A 371, 20120465 (1-4)

Stochastic description of delayed systems

Lafuerza, Luis F.; Toral, Raul
Philosophical Transactions of the Royal Society A 371, 20120458

Rogue waves in optically injected lasers: Origin, predictability, and suppression

Zamora-Munt, Jordi; Garbin, Bruno; Barland, Stéphane; Giudici, Massimo; Rios Leite, Jose R.; Masoller, Cristina; Tredicce, Jorge R.
Physical Review A 87, 035802 (1-5)

Correlated Multipartite quantum systems

Battle, J.; Casas, M.; Plastino, A.
Physical Review A 87, 032318 (1-8)

Spontaneous synchronization and quantum correlation dynamics of open spin systems

Giorgi, G. L.; Plastina, F.; Francica, G.; Zambrini, R.
Physical Review A 88, 042115 (1-9)

Avoiding dissipation in a system of three quantum harmonic oscillators

Manzano, Gonzalo; Galve, Fernando; Zambrini, Roberta
Physical Review A 87, 032114 (1-13)

Information sharing in quantum complex networks

Cardillo, Alessio; Galve, Fernando; Zueco, David; Gómez-Gardeñes, Jesús
Physical Review A 87, 052312

Dynamic thermoelectric and heat transport in mesoscopic capacitors

Lim, J.S.; Lopez, R.; Sanchez, D.
Physical Review B 88, 201304 (1-5)

Nonlinear heat transport in mesoscopic conductors: Rectification, Peltier effect, and Wiedemann-Franz law

Lopez, R.; Sanchez, D.
Physical Review B 88, 045129 (1-8)

Majorana modes and complex band structure of quantum wires

Serra, Llorenç
Physical Review B 87, 075440 (1-8)

SU(3) Kondo effect in spinless triple quantum dots

López, Rosa; Rejec, Tomaz; Martinek, Jan; Zitko, Rok
Physical Review B 87, 035135

Majorana modes in smooth normal-superconductor nanowire junctions

Oscá, Javier; Serra, Llorenç
Physical Review B 88, 144512 (1-9)

Non-equilibrium spin-current detection with a single Kondo impurity

Lim, Jong Soo; Lopez, Rosa; Limot, Laurent; Simon, Pascal
Physical Review B 88, 165403 (1-9)

Kondo Effect in a Quantum-Dot-Topological-Superconductor Junction

Lee, Minchul; Lim, Jong Soo; Lopez, Rosa
Physical Review B 87, 241402 (R) (1-5)

Tunable zero-field Kondo splitting in a quantum dot

Larsson, M.; Lim, J.S.; López, R.; Xu, H.Q.
Physical Review B 88, 085407

Delayed feedback control of unstable steady states with high-frequency modulation of the delay

Gjurchinovski, Aleksandar; Jüngling, Thomas; Urumov, Viktor; Schöll, Eckehard
Physical Review E 88, 032912

Self-Organization and Nanostructure Formation in Chemical Vapor Deposition

Walgraef, Daniel
Physical Review E 88, 042405 (1-12)

Discontinuous Attractor Dimension at the Synchronization Transition of Time-Delayed Chaotic Systems

Zeeb, S.; Dahms, T.; Flunkert, V.; Schöll, E.; Kanter, I.; Kinzel, W.
Physical Review E 87, 042910 (1-10)

Strong and weak chaos in networks of semiconductor lasers with time-delayed couplings

Heiligenthal, Sven; Jüngling, Thomas; D'Huys, Otti; Arroyo-Almanza, Diana A.; Soriano, Miguel C.; Fischer, Ingo; Kanter, Ido; Kinzel, Wolfgang
Physical Review E 88, 012902

Characterizing the deterministic nature of individual power dropouts in semiconductor lasers subject to delayed feedback

Hicke, Konstantin; Porte, Xavier; Fischer, Ingo
Physical Review E 88, 052904 (1-6)

Limits to detection of generalized synchronization in delay-coupled chaotic oscillators

Kato, Hideyuki; Soriano, Miguel C.; Pereda, Ernesto; Fischer, Ingo; Mirasso, Claudio R.
Physical Review E 88, 062924 (1-13)

Extreme intensity pulses in a semiconductor laser with a short external cavity

Reinoso, Jose A.; Zamora-Munt, Jordi; Masoller, Cristina
Physical Review E 87, 062913

Weighted-ensemble Brownian jumps simulations: sampling of rare events in equilibrium and non-equilibrium systems

Kromer, J.A.; Schimansky-Geier, L.; Toral, R.
Physical Review E 87, 063311

Temperature-driven nonclassical light

Pennini, F.; Plastino, A.; Ferri, G.L.
Physical Review E 87, 064101

A dark-field microscope for background-free detection of resonance fluorescence from single semiconductor quantum dots operating in a set-and-forget mode

Kuhlmann, Andreas; Houel, Julien; Brunner, Daniel; Ludwig, Arne; Reuter, Dirk; Wieck, Andreas; Warburton, Richard
Review of Scientific Instruments 84, 073905 (1-7)

Phase diagram for a single flexible Stockmayer polymer at zero field

Cerdà, Joan J.; Sanchez, P.A.; Holm, Christian; Sintes, Tomas; Soft Matter 9, 7185-7195

Impact of environmental dynamics on economic evolution: A stylized agent-based policy analysis

Nannen, Volker; van den

Bergh, Jeroen C. J. M.; Eiben, A. E. Technological Forecasting and Social Change 80, 329-350

On the Lattice Structure of Probability Spaces in Quantum Mechanics

Holik, F.; Massri, C.; Plastino, A.; Zuberger, L. International Journal of Theoretical Physics 52, 1836-1876

