# PUCRS MAGAZINE

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Where fiction comes alive with projects of a bionic hand and a piano-playing robot

The future has arrived with the newborn Nanopuc

PHOTO: JOÃO MARCELO KETZER

Bubbles of gas hydrate, the energy source for the future

# Black gold

PUCRS opens the Institute of Petroleum and Natural Resources in partnership with Petrobras. Research to exploit energy sources such as gas hydrates and petroleum gathers momentum

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# Towards the future

I am pleased to present the first English edition of PUCRS magazine. At full maturity – 36 years of continuous circulation –, in 2014 this publication had great moments while focusing on its true mission: articles which readers crave for. And now, one more big step! On this English version, the challenge is to bring compelling articles, endowed with good resources, good sources, and good insights to a wider audience, using all these elements to translate the large world of PUCRS.

The current moment is characterized by constant changes aligned with the needs and accomplishments of today's society. We live in the so-called Knowledge Society, in which the role of universities is indisputable. PUCRS, in harmony with the advancements of the 21ST century, follows the path of innovation, which seeks quality and excellence. Our Strategic Plan emphasizes internationalization, entrepreneurship and interaction with society not only in technological areas, communication, and health sciences, but also in several other fields. Human sciences, philosophy, and theology, memorable tradition since the origins of universities, support and follow the permanent dialog with the dynamic world of applied sciences and technology.

An unquestionable aspect to face and to adapt to the future is the permanent education training of faculty and researchers. In this sense, continuing education seminars have been offered in order to qualify professors and researchers to use updated teaching methodology and new research paradigms, such as online education, OpenCourseWare, and the wide range of learning resources currently available.

The internationalization of researchers, professors, and students is likewise essential, so that the university becomes open to the world, and the world, in turn, gets closer to the university.

PUCRS is also alert to the analysis and identification of new formats and approaches for the undergraduate and graduate programs, aiming at providing students with interdisciplinary academic experience, focusing on the analysis of problems and on the proposition of solutions. They need to experience new ways of learning, having research as an essential tool for the development of autonomy and the acquisition of knowledge throughout life. They need to develop their ability to adapt to what is new. Otherwise, they will leave the University already regarded as obsolete.

The provision of continuing education, with courses aligned with the demands of society, becomes crucial in this new scenario. New methods and possibilities of teaching and learning must integrate the actions of universities, whose role is to create, transmit, and preserve the knowledge already produced as well as to innovate and break existing paradigms.

Considering these and other aspects, PUCRS has emerged among the leading institutions of higher education in Brazil, meeting the purpose of contributing to the social development. The excellence in education and research has been confirmed by the rankings of the Ministry of Education, and by the Ministry of Science, Technology and Innovation, which is focused on a clear and challenging vision of the future, as well as on the fulfillment of the University's mission.

It is an honor to have the opportunity to get to our readers, who are far beyond the walls of the University, to deliver this edition. I wish this magazine inspire you to know and visit PUCRS, a catholic, innovative and entrepreneurial University pursuing excellence.

*Joaquim Clotet*
President of PUCRS

PHOTO: GILSON OLIVEIRA

PHOTO: GILSON OLIVEIRA

# Institute o

**The opening, on November 26, gives boost to the development of state-of-the-art technologies in Brazil**

Seven years have passed and much has happened. The Center of Excellence in Research and Innovation in Petroleum, Mineral Resources and Carbon Storage (Cepac) first began with a focus on carbon sequestration, extended its activities, became a benchmark in Brazil and abroad, and now opens an area four times larger (seven floors instead of the old two), in the Science and Technology Park. First associated with the Institute of the Environment (IMA), from November 26 on Cepac will be part of the Institute of Petroleum and Natural Resources (IPR).

From 2007 to 2014, Cepac obtained more than BRL 60 million from Petrobras, its greatest partner, and currently has other three projects in progress, involving BRL 20 million. The establisment of IPR aims at enhancing research and high-complexity specialized service rendering in the fields of petroleum and gas, and ensuring the country is able to develop state-of-the-art technologies. "Several analyses need to be sent outside the country by the petroleum industry. We want to progress in terms of knowledge detection and perform increasingly sophisticated experiments," IPR Director, Geologist João Marcelo Ketzer, says. According to him, given the importance of the Institute, it will be possible to broaden the horizons. He considers that, even if not being associated with IMA, IPR will keep environment protection in mind, however, with new emphasis on research related to the exploitation of natural resources.

One of the focal points of IPR and Cepac is the study of gas hydrates, the energy source for the future. The team has carried out four maritime missions to the Cone of Rio Grande, in the south of the state, as part of Project Conegas 1. As ice, the substances are considered unconventional gas reserves, found on

*Gas hydrate: the energy source for the future*

# PUCRS opens the of Petroleum

the seabed at great depths. Resembling ice rocks, they have their structures stabilized by molecules of natural gas (methane, butane, propane, and carbon dioxide). The quantity of gas hydrates in the planet can be greater than that of all other fossil resources (coal, petroleum, and natural gas) together. Two other expeditions are scheduled: one at the beginning of 2015 and another in the second half of 2016.

Gas hydrates have great potential, but there must also be found a way to prevent their deposit in pipelines under the sea, as they block the passage of gas. "We will study the precipitation in the laboratory, and also mechanisms to cover the ducts, so that they can help in the flow of petroleum," Ketzer says.

IPR has a pilot plant for gas hydrate synthesis that is unparalleled in the world. The equipment, designed in association with experts from Spain and aimed at studies at the Center, reproduces the conditions of the ocean at a depth of 2,000 meters and examines how the substances are formed, either by natural processes or in undersea pipelines.

For the new stage, after establishing the IPR, there are plans for equipment for advanced isotopic studies, which will enable the understanding of the origin of reservoir rocks, petroleum, and the gases found inside them. "As the exploration of a well is very expensive, we need tools to anticipate what we can possibly find," the director explains. In the case of the pre-salt, the challenges are even greater, because there is no known geological situation alike in the world, so there is a lack of examples that could be a base for its exploitation. Those are rocks from over 100 million years ago, before the opening of the Atlantic Ocean. In Brazil, these petroleum fields fill up approximately 800 km of coastline. "The Santos Basin, for example, has been studied for 30 years. It is now possible to predict where the best reservoirs are."

The boom in demand for studies on the pre-salt is barely starting, and PUCRS is getting prepared for this context. "We want to be recognized as a distinguished Institution, in order to respond to this need and go further, doing innovative research," Ketzer says.

Following the $CO_2$ storage project, Cepac will simulate (at Tecnopuc Viamão) techniques for the identification of leaks of that gas on the surface. There are only four projects comparable to that in the world. Gases of known composition will be introduced in the ground. The experiments begin in March. The Center is supported by the USA and the São Paulo State University (Unesp). The initiative began at Fazenda da Ressacada, in Santa Catarina, in association with the Federal University of Santa Catarina (UFSC).

