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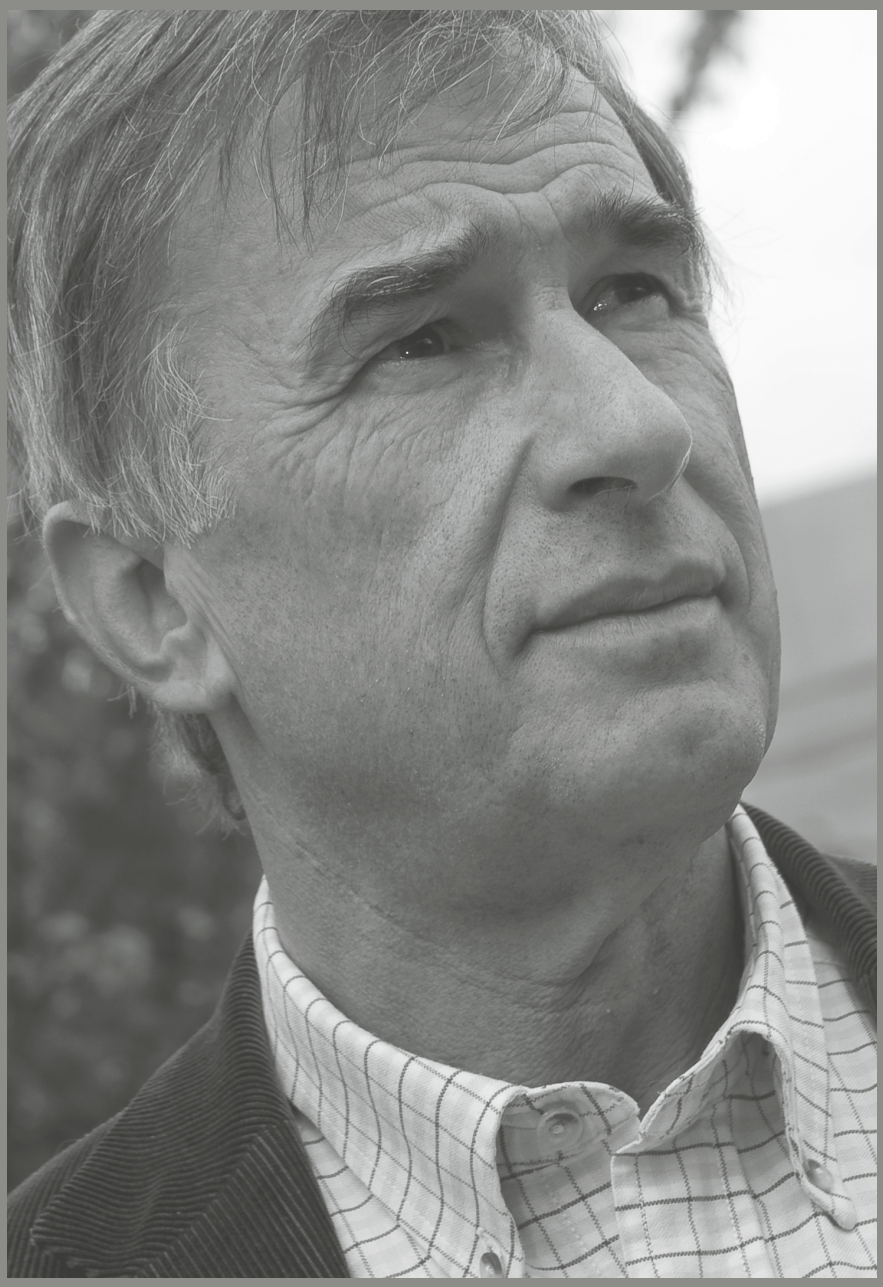
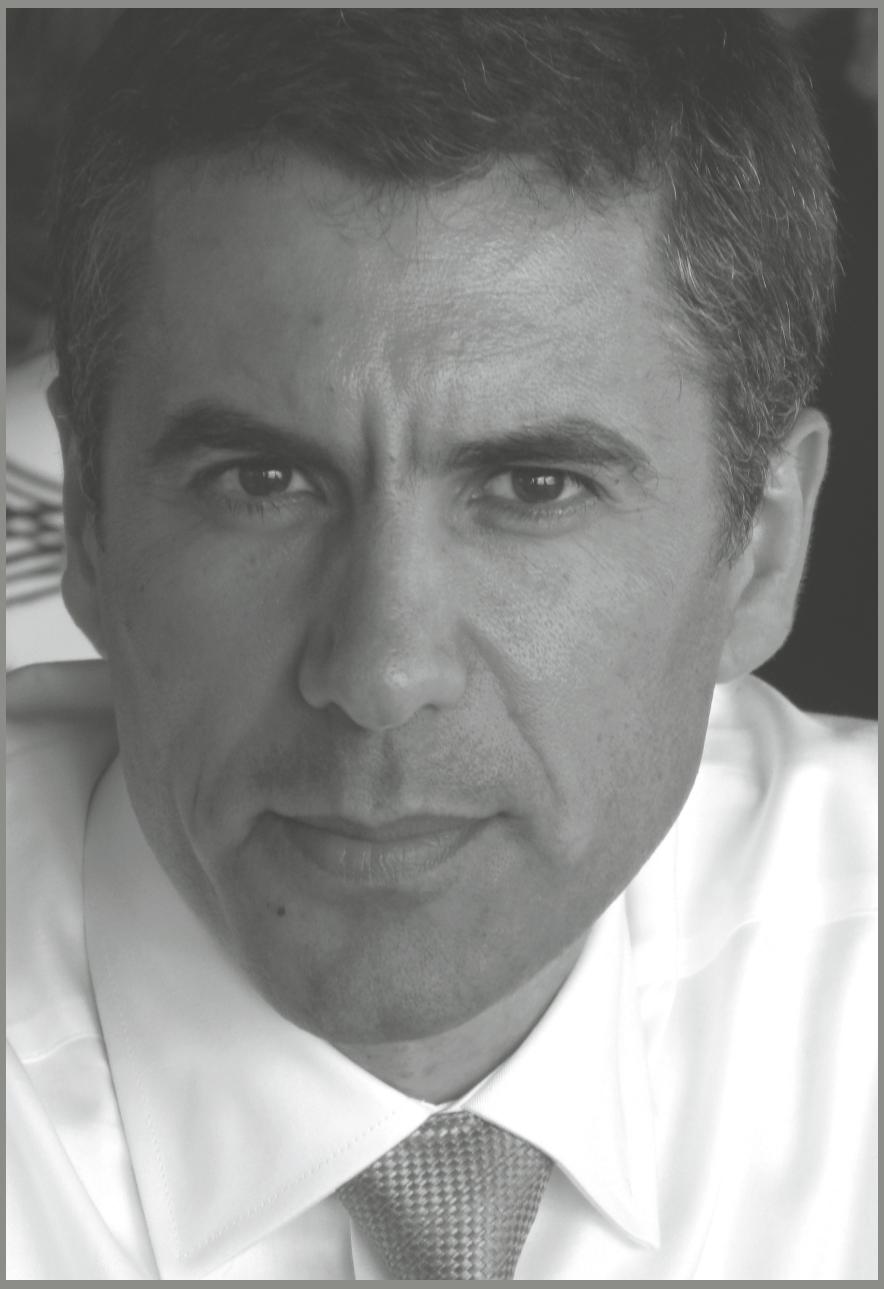


“ Establishing research at the centre of the institution’s priorities requires distinct efforts in different areas and therefore seems to me to be the main strategic factor as motor of the different components of the university’s mission.
The quality of research constitutes, in itself, an intrinsic indicator of the quality of academics and researchers, that is, of the capacity and potential in the institution to produce new knowledge. ”



message from the vice-rector

josé fernando ferreira mendes

university of aveiro

We are pleased to present the first edition of Research Highlights an annual publication of research developed at the University of Aveiro.

Research Highlights is a collection of short summaries of research conducted at UA's labs and centres by our students, researchers and faculties.

Research Highlights is designed with the aim of publicizing research done at the UA and our objective is to compile the UA's foremost research activities. Of course a lot more research has been done, but in order to cover most of our scientific areas each research unit was given the possibility to present one or two internationally recognized results. In this way, the publication also provides an overview of the most interesting results in the different areas of research.

The University of Aveiro is a young University (founded in 1973), but one which has already achieved international recognition for the quality of both its teaching and research.

As a research-focused institution, the University of Aveiro is strongly committed to carrying out research that is recognized world-wide in strategic areas of knowledge. One of our main objectives is to increase international recognition in research and continue to be recognized as a university with a strong focus on applied research, contributing significantly to the social and economic development of the region and the country. In terms of research production and impact, the UA is already a leading university in Portugal. At the University of Aveiro we currently have 4 Associated Laboratories and 12 Research Units covering most of the areas of knowledge where high-level research is created - 87,5% of these research centres received a classification of Very Good or Excellent in the evaluation process conducted by the Portuguese Science and Technology Foundation.

Before concluding this short message, I would like to say that we are particularly proud to have contributed to the science and technology carried out in Portugal and will continue to do so, by increasing the amount of relevant results achieved, by providing the conditions for the development of high level research, by supporting emerging young scientists and by building a strong research community.

RESEARC

H HIGHLIGHTS

the square kilometer array

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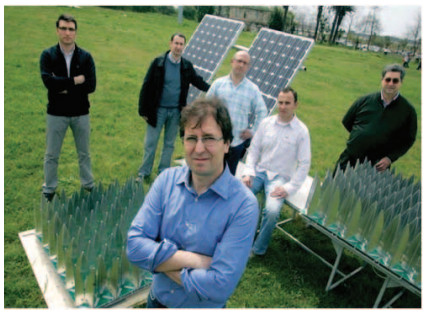

The SKA project is a global project with the participation of 17 countries and 55 institutions around the world (Europe, USA, China, Australia, South Africa, Russia, India, South Korea, Japan, Brasil) whose Phase 1 of construction will start by 2015. As a top project from the European Strategy Forum on Research Infrastructures (ESFRI) roadmap, it aims to construct and install in the South Hemisphere (either in Australia or South Africa) a giant radiotelescope that will represent the future of radio astronomy, probing an ample radio wavelength bandwidth from decametric waves up to microwaves. Spaning a 3000 km sized area, SKA will be a Data Factory, a dense sensor networked machine with several thousand 12-meter parabolic antennas and sparse and dense Phased Arrays shedding light on new cosmic phenomena with applications in space sciences. The sensors will be distributed along an ultra-fast fiber optics network with a debit of several Terabits/sec (hundred of Petabyte/year) connecting the antennas to a correlator capable of processing an Exabyte of information. Roughly, by 2017 it will produce a data traffic 200 times the world Internet traffic today, constituting an archetype of Future Internet. The European Site Emulator will be located in Moura in the South of Portugal, after careful European spectral testing led locally by IT and where prototypes will be tested, opening a new European R&D window in Portugal, as it was demonstrated for the Portuguese Authorities in March 2010.