The workings of the maximum entropy principle in collective human behaviour

Hernando, A.; Hernando, R.; Plastino, A.; Plastino, A.R. Journal of the Royal Society Interface 10, 20120758

Tsallis' maximum entropy ansatz leading to exact analytical time dependent wave packet solutions of a nonlinear Schrödinger equation

Curilef, S.; Plastino, A.R.; Plastino, A. Physica A 392, 2631-2642

A Shannon–Tsallis transformation

Rufeil Fiori, E.; Plastino, A. Physica A 392, 1742-1749

Scale-invariance underlying the logistic equation and its social applications

Hernando, E.; Plastino, A. Physics Letters A 377, 176-180

Characterization of chaotic maps using the permutation Bandt–Pompe probability distribution

Rosso O.A.; Olivares, F.; Zunino, L.; De Micco, L.; Aquino, A.L.L.; Plastino, A.; Larrondo, H.A. The European Physical Journal B 86, 116

Transmission of HIV in sexual networks in sub-Saharan Africa and Europe

van de Vijver, D.A.M.C.; Prosperi, M.C.F.; Ramasco, J.J. The European Physical Journal Special Topics 222, 1403-1411

a.5.2 Other publications in journals

Modeling zero-lag synchronization of dorsal horn neurons during the traveling of electrical waves in the cat spinal cord

Kato, H.; Cuellar, C.; Delgado-Lezama, R.; Rudomin, P.; Jimenez-Estrada, I.; Manjarrez, E.; Mirasso, C. R. Physiological Reports 1, e00021 (1-14)

50 años del efecto mariposa

Mirasso, Claudio R.; Hernandez-Garcia, Emilio ENKI. Revista Científico-Cultural Marzo, 54

a.5.3 Book Chapters and Others

Spin-current noise from fluctuation relations

Lim, J. S.; Sanchez, D.; Lopez, R. The Physics of Semiconductors (Ed. by T. Ihn, C. Roessler, A. Kozikov). AIP Conference Proceedings 1566, 363 (1-2)

Dynamics in Online Social Networks

Grabowicz, Przemyslaw A.; Ramasco, José J.; Eguíluz, Víctor M. Dynamics on and of Complex Networks, Volume 2, Applications to Time-Varying Dynamical Systems (Ed. by Mukherjee, A., Choudhury, M., Peruni, F., Ganguly, N., Mitra, B.), 3-17

Timing interactions in social simulations: The voter model

Fernández-Gracia, Juan; M. Eguíluz, Víctor; San Miguel, Maxi Temporal networks (Edited by Holme, P. and Saramäki, J.), 331-352

Frequency and phase locking of laser cavity solitons

Ackemann, T.; Noblet, Y.; Paulau, P.V.; McIntyre, C.; Colet, P.; Firth, W.J.; Oppo, G.-L. Spontaneous Symmetry Breaking, Self-Trapping, and Josephson Oscillations in Nonlinear Systems (edited by B. A. Malomed), 49-87

Distinguishing Topical and Social Groups Based on Common Identity and Bond Theory

Grabowicz, Przemyslaw A.; Aiello, Luca Maria; Eguíluz, Víctor M.; Jaimes, Alejandro Proceedings of the Sixth ACM International Conference on Web Search and Data Mining WSDM'13, 627–636

Semiconductor laser beam combining.

Liu, Bo; Colet, Pere; Braiman, Yahuda. Semiconductor Lasers. Fundamentals and applications. Ed. By A. Baranov and E. Tournié, Woodhead Publishing (Elsevier) 121-148

Big data and urban mobility.

Tugores, Antonia; Colet, Pere. Iberian Grid Infrastructure Conference. Editors: Ignacio Blanquer, Isabel Campos, Gonçalo Borges, Jorge Gomes, 75-87

Data-driven modeling of systemic delay propagation under severe meteorological conditions

Fleurquin, Pablo; Ramasco, José J.; Eguíluz, Víctor M. Tenth USA/Europe Air Traffic Management Research and Development Seminar (ATM2013)

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

a.6.1 Invited talks in conferences and workshops

San Miguel, M.; Fernández-Gracia, J.; Suchecki, K.; Ramasco, J.J.; Eguíluz, V.M.
Voter Model, Opinion Diffusion and Mobility Networks.
CompleNET2013, Berlin, Germany.
 March 13

Serra, Llorenç
Spin-orbit interaction and Majorana modes in semiconductor wires.
International workshop on spin-orbit interaction for light and matter waves. Dresden, Germany.
 April 14

Hernandez-Garcia, Emilio
Anticipating climatic tipping points and regime shifts.
2nd LINC (Learning about Interacting Networks in Climate) School, Soesterberg, The Netherlands.
 April 24

Brunner, Daniel; Soriano, Miguel; Cornelles; Mirasso, Claudio R.; Fischer, Ingo
High speed, high performance all-optical information processing utilizing nonlinear optical transients.
CLEO/Europe-IQEC 2013, Munich, Germany.
 May 13

Zambrini, Roberta
Advances in quantum synchronization.
Complex Quantum Systems and Their Applications; Ackergill Tower, Wick, Northern Highlands, UK.
 May 27

Colet, Pere
Oscillatory and excitable dynamics of dissipative solitons in optical cavities.
Minisymposium on Nonlinear Dynamics in Lasers: Fundamental Issues and Novel Applications in Dynamic Days Europe 2013. Madrid, Spain
 June 3