*João Marcelo Ketzer with hydrates: as ice, they are considered unconventional gas reserves*

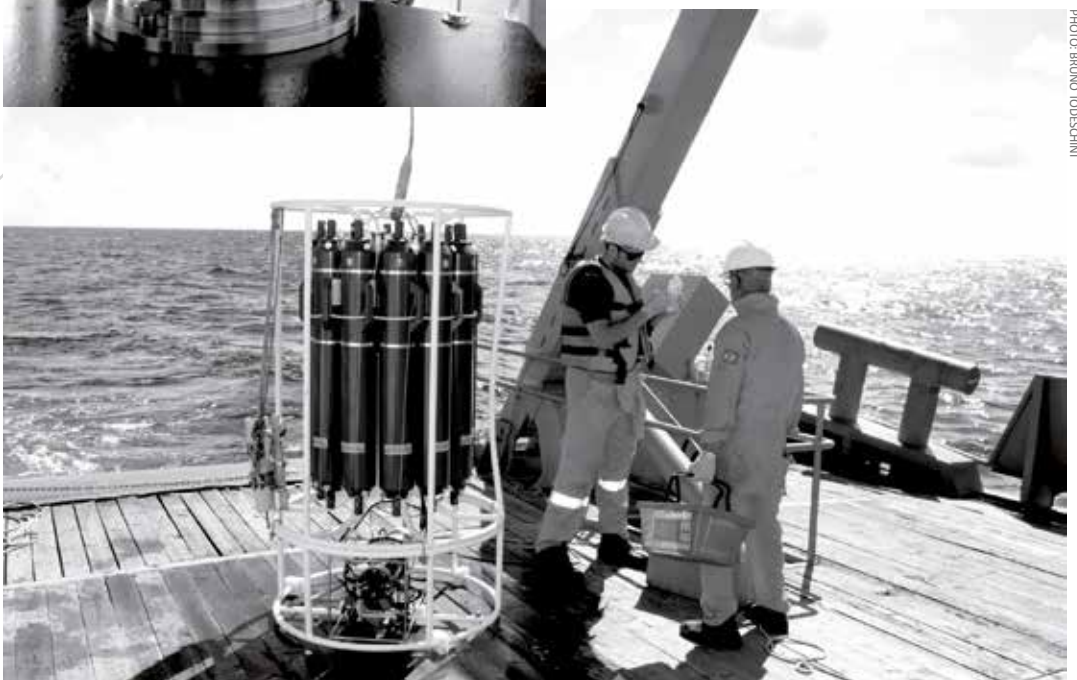


PHOTO: BRUNO TODESCHINI

*Offshore: PUCRS has made four expeditions for deep-sea research in the Pelotas Basin, 100 km off the RS coast*

# Interdisciplinary effort

Jorge Audy, Vice President for Research, Innovation and Development, points out that the establishment of IPR represents the consolidation of this field at PUC, and the growing partnership with Petrobras in R&D. "Over the last few years, energy-related projects – in this case with petroleum and natural resources – have grown strongly in the University, as the result of an interdisciplinary effort of researchers from several fields of knowledge, aiming at contributing with one of the greatest challenges of our society: energy to sustain the development process of the country."

For the Dean of the Research Office, Carla Bonan, IPR is expected to become a national and international benchmark in the development of research projects and training of qualified human resources. "The Institute will provide visibility and sustained growth of the actions and initiatives of the University in this area," Carla affirms. She highlights the fact that the rise of IPR is strategic and is consistent with the view of development espoused by PUCRS. "What is expected is that the scientific collaborations will intensify through partnerships with other academic units and institutes of PUCRS. Nationally and internationally, IPR will strengthen the existing partnerships and start new ones with companies and Brazilian and foreign universities."

Ketzer credits the technical expertise of the staff and the innovation environment promoted by PUCRS for the growth of Cepac and the birth of IPR. "We had exponential growth in a favorable environment." One of the aspects mentioned by him is project management, which is led by a team of the Center and by PUCRS' Technology Management Agency (AGT).

The Geology manager of the E&P-Libra/Exploration and Technical Competencies of Petrobras, Adriano Viana, says that the company sees the University as "a technological partner of great importance and exemplary technical and administrative performance, having become a national benchmark." He adds that technical excellence, commitment, flexibility, and efficiency are essential values of Petrobras presented by PUCRS.

"The scientific projects developed in partnership allowed the formation of research groups and the implementation of technological infrastructure unique in the country, with the production of high-impact results, encompassing sectors that range from exploitation of unconventional energy resources to analyses of the environmental impact of such activities," Viana affirms. With the Institute of Petroleum and Natural Resources, Petrobras believes that there will be a broadening of the possibility of PUCRS operating as a strategic partner in investments of the resources payable to the Union pursuant to the Law of Special Participation arising from petroleum production. "The possibility of attracting the best brains to further qualify the personnel available and acting extensively in the petroleum and gas chain are just some of the expectations that Petrobras puts on the University," the manager adds.

PHOTOS: BRUNO TODESCHINI

*PUCRS is considered an important technological partner by Petrobras, and has become a national benchmark*

# The new building

At a cost of BRL 14 million funded by Petrobras, with matching funds from PUCRS, the new building was expanded from 1.1 thousand square feet to 4.8 thousand square feet. The challenge was designing a space for the existing equipment and preparing it for the equipment that has not arrived yet. "I searched for technical specifications to predict the future composition, from power plugs to gas lines. It was difficult to get the information from companies without having yet acquired the equipment," says the Coordinator of the Geochemical Analyses Laboratory, Rogério Lourega, a Professor at the School of Chemistry, who took part in the project of the new building.

There will be laboratories on the ground floor, and on the third and fourth floors. The fifth and the sixth floors will have offices. In 2015 there will be equipment on the second floor too. Among other novelties is the fact that the new building will have an ultra-clean room, which will house a spectrophotometer, for mass detection, starting in April. The auditorium, on the seventh floor, will be named after Professor and Geologist Jorge Alberto Villwock, who passed away in 2013. "It will be a tribute to his important role in inspiring and assisting the early stages of the association with Petrobras," Vice President Jorge Audy says.

With this expansion, Lourega believes that the demands will increase considerably. "Our equipment is totally state of the art. As it is automated, the analyses are carried out in a very short time." He also highlights Cepac as a benchmark for training human resources.

*With 4.8 thousand square feet, the IPR building will accommodate twice as many employees by 2016*

PHOTO: GILSON OLIVEIRA

*In the Pelotas Basin: PUCRS is at the same level as Japan in terms of missions for the study of gas hydrates*

PHOTO: BRUNO TODESCHINI

*2011: three hundred kilometers off the coast, the vessel carried more than 10 thousand items*

# Missions in the sea: paradigm shift

It took more than a year to prepare for the first oceanographic mission, in 2011, and it was the biggest challenge for João Marcelo Ketzer, then Coordinator of Cepac. "Taking 30 students to sea was a paradigm shift." The team was divided in seven work fronts. Fifteen departments/Schools of PUCRS were involved in the process. In 2009 and 2010, Ketzer and Gesiane Sbrissa took part in two missions in Japan. Seven members of the Center were trained in laboratories in Japan and one was in the USA.

Altogether, there were four expeditions in the Pelotas Basin, for a period of 85 days. "In the first expedition, at least half of the people had never been on a ship," Ketzer says. We had twelve people in the first expedition; thirty, in the second; eight, in the third, and thirty-two, in the fourth. "We are now at the same level as Japan in terms of missions for the study of gas hydrates."

Three hundred kilometers off the coast, nothing should be missing – from computers to gloves. The vessel carried more than 10 thousand items organized in boxes, with color tags for each laboratory. Five structures were built on board for analyses of samples, sediments, and microorganisms.