IT is a member of the PrepSKA Consortium, funded by FP7, aiming to produce the SKA Concept Design by 2012. In particular, we lead the task, in partnership with Nokia Siemens Networks, of the configuration of the SKA data System Transport and Network using unique top transmission technologies and also component testing using the GEM radiotelescope in Pampilhosa da Serra. We also triggered the green energy usage to feed this sensor machine, using national know-how from Martifer Solar and Logica EM. The local testing will be developed jointly with the SKA European Consortium and a vast national academic involvement.

new developments in nanotechnology

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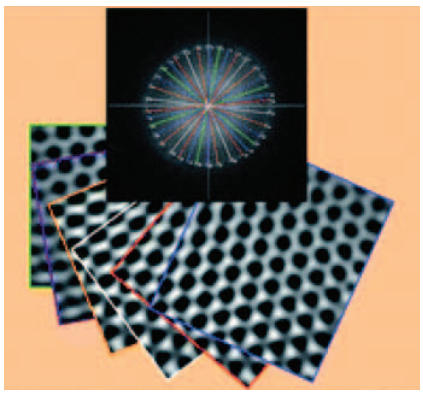
Single or few-layer graphene (FLG) sheets offer extraordinary electronic, thermal and mechanical properties and are expected to find a variety of applications. Fully exploiting the properties of graphene will require a method for the production of high-quality graphene sheets (almost pristine graphene) in large quantities. In this regard, we report a two-step method for obtaining a homogenous colloidal suspension of single or FLG sheets up to 0.15 mg ml^{-1} in N,N-dimethylformamide solution. The graphene nanostructures are directly imaged using a high-resolution transmission electron microscope (HRTEM) operated at 200 kV with a point resolution of 0.16 nm. We observed rotational misorientation within the flake in the HRTEM images of 2, 4 and 6 layers of graphene sheets, giving rise to Moiré patterns. By filtering in the frequency domain using a Fourier transform, we reconstruct the graphene lattice of each sheet and determine the relative rotation between consecutive graphene layers up, to six separate sheets. Direct evidence is obtained for FLG sheets with packing that is different to the standard AB Bernal packing of bulk graphite. Furthermore, we observed periodic ripples in suspended graphene sheets in our TEM measurements. Electrostatic force microscopy was used to characterize the electric potential distribution on the surface of FLG sheets on SiO_2/Si substrates in ambient conditions. The FLG sheets were found to exhibit a conducting nature with small potential variations on the surface.



assessment of water quality in the alqueva reservoir (portugal) using bioassays

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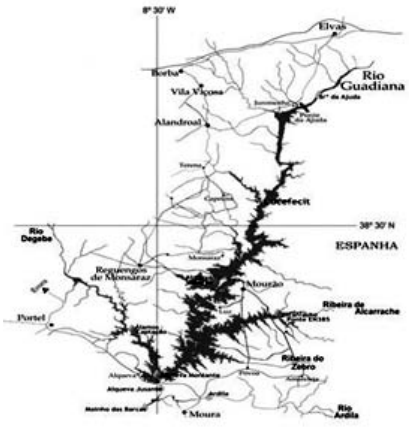

The Alqueva Reservoir is the biggest artificial freshwater reservoir in Europe and is an important water supply for human and agricultural consumption in the Alentejo region (Portugal). Pollution can impair environmental and human health status, and to assure water quality and ecological balance it is crucial to frequently monitor water supplies.

In this study, we used an ecotoxicological test battery to identify the potential toxicity of water from this reservoir. Water samples from the Alqueva aquatic system were collected bimonthly in 2006 from 11 different water points and their potential toxicity to algae, insect larvae and bacteria were evaluated.
Although in some sampling points pesticide concentrations (single and sum) were still below the legal maximum permissible concentrations, water samples showed high toxicities especially during the summer months. In addition, several sampling points showed pesticide concentrations above the permissible level which can pose a significant risk to humans and the environment.

Some recommendations and perspectives can be withdrawn from this study. On its own, chemical analysis is not enough to derive conclusions regarding the water quality and/or status; they must be complemented by laboratory bioassays with several test species. Single chemical, maximum permissible values and the sum of pesticide concentrations do not take into account possible patterns of synergism, antagonism, dose level dependencies, or even the dominance of several chemicals within a mixture. The Alqueva aquatic system, like other aquatic systems, should be maintained under strict biomonitorization programmes considering that unbalanced alterations caused by human activities (e.g. agriculture) can jeopardize the environment quality and human health.

Currently a bottom-up approach using binary mixture exposures in the laboratory is being carried out to continue this work, considering the herbicides more prominently found throughout the sampling seasons. The results are expected to drive to conclusions on the toxicity dominant chemicals in mixtures.

paper minesweeper

evgeny lakshtanov

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Similar version to the well-known and popular game Minesweeper, but which is to be used without a computer, with the aid of pen and paper only, or as a table game.

This game can have different difficulty levels, from the more basic to the more complex. The game field consists of a table with open cells, that is, with numbers. The goal of the game is to determine, in the empty fields of the game field, where, for instance, the treasure box, in the didactic application, or where the mines, in the ludic application, are.

The number in a given field is equal to the number of neighbour fields that contain treasure boxes/mines. The player shall, for instance, mark with a cross the fields where he/she believes that the treasure box/mine is, and with, for instance, a dash the fields he/she considers to be empty. At the end, the player can confirm if his/her answers are correct, through a solutions table.

A corresponding Portuguese patent was registered under number 1319/2009 (as well as a trademark “paper minesweeper”). Due to the popularity of “Minesweeper” and the potential of this new entertaining and educational board game, it is expected to have a wide use in the future.

The development of initial configurations for the “paper minesweeper” was done using a mathematical technique usually used for quantum mechanics.

the numerical and real inversion formula of the Laplace transform

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A great variety of problems can be modelled by using differential equations or, in a parallel way, integral equations. In this latter case, integral transforms have a main role in the characterization of the corresponding integral equation. Two of most useful and known integral transforms are the Fourier analysis and the Laplace transform.

To solve the above mentioned equations (or systems of equations), we need to have information about the inverse of the integral transform in use. The problem is that such inverse depends strongly on the spaces under consideration. So, it may even occur that in one framework the inverse transform exists uniquely but in a different framework it may be possible to consider different types of inverses for the same integral transform (or that the inverse simply does not exist).

Typically, the ill-posed problems (i.e., a problem which may have more than one solution, or in which the solutions depend discontinuously upon the initial data) are the most difficult ones.

Within this scope, the numerical and real inversion formula of the Laplace transform is a classical famous ill-posed and very difficult problem. However, corresponding effective formulations have great and fundamental applications.

An effective algorithm and software was constructed for the numerical and real inversion formula of the Laplace transform. This was also supported by the Japan Sciense and Technology Agency government, Gunma University and Kyoto University, and international patents in USA, Canada, Germany, France, Italy and UK were proposed.

high diversity of frenulates (polychaeta: siboglinidae) in the gulf of cadiz mud volcanoes: a DNA taxonomy analysis

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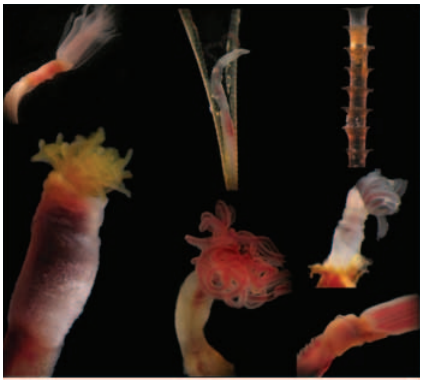
Siboglinids are tube-dwelling annelids that are important members of deep-sea chemosynthetic communities, such as hydrothermal vents, cold seeps and whale-falls. As adults, they lack a digestive system and depend entirely on endosymbiotic bacteria for nutrition. Most species have long thin bodies that span REDOX boundaries in the marine sediment, absorbing oxygen with an anterior gill-like organ and reduced compounds (e.g. hydrogen sulphide) through their posterior body. The taxonomy and systematic position of Siboglinidae was under debate for many years but current data place these animals, formerly known as the phyla Pogonophora and Vestimentifera, within the polychaete clade Siboglinidae, and most researchers recognize four main lineages within Siboglinidae: Frenulata, Vestimentifera, *Sclerolinum* and *Osedax*. The lack of sampling of frenulates has been one of the biggest issues in the study of siboglinid evolution. Sampling constraints, a shortage of taxonomic expertise, and the fact that for a long time specimens were fixed in formaldehyde, which is incompatible with most molecular biology techniques, have all contributed to the current situation of Frenulata being the least-studied group of siboglinids.

The discovery of diverse chemosynthetic communities in mud volcanoes in the Gulf of Cadiz, often dominated by frenulates, and explorations ran by several research programmes have provided excellent opportunities to sample these fascinating worms. Because the long tubiculous bodies were often broken during sampling, and therefore difficult to identify morphologically, we employed DNA taxonomy to assess their diversity. Using COI sequences we were able to distinguished 15 evolutionary lineages, 11 of which may be new to science. The remarkable diversity of Frenulata found in the Gulf of Cadiz is unprecedented and most likely results from the environmental heterogeneity associated with the bathymetry and geochemical settings of the mud volcanoes. This study provided the largest set of DNA sequences of Frenulata species that will be of utmost importance to future phylogeny, taxonomic and biogeographical studies. Moreover, it shows how important it is to explore poorly known deep-sea regions to fully understand the biodiversity and biogeography of the deep-sea, which we are far from accomplishing.



the proton radius conundrum

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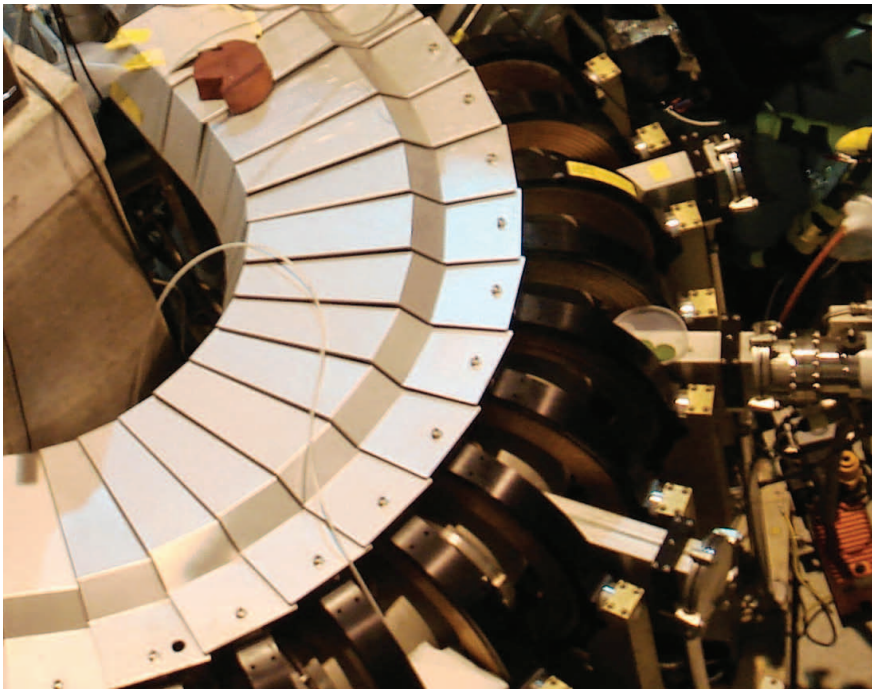

Being the simplest atom, hydrogen has been intensively studied during the past century and used as the ideal playground to test the foundations of physics. Therefore it has been regarded as the "Rosetta Stone" of quantum physics as many answers were reached from its intense study.
An idea to deduce the proton radius by means of hydrogen laser spectroscopy was born in the early seventies. Muonic hydrogen would be used instead of atomic hydrogen. About 200 times heavier, the negative muon should orbit about 200 times closer to the proton. Hence, the influence of the proton on the atomic energy levels of the muon should be magnified. The unprecedented accuracy of the method was expected to put QED to the test as QED can relate the proton radius to the hydrogen Lamb-shift - the transition energy aimed to be directly measured. Nevertheless, such measurement took about 40 years to be accomplished due to the overwhelming technical difficulties involved and it was only possible due to the joint effort of 32 scientists from 3 continents in which each team has brought its own expertise in the fields of accelerator physics, atomic physics, laser technologies and detectors.

One of those technical difficulties was the development of a suitable X-ray detector system. The task was realized through the main contribution from the Portuguese team which includes the I3N-Aveiro researchers, Prof. João Veloso and Dr. Daniel Covita, and it renders to be crucial to achieve the experimental success, a success that only arrived on the evening of July 5 2009, after three unsuccessful runs (2002, 2003 and 2007), and following 3 months of set up time and three weeks of continuous data taking (day and night).