Fischer, Ingo
Utilizing semiconductor laser dynamics for photonic information processing.
Dynamics Days Europe 2013. Madrid, Spain
 June 4

Fischer, Ingo
Generalized Synchronization Properties of Delay-Coupled Semiconductor Lasers.
Dynamics Days Europe 2013. Madrid, Spain
 June 5

Mirasso, C.; Matías, F.; Gollo, L.L.; Carelli, P.; Copelli, M.
Anticipated synchronization in cortical circuits.
Dynamics Days Europe 2013, Madrid, Spain.
 June 7

Ramasco, JJ
A microscopic model for social influence in spatially extended electoral processes.
conference "From cognitive activity to artificial self-awareness" organized by the FP7 project Recognition at Florence, Italy.
 June 18

Fischer, Ingo
Implementing Neuro-Inspired Information Processing Using Photonic Systems.
invited course at NETT Summer School on Neural Engineering. Nottingham, UK.
 July 1

Zambrini, Roberta
Bringing spontaneous synchronization into the quantum regime.
LPHYS13, Quantum Information Science, Prague, Czech Republic.
 July 15

Toral, Raúl
Efecto de la heterogeneidad en sistemas interaccionantes.
XXXIV Reunión Bienal de la Real Sociedad Española de Física. Valencia, Spain.
 July 15-19

Oliver, Neus; Fischer, Ingo
Exploring chaotic semiconductor lasers for high speed random bit generation: practical and information theoretic limitations.
Invited Keynote Speech at The 6th International Workshop on Chaos-Fractals Theories and Applications. Taiwan, China
 August 10

Hernandez-Garcia, E.
Mobility and flow effects across biological scales.
Models in Population Dynamics and Ecology, MPDE'13 (Osnabrueck, Germany).
 August 26

Hernandez-Garcia, E.
Competitive patterns of interacting random walkers.
Third Summer School on Statistical Physics of Complex and Small Systems (Palma de Mallorca).
 September 9

San Miguel, M.
Social influence and recurrent mobility underlie background fluctuations of electoral processes.
Keynote talk at "Complexity in online social networks and Big Data", Satellite of ECCS13, Barcelona, Spain.
 September 18

Ramasco, JJ
Systemic delay propagation in the US airport network.
ECCS satellite Tnets'13: Temporal Networks in Human Dynamics, Barcelona.
 September 19

Brunner, Daniel; Soriano, Miguel; Cornelles; Appeltant, Lennert; Larger, Laurent; Mirasso, Claudio; Fischer, Ingo
Ultra-fast photonic information processing using delayed feedback systems.
International Workshop on Experimental Reservoir Computing, Besançon, France.
 October 14

Brunner, Daniel; Fischer, Ingo
All-optical RC using an array of lasers.
International Workshop on Experimental Reservoir Computing, Besançon, France.
 October 14

Soriano, Miguel Cornelles
Dynamics and applications of delay-coupled semiconductor lasers.
Invited course at ICTP-SAIFR School on Nonlinear Optics and Nanophotonics (Sao Paulo, Brazil).
 November 25

Toral, Raúl
Macroscopic order induced by microscopic disorder: Collective effects induced by diversity or noise.
14th Workshop on Instabilities and Nonequilibrium Structures. Viña del Mar, Chile.
 December 9-13

Ramasco, JJ
Systemic delay propagation in the US airport network.
Net-works 2013, El Escorial, Madrid.
 December 11

a.6.2 Other talks in conferences and workshops

Fernandez-Gracia, Juan; Suchecki, Krzysztof; Ramasco, Jose J.; San Miguel, Maxi; Eguíluz, Víctor M.
Modeling spatial patterns in voting behavior.
DPG spring meeting 2013 (Regensburg, Germany).
 March 10

Ramasco, JJ
Influence of opinion dynamics on the evolution of games.
CompleNet 2013, Berlin, Germany
 March 13

Fleurquin, P.; Ramasco, J.J.; Eguíluz, V.M.
Systemic delay propagation in the US airport network.
CompleNet 2013, Berlin, Germany.
 March 13

Rodriguez Mendez, Victor
Inference in networks embedded in metric spaces.
2nd LINC School (Learning about Interacting Networks in Climate). Soesterberg, The Netherlands.
 April 24-30

Fleurquin, P.; Ramasco, J.J.; Eguíluz, V.M.
Systemic delay propagation in the US airport network.
IWSOS (Palma de Mallorca).
 May 9

Manzano, G.; Galve, F.; Giorgi, G.L.; Colet, P.; Hernandez-Garcia, E.; Zambrini, R.
Synchronization and Quantum Correlations in Harmonic Networks.
CLEO Europe-IQEC Conference 2013, Munich, Germany.
 May 12

Parra-Rivas, Pedro; Gomila, Damià; Matías, Manuel A; Colet, Pere
Dissipative soliton excitability induced by spatial inhomogeneities and drift.
International Quantum Electronics Conference 2013, Munich (Germany).
 May 12

Oliver, Neus; Soriano, Miguel Cornelles; Sukow, David W.; Fischer, Ingo
Experimental Criteria for High-Speed Random Bit Generation Using a Chaotic Semiconductor Laser.
CLEO/Europe - IQEC 2013 (Munich).
 May 14

Porte, Xavier; Soriano, Miguel Cornelles; Brunner, Daniel; Fischer, Ingo
Bidirectional Secure Key-Exchange Using Chaotic Semiconductor Lasers.
CLEO/Europe - IQEC 2013 (Munich).
 May 16