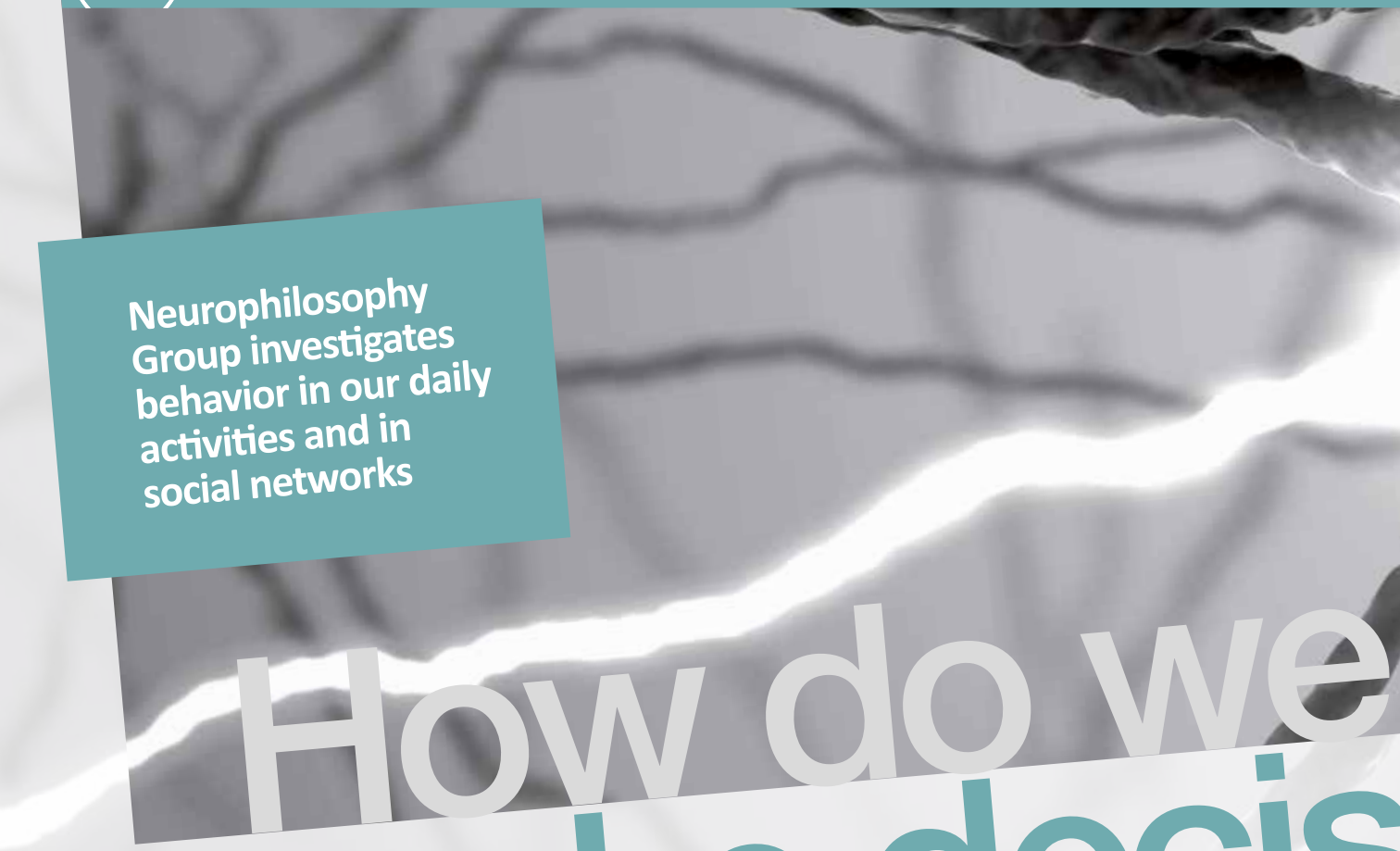
# "No one is more passionate about this than me"

Through the window of her office, on the ninth floor of the Main Library – where Cepac was temporarily established –, Lia Bressan, a 31-year old chemist, watched the progress of the works in the building housing IPR. "I would take photos of the building every day." Seven years ago, while the Center was being planned, still in building 5, Lia began her Master's studies in Engineering and Materials Technology, advised by Professor João Marcelo Ketzer. At that time, he gave her a text about carbon sequestration. "Papers about this subject used to be quite rare, but nowadays there are thousands of them." To be a part of this worldwide development makes her euphoric. "My family says that there is no one more passionate about this than me." She has just finished her doctoral studies, and in 2012 became a professional at the Center. It was challenging to learn how to work with the equipment, and now she realizes how much the team has grown. "We are ready to think about more complex things."

She works in the project for the storage of $CO_2$, but ends up getting involved in other projects. She took part in two missions of Conegas 1, and was delighted with the experience and opportunity of spending time with her colleagues. The spicy food and the difficulties to contact her family are among her memories, as well as the hard work on the ship. "The Japanese who were aboard got surprised about how well-prepared we were. Nothing was missing."

PHOTO: GILSON OLIVEIRA

*Lia has been in two maritime missions of Conegas 1 and was delighted with the experience*



**Neurophilosophy Group investigates behavior in our daily activities and in social networks**

# How do we make decis

What influences our choices? Do social networks change relations? Are there any differences between face-to-face and online behavior? The Research Group in Neurophilosophy studies the brain processes involved in decision-making in our daily activities and on Facebook. The study, funded by CNPq, is conducted by members of the Brain Institute of Rio Grande do Sul (InsCer), the Brazilian Center for Research in Democracy, and the Institute of Bioethics.

Last year, one hundred and fifty university students, ages between 18 and 40 responded to a questionnaire on their use of the Internet. Twenty respondents who use social networks very frequently and twenty who use them occasionally will be selected. Starting this semester, the 40 subjects will be submitted to a functional magnetic resonance imagining procedure. During the exam, they will answer questions about how they would behave in real and virtual life. One hypothesis of the study is that those "addicted" to social networking websites do not differentiate the two realities and, thus, would present similar neural representations in both cases.

The coordinator of the study, Nythamar de Oliveira Júnior, a professor at the School of Philosophy and Human Sciences and of the Center for Research in Democracy, says that the idea came from the book *Descartes' Error*, by António Damásio, Doctor Honoris Causa at PUCRS. "We will attempt to detect people's reaction to controversial subjects". He believes that society is less biased and that it has "left the ghetto".

For Neurophilosophy, themes of interest are discussions on the immaterial and the material, the brain and the mind, etc., always seeking to go beyond dualism. "The crux of the matter is sorting out how to explain, concurrently, human neurobiological and cultural development, represented by arts, religions and literature", says Oliveira Júnior. The brain is seen as a supercomputer, with a circuit uniting several networked decision processing centers. "Choices are not made then and there. Memories, past experiences and narratives, as well as social conditions, influence them". From a deterministic point of view, neural mechanisms would condition certain behaviors and nothing could be changed. The director of InsCer, Jaderson Costa da Costa, says that the human brain has advantages over the supercomputer. "First, because it performs parallel processing, but mainly because it can err; erring means making decisions (either right or wrong) instead of being programmed to execute pre-established algorithms which do not admit errors (of the programmer!)".