The experiment was performed at the πE5 beam-line of the proton accelerator at PSI (see photo). An intense and low-energy muon beam (~5 keV kinetic energy) was generated and injected into a hydrogen target at low pressure (1 hPa). The muons are stopped in the hydrogen gas forming highly excited muonic hydrogen ($n \approx 14$) which quickly de-excite to ground state (1S). However, a small fraction ends up at the long-lived (metastable) 2S state.
A set of detectors produces a trigger signal each time a muon enters the hydrogen target and allows the tunable laser system to be fired into the hydrogen target. If the laser pulse matches the Lamb-shift energy it will induce the muon transition to an upper level (2P). Once in the 2P state, the muon decays rapidly to the ground state with the emission of an X-ray photon detected by the X-ray detector system placed around the hydrogen target. The temporal coincidence between the trigger signal, the laser shoot, and the 2P-1S characteristic X-ray, inside a very narrow time window separates a good event from background. By tuning the laser to scan the region around the transition energy over many repetitions, a resonance spectral line was obtained which allowed a very accurate measurement of the muonic hydrogen Lamb-shift.

After a long and careful analysis of this signal, the deduced value of the proton radius turned to be ten times more precise, 0.84184 femtometers (1 femtometer = 0.000 000 000 000 001 meter), but in strong disagreement with the accepted value (0.8768 femtometers). This unexpected difference of about 4% is huge in the QED framework and discussions on possible reasons to explain it are still ongoing. There are several aspects which are under scrutiny by now: previous high-precision measurements, extended and intricate calculations involved and maybe at some point even small readjustments to the world's most precise and best-tested fundamental theory itself – quantum electrodynamics. The conundrum is set and further developments from experimental and theoretical work are awaited.

It is rather remarkable that hydrogen spectroscopy continues to challenge our understanding of physics, as it has done over the past 100 years. And if experimental discrepancies are confirmed, more remarkable will be that this high-accuracy experiment may have seen beyond the standard model of particle physics before the high-energy giant colliders. By now, the proton radius conundrum is one of the hottest topics of physics as it proves the recent 9th position of our collaboration in the top 10 breakthroughs of 2010 selected by the *Institute of Physics* (IOP) or the fact of its related *Nature* publication, [*Nature*, 466(2010)213, cover of the issue] being the most downloaded paper in August 2010 from the *Nature* website.

climate-driven changes in air quality over europe by the end of the 21st century, with special reference to portugal

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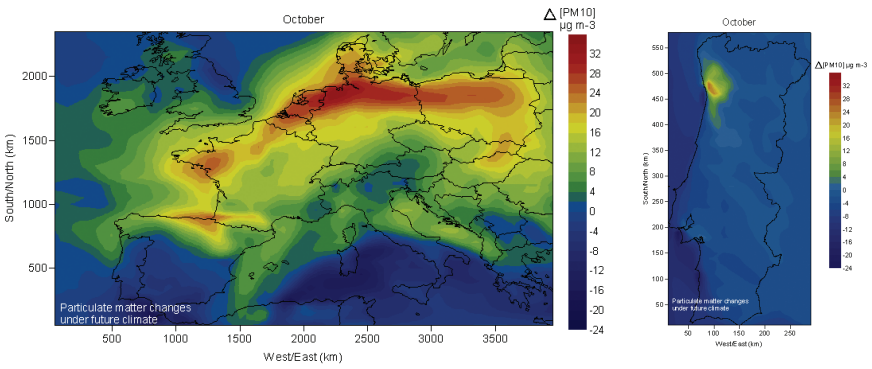
Climate change alone may deeply impact air quality levels in the atmosphere because the changes in the meteorological conditions will induce changes in the transport, dispersion and transformation of air pollutants. Ozone and particulate matter (PM10) are two major atmospheric pollutants that may deeply influence human health and ecosystems with significant social, environmental and economic impacts. In this sense, the aim of this work was to evaluate the impact of climate change on the air quality over Europe and Portugal, using a reference year (1990) and the *International Panel on Climate Change – IPCC Special Report on Emission Scenarios – SRES* A2 year (2100). The Hadley Centre global atmospheric circulation model (HadAM3P) was used to provide results for these two climatic scenarios, which were then used as synoptic forcing for the MM5-CHIMERE air quality modelling system. Results suggest that the O_3 monthly mean levels in the atmosphere may increase almost 50 $\mu g.m^{-3}$ across Europe in July under IPCC SRES A2 scenario. In Portugal, this increase may reach 20 $\mu g.m^{-3}$. The changes of PM10 monthly average values over Europe will depend on the region. The increase in PM10 concentrations during specific months could be explained by the average reduction of the boundary layer height and wind speed in future climate conditions. Increases in the maximum values can also be expected by the end of the 21st century. This trend provides important information regarding the obligation to accomplish the national and European air quality standards. It also lights out the urgent need to institute measures aimed at decreasing precursor ozone emissions and PM10 emissions in order to reduce the peak ozone and PM10 values, but also to take background conditions into account.

In the scope of the air quality management for the next decades it is necessary to include climate change and changes in climate variability when defining long-term plans and measures to improve the quality of the air we are breathing.



quantum cryptography

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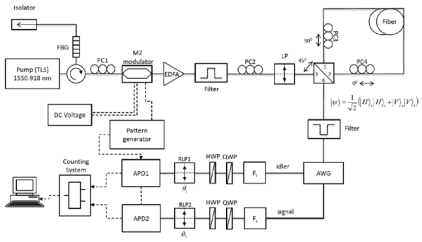
In this project, we have been engineering secure fiber-optic communication systems based on quantum cryptography. Instead of being based on unproven lack of computational power, like traditional cryptographic protocols, quantum cryptographic protocols rely on fundamental laws of nature to guarantee that any attempt to hack into a communication system cannot go undetected.

In the framework of the project "*QuantPrivTel – Quantum Private Telecommunications*", we succeeded in generating, transmiting and detecting single and entangled photons. Single photons are elementary particles that follow the rules of quantum physics.

After coding information in the photons' polarization, any attempt to extract the information using a wrong basis is going to produce a random result, i.e. noise. Entangled photon pairs are pairs of elementary particles that exhibit non-classical correlation, which makes any attempt to extract the information in one photon noticeable in the other photon of the pair.

To generate a stream of single-photon pulses, we are using the stimulated four-wave mixing effect in optical fibers. The four-wave mixing is a Kerr nonlinear phenomenon that occurs when photons' from one or more waves are annihilated and new photons are created at different optical frequencies preserving the aggregate momentum and energy. We are able to control the number of photons per pulse on average by manipulating the efficiency of the four-wave mixing process.

We are using the spontaneous four-wave mixing in optical fibers to generate entangled photon pairs. We have been exploring the momentum and energy conservation of the generated photon-pair to manipulate the photon quantum states. We have made coincident measurements and with these measurements we are able to assess the quality of the photon-pair generated, namely the degree of entanglement. We observe that the spontaneous Raman scattering is a major source of non-correlated photons. We found that in a single-pump configuration, photon-pairs can be created with polarization either parallel or orthogonal to the pump. In a dual-pump configuration, we found that by manipulating the optical power of each pump we can improve the quality of the generated photon-pair. We also found that orthogonally polarized pumps can generate photon-pairs with a high degree of entanglement.



cognitive radio (plug 2010 award)

nuno carvalho[1], josé vieira[2], arnaldo oliveira[1], pedro cruz[1], daniel albuquerque[2], nelson silva[1]

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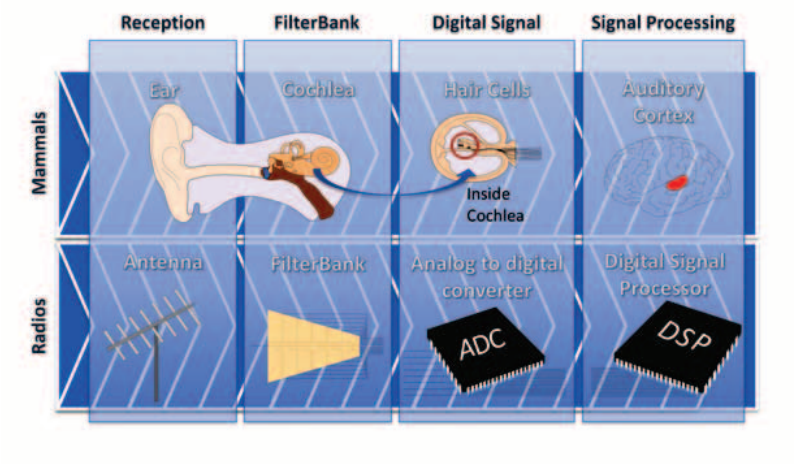
Nowadays, new telecommunications standards or new releases of existing ones (e.g., Worldwide Interoperability for Microwave Access (WiMAX), 3GPP Long Term Evolution (LTE), Universal Mobile Telecommunications System (UMTS), High Speed Downlink Packet Access (HSDPA), etc) are constantly appearing. In this scenario, interoperability across existing standards is a crucial requirement to achieve a high quality of service (QoS). Software Defined Radio (SDR) technology holds the best promise of meeting this requirement whilst efficiently tackling the ever-increasing complexity of radio systems.

One of the most interesting potential applications of SDR is to increase the spectrum occupancy by designing opportunistic radio systems, i.e. systems capable of dynamically allocating regions of the spectrum that happen to be free at a given moment, which implies the ability to "see" or "be aware" of the entire spectrum and its usage at a precise time. This has motivated the scientific community to study different radio architectures with the ability of detecting signals over a broad frequency band with a high dynamic range. This requirement poses problems due not only to bandwidth restrictions but also to high peak-to-average power ratio (PAPR) demands or RF interference from one or more sources.

Building flexible multi-mode/multi-standard SDR and Cognitive Radios (CR) requires digital processing of high-frequency and wide-band signals, which is challenging in terms of sampling rate, operating speed, dynamic range and power consumption. For this reason, a purely software-based implementation using off-the-shelf Digital Signal Processor (DSP) units is hardly feasible. It is necessary to resort to specialized hardware devices, e.g. based on Field Programmable Gate Arrays (FPGAs). The large integration capacity and advanced features of modern FPGAs make them appealing for an increasing number of practical applications. Their reconfigurability makes them particularly suited for applications requiring fast design cycles, dynamic adaptation and/or field updates.



characterization of mitochondrial proteome in pathophysiological conditions

rita ferreira, rui vitorino, renato alves, ana padrão, pedro domingues, rosário domingues, francisco amado

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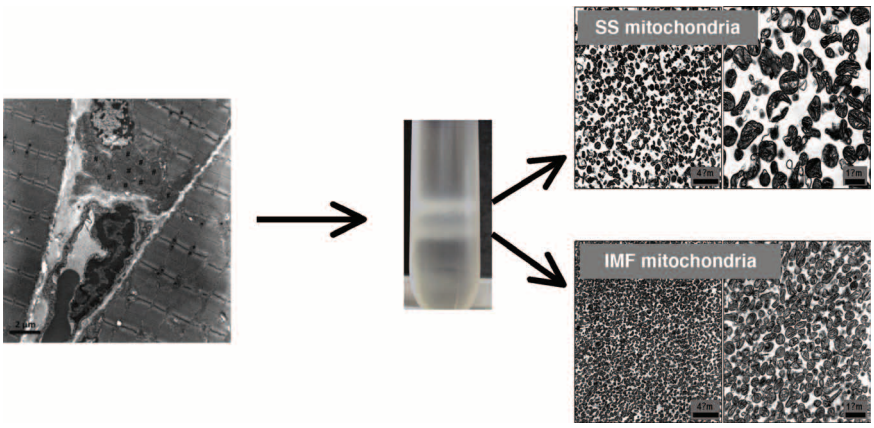
Lifestyle is a key modulator of the aging process. We have shown that lifelong physical activity prevents age-induced loss of mitochondrial functionality in skeletal muscle by preventing oxidative damage of mitochondrial proteins. Indeed, the decreased capacity for ATP production observed in aged mice seems to be related with the increased carbonylation of specific proteins, particularly metabolic ones. The attenuation of these effects by lifelong physical activity suggests new connections between molecular age-related changes and cellular functions known to be impaired in aged muscle.