Zamora-Munt, Jordi; Garbin, Bruno; Barland, Stehane; Giudici, Massimo; Rios Leite, Jose R.; Masoller, Cristina; Tredicce, Jorge R.
Experimental and numerical study of the predictability of rogue waves in semiconductor lasers.
CLEO/Europe-IQEC 2013 (Munich).
 May 16

Fernandez-Gracia, Juan; Suchecki, Krzysztof; Ramasco, Jose J.; San Miguel, Maxi; Eguíluz, Víctor M.
Opinion diffusion on a network of commuting agents: confrontation with election data.
XXXIII Sunbelt Social Networks Conference of the International Network for Social Network Analysis (INSNA) (Hamburg, Germany).
 May 21

Fernandez-Gracia, Juan; Suchecki, Krzysztof; Ramasco, Jose J.; San Miguel, Maxi; Eguíluz, Víctor M.
Recurrent mobility networks and imperfect imitation shape voting behavior.
NetSci 2013 (Copenhagen, Denmark).
 June 3

Perez, Toni; Eguíluz, Victor
Synchronization of Neuronal Complex Networks in the presence of delayed interactions.
Dynamics Days Europe 2013, Madrid.
 June 3

Zamora-Munt, Jordi; Matías, Manuel A.; Colet, Pere
Resilience of synchronization against topological changes in resonant and nonresonant coupled oscillators.

Dynamics Days Europe 2013 (Madrid).
 June 3

Hernandez-Garcia, E.
Patterns and survival of competitive Levy and Brownian walkers.

Dynamics Days Europe 2013 (Madrid).
 June 6

Hicke, Konstantin; Porte, Xavier; Fischer, Ingo
Distinguishing deterministic and noise-driven power-dropout events in semiconductor lasers with delayed feedback.

Dynamics Days Europe 2013, Madrid.
 June 6

Toral, Raúl
Stochastic protein dynamics model with delay degradation.

7th International Conference of Engineering of Chemical Complexity. Rostock, Germany.
 June 9-13

Fleurquin, Pablo; Ramasco, Jose J.; Eguiluz, Victor M.
Data-driven modeling of systemic delay propagation under severe meteorological conditions

10th USA/Europe Air Traffic Management Research and Development Seminar (Chicago).
 June 10

Fernandez-Gracia, Juan; Suchecki, Krzysztof; Ramasco, Jose J.; San Miguel, Maxi; Eguiluz, Víctor M.
Agent based model for voting behavior incorporating spatial and demographic heterogeneities.

18th Annual Workshop on the Economic Science with Heterogeneous Interacting Agents (WEHIA) (Reykjavik, Iceland).
 June 20

Toral, Raúl
Leadership and peer effects in a heterogeneous organization.

18th Annual Workshop on the Economic Science with Heterogeneous Interacting Agents (WEHIA). Reykjavik, Iceland.
 June 20-22

Sánchez, P.; Holm, C.; Sintés, T.; Cerdà, J.J.

Magnetic filaments: phase diagram in bulk.

5th Iberian Meeting on Colloids and Interfaces, RIC15. Donostia, Spain
 June 28

San Miguel, M.; Ramasco, J.J.;

Vilone, D.; Sánchez, Anxo
Social and Strategic Imitation: The way to consensus.

19th International Conference on Computing Economics and Finance, Vancouver, Canada.
 July 10

Vasile, Ruggero; Galve, Fernando; Zambrini, Roberta

Open system dynamics of harmonic chains.

XXXIV Reunion Bienal de la Real Sociedad Espanola de Fisica, Valencia.
 July 16

Borras, A.; Zander, C.; Plastino, A.R.; Plastino, A.; Casas, M.
Entanglement and the speed of evolution of two interacting qubits.

XXXIV Reunion Bienal de la Real Sociedad Española de Física, Valencia, Spain.
 July 15-19

San Miguel, M.; Fernández-Garcia, J.; Suchecki, K.; Ramasco, J.J.;

Eguiluz, V.M.
Voter Model, Opinion Diffusion and Mobility Networks.

STATPHYS25: 25TH IUPAP International Conference on Statistical Physics. Seoul, Korea,
 July 21

Tugores, Antònia; Colet, Pere
Mobility data storage and analysis.

EuroSciPy 2013. Brussels.
 August 21

Martínez-García, R.; Calabrese, J.M.; Mueller, T.; Olson, K.A.; López, C.
Optimizing the search for resources by sharing information: Mongolian gazelles as a case study.

Models in Population Dynamics and Ecology, MPDE'13 (Osnabrueck, Germany).
 August 29

Carro, Adrián; Toral, Raúl; San Miguel, Maxi

Network effects on the local and dynamic properties of an agent-based herding model.

III Summer School on Statistical Physics of Complex and Small Systems. Palma, Spain.
 September 2

Manzano, G.; Galve, F.; Giorgi, G.; Colet, P.; Hernández-García, E.; Zambrini, R.

Synchronization and quantum correlations in networks.

III Summer School on Statistical Physics of Complex and Small Systems. Palma de Mallorca, Spain.
 September 2-13

Martínez García, Ricardo
Optimal search by sharing information. The case of Mongolian gazelles.

III Summer School on Statistical Physics of Complex and Small Systems. Palma de Mallorca, Spain.
 September 2-13

Carro, Adrián; Toral, Raúl; San Miguel, Maxi

Dynamics of link states in complex networks.

ECCS'13 Warm-Up School on Complex Networks. Barcelona, Spain.
 September 13

Diakonova, Marina; Eguiluz, Víctor M.; San Miguel, Maxi

Multiplexing the Coevolving Voter Model.

Multiplex Networks, Satellite of ECCS'13. Barcelona, Spain
 September 16

Ramasco, JJ
Rethinking the logistic approach for population dynamics of mutualistic interactions.