When he delivers lectures in schools, researcher Augusto Buchweitz, of InsCer and the School of Letters, is always asked these questions: "Is the brain of the new generations different?" and "Which is the consequence of making intensive use of the Internet?". With the results of this research, he will

# sions?

collect new evidence to answer them. "We are interested in studying those who were born in this online world". According to him, the study will also evaluate the state of rest (when the brain is in standby) of those who use the Internet intensively and those who are indifferent to it.

A hypothesis is that, among the "addicted", some areas remain activated. "Are these people more anxious? Perhaps we will be able to answer". For researcher Alexandre Franco, of InsCer and School of Engineering, results will explain a little more about how the brain functions. "The Brain Institute must go beyond clinical research, and this type of research will become increasingly relevant", he says.

The project, which should last three years, involves three undergraduate students, one specialization student, four master's and 12 doctoral candidates, from such diverse fields as Engineering, Philosophy, Psychology, Medicine and Letters. Foreign researchers are being contacted to replicate the study in other countries, allowing evaluation on the influence of the cultural aspect.

## Reason and emotion, in Damásio

PUCRS researchers are inspired by the studies of the Portuguese neuroscientist António Damásio. By observing patients with neurological and psychological disorders, he noticed that emotion is an integral part of the "machinery" of reason. He reports cases of people who suffered brain damage and kept their language skills, memory, knowledge and attention; however, they started presenting a "decision-making deficit", an inability to feel emotions. According to the author, in *Descartes' error*:

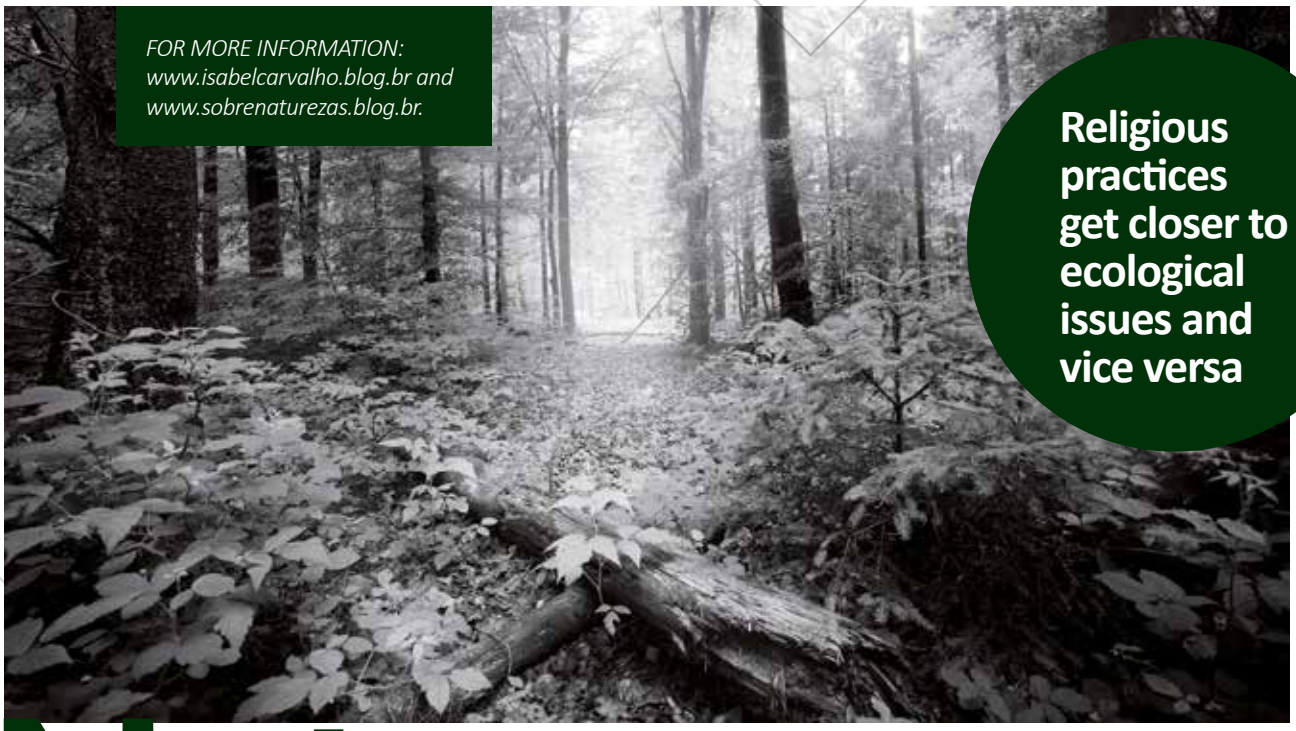
– I began writing this book to propose that reason may not be so pure as most of us believe or wish it would be, and that emotions and feelings may not be complete intruders in the realm of reason, but rather entangled in its webs, for better or worse.

To Damásio, feelings are neither intangible nor illusory. "Against traditional scientific opinions, they are exactly as cognitive as any other perception. They result from a curious physiological organization that has made the brain captive audience of the body's theatrical activities."

## The game

Damásio, Antonio Bechara and other researchers have developed a test to assess decision-making. A player sits in front of four decks of cards labeled A, B, C and D, receives a loan and is informed that s/he must gain as much as possible. S/he is to turn cards until the researcher says "stop". Regular people are attracted by the high rewards in decks A and B, but notice that some cards demand high payment and change preference to C and D. Patients with frontal brain lesions turn more and more cards in A and B, going bankrupt in the middle of the game. Damásio believes that these patients are insensitive to the future. He says, "it is the abandonment of what their brains learned from education and socialization".

PHOTO: FREE IMAGES



*FOR MORE INFORMATION:*
*www.isabelcarvalho.blog.br and*
*www.sobrenaturezas.blog.br.*

**Religious practices get closer to ecological issues and vice versa**

# Nature as a d of the sacr

In Parque da Redenção, in Porto Alegre, it is common to see people hugging trees or getting moved by the beauty of landscapes. In the Buddhist temple of Três Coroas, in the *Serra Gaúcha*, there are signs that read: "Do not step on the ants". Ecovillages, communities holding sustainable values, are being created all around the world following the New Age movement. Other religious or spiritual practices are also connected to nature. The Federação Afroumbandista e Espiritualista Rio Grande do Sul (Fauers) has launched four primers that encourage manufacturing offerings in such a way as to minimize environmental impact, for instance, producing boats with biodegradable materials. Also during the Romaria das Águas (Pilgrimage of the Waters), in the Capital, the Ecology Pastoral of the Catholic Church has discussed ecological issues with the population.

What do these examples have in common? Researcher Dr. Isabel Carvalho, Dean of the Graduate Program in Education, believes that the environmental issue is currently getting closer to the sacred. "Ecology brings a new dimension of transcendence, no longer outside this world. The extraordinary things of life are now in nature." To the professor, this contemporary phenomenon takes place in a scenario where the great religious traditions decline and new forms of faith and spirituality emerge. "Religions perform such ecological practices not only as part of a social action, but also as a search for purpose." Another remarkable characteristic of these new forms of spirituality is deterritorialization, with experiences shared in different parts of the world.