Being mitochondria a pivotal organelle in the signalling and bioenergetic processes of tissues like the striated muscle (cardiac and skeletal), we have shown the importance of subcellular location in mitochondrial plasticity. Using proteomics of mitochondria and its subfractions, we have identified 325 distinct proteins, most of which from the functional clusters of oxidative phosphorylation, metabolism and signal transduction. Compared to the mitochondria located near the sarcolemma (SS), mitochondria interspersed in the myofibrils (IMF) expressed higher levels of proteins associated with oxidative phosphorylation and have higher respiratory chain complexes activity. This observation suggests a specialization of IMF mitochondria toward energy production for contractile activity. Functional differences between IMF and SS mitochondria were also related with distinct membrane proteins susceptibility to oxidative damage, being SS mitochondrial proteins more prone to carbonylation. Therefore, mitochondria localization in the fiber also determines protein's susceptibility to posttranslational modifications.



GPON in a BOX

paulo andré[1], armando pinto[2], antónio teixeira[2], mário lima[2], rogério nogueira[1], joão pinto[4], ali shahpari[4], telmo almeida[1], gabriel gonçalves[4], fernando parente[4], andreia alves[4], irina carvalho[4], paulo monteiro[4], josé girão[2], joão davim[4]

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This Project is promoted by Portugal Telecom Inovação in collaboration with the Instituto de Telecomunicações (IT) and financed by the QREN with total investment of 6.5 M€.

The main objective is to develop new components for the next generation of optical networks. These components, to be manufactured by Portuguese industry, should provide complete off-the-shelf solutions to interconnect residences and business centers through optical fibers, allowing the subscription of services such as digital and analog TV, internet and voice. The characteristics for the developed solutions, in comparison with commercial ones, are the low implementation cost and energy consumption, flexibility in terms of network

design and interoperability with of other brands equipments.

IT ontributions are to develop solutions for the subscribers of optical interfaces, to implement and propose new amplifications concepts, to increase the total network length and to provide tools for the network cost planning.

retrieval of the alzheimer's amyloid precursor protein from the endosome to the TGN occurs via the retromer and is dependent on protein phosphorylation

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In cells, retrograde transport of several transmembrane proteins from endosomes to the trans-Golgi network (TGN) occurs via Rab 5-containing endosomes, mediated by clathrin and the recently characterized retromer complex. This complex and one of its putative sorting receptor components, SorLA, were reported to be associated with late onset Alzheimer's disease (AD). Researchers at the Centre for Cell Biology are able to show for the first time the formation of an APP (Alzheimer's Amyloid Precursor Protein) – and retromer-containing protein complex. Thus providing a physiologically significant means of APP retrieval from the endosome to the TGN. Furthermore, protruding tubules near the TGN containing APP, were shown to occur, again supporting an association with a retromer-mediated pathway.

From a regulatory perspective, mimicking APP phosphorylation at residue S655, within the APP 653YTSI656 basolateral motif, enhances APP retrieval via a retromer-mediated process. Additionally, the phosphomimetic APP S655E displays decreased APP lysosomal targeting, enhanced mature half-life, and decreased tendency towards Abeta production. VPS35 downregulation impairs the phosphorylation dependent APP retrieval to the TGN, and decreases APP half-life.

In essence, we reported for the first time the importance of APP phosphorylation on S655 in regulating its retromer-mediated sorting to the TGN or lysosomes. Significantly, the data are consistent with known interactions involving the retromer, SorLA and APP. Further, these findings add to our understanding of APP targeting and potentially contribute to our knowledge of sporadic AD pathogenesis representing putative new targets for AD therapeutic strategies.

system of seven planets discovered

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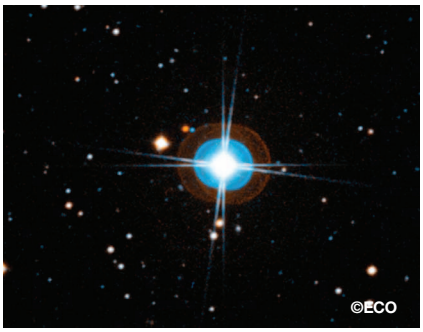

An international team of astronomers, including Alexandre Correia from the Physics Department, University of Aveiro, have discovered a planetary system containing at least five planets, orbiting the Sun-like star HD 10180. The researching team also found strong evidence for two more planets, one of which would have the lowest mass ever found. This would make the system very similar to our Solar System in terms of the number of planets, which comprises eight planets.

The discovery has been made possible using the HARPS spectrograph, attached to ESO's 3.6-metre telescope at La Silla, Chile. HARPS is an instrument with unrivalled measurement stability and great precision. It is the world's most successful tool to find planets around other stars. The method consists in measuring the Doppler shift of the star, and hence infers its radial velocity variations provoked by the complex gravitational attractions from the planetary companions.

The Sun-like star HD 10180 is located 127 light-years away in the southern constellation of Hydrus (the Male Water Snake), and it has been followed for six years. Thanks to 190 individual HARPS measurements, the astronomers detected five strong signals corresponding to planets

with Neptune-like masses, between 13 and 25 Earth masses, which orbit the star with periods ranging from about 6 to 600 days. The trace of two additional planets is also visible in the data. One would be a Saturn-like planet (with a minimum mass of 65 Earth masses) orbiting in 2200 days. The other would be the least massive exoplanet ever discovered, with a mass of about 1.4 times that of the Earth. It is very close to its host star, with an orbital period of only 1.18 days.

The five Neptune-like planets are located between 0.06 and 1.4 times the Earth–Sun distance from their central star, that is, lying within a distance equivalent to the orbit of Mars. Thus, the HD 10180 system is more populated than our Solar System in its inner region, and has many more massive planets there. In addition, all the planets seem to have almost circular orbits, and obey an equivalent of the Titius–Bode law that exists in our Solar System: the distances of the planets from their star seem to follow a regular pattern. The system of planets around HD 10180 is thus unique and the most similar to our own discovered so far.

metabolic signatures of lung cancer unveiled by NMR-based metabonomics

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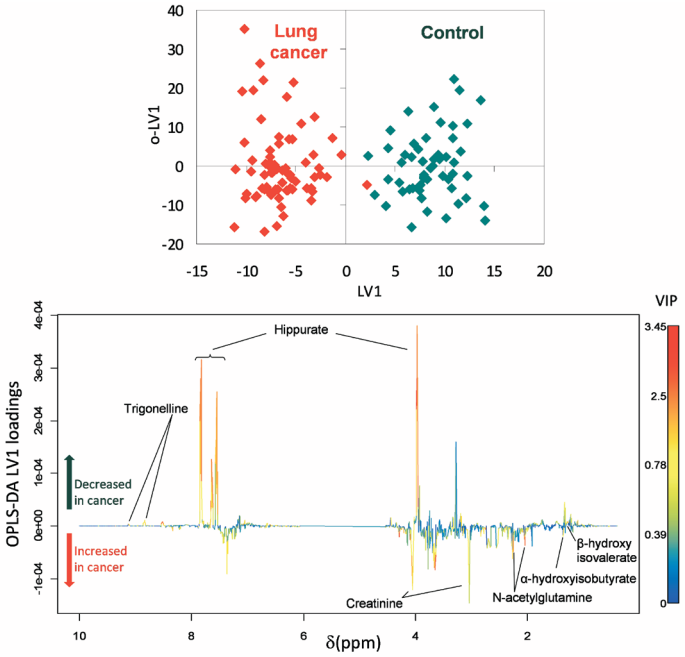
By providing a non-selective survey of a wide range of endogenous metabolites and of their variations upon different pathological conditions, metabonomics is exquisitely valuable in disease diagnosis and follow up. We have applied this approach to investigate the metabolic signatures of primitive lung cancer, through the analysis of tissues and biofluids by ^{1}H Nuclear Magnetic Resonance (NMR) spectroscopy combined with multivariate statistics. Tumour and non-involved adjacent tissues, collected after surgical resection and directly analysed by High Resolution Magic Angle Spinning (HRMAS) NMR, could be clearly discriminated and putative biomarkers of malignancy were highlighted. Moreover, consistent metabolic differences were found between adenocarcinoma, carcinoid and epidermoid tumours, adding valuable knowledge on the biochemistry of different histological types of bronchial-pulmonary carcinomas, not available through conventional histopathology. We have also applied NMR-based metabonomics to blood plasma and urine from lung cancer patients and a control group of healthy individuals. Multivariate modelling of spectroscopic data produced very good discrimination between the two groups, with sensitivity and specificity levels above 90%. In spite of the high inter-individual variability, a number of metabolites were found to be consistently altered in the biofluids of patients relative to control subjects, therefore suggesting a systemic metabolic signature for lung cancer and showing the potential of NMR-based metabonomics for the minimally invasive detection and monitoring of the disease. It should also be noted that whereas some of the metabolites found to be altered in tissues and biofluids related to known cancer biochemical hallmarks, such as the Warburg effect, increased glutaminolysis, and deregulated lipid metabolism, others, like elevated short chain fatty acids and creatinine in urine, were unexpected, paving the way to formulate new pathophysiological hypotheses.

Multivariate modelling of the urinary profiles of lung cancer patients and healthy controls



luminescent nanothermometers for long-term absolute measurements

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Temperature is a fundamental thermodynamic variable, the measurement of which is crucial in countless scientific investigations and technological developments. Thermocouples and thermistors constitute accurate, affordable and easy-to-install experimental probes; however, such traditional thermometers are unsuited to length scales of under 10 microns. This intrinsic limitation has encouraged the development of new non-contact accurate thermometers with micrometric and nanometric precision. At the Universities of Aveiro and Zaragoza we have addressed this issue during the last 4 years and recently we have reported a unique luminescent self-referencing nanothermometer allowing absolute measurements in the 10-350 K temperature range and submicrometer spatial resolution.

The developed thermometer has up to 4.9%·K^{-1} temperature sensitivity (1.5 times larger than the highest value reported previously) and it exhibits high photostability for long-term use. The nanothermometer is a versatile material which can be processed in different forms adapted to the desired application. So far we have processed this nanothermometer in two different forms; i) a thin film coating an integrated circuit trough which we obtain an high resolution (0.1 micron) 2-dimensional temperature mapping and ii) nanobeads composed of maghamite nanoparticles, used as a magnetic-actuated heat sources, covered by a hybrid matrix containing Europium and Terbium chelates. The emission properties change with the temperature making possible to predict the temperature by the analysis of the “colour” of the material.

The synergetic outcomes arising by combining temperature sensing/mapping and superparamagnetism opens the way for new exciting applications, especially in the biomedical field. In particular, such association will provide a unique instrument to map, in a non-invasive way, temperature distributions in biological tissues during heat release, due to the application of an ac field to magnetic nanoparticles (magnetic hyperthermia), this being, with no doubt, a powerful tool for the study of biochemical micro-processes occurring within a cell.

strong piezoelectricity in peptide nanotubes

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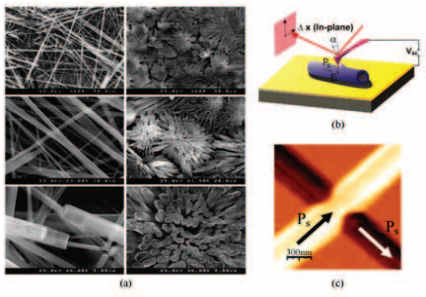

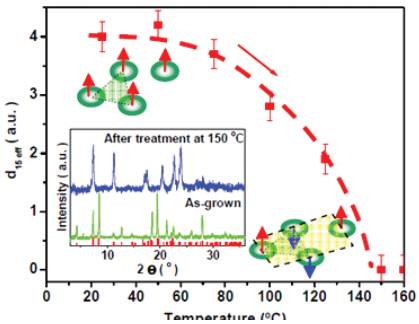

Piezoelectricity, the ability of noncentrosymmetric materials to produce mechanical stress/strain under an electric field or charge/voltage under a mechanical force, is widely used in many areas, e.g. in medical ultrasound transducers and filters for mobile phones. Until recently, only inorganic piezoelectrics (such as PZT or $LiNbO_3$) have been used based on their high piezoelectric coefficients. In view of growing interest in biomedical applications and green technologies, bioorganic materials having a significant piezoactivity are required for ever expanding area of piezodevices. Several natural biomaterials were found to be piezoelectric but their piezoelectric properties were by far insufficient to be used in the devices.