European Conference on Complex Systems ECCS 2013, Barcelona, Spain.
 September 16

Lenormand, Maxime

A Universal Model of Commuting Network.

Urbannet 2013 workshop, a satellite of the European Conference on Complex Systems (ECCS 2013), Barcelona, Spain.

September 18

Tugores, Antònia; Colet, Pere
Big data and urban mobility.

Iberian Grid Infrastructure Conference, Madrid, Spain.

September 19

Fleurquin, Pablo; Ramasco, Jose J.; Eguiluz, Victor M.

Analysis of air transport using Complex Networks.

Complex World workshop on Air Transport Network: an Integrated View. Barcelona, Spain.

September 20

Parra-Rivas, P.; Gomila, D.; Matias, M.A.; Colet, Pere

Dissipative soliton excitability induced by spatial inhomogeneities and drift.

ENOS 13, Workshop on Extreme Nonlinear Optics and Solitons. Berlin, Germany.

October 28

Rodríguez Mendez, Victor
Inferring hidden variables in complex networks.

LINC Workshop and Mid-Term Review Meeting. Postdam, Germany.

November 17-20

Zamora-Munt, Jordi
Predictability, control, and mechanisms responsible for the appearance of extreme intensity pulses in semiconductor lasers.

ENOS 13, Workshop on Extreme Nonlinear Optics and Solitons. Berlin, Germany.

October 29

Tugores, Antònia
Mobility data storage and analysis.

PyConES, Madrid, Spain.

November 23

Fernandez-Gracia, Juan; Suchecki, Krzysztof; Ramasco, Jose J.; San Miguel, Maxi; Eguiluz, Víctor M.
Recurrent mobility networks and imperfect imitation shapes voting behavior.

Net-Works 2013, El Escorial (Madrid), Spain.

December 11

a.6.3 Poster presentations

Serra, Llorenç

Majorana modes and complex band structure of quantum wires.

International workshop on spin-orbit and interaction effects in nano-electronics.

February 4 to 6

João H. Bettencourt; Cristóbal López; Emilio Hernández-García; Ivonne Montes; Joël Sudre; Boris Dewitte; Aurélien Paulmier; Véronique Garçon

Lagrangian variability of the eastern tropical pacific oxygen minimum zone.

European Geosciences Union General Assembly (Vienna).

March 7 to 12

Paulau, P.; McIntyre, C.; Noblet, Y.; Firth, W.J.; Colet, P.; Ackemann T.; Oppo, G.-L.

Locking of Laser Cavity Solitons Trapped by Defects in VCSELs.

Conference on Lasers and Electro-Optics CLEO, Munich (Germany).

May 12 to 16

Nguimdo, Romain Modeste; Colet, Pere; Danckaert, Jan
Terabit/s Physical Random Bit Generation Based on Optoelectronic Phase-Chaos System.

Conference on Lasers and Electro-Optics CLEO, Munich (Germany).

May 12 to 16

Nguimdo, Romain Modeste; Chembo, Yanne Kouomou; Colet, Pere; Larger, Laurent
Phase noise performance of double-loop optoelectronic microwave oscillators.

Conference on Lasers and Electro-Optics CLEO, Munich (Germany).

May 12 to 16

Soriano, Miguel Cornelles; Nguimdo, R. Modeste; Colet, Pere
Identification of the delay time in semiconductor lasers with optical feedback.

CLEO/Europe-IQEC 2013 (Munich).

May 13

Zamora-Munt, Jordi; Matias, Manuel A.; Colet, Pere
Resilience of large amplitude coherent output in coupled lasers.

CLEO/Europe-IQEC 2013 (Munich).

May 14

Ser-Giacomi, E.; Hernandez-Garcia, E.; Lopez, C.

Networks of oceanic transport in the Mediterranean.

Dynamics Days Europe 2013 (Madrid).

June 3 to 7

G. Manzano; F. Galve; G.-L. Giorgi; P. Colet; E. Hernandez-Garcia; R. Zambrini

Synchronization and quantum correlations in harmonic networks.

Dynamics Days Europe 2013 (Madrid).

June 3 to 7

Rodríguez-Méndez, Victor M.; Ramasco, José J.; Eguiluz, Victor M.

Inference in networks embedded in metric spaces.

Dynamics Days Europe 2013 (Madrid).

June 3

Martínez-Llinàs, Jade; Colet, Pere; Erneux, Thomas

Tuning the period of square-wave oscillations in two delay coupled systems with delay feedback.

Dynamics Days (Madrid 2013).

June 3 to 7

Nguimdo, Romain Modeste; Chembo, Yanne Kouomou; Colet, Pere; Larger, Laurent
Phase noise performance of double-loop optoelectronic microwave oscillators.

Dynamic Days Europe, Madrid (Spain).

June 3 to 7

Nguimdo, Romain Modeste; Danckaert, Jan; Colet, Pere
High-speed key exchange using chaotic systems.

Dynamic Days Europe, Madrid (Spain).

June 3 to 7

Paulau, Pavel V; McIntyre, C.; Noblet, Y.; Radwell, N., Firth, William J.; Colet, Pere; Ackemann, Thorsten
Adler synchronization of spatial laser solitons pinned by defects.

Dynamic Days Europe, Madrid (Spain).