These experiences also value the combination of indigenous and pre-Christian elements with circle dances, meditation and phytotherapy. "They are part of a great countercultural movement that, by questioning the status quo, valued the body, life outside the mercantile system, outdoor walks and non-industrial food", explains Isabel. Those living in ecovillages, for instance, seek inspiration in ancestral practices and traditional popular knowledge. A newfangled sensitivity is verified regarding the animals, with increasing adhesion to vegetarianism, veganism, and movements for the rights and welfare of dogs, cats and other animal species.

> Ecology brings a new dimension of transcendence, no longer outside this world. The extraordinary things of life are now in nature.
>
> **Isabel Carvalho**

Research involving relations between religious practices and ecology is carried out by the SobreNaturezas Interdisciplinary Group, linked to PUCRS Graduate Program in Education and UFRGS Graduate Program in Social Anthropology. At the federal university, the group is coordinated by anthropologist Carlos Alberto Steil, while, at PUCRS, it is coordinated by Dr. Isabel Carvalho.

## Symmetry between humans and animals

Tim Ingold, a British anthropologist developing long-standing research on hunter-gatherer peoples of the Arctic Circle, innovates by dissolving modern borders established between culture and biology, human and natural sciences. To him, this dichotomy would be "the anchoring point of an anthropocentric ideology that seeks to deny the material conditions and the flow of life comprising all beings that inhabit the world-environment", say Dr. Carlos Alberto Steil and Dr. Isabel Carvalho, organizers of the book *Cultura, Percepção e Ambiente: diálogos com Tim Ingold*. The work was launched after the British researcher's participation in a conference at PUCRS.

The author's anthropology seeks a symmetry approaching humans not only to animals, but also to stones, seas, skies, and winds... Ingold maintains that scientific production does not give due credit to the flows of life that make intellectual activity possible. It cites texts and authors who influence works, but is silent on the conditions leading to their production. "The ecological dimension in Ingold's thought has a much deeper sense than just the relation between human beings and the environment, as if the former could be outside the world, as an autonomous being, independent from the forces of nature", say Steil and Carvalho. The anthropologist stresses the equivalence between the actions of humans and other beings, which result in lines, paths, plots and traces embedded in the landscape.

PHOTO: GILSON OLIVEIRA

*British Tim Ingold: ecological thought*

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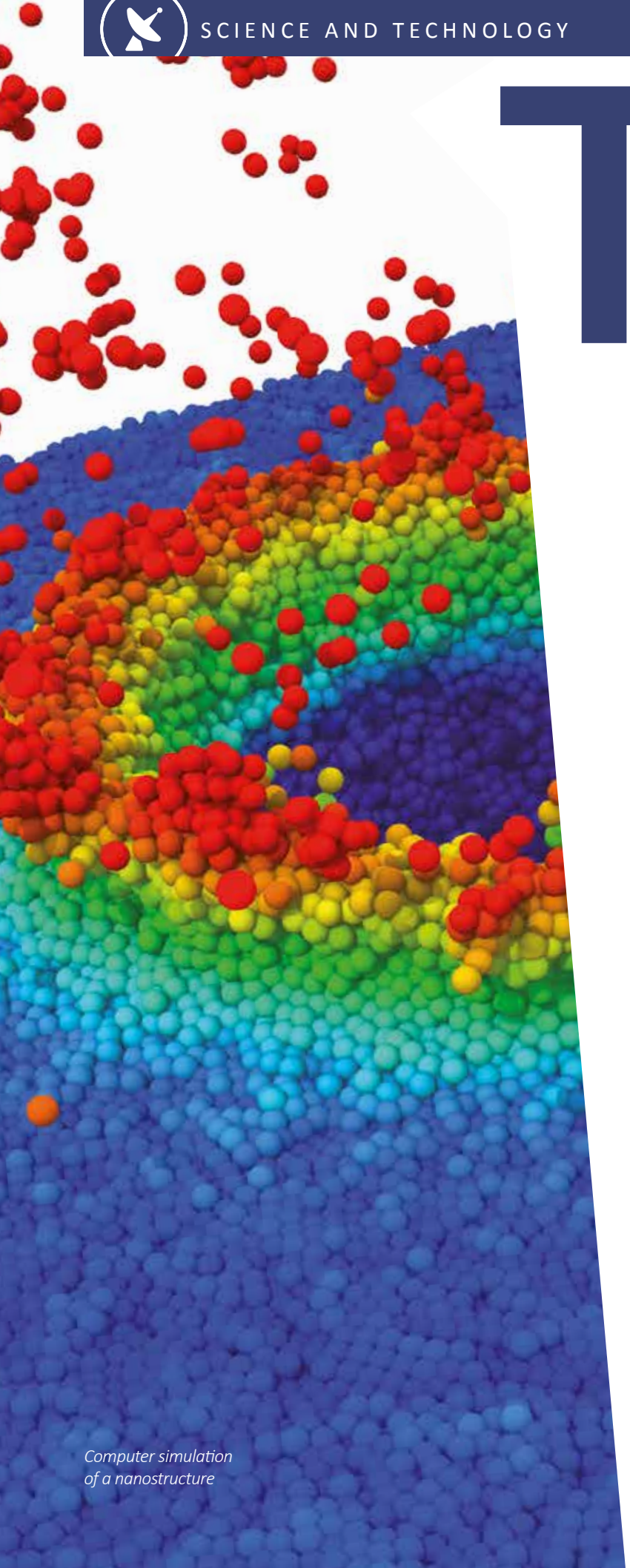
> True, deep spirituality is feeling we belong to this marvelous and mysterious process that characterizes Gaia, our living planet, the fantastic symphony of organic evolution that created us and millions of other species; it is feeling responsible for its continuation and development..
>
> **José Lutzenberger (sentence engraved on his tombstone)**

## Rincão Gaia: along the paths of religiosity

One of the studies developed by the Group SobreNaturezas studied how visitors of the Rincão Gaia, in Pantano Grande, 120 kilometers away from Porto Alegre, associate ecology to religiosity. The place is the rural headquarters of the Gaia Foundation, an NGO founded by ecologist José Lutzenberger, where tracks and courses for production and consumption of agroecological food take place. "Being at Rincão Gaia provides an experience of communion with the local landscape and connects people to a global, planetary dimension", Dr. Isabel Carvalho explains. The study included observation and interviews with members of the Foundation and visitors participating in its activities.

The place reflects the regeneration of an area devastated by basalt extraction for the construction of a highway. Its very name conveys that message. The "rincão" (corner) is part of Gaia (in Greek mythology, Mother Earth) and symbolizes the possibility of healing degraded environments.

The history of its founder is present in pedagogical activities. One of the highlights of this tour is visiting the place where Lutzenberger is buried. The researchers have noticed that participants in courses and workshops retreat into deep silence when they approach the grave, as though entering a sacred site of devotion. Lutzenberger used to say that, after his death, he did not want to be placed inside a concrete grave, which would impose a barrier to his integration with other organic elements. His body was only covered by a cotton cloth and placed five spans under the surface. The study, authored by Isabel Carvalho, Carlos Alberto Seil, and social scientist Erica Pastori was published in PUCRS Educação Journal.