In 2010, a strong piezoelectricity (of the order of that in the classical transducer material $LiNbO_3$) was discovered in artificially prepared biomaterials: peptide nanotubes (PNTs) made by a self-assembly process of small diphenylalanine, NH2-Phe-Phe-COOH,

peptide monomers. These PNTs are derived from the smallest recognition motif of the famous amyloid-β protein, associated with over 30 diseases, mostly neurodegenerative ones such as Alzheimer, Huntington, Parkinson, Creutzfeldt-Jacob and prions. They conveniently self-assemble in stable and rigid tubular nanostructures where piezoelectric polarization is directed along the tube axis. Both horizontal and vertical tubes were prepared in UA and characterized by Piezoresponse Force Microscopy – a novel method actively developed in CICECO group Among the recent findings of the joint CICECO/TEMA team is the discovery of irreversible transformation of PNTs to another crystalline (possibly orthorhohombic) so that two stable polymorphic phases can exist at room temperature. The polarization was found to decrease from room temperature to 140 ºC and antiferroelectric-like ordering with opposite polarization orientations in adjacent aromatic rings is observed. Amazingly, polarization switching was observed in such tubes proving their ferroelectric nature. These findings were supported by rigorous molecular simulations showing that ferroelectric-like behavior is originated from the hydrogen bonds connecting individual FF monomers, which break upon the temperature increase.

This discovery opens up an avenue for using PNTs (currently considered as a dielectric analog of carbon nanotubes) as bioorganic sensors, actuators and molecular motors.

galapro – education of trainers for intercomprehension in romance languages

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in collaboration with research teams from 7 other european universities:
université stendhal grenoble III (FR.); université de lyon II (FR.); universidad complutense de Madrid (ESP.); universitat autònoma de barcelona (ESP.); université de mons-hainault (BEL.); università de cassino (IT.); université a.i. cuza (ROM.)

GALAPRO (www.galapro.eu) is an internet platform aiming at developing an education of teachers and trainers for intercomprehension in Romance Languages (Catalan, Spanish, French, Italian, Portuguese and Romanian) either through distance learning or blended learning methods.

This multilateral project is addressed to language teachers; teachers of other subjects working in a plurilingual and intercultural context; tutors of distance learning directed to intercomprehension; students of different areas (particularly languages and cultures or sciences of communication, language and education).

The Galapro Team intends not only to develop professional competences in the realm of intercomprehension but also to develop transversal competences in the use of ICT, with both communicative and professional purposes. It is expected that this project will enable, in language education professionals, a feeling of belonging to a broader community, which will help to disseminate and consolidate a school culture of intercomprehension.

The training is conceived according to two axes: education in didactics of intercomprehension through the practice of intercomprehension, and construction of plurilingual virtual communities of collaborative learning and teaching of intercomprehension. The education trajectory is organised in five phases.

Phases	Brief description
Preliminary phase	Discovery of Galapro (principles, aims, tools, platform) and identification of educational needs, issues and thematics.
Our questions and dilemmas	Constitution of plurilingual Work Groups (WK) according to the needs, issues and thematics identified.
Educate oneself to educate	Definition of a working plan.
In training/education	Development of the working plan and publication; discussion of the products of the several WG.
Evaluation and balance	Evaluation and balance of the functioning dynamics and products of the WGs.

The online plurilingual platform (in www.galapro.eu/sessions) is expected to help the trainees develop their work during the training (which lasts about 10 to 15 weeks), thanks to its communication tools (discussion forum, chat, e-mail) and working spaces (personal and institutional offices and lib, among others).

The platform has been available since February 2009. Since then, two training sessions have already been developed by 300 participants from 12 different countries from 3 different continents (European, American and African). The team Galapro is being asked, by some international associations and institutions for language education policy, to disseminate this training and implement it in other countries in the world, to different publics and including other languages. We can say that this project and its platform are acknowledged as truly relevant to the promotion of plurilingualism and intercultural competences in the globalised contexts we live in.

minor composition changes for major impact on tolerance to reactive gases

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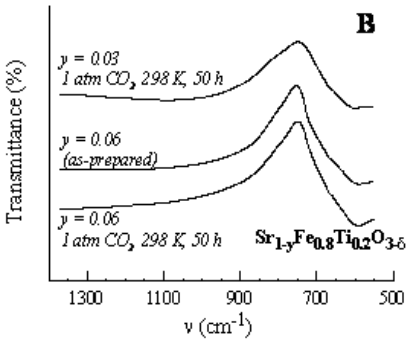
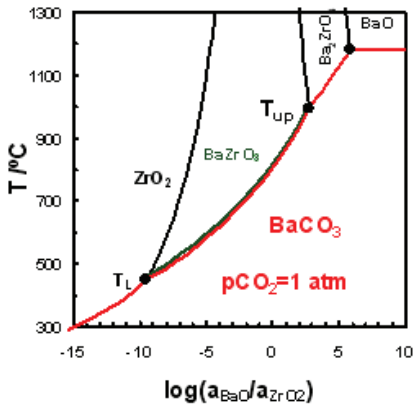
Thermodynamic predictions are used to predict interaction of a variety of materials with reactive gases. It was demonstrated that minor composition changes suppress the activity of reactive components and play major impact on tolerance to reactive gases. This thermodynamic approach was also used as guideline for establishing stability ranges on thermal cycling, and to minimize the thermodynamic driving force for degradation in contact with gases.

Thermodynamic analysis of AO-BO_2-G systems (G=CO_2, H_2O, H_2S, etc.) provide guidelines for interpretation of resistance of $A^{II}B^{IV}O_3$-perovskites to reactive gases, with emphasis on materials with high technological relevance. The analysis demonstrated major differences between stability limits for materials with excess and deficiency of the reactive AO oxide, and corresponding upper and lower temperature limits for immunity to reactive gases. On combining these thermodynamic calculations for a variety of $A^{II}B^{IV}O_3$ perovskites, a high degree of





correlation between the stability limits and the Goldschmidt tolerance factor was demonstrated. These correlations allow reliable predictions to be obtained even for complex compositions and for cases when insufficient thermodynamic data prevent precise analysis.

The upper and lower temperature limits of stability ranges can be used to predict the evolution of reactions on cooling from high temperatures and also upon re-heating ABO_3 perovskites in reactive atmopsheres, as confirmed by IR, TG, etc.

Representative materials are used to confirm the applicability to components of solid state electrochemical systems proposed for conversion of hydrocarbon fuels, and is also being used for interactions of cements with CO_2 and/or humidity.

novel porphyrin macrocycles and polyhydroxylated 2,3-diaryl-9H-xanthen-9-ones: synthesis, biological evaluation, applications and patents

josé cavaleiro, artur silva, graça neves, augusto tomé, amparo faustino, joão tomé, carla carvalho, clementina santos

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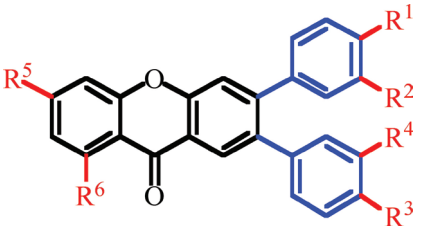
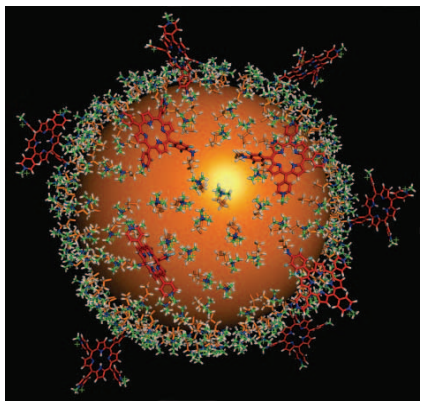
A) New synthetic methodologies leading to porphyrin derivatives have been studied. Such methodologies involve the macrocycle derivatization by cycloaddition transformations, and also other structural modifications from beta-substituted macrocycles. The new compounds have been structurally elucidated and biologically evaluated. Significant applications have been found on the use of the new compounds as antimicroorganism agents.

Such applications include processes of waste water purification by using porphyrins as photosensitizers in heterogeneous media (in a collaborative action with CICECO colleagues, a patent has been registered). Other porphyrin applications were found for the use of such compounds in photodynamic therapy of cancer cells; their anti-microorganism actions have also been well established. Certain Mn(III) and Fe(III) complexes have also demonstrated very good catalytic action in the oxidative transformation of organic substrates into higher value-added products.

B) Xanthones constitute one of the major classes of naturally occurring oxygen-containing heterocyclic compounds containing dibenzo-pyrone rings. Natural derivatives can be hydroxylated, methoxylated or prenylated, among other possibilities; the parent compound xanthone itself is not known as a natural product. The presence of aryl groups on the xanthone core has only been reported for a few synthetic derivatives, and as far as we know the literature had never presented the synthesis of xanthones featuring 2,3-diaryl moieties before our work. A large number of hydroxylated 2,3-diaryl-9*H*-xanthen-9-ones have been synthesised by two different approaches, involving modern organic transformations. The biological evaluation of the prepared 2,3-diarylxanthones showed they present potent potential as new drugs and cosmetics and the excellent results led us to register them in a patent.





improving cellulase activity for cellulose hydrolysis towards the future production of second generation bio-ethanol

ângelo salvador
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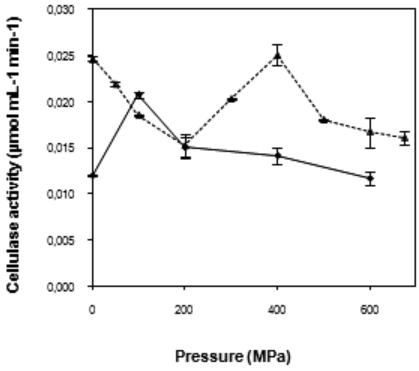
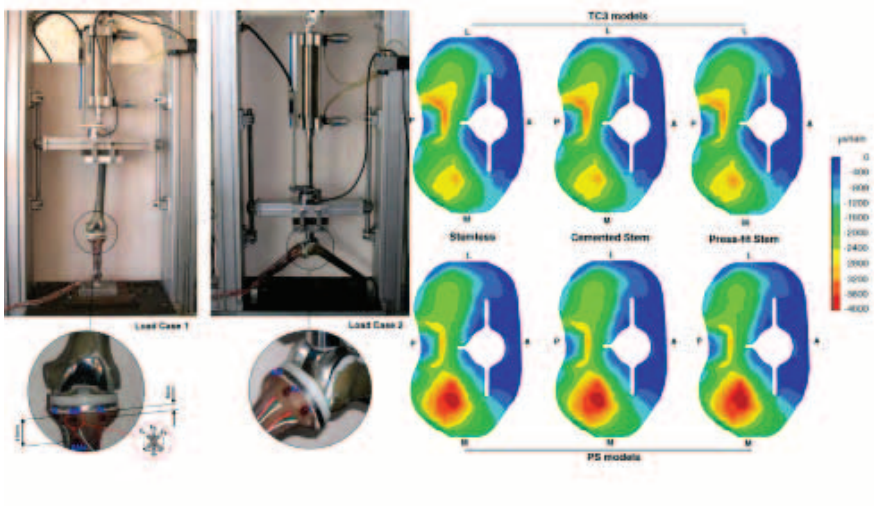
The limited reserves of fossil fuels have forced attention to the use of renewable biomaterials for energy production, with particular focus on the use of cellulose, for the production of ethanol (second generation bio-ethanol). For this to become viable, a limiting and crucial step is the hydrolysis of cellulose, due to the protection of the sugar molecules against chemical and enzymatic hydrolysis, by the tight packing of cellulose chains in microfibrils and cellulose poor solubility in aqueous solutions. Ionic liquids (ILs), salts that are liquids at room temperature, are an emerging new class of solvents for biocatalysis, with some showing capacity to dissolve cellulose, opening interesting possibilities to render cellulose more accessible to hydrolysis. High pressure (HP), now an established method for cold pasteurization of foods, has also the potential to change enzymes activity and selectivity.