June 3 to 7

Vasile, Ruggero; Galve, Fernando; Zambrini, Roberta
Open system dynamics of harmonic chains.
CEWQO 2013 (Stockholm).
 June 16 to 20

Carro, Adrián; Toral, Raúl; San Miguel, Maxi
Network effects on the local and dynamic properties of an agent-based herding model.
WEHIA (Workshop on Heterogeneous Interacting Agents), Reykjavik University, Reykjavik, Iceland.
 June 20 to 22

Matias, Fernanda; Carelli, Pedro; Mirasso, Claudio; Copelli, Mauro
The interplay between STDP rules and anticipated synchronization in the organization of neuronal networks.
Computational Neuroscience Meeting (Paris).
 July 13 to 18

Matias, Fernanda; Gollo, Leonardo; Carelli, Pedro; Copelli, Mauro; Mirasso, Claudio
Anticipated synchronization in neuronal motifs.
Computational Neuroscience Meeting (Paris).
 July 13 to 18

Martinez-Garcia, Ricardo
Optimizing the search for resources by sharing information: Mongolian Gazelles as a case study.
STATPHYS25. Seoul, Republic of Korea.
 July 22

Marina Diakonova, Victor Eguiluz, Maxi San Miguel
Fragmentation Transitions in Multilayer Networks.
Seoul StatPhys25.
 July 25

Tugores, Antònia; Colet, Pere
Grid made easy.
EuroSciPy 2013. Brussels.
 August 21 to 24

Martinez-Garcia, R; Calabrese J.M.; López, C.
Spatial patterns in mesic savannas: the local facilitation limit and the role of demographic stochasticity.
Models in Population Dynamics and Ecology, MPDE'13 (Osnabrueck, Germany).
 August 28

Escalona-Morán, Miguel; Paredes, Gilberto; Cosenza, Mario
Complexity, Information Transfer and collective behavior in chaotic dynamical networks.
III Summer School on Statistical Physics of Complex and Small Systems.
 September 2 to 13

Manzano, G.; Galve, F.; Giorgi, G.; Colet, P.; Hernandez García, E.; Zambrini, R.
Synchronization and quantum correlations in networks.
III Summer School on Statistical Physics of Complex and Small Systems. Palma de Mallorca, Spain.
 September 2-13

Martínez García, Ricardo
Optimal search by sharing information. The case of Mongolian gazelles.
III Summer School on Statistical Physics of Complex and Small Systems. Palma de Mallorca, Spain.
 September 2-13

Rodríguez-Méndez, Victor M.; Ramasco, José J.; Eguíluz, Victor M.
Inference in networks embedded in metric spaces.
III Summer School on Statistical Physics of Complex and Small Systems (Palma de Mallorca).
 September 2 to 13

Martínez-Llinàs, Jade; Colet, Pere; Erneux, Thomas
Tuning the period of square-wave oscillations in two delay coupled systems with delay feedback.
III Summer School on Statistical Physics of Complex and Small Systems, Palma.
 September 2 to 13

Tugores, Antònia; Colet, Pere
Distributed databases to study human mobility through social networks.
EGI Technical Forum 2013, Madrid.
 September 16 to 20

Zamora-Munt, Jordi; Colet, Pere; Matías, Manuel
Recovery of synchronization in oscillators coupled through a non-resonant mediator and direct interactions.
European Conference on Complex Systems (Barcelona).
 September 17

Crespi, S.; Bettencourt, J.H.; Lopez, C.; Hernandez-Garcia, E.
Airflow dynamics models support the hypothesis of the hydrotherapy pool as the source of infection in a travel-associated outbreak of legionnaires' disease.
8th International Conference on Legionella (Melbourne, Australia).
 October 29 to November 1

Bettencourt, J.H.; Lopez, C.; Hernández-García, E.; Montes, I.; Sudre, J.; Dewitte, B.; Paulmier, A.; Garçon, V.
Lagrangian variability of the Eastern Tropical Pacific Oxygen Minimum Zone.
A Changing Ocean - EUR-OCEANS Hot Topics Conference (Gran Canaria, Spain).
 November 6 to 8

Ismael, Hernandez-Carrasco; Vincent, Rossi; Emilio, Hernandez-Garcia; Véronique, Garçon; Cristobal, Lopez
The reduction of planktonic biomass induced by mesoscale stirring: a modelling study in the Benguela upwelling.
A Changing Ocean - EUR-OCEANS Hot Topics Conference (Gran Canaria, Spain).
 November 6 to 8

Enrico Ser-Giacomi, Emilio Hernández-García, Cristóbal López and Vincent Rossi
Networks of Lagrangian transport: an application to detect "provinces" in the Mediterranean Sea.
LINC Workshop and Mid-Term Review Meeting (Potsdam, Germany).
 November 17

Rodriguez-Mendez Victor.
LINC Workshop and Mid-Term Review Meeting (Potsdam, Germany).

Inferring hidden variables in complex networks.

November 17 to 20

Fernández-Gracia, Juan
Imperfect imitation and mobility networks shape voting behavior.

Network Frontier Workshop (Evanston, IL).

December 4 to 6

a.6.4 Seminar talks in other research centers

Matias, Fernanda
Anticipated Synchronization Between Neuronal Populations.

Laboratory of Computational Neuroscience, École polytechnique fédérale de Lausanne (Switzerland).

January 23

Cerdà, Joan J.
Simulating Magnetic Filaments.

Invited talk in the department of physics of Università di Roma 'La Sapienza'.

February 8

Fischer, Ingo
Neuro-inspired photonic information processing.

Ludwig-Maximilians University Munich, Germany.

May 17

Matias, Manuel A.
Oscillatory and excitable dynamics of localized structures.

Seminar at Institute of Physics, Humboldt University at Berlin, Berlin, Germany.