*Computer simulation of a nanostructure*

# The

**When we talk about weather-resistant paints, precise diagnoses, biocompatible implants – containing medicinal products and proteins –, ixodicides for use in animals feeds, and new sustainable energy sources, it sounds like a movie, but it is not. These research topics are now part of the Multidisciplinary Center for Nanoscience and Micro-Nanotechnology (NanoPUC).**

*Aline Lucas works at the supercritical unit of Lope*

PHOTOS: GILSON OLIVIERA

# future has arrived

A tennis ball is a billion times smaller than the Sun: this is the difference between one nanometer and one meter. Working with matter at this extremely small scale brings many advantages and new opportunities for technological innovation, creating advancements present in everyday life, such as smaller devices with more features than regular ones. It is estimated that the global market for materials, industrial processes, and nanotechnology products will be in the order of US$ 1 trillion in 2015, affecting different sectors of the economy.

At PUCRS, twenty-five Physics, Chemistry, Engineering, Medicine, Dentistry, Biosciences, and Pharmacy professionals have seventy projects already implemented or currently in progress, mobilizing more than US$ 5 million. In addition to these Schools, NanoPUC is a truly transdisciplinary center that involves the Research and Development Institute (Ideia), the Brain Institute of Rio Grande do Sul (InsCer), the Institute of Pharmacology and Toxicology (Intox), and the Biomedical Research Institute (IPB).

Vice President for Research, Innovation and Development, Jorge Audy, affirms that NanoPUC was actually an old dream. "At the beginning of the century, Nanotechnology, Biotechnology, Information technology and Cognitive science were considered gates to the future. We introduced movements at PUCRS that resulted in actions such as InsCer and Tecnopuc, which aim at expanding the participation in these fields. But the University was not yet ready for a Research Center or Institute focusing on Nanotechnology." Two years ago, the initiative was retaken, starting with a mission of President Joaquim Clotet, Audy and Professor Ricardo Papaléo to the USA, where they visited nanotechnology laboratories at Harvard University, in Boston. Professor Papaléo, from the School of Physics, mapped the area at PUCRS and is currently the Head of the Center.

Professor Papaléo, who is in charge of the Nanostructures and Nanoscopic Physics Research Group, remarks that NanoPUC seeks to share expertise and infrastructure, to boost scientific and technological production. The aim is to increase the visibility of actions in nanotechnology and obtain more opportunities to raise funds for research. On August 20, the first institutional workshop took place in order to provide such exchange.

According to Carla Bonan, Dean of Research of the Office of the Vice President for Research, Innovation and Development, the beginning of NanoPUC is mostly due to the modernization of the Central Laboratory for Microscopy and Microanalysis (LabCEMM) of Ideia, with the purchase of two electron microscopes and one atomic force microscope, specially dedicated to the analysis of matter with high spatial resolution. The equipment was purchased by means of subproject Nano2020, submitted to the Funding Authority for Studies and Projects (Finep)/ Ministry of Science, Technology and Innovation.

The interest in the area can be seen in international cooperation projects kept by PUCRS. Students from different levels have the opportunity to get involved with the latest resources in the field. Carla Paludo and Rafaela Oliveira are examples from the Undergraduate Course in Pharmacy: they have learned a methodology for the development of nanoparticles during a research internship at the University of Algarve (Portugal). Now, as research fellows at the Microgravity Center (MicroG)/School of Engineering (Feng), they use the 3D-clinostat device to assess the stability of materials in simulated hypogravity.

The University of South Florida (USA) has become interested in detecting the impact of such environment in nanoemulsions of pharmaceuticals and cosmetics. Two students from that University visited MicroG to understand and apply the technique. Preliminary results show that simulated hypogravity enhances the stability of these products, which, in practice, may mean an extended expiration date. "Nanotechnology associated

*Students Carla Paludo (L) and Rafaela Oliveira with the 3D-clinostat*

*Papaléo (R), Bringa, and Leandro Gutierres watch the effect of radiation on nanostructures*

PHOTO: BRUNO TODESCHINI

with simulated hypogravity is something still little known and somewhat unexplored by the scientific community," the coordinator of the Joan Vernikos Aerospace Pharmacy Laboratory, Professor Marlise dos Santos, says.

The Unit Operations Laboratory (Lope) of Feng also has projects in collaboration with universities and funding agencies. Along with the University of Valladolid and the funding of the Spanish National Research Council and CNPq (*National Council for Scientific and Technological Development*), Professor Eduardo Cassel works in the development of an ixodicide from a native plant extract. The supercritical unit is used so that the material may be added to animal feeds.

One of Lope's roles is to build equipment. In addition to a lower cost in relation to marketed pieces, it makes them suitable to the purposes of research. A device currently being tested, the supercritical antisolvent (SAS), is intended for the production of polymer nanoparticles. This project is part of the Master's thesis of Engineer Guilherme Rossa. One of the experiments is the production of decaffeinated yerba mate. The SAS uses $CO_2$, an ecologically suitable solvent.

Engineer Rodrigo Scopel and Pharmacist Manoel Falcão, doctoral students of the Graduate Program in Material Engineering and Technology (PGETEMA), are currently at the University of California, Los Angeles, working with anticancer compounds. "The objective is the controlled release of drugs, so that the amount can be reduced," Cassel explains. The project will use the SAS for polymer insertion. Another project, by doctoral student Aline Lucas, aims at producing suture threads with high antioxidant power, which improve wound healing. Extracts from the native plant *Baccharis* are added in the polymer matrix.

PUCRS also attracts professionals. Sven Müller, from Germany, will be working at NanoPUC for three years, with a Young Talents Scholarship from CNPq/Science without Borders. His project relates to the manufacturing and characterization of nanowires, which may be used with miniature sensors and as high-efficiency thermoelectric materials. Although Germany has more groups working on his field of research than Brazil, he believes that here the integration of students from various areas in such teams begins at an earlier stage.

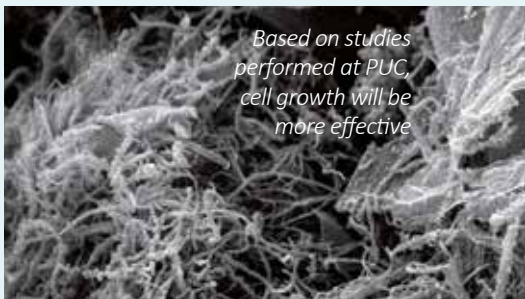
With the Center for Heavy Ion Research (GSI, Germany), the National University of Cuyo (Argentina), and UFRGS, Papaléo studies the effect of radiation on nanostructures. At this scale, materials have no fixed properties, as they depend more on their size and shape. "If I cut a piece of iron, even if just in one millimeter, it will still be iron. That does not occur with nanoparticles, which have other functionalities, and that may create technological opportunities," he explains. One of the conclusions of this project is that this material proves to be more resistant to the effects of radiation. The simulations are carried out at the High Performance Laboratory of Ideia. One day of processing results in a 4 million-particle equation, a very complex calculation. Recently, Argentinian researcher Eduardo Bringa came to see the process. "The computing resources of PUCRS are very good. They enable calculations to be made in relatively shorter time."

# In search of the ideal tube

Since 1997, the hand surgeon Jefferson Braga has been using silicone to reconstruct peripheral nerves (out of the vertebral column) of his patients. In 30% of cases, they need to undergo another surgery after 17 months. A good material currently in the market costs R$ 10,000. Within the next five years, the surgeon hopes to use the product made at PUCRS, with much lower cost and better effectiveness in cell growth. Tests with animals should start this semester. Another project, with University of Montpellier (France), relates to the use of growth factors. "The studies are supplementary," says Braga, who is the Dean of the School of Medicine, affirms.