In this work the combined effect of an ionic liquid, [bmim]Cl, and HP (up to 675 MPa) on the activity of one enzyme was studied for the first time (cellulase and carboxymethyl cellulose were used as case-study). The results showed that cellulase activity in the ionic liquid [bmim] Cl at atmospheric pressure is lower

(30 to 50%) compared to buffer and correlates linearly with the decrease of the thermodynamic water activity (a_w) caused by [bmim]Cl. In 10% [bmim]Cl, cellulase activity under pressure varies from equal to 1.7-fold higher (at 100 MPa) the value at atmospheric pressure. These results open the possibility to improve cellulase activity, and possibly of other enzymes, in ILs, by carrying out the reaction under pressure, by combining the peculiar solvent properties of ILs and the effect of HP on enzymatic reactions. In the case of cellulose this can lead to future methodologies to render cellulose hydrolysis viable to produce bio-ethanol.



a stemmed femur change the structural behaviour of proximal tibia? It seems that this question has not yet been fully answered and the use of stems in the opposite bone structure requires further analysis. The main insight given by the present study lies in the fact that the use of femoral stems does not contribute to an increase of the risk of failure of the tibia.



new developments in clinical biomechanics

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Recognized failure mechanisms after revision total knee arthroplasty include failure of fixation, instability and loosening. Thus, extended stems have been used to improve fixation and stability. In clinical cases where the stem is only applied in the femur, a question concerning the structural aspect of tibia may arise: Does

mudbag: heated electrode for applying treatment based on geomaterials alone or incorporated into dermoproducts (creams, ointments, lotions) and/or drugs

fernando rocha[1], eduardo silva[1], josé martins de carvalho[2], ana quintela[1], denise terroso[1] & exatronic

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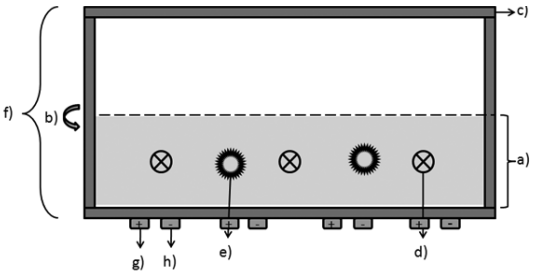

a) Area of the bag with the tissue diver
b) Bending area
c) Region where the two extremities are united for closing the bag
d) Temperature sensors
e) Electrodes for measuring the bioimpedance
f) Reusable bag in porous or permeable fabric
g) Active electrode embedded in the storage electrode
h) Return electrode embedded in the storage electrode

Minerals have been used for therapeutic purposes since the beginning of mankind. Clay minerals have been the most used for this purpose, for pharmaceutical application or application in aesthetic medicine, due to their highly specific surface, excellent rheological and/or adsorption/absorption capacity. Pelotherapy, or “Mudtherapy”, is the use of mud/clay (both geological politic materials) for therapeutic applications, internal or external. Some Portuguese

geomaterials have been studied to analyze their suitability for medical treatments of hydrology. After adequate “ageing” preparation, called maturation, the mixture leads to production of mud/clay “peloids” whose characteristics will depend on the composition of mud/clay, geochemistry of mineral water, the mixture between the clay and water and, finally, the “maturation” process carried out. Thermal properties are a very important parameter for this application since good heat retention is wanted. Generally, the “peloid” is applied hot (30-40 °C) for 20 to 30 minutes in layers 1 to 2 cm, covered with a waterproof material to retain heat. The heat is conducted for through dermal and subcutaneous tissue and after 10 minutes it reaches the inside of the body, as far as we know by conduction and convection via blood. This application produces a feeling of warmth in the area to be treated, vasodilatation, perspiration and respiratory and cardiac stimulation.

Studied technology refers to a medical device that functions as electrode in medical acts involving the use of electric currents, namely iontophoresis. This invention can be used in treatments in Thermal Centres, Thalassotherapy Centres, Medical Geological Centres, Spas, Physical Medicine Centres and Rehabilitation and Aesthetic clinics. The electrodes allow the passage of electric current through the skin and keep geomaterials and/or drugs to be applied at a constant temperature. The electrode consists of two parts, the electrode storage that contains the product to be applied and the heating element. The electrode storage consists of assue driver that can take the form of a bag where are placed the formula with geomaterials and/or drugs.

The application of these geomaterials is yielded using this device because it maintains constant temperature during treatment, thus promoting greater therapeutic efficacy and reducing the time of treatment required for successful therapeutic action. On the other hand, adequate geomaterial allows a lower power consumption and appropriate temperature for a better rate of release of active principle.

urbsoil-lisbon: geochemical survey of lisbon urban soils: a baseline for future human health studies

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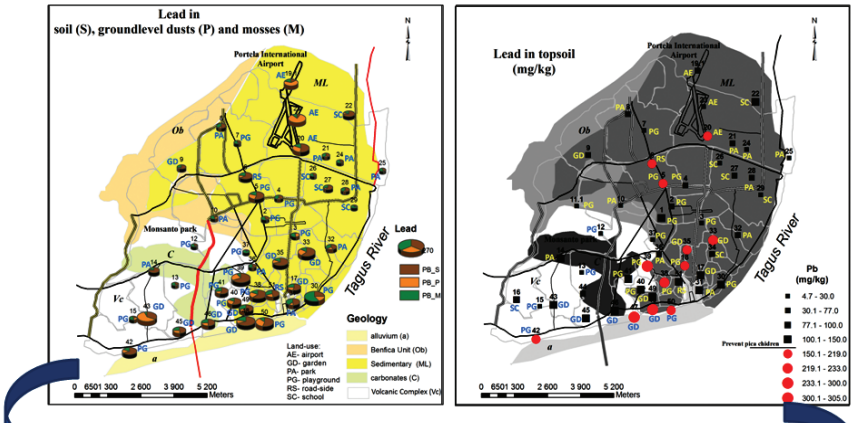


Soil with Pb above standard recommendations (<150 mg/kg)	Land-use	Contributor	Metal source	Probability of exposure through ingestion
Sample 5 – Campo Grande	Playground	Atmospheric dust	Brake wear	High
Sample 6 – Campo Grande	Road-side	Atmospheric dust	Brake wear	Medium
Sample 18 – Mártires da Pátria square	Playground	-	Traffic related	High
Sample 20 – Portela	Airport	Ground dust deposition	Traffic	Low
Sample 33 – Paiva Couceiro square	Garden	Soil (long residence time?)	Fueling Station	Medium
Sample 35 – Estefânia	Garden	Soil (long residence time?)	Traffic/brake wear	Low
Sample 38 – Principe Real square	Playground	Soil/atmospheric dust	Traffic/coal	High
Sample 39 – Amoreiras	Playground	Soil/dust deposition	Traffic/brake wear	High
Sample 42 – Belém	Playground	Soil (long residence time?)	Traffic/brake wear	High
Sample 48 – Santos	Garden	Soil/Atmospheric dust	Traffic/Brake wear	Medium
Sample 50 . D.Luis I square	Playground	Soil/dust deposition	Brake wear/railway	High

Urban soils are the 'recipients' of large amounts of potentially harmful elements (PHE) from a variety of sources including industrial waste, vehicle emissions, coal burning waste, and other activities. In areas where public gardens and parks are exposed to significant pollution levels, soil and ground-level dust may have toxic effects as a consequence of inhalation or ingestion by humans, particularly children, posing major health hazards. Exposure to PHE from contaminated urban soils normally has direct pathways as children pica behavior (deliberate soil intake), dust inhalation and dust adhering to hands that is transferred to the mouth and ingested (involuntary ingestion). The US EPA has recommended values of 100 mg day^{-1} to represent the mean soil intake for children aged 1 to 6. Elements such as

arsenic, lead, chromium or thallium, are some of the most toxic and can even lead to death if ingested in large doses, or during long periods of time. Organic compounds as PAHs and PCBs are also potentially harmful to human health, yet any urban environment has increasing levels in such compounds.

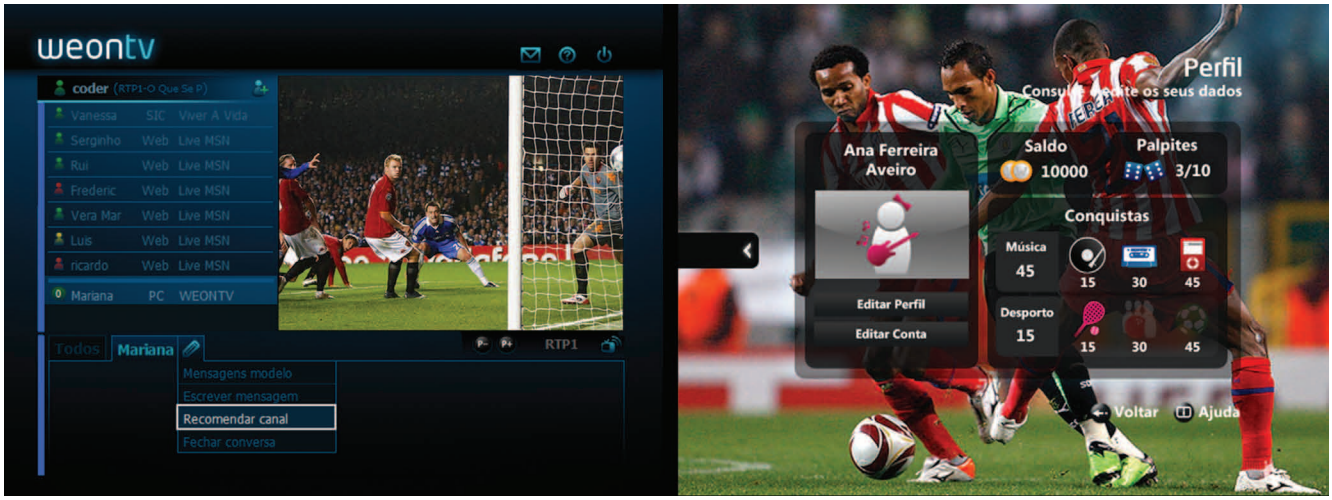
Traditionally, soil cleanup criteria for site remediation have been set using concentration-based standards that often require remediation to background levels or to other specified levels that are considered administratively acceptable. However, such criteria do not take into account a number of site-specific factors that considerably modify exposure, and therefore the risk, posed by such PHE. Site-specific factors include several soil properties such as pH, grain size, mineralogy, cation exchange capacity (CEC) or organic matter.