June 27

Ser-Giacomi, Enrico; Hernández-García, E.; López, Cristóbal; Rossi, Vincent

Flow transport networks.

Vortech, Delft.

October 18

Hernandez-Garcia, E.
Competitive Lévy and Brownian walkers: Patterns, clusters and survival.

Seminar given at the Institut für Physik, Humboldt Universität, Berlin (Germany).

November 21

San Miguel, Maxi
Presentation of EUNOIA project at the City Hall of Barcelona.

November 25

a.8. Press & Media

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

a.8.1 Written Media

Els investigadors de l'IFISC (CSIC-UIB) proposen un marc teòric per estudiar els efectes combinats de la temperatura i els camps elèctrics en nanoestructures.

Nota informativa UIB.

January 15

L'IFISC (CSIC-UIB) proposa un mètode de processament d'informació de gran velocitat basat en sistemes amb capacitat d'aprenentatge.

Nota informativa UIB.

January 16

L'IFISC proposa un processament d'informació de gran velocitat.

Diario de Mallorca.

January 17

La temperatura i els camps elèctrics.

Diario de Mallorca.

January 17

"La Universitat respon": deu investigadors de la UIB resolen preguntes científiques en microespais audiovisuals.

Nota informativa UIB.

January 24

Investigadores resuelven preguntas científicas en microespacios audiovisuales.

Última Hora.

January 25

Wikipedia information flow analysis reveals the scale-free architecture of the Semantic Space.

Notícia SINC. Servicio de Información y Noticias Científicas.

January 25

Deu investigadors resolen dubtes científics en microespais divulgatius.

Diario de Mallorca.

January 31

L'IFISC (CSIC-UIB) assessora la Comissió Europea per fer front als reptes del desenvolupament urbà en el segle XXI.

Nota informativa UIB.

February 11

- Sistemas que almacenarán la energía en el futuro.
El Mundo. B@leópolis.
February 12
- L'IFISC assessora la Comissió Europea en els reptes urbans del segle XXI.
Diario de Mallorca.
February 14
- Els investigadors de l'IFISC desenvolupen un model capaç de predir la congestió aèria.
Nota informativa UIB.
February 15
- Stop a los retrasos en cascada. Entrevista a Jose Ramasco, Pablo Fleurquin y Víctor M. Eguíluz.
El Mundo. B@leópolis.
February 19
- Investigadors de l'IFISC desenvolupen un model per predir la congestió aèria.
Diario de Mallorca.
February 21
- Els investigadors de l'IFISC (CSIC-UIB) estudien la capacitat discordant de les portes lògiques quàntiques.
Nota informativa UIB.
February 21
- La UIB abre la investigación a la sociedad.
Diario de Mallorca.
February 21
- Abriendo la Ciencia.
Diario de Mallorca.
February 24
- La sociedad, protagonista en la agenda de la ciencia.
El Mundo. B@leópolis.
February 26
- Estudi d'elaboració de continguts col·laboratius a Viquipèdia.
Diari de Balears.
March 1
- Interessant estudi sobre Viquipèdia.
Diari de Balears.
March 4
- Publicado un estudio de la UIB sobre Wikipedia.
Diario de Mallorca.
March 4
- Publicado en una revista internacional un estudio de la UIB sobre Wikipedia.
Última Hora.
March 4
- L'IFISC (CSIC-UIB) estudia la cooperació i el conflicte en l'elaboració de continguts a la Viquipèdia.
Nota informativa UIB.
March 5
- Un modelo estudia el conflicto y la cooperación en la Wikipedia.
El Mundo. B@leópolis.
March 5
- La dinámica de la población española sigue el principio de máxima entropía.
SINC. Servicio de Información y Noticias Científicas.
March 7
- L'IFISC estudia la cooperació i el conflicte en l'elaboració de la Viquipèdia.
Diario de Mallorca.
March 7
- Els investigadors de l'IFISC (CSIC-UIB) proposen els beneficis de l'aplicació de la llum làser complexa.
Nota informativa UIB.
March 26
- La virtud caótica de la luz láser.
El Mundo. B@leópolis.
April 16
- La Ciencia de los Sistemas Complejos y la Movilidad Urbana.
EFE.
April 30
- L'IFISC debat sobre l'autoorganització en xarxes a l'WSOS 2013.
Nota de Prensa UIB.
May 9
- IFISC reuneix 35 investigadors de tot el món.
Diario de Mallorca.
May 10
- Los datos son la nueva minería de oro y diamantes.
Diario El Mundo.
May 14
- L'IFISC organitza la sisena edició del Cicle Explorant les Fronteres entre els Sabers.
Nota de Prensa UIB.
May 16
- Mosh Pit Mechanics, Chattering Gazelles, and Bouncing Baby Shampoo.
Physics Central blog.
May 16
- El número Pi.
Diario de Mallorca.
May 26
- Las neuronas son baterías como las de un móvil.
El Mundo.
May 28
- Cafè-teatre científic per explorar les fronteres del saber amb l'IFISC.
Diario de Mallorca.
May 30
- La cantera científica es tan difícil de formar como la del Barça.
Entrevista a Bartolo Luque por Matías Vallés en el Diario de Mallorca.
June 1
- Un estudi de l'EVOCOG i l'IFISC sobre el "moment ahà!" es publica a la revista Proceedings of the National Academy of Sciences del 10 de juny.
Nota de Prensa UIB.
June 12
- Els investigadors de la UIB se situen davant el "moment ahà!".
Diario de Mallorca.
June 13
- Focus: Animal communication could support efficient foraging.
Physics 6, 68 (2013) - [http://dx. doi.org/10. 1103/Physics. 6. 68](http://dx.doi.org/10.1103/Physics.6.68) (American Physical Society) .
June 14
- Investigadors balears estudien la relació entre el cervell i la bellesa.
Ara Balears i Ara Barcelona.
June 16
- La bombilla de la belleza.
El Mundo. El día de Baleares.
June 18
- "Tenir molta informació no sempre és positiu" segons el treball publicat a Physical Review Letters amb la participació de l'IFISC.
Nota de Prensa UIB.
June 19
- "Tenir molta informació no sempre és positiu".
Diario de Mallorca.
June 20