"Biodegradable and biocompatible material is used, and it connects and guides the growth of the injured nerve, being slowly absorbed by the body afterwards without the need of another surgery for the removal of the tube," Nara Basso, a Professor at the School of Chemistry and a participant in the project, explains. The tube is made of polymer (plastic) poly(lactic-*co*-glycolic acid – PLGA), which is widely used in tissue engineering, or of chitosan (a biopolymer which has antibacterial effect on wound healing). Polypyrrole nanofibers, a polymer with good electrical conductivity, are also used. "It can generate electrical signals to target places and support cell growth. It is possible to add some drug to be released as the tube dissolves," Nara says. The shape of the fiber, which is similar to living tissues, should help the treatment. Undergraduate student Lucas Weber, Master's students Fabiana Pilar and Cristhiane Valente, and doctoral student Eduardo Goldani are all part of the research team.

Concerning nerve regeneration, there is also the development of microstructured membranes, creating grooves in the silicone. The project includes Papaléo and Master's student Giovana Garcez, in addition to the partnership of the Swiss Federal Institute of Technology in Lausanne (EPFL), Switzerland. In the near future, biodegradable polymers will be studied to possibly replace the silicone.



*Based on studies performed at PUC, cell growth will be more effective*

# The multiple functions of plastics

Polymers are used as raw material for various products ranging from grafts to paints resistant to moisture and to the action of ultraviolet rays. These polyurethane-based materials are part of the studies of the Research Group for the Development of Clean Technologies and Materials of the School of Chemistry, in collaboration with companies.

Two of the projects involving nanotechnology have patent applications filed. One of them is carried out in partnership with A.S Technology, from São Paulo, which has been a partner of the School of Chemistry for ten years. The most recent work aims at creating a polyurethane nanotube for vascular grafts (or prostheses), as part of the doctoral studies of Chemist Emanuelli Cabral. According to Professor Rosane Ligabue, these devices have extremely small cavities and channels, which are important for cell adhesion and growth, aiming at regenerating vascular tissues.

Studies with animals will be performed this semester, at Intox. In comparison with materials existing in the market, all imported, the polyurethane-based nanotube produced at PUCRS is more flexible and more resistant. In some cases, it is necessary to replace the implant one or two years after surgery, as these devices can lead to restenosis (abnormal narrowing of a blood vessel that recurs after surgery).

According to Cardiologist Luiz Carlos Bodanese, also a Professor at the School of Medicine, cheaper alternatives are sought to properly treat the peripheral occlusive vascular disease, which results from atherosclerosis. In addition to diet and medication, the treatment involves devices that aim at correcting blockages caused by fat deposits in coronary and peripheral vessels (legs, kidneys, or brain), and carry less risk than surgery. "There is a demand for innovative technologies which are less harmful to the body." Bodanese and Cardiovascular Surgeon Sílvio Perini participate in the research.

Multilayered tubes will be produced in a new doctoral project at PGETEMA. "We are searching for an intelligent polymer, whose structure has molecules or 'arms' with sensitivity to different stimuli, which can be temperature and pH, and compatible surface. This way we can add enzymes or proteins to improve regeneration," Rosane says.

Additionally, at the Laboratory of Organometallic Chemistry and Resins, and at the Laboratory for Characterization of Materials, the formulation of a special paint, resistant to aging, is being developed. It is a joint project with the Exceller company, from Cachoeirinha, which won the bidding process of Finep, in 2009, and will be happening until February 2015. This time, the polyurethane can be combined with other polymers, natural fibers, and inorganic fillers to form a nanocomposite. The samples are tested in relation to exposure to moisture and UVA and UVB rays.

Another advantage is a lower impact on environment and human health. "It is not based on an organic solvent, because we can disperse the system in water," Rosane explains. Eighty percent of the project is carried out at PUCRS. The researchers started with 300-500 grams. This semester, there will be a pilot plant at Exceller producing 500-800 kilograms.

Two dissertations connected to this study were concluded, and two more are in progress. There is also publication of papers and participation in events in Brazil and abroad. And new ideas have emerged, such as working with technological, waterproof, and antimicrobial fabrics.

Along with the University of Toulouse III – Paul Sabatier, the School of Chemistry studies the synthetic talc, a clay mineral effective in the combination with polymers used as adhesives or paints. "It improves thermal and mechanical properties, and has a wide range of applications," Sandra Einloft, Dean of the School, says. She stayed as a visiting professor for two months at the French university to participate in the research. The talc is used as filler in the paper and pulp, paint, and plastic industries. Toulouse synthesizes the material with less impurities.

There is also research to capture carbon dioxide, seeking options to minimize the concentration in the atmosphere. The doctoral dissertation of Aline Aquino, with a double degree (PUCRS and Universidade Nova de Lisboa), identified a nanostructured material that is excellent for this purpose. Her advisor at the Portuguese University is Professor Eurico Cabrita; Sandra is her advisor at PUCRS.

*Laboratory of Organometallic Chemistry: formulation of a special paint resistant to aging*

PHOTOS: BRUNO TODESCHINI

*Equipment testing exposure to UVA/ UVB rays*

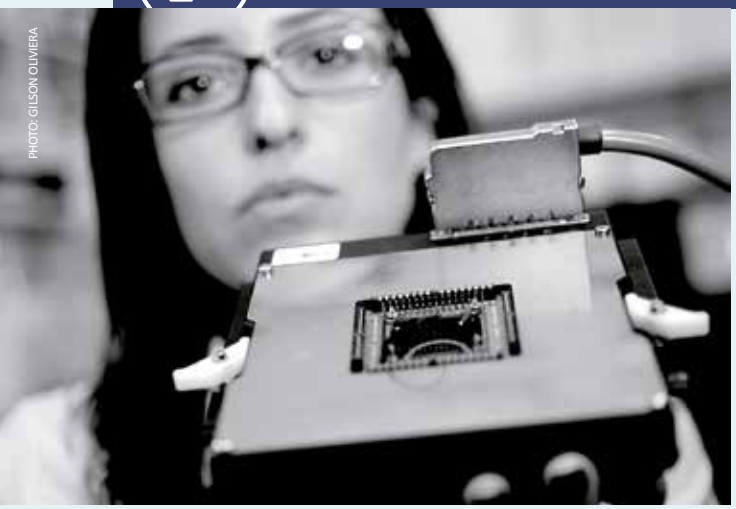


PHOTO: GILSON OLIVIERA

*Carolina Vidor and the equipment that records electrical patterns of the brain*

# Understanding epilepsy

In a few years, a patient with epilepsy will have a sensor that will predict a crisis while releasing a drug to avoid it. During a surgery for the removal of a focus (or of a tumor), it will be possible to identify a healthy or diseased brain tissue, allowing greater accuracy and safety during the procedure. Meanwhile, studies conducted by the School of Physics and the InsCer try to understand epilepsy by means of microelectrodes that stimulate and record the electrical patterns of neural networks of animals.