The main purposes of this project are: environmental characterization of urban soils from Lisbon using biomonitors, soil and ground-level dust; identification of PHE and organic compounds that may represent risk to human health; identification of pollution sources; quantification of metal fractions in mobile forms, therefore with higher probability of being bioaccessible to humans; estimating bioaccessibility of Pb in soil and dust using in-vitro tests that reproduce the human gastrointestinal tract of a child; identify soil site specific factors that control metal mobility and Pb oral bioaccessibility; gather all the results in a GIS data platform.

social iTV applications

jorge ferraz de abreu, pedro almeida

department of communication and art & CETAC.MEDIA – communication sciences & technologies research centre, university of aveiro



WeonTV buddies and message centre | **wize** profile area

Research in the Social TV field has contributed to the development of interactive television applications that integrate social features exploring TV consumption as a promoter of sociability practices. Among these features, awareness of online users and viewed TV channels, along with text or audio communication services support the promotion of on-line conversations and other forms of social interaction among television viewers. In this context, the CETAC.MEDIA research group in Social iTV has been developing the following applications:

WeOnTV
A Social TV application to support interaction about TV content developed for the most popular IPTV service in Portugal – the MEO product. The application relies or the integration of Instant Messaging (IM) features on television allowing users to know what others are watching, to make program recommendations or chat in multiple formats.

iNeighbour TV
Although Social TV applications may be seen to target the younger generations, it also becomes possible to identify a potential interest in the adoption of these applications among a more socially isolated audience such as the senior citizens.

Developing an application to promote social networks dynamics among senior citizens and fight seclusion is the goal of the iNeighbour TV project. It aims to take advantage of television as a device of family interaction paradigms and strong penetration in Portuguese households.

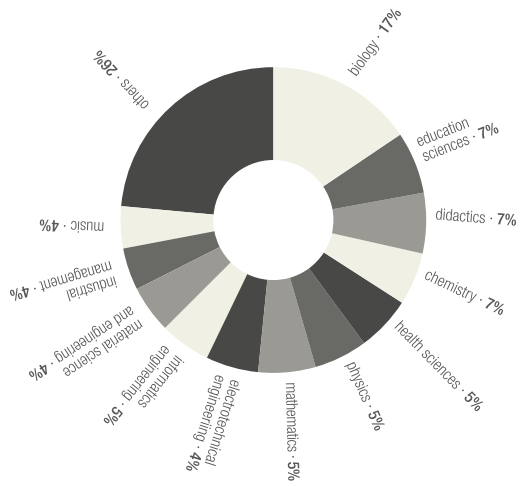
Crossed TV Games – Wize application
This project aims to develop a social game to be integrated in an IPTV commercial service. New ways to experience TV content (e.g. talent shows or live sports events) by playing a TV related game on television is the expected outcome of this project.


2010


IN REVIEW

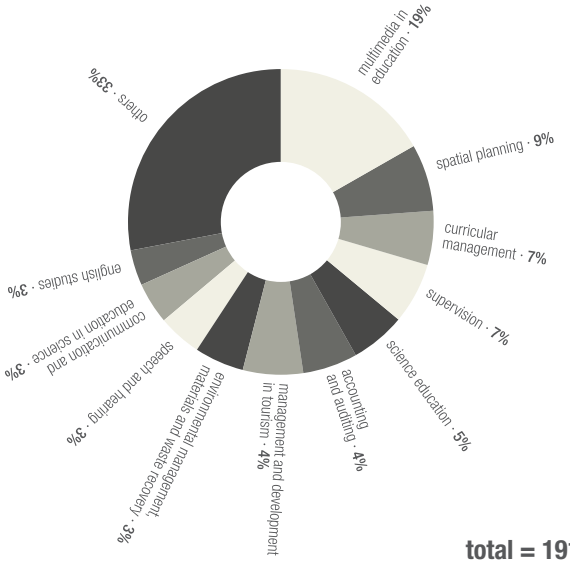
theses

PhD theses in 2010 per area [1]



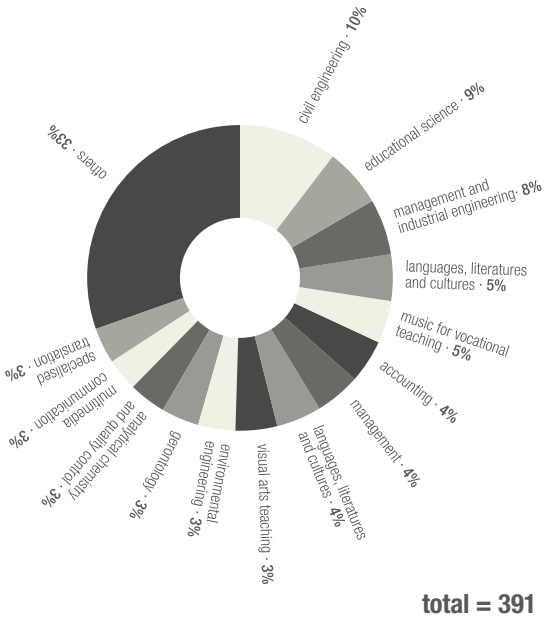
total = 131

Masters theses (before the bologna process) in 2010 per area [2]



total = 191

Masters theses under the bologna process in 2010 per area [3]



total = 391

[1] **Others:** Geosciences; Environmental Applied Sciences;Social Sciences; Chemistry Engineering; Linguistics; Psychology; Biochemistry; Political Sciences; Culture; Design; Literature; Tourism; Biomedical Sciences; Multimedia in Education; Health Technologies.

[2] **Others:** Energy and Environmental Management; Mechanical Engineering; Teaching of Biology and Geology; Portuguese Studies; Information Management; Management and Environment Policy; Business Economy; Chinese Studies; Technology, Innovation and Knowledge Management; Activation of Psychological Development; Coastal Sciences; Design, Materials and Product Management; Operations Management and Logistics; Operations Management and Logistics; Public Management; Mathematics; Music; Higher Education Policy and Management; Quality and Treatment of Water and Wastewater; Toxicology; Contemporary Artistic Creation; Education in Sciences; Education in Languages; Biomedic Engineering; Electronics and Telecommunications Engineering; Applied Physics; Molecular Microbiology; Industrial Minerals and Rocks.

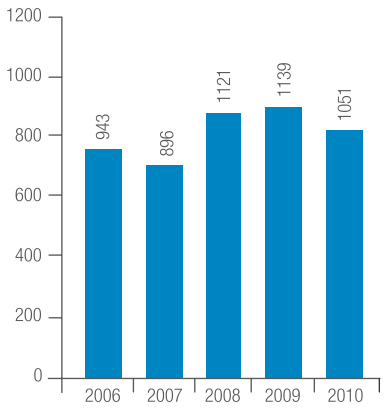
[3] **Others:** Mathematics and Applications; Design; Economics; Publishing; Materials Derived from Renewable Resources; Applied Biology; Music; Sustainable Energy Systems; Ecology, Biodiversity and Ecosystems Management; Biology and Geology Teaching; Meteorology and Physical Oceanography; Biomolecular Methods; Speech and Hearing Sciences; Materials Engineering; Physics; Tourism Management and Planning; Public Administration and Management; Molecular and Cell Biology; Coastal and Ocean Sciences; Chemistry; Organic Chemistry and Natural Products; Political Science; Accounting and Public Administration; Geological Engineering; Mathematics Teaching; Geomaterials and Geological Resources; Microbiology; Regional and Urban Planning; Marine Biology; Biochemistry; Biochemistry and Food Chemistry; Contemporary Artistic Creation; Ceramics and Glass Engineering; Physical Engineering; Toxicology and Ecotoxicology.

publications*

top 10 subject ares for papers published in 2010

	record count	% of 1051
materials science, multidisciplinary	135	12,84%
environmental sciences	118	11,23%
chemistry, physical	87	8,28%
physics, applied	80	7,61%
chemistry, multidisciplinary	70	7,02%
physics, condensed matter	56	5,33%
mathematics, applied	46	4,38%
nanoscience & nanotechnology	43	4,09%
chemistry, organic	36	3,43%
engineering, electrical & electronic	35	3,33%
marine & freshwater biology	35	3,33%

published paper @ua



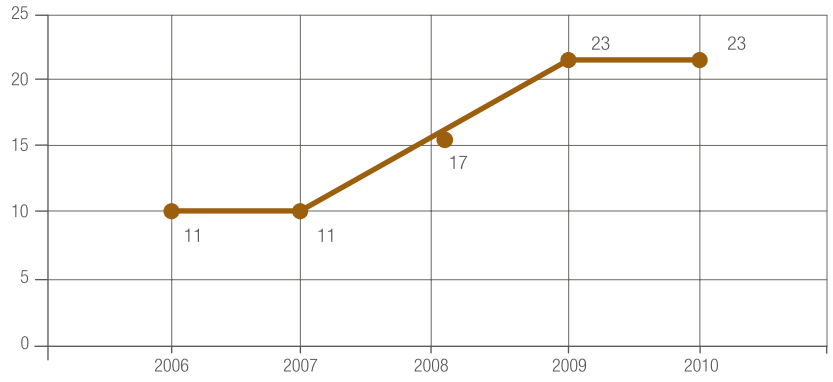
top 10 cited papers

	total nº citation [2006 › 2010]
Lovis, C., Mayor, M., Pepe, F., Alibert, Y., Benz, W., Bouchy, F., Correia, A. C. M., Laskar, J., Mordasini, C., Queloz, D., Santos, N.C., Udry, S., Bertaux, J.L. & Sivan, J.P. (2006). An extrasolar planetary system with three Neptune-mass planets. *Nature*, 441, 305-309.	160
Dorogovtsev, S.N., Goltsev, A.V. & Mendes, J.F.F. (2008). Critical phenomena in complex networks. *Reviews of Modern Physics*, 80, 1275-1335.	159
Carlos, L.D., Ferreira, R.A.S., Bermudez, V.D. & Ribeiro, S.J.L. (2009). Lanthanide-Containing Light-Emitting Organic-Inorganic Hybrids: A Bet on the Future. *Advanced Materials*, 21, 509-534.	100
Santos, L., Lopes, J.N.C., Coutinho, J.A.P., Esperanca, J., Gomes, L.R., Marrucho, I.M. & Rebelo, L.P.N. (2007). Ionic liquids: First direct determination of their cohesive energy. *Journal of the American Chemical Society*, 129, 284-285.	100
Martianov, I., Ramadass, A., Barros, A. S., Chow, N. & Akoulitchev, A. (2007). Repression of the human dihydrofolate reductase gene by a non-coding interfering transcript. *Nature*, 445, 666-670.	92
Gruverman, A. & Kholkin, A. (2006). Nanoscale ferroelectrics: processing, characterization and future trends. *Reports on Progress in Physics*, 69, 2443-2474.	89
Vazquez, A., Oliveira, J.G., Dezso, Z., Goh, K.I., Kondor, I. & Barabasi, A.L. (2006). Modeling bursts and heavy tails in human dynamics. *Physical Review E*, 73.	89
Gardas, R.L., Freire, M.G., Carvalho, P.J., Marrucho, I.M., Fonseca, I.M.A., Ferreira, A.G.M. & Coutinho, J.A.P. (2007). High-pressure densities and derived thermodynamic properties of imidazolium-based ionic liquids. *Journal of Chemical and Engineering Data*, 52, 80-88.	84
Harbuzaru, B.V., Corma, A., Rey, F., Atienzar, P., Jorda, J.L., Garcia, H., Ananias, D., Carlos, L.D. & Rocha, J. (2008). Metal-organic nanoporous structures with anisotropic photoluminescence and magnetic properties and their use as sensors. *Angewandte Chemie-International Edition*, 47, 1080-1083.	74
Crous, P.W., Slippers, B., Wingfield, M.J., Rheeder, J., Marasas, W.F.O., Philips, A.J.L., Alves, A., Burgess, T., Barber, P. & Groenewald, J.Z. (2006). Phylogenetic lineages in the Botryosphaeriaceae. *Studies in Mycology*, 235-253.	71