La comunicaci3n entre individuos podr3a optimizar la b3squeda de recursos en algunas especies animales.
F3sica al dia, web de noticias de la Real Sociedad Espa3ola de F3sica.
June 20

32 alumnes de secund3ria de les Illes Balears es converteixen en científics en el IV Campus Científicotècnic d'Estiu de la UIB.
Nota de premsa UIB.
June 21

La UIB acull el Campus Científicotècnic per a Secund3ria.
Diario de Mallorca.
June 27

An explosion of delays.
Revista americana Wired.
July 8

Por que Espa3a s3 puede absorber m3s científicos.
esmateria. com.
July 9

Modelling animal interactions.
The Hindu.
July 18

L'IFISC organitza un seminari de record científic de la doctora Montserrat Casas.
Nota de Premsa UIB.
July 19

Gazelles: one steppe ahead.
Physics World.
August 1

Gazelles: one stepped ahead.
Physics World.
August 13

Dynamics, control and information in delay-coupled systems.
The Philosophical Transactions of the Royal Society A just published a Theme Issue on Dynamics, control and information in delay-coupled systems .
August 19

Fukushima radioactive oceanic plume will reach US shores next year.
Press releases, various interviews, online articles.
August 26

Inaugurada la Escuela de Verano de F3sica Estadística de la Universitat con 45 alumnos.
Diario Ultima Hora.
September 3

L'Escola d'Estiu de F3sica Estadística i Sistemes Complexos i Petits organitzada per l'IFISC acull 45 estudiants en la seva tercera edici3. *Nota de Premsa UIB.*
September 4

La radicaci3 de Fukushima arribar3 per mar a les costes dels EUA el 2014 en quantitats inofensives, segons un estudi en el qual participa un investigador de l'IFISC.
Nota de Premsa UIB.
September 4

La Universitat de Waterloo premia un treball pioner en l'an3lisi de dades en sistemes complexos elaborat amb la participaci3 de l'IFISC.
Nota de Premsa UIB.
September 5

El or3culo de los bytes.
El Mundo.
September 10

Los tuits dibujan el recorrido de la cadena humana catalana.
esmateria. com.
September 12

La Via Catalana es fa visible al mapa fent servir dades de Twitter, segons els investigadors de l'IFISC (CSIC-UIB).
Nota de Premsa UIB.
September 16

Científicos de las Islas dibujan el mapa de la cadena humana de la Diada.
Ultima Hora.
September 16

Un grup de científics de l'IFISC (CSIC-UIB) organitzen el taller Urbannet en la principal confer3ncia europea sobre sistemes complexos ECCS'13.
Nota de Premsa UIB.
September 18

L'IFISC orfereix dos tallers en la Setmana de la Ci3ncia.
Diari Ara Balears.
November 4

Qu3 s'amaga darrera l'arc de Sant Mart3?
Diario de Mallorca.
November 6

Setmana de la Ci3ncia i la Tecnologia.
Diario de Mallorca.
November 7

L'IFISC ha recollit dos mil milions de tuits en un any per analitzar la mobilitat de Londres, Barcelona i Zurich.
Nota de Premsa UIB.
November 27

Dos milions de tuits per analitzar la mobilitat de les ciutats europees.
Diario de Mallorca.
December 12

Visites escolars. La UIB es presenta als centres educatius.
Diario de Mallorca.
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a.8.2 Radio and TV

La Universitat respon: es pot predir l'evoluci3 d'una epid3mia?
V3deo canal UIB.
January 15

¿Se puede predecir la propagaci3n de epidemias?
Canal UIB (V3deo Jose Ramasco).
January 15

Entrevista a Claudio Mirasso.
Canal Extremadura.
January 26

Wikipedia.
V3deo institucional CSIC comentando resultados de M. San Miguel.
March 5

El CSIC elabora un modelo matem3tico que desvela c3mo se resuelven los conflictos en Wikipedia.
Radio Asturias. Entrevista a Maxi San Miguel.
March 5

El CSIC elabora un modelo matem3tico que desvela c3mo se resuelven los conflictos en Wikipedia.
Onda Regional de Murcia. Programa Adelantos. Entrevista a Maxi San Miguel.
March 6

El IFISC en "A Hombros de Gigantes".
Reportaje sobre el IFISC en el programa de radio RNE "A Hombros de Gigantes", con intervenciones de Maxi San Miguel y Claudio Mirasso.
March 18

Interview to Xurxo Mari3o.
Cadena SER Balears.
May 25

Interview to Bartolo Luque.
Cadena SER Balears.
May 31

APPENDIX

Interview to Xurxo Mariño.
Balears fa Ciència. IB3.
June 8

Uns investigadors dibuixen el
procés de formació de la Via
Catalana a través dels tuits
geolocalitzats.

*324. cat. Totes les notícies de TV3 i
Catalunya Ràdio.*
September 17

La Via Catalana en Twitter.
Radio RAC 1.
September 19

Interview to Maxi San Miguel.
A vivir que son dos días Baleares.
Cadena Ser.
September 28