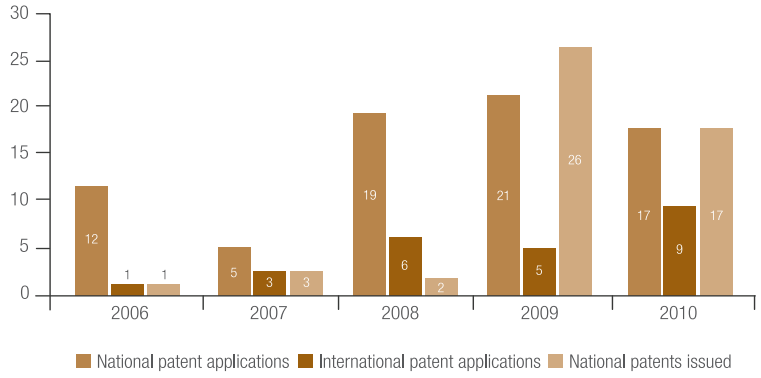
* Data retrieved from ISI Web of Knowledge℠ (Thomson Renters) in January 2011

patents

patent applications

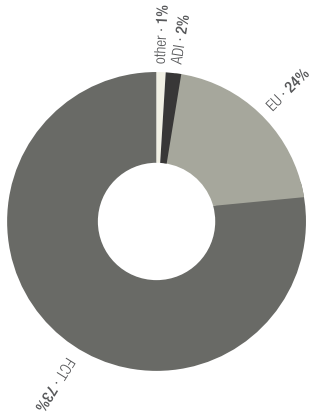


national and international patent applications per year



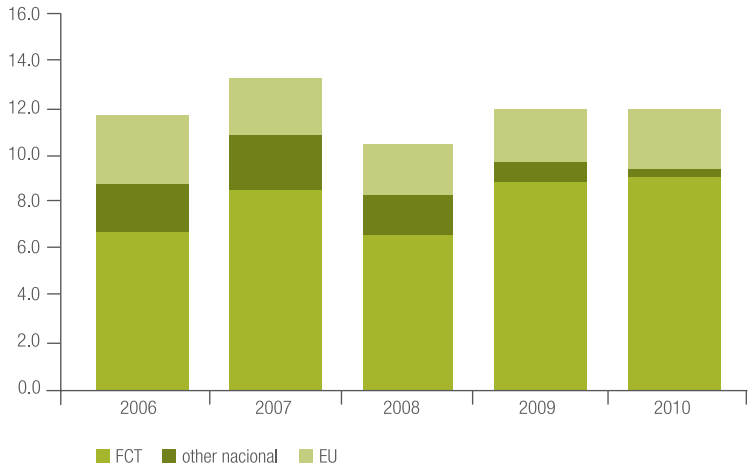
budget

total funding 2010 research projects

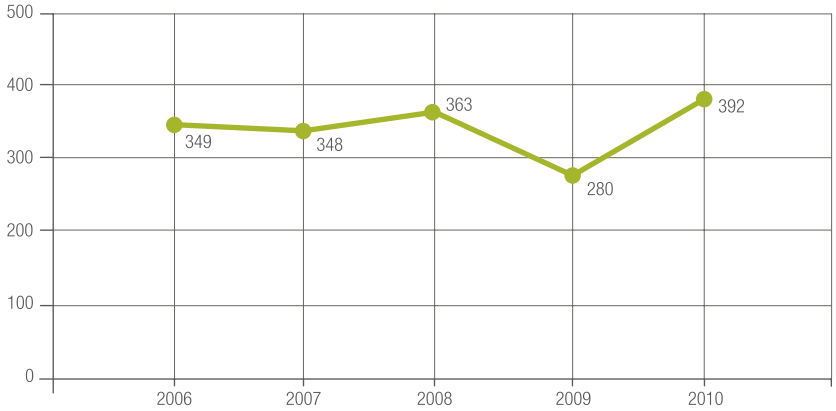


FCT Portuguese foundation for science and technology
ADI Portuguese Innovation Agency
EU European Union

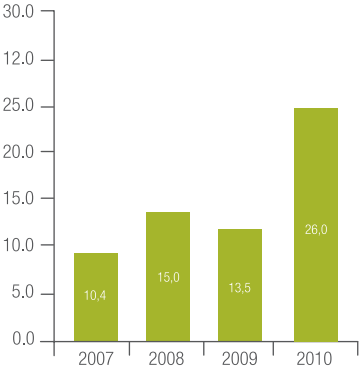
total funding – research projects and research centres (M€)



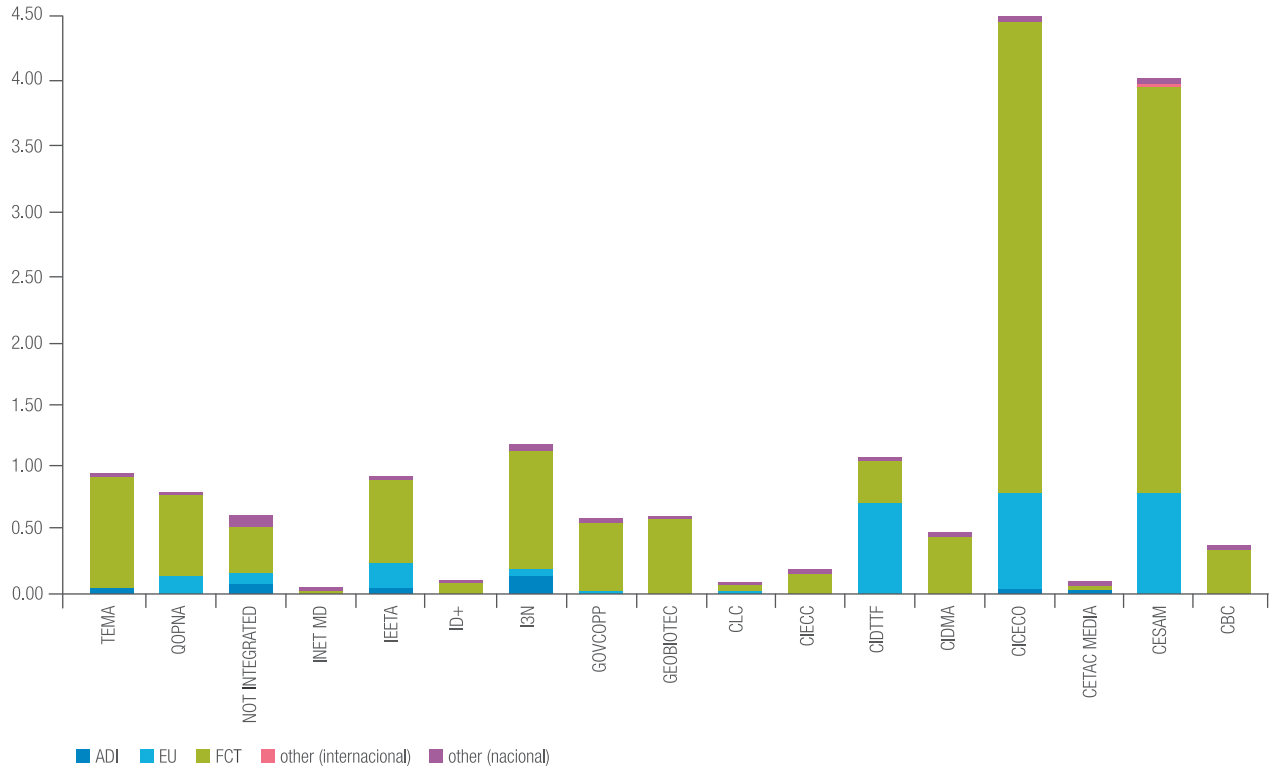
total ongoing research projects



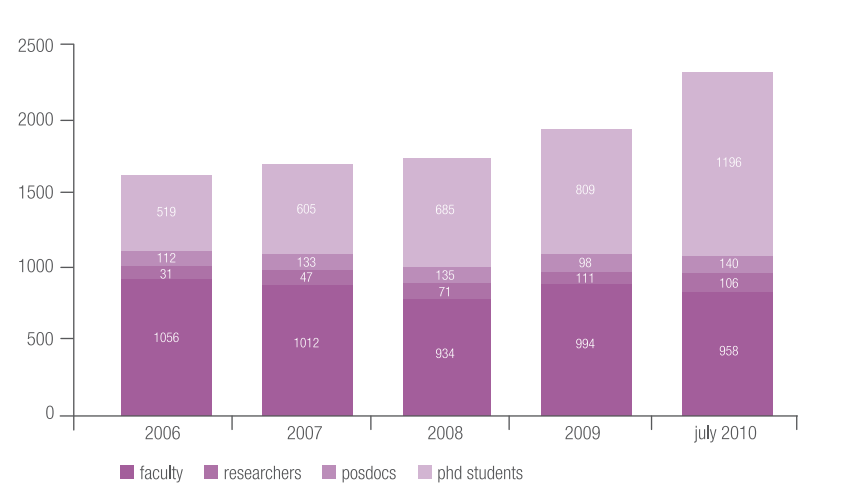
total budget for starting year – research projects and research centres (M€)



total funding by research centre and funding agency, 2010 (M€)



people


2500
2000
1500
1000
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0
519
112
31
1056
605
133
47
1012
685
135
71
934
809
98
111
994
1196
140
106
958
2006
2007
2008
2009
july 2010
faculty
researchers
posdocs
phd students

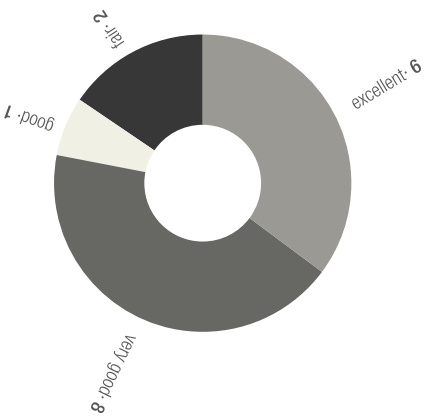
research centres

The University of Aveiro hosts 17 research centers, including 4 Associate Laboratories and 13 Research Units. Associate Laboratories are research units which demonstrate, in particular through the results of evaluation, the capacity to cooperate in a stable, competent and effective manner in carrying out specific objectives of the scientific and technological policy laid down by the Portuguese government.

These research centers are evaluated by the Portuguese Science and Technology Foundation (FCT) according to a system based on the periodic assessment, by international experts, of reports and activity plans, including direct contacts with researchers and their institutions during visits to all units. This evaluation exercise culminates in the attribution of a qualitative grade which determines the volume of pluriannual funding to be received up to the next evaluation.

The most recent round of FCT evaluations took place in 2008, and the UA research centers were evaluated as follows.

research units



(1) good
› **CIECC** Research Centre for Education and Behavioural Sciences
(2) fair
› **CETAC.MEDIA** Research Centre for Communication Technologies and Sciences
› **CLC** Centre for Languages and Cultures
(6) excellent
› **CIDTTF** Didactics and Technology in Teacher Training
› **QOPNA** Organic Chemistry, Natural and Agro-food Products
associate laboratories
› **CESAM** Centre for Environmental and Marine Studies
› **CICECO** Centre for Research in Ceramics and Composite Materials
› **I3N-FSCOSD** Institute for Nanostructures, Nanomodelling and Nanofabricattion – Physics of Semiconductors, Optoelectronics and Disordered Systems
› **IT** Telecommunications Institute
(8) very good
› **CBC** Centre for Cell Biology
› **CIDMA** Centre of Research and Development in Mathematics and Applications
› **GEOBIOTEC** GeoBioSciences, GeoTechnologies and GeoEngineering
› **GOVCOPP** Governance, Competitiveness and Public Policies
› **ID+** Research Institute for Design, Media and Culture
› **INET-MD** The Ethnomusicology Institute – Centre for the Study of Music and Dance
› **IEETA** Institute of Telematics and Electronic Engineering of Aveiro
› **TEMA** Centre for Mechanical Technology and Automation

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