With Doctor Papaléo as advisor, Physicist Carolina Vidor has explored this subject in her undergraduation final paper and in her Master's thesis at PGETEMA, and she has now been accepted for a doctoral program in Switzerland through EPFL, a partner of PUCRS in the project. During her Master's program, Carolina underwent a training course in Lausanne related to the use of the equipment, which records the electrical patterns of the brain from a microfabricated sensor. Consisting of 64 microelectrodes, it enables the investigation of neuron activity in network, increasing the level of detail. During electroencephalography, macroelectrodes connected to the scalp result in a less refined analysis. Neurologists André Palmini and Jaderson Costa da Costa, and Neurosurgeon Eliseu Paglioli Neto will analyze brain slices taken from patients during surgical extirpation of epileptic focus, for a deeper analysis of the electrical patterns that predict crises.

# Obstacles for viruses and bacteria

The Coordinator of the Laboratory for Materials and Nanoscience of the School of Physics, Roberto Hübler, has advised around 40 students in graduate research at Doctoral and Master's level in nanotechnology in the Graduate Program in Medicine and Health Sciences, Dentistry, and Material Engineering and Technology. Projects in partnership with companies have very good results in the construction of resistant titanium oxide implants, including excellent osseointegration speed. In nanoscale, another advantage is to reduce the risk of infection, as bacteria and viruses are 200 to 300 nanometers large, and are unable to enter the tube.

Hübler explains that the material works as a sponge. "It attracts the essential liquids, helping cell fixation." If there is affinity with the body, the implant works as the basis for the creation of a structure, and leaves no gap between the bone. In vitro tests (at IPB) and tests with animals have been carried out. Those were part of two Doctoral dissertations and one Master's thesis. The thesis of Engineer Renata Renz now tests the application of pharmaceuticals in the implant itself, so that an even more significant effect is achieved. The preclinical phase will be sponsored by the Baumer company.

During their doctoral studies, Physicist Paula Velleda and Dentist Marcelo Abreu, growth hormone was used in the implants. "The speed of bone growth reached ten times of what has been reported so far," Hübler says. Another challenge is to find bioabsorbable materials, such as PLGA. "For example, if a person shatters his or her mandible in a traffic accident, today, a surgeon removes the fibula of the leg, and the replacement is sculptured with bone or a metal prosthesis. The idea is to create a mineral and PLGA pre-structure to be absorbed slowly and reproduce the bone. A nine-hour surgery would take just a few minutes," Hübler affirms. Degradation tests will be performed at IPB this semester.

The Center for Research and Development in Physics has a range of equipment to ensure the purity of the material used, check its mechanical properties, and check its crystal structure. One of those devices was designed and built from scratch at PUCRS in 1996. A similar version of it was made available in the market recently. It is a machine of thin films, which breaks down the coating, allowing changes in the properties of the surfaces. It transforms solid materials into vapor and deposits atom by atom, generating a nanometric film. "We started with a solid piece of aluminum that was sculptured so that it had no leaks or welds," the Professor says.

*Device created at PUCRS transforms solid materials into vapor and deposits atom by atom, generating a nanometric film*

PHOTO: : BRUNO TODESCHINI

# Investments in nanoscience

**Central Laboratory for Microscopy and Microanalysis has new high-resolution microscopes**

In the metric scale, the human eye has the capacity to reach micrometers (one millimeter divided by ten). But with the new equipment of the Central Laboratory for Microscopy and Microanalysis (LabCEMM), it is possible to examine even smaller structures, in nanometers. After a renovation that expanded its physical space by 205%, from 113.7m² to 316.42m², to house five new state-of-the-art multiuser microscopes, the department will be reopened in mid-2014.

Carlos Nelson dos Reis, Director of the Institute for Research and Development (Ideia), where LabCEMM is located, says that one of PUCRS priorities and strategies is to invest heavily in research in nanoscience. "In order to do so, we need high-resolution microscopic images", he says. The laboratory now operates with multi-user scanning, transmission, confocal, atomic force and FEG scanning microscopes available to be used by the University, companies in the Science and Technology Park (Tecnopuc), other institutions, visiting researchers and external companies.

PUCRS Vice President for Research, Innovation and Development, Jorge Audy, points out that such renovations and investments allow qualifying education and widening the scope of research projects requiring the use of leading-edge microscopes. "With the inauguration, we will certainly have one of the most modern centers for microscopy and microanalysis in the country, in Brazilian universities", Audy maintains. Funds have been raised through calls for projects of agencies such as Finep and Globaltec.

To Carla Bonan, dean of Propesq's Office of Research, the new equipment and adaptation of the lab space have made it a highly qualified environment reaching international excellence standards. "It is an important multi-user research-support structure providing infrastructure in microscopy to support researchers from the whole University in research and technology-based activities", she says.

*Scanning microscope shows the image of a surface in detail*

PHOTO: GILSON OLIVEIRA

## To be world reference

With the growth of LabCEMM, all science areas are benefited, including medicine, dentistry, engineering, physics, biology and chemistry.

The your microscopes can be used to analyze any type of material, from solid to liquid, from rock to protein, metal, cells, fabrics, asphalt and concrete.

The new acquisitions have resulted in an expansion of the team to respond to demands of the university, society and Tecnopuc. Propesq has also appointed a scientific committee to promote and encourage the use of the laboratory and prepare research in project development. According to Carlos Nelson dos Reis, the University is seeking to become local, national, and international reference, advancing its research from an international stance. "We have agreements with universities worldwide, and researchers in cooperative studies with PUCRS need a structure akin to the one available at their institutions. LabCEEM offers just that", the director of Ideia completed.

PHOTO: GILSON OLIVEIRA

**The milk produced by the goat has the protein needed by patients with Gaucher's disease**

*At the laboratory: Jocelei Chies, Director of Quatro G and coordinator of the project, performs biological tests with goat milk*

# Latin America has first trans

Born in March 2014, Gluca is a goat that eats the same as other animals of its species, but it receives special attention. It is the first transgenic and cloned goat in Latin America and is now producing milk with a human protein called glucocerebrosidase (which inspired its name), used to treat Gaucher's disease. About six hundred patients in Brazil generate an annual expense of as much as BRL 250 million for the Ministry of Health. The Country is dependent on the import of recombinant proteins (produced through transgenesis). The research will go through other steps before resulting in a national medication.

Jocelei Chies, Director of Development at Quatro G and coordinator of this project, believes that this process will take from eight to ten years. The work is developed jointly by Quatro G, a company installed at PUCRS Science and Technology Park (Tecnopuc), and Esperança Agropecuária e Indústria/ University of Fortaleza (Unifor), with funds from the Funding Authority for Studies and Projects (Finep)/Ministry of Science, Technology and Innovation.

Before Gluca weighed around 40 kg and began producing milk, Quatro G performed preliminary biological tests and protein-purification tests from the milk. Molecular analyses are also carried out to decode the clone, which may serve as a basis for a herd and a large-scale production of the protein. "We needed to find out if the protein was found in the milk, and at what level/ percentage," Jocelei explains. On October 8th 2014, she secreted the first milk sample after induction. Preliminary results show the presence of glucocerebrosidase. More tests are needed in order to check the amount of protein in milk and whether it has activity.

The purification of human milk protein and the corresponding biological tests are part of the fourth (and last) stage of the project. The first stage consisted in the construction of the gene for the expression of the mammary gland, made at Quatro G. The insertion of the gene into goat cells, and the production of embryos/clones (third stage), and the embryo transfer happened at Unifor.

The couple Luciana and Marcelo Bertolini, who work at Unifor, and Gaby Renard and Ana Christina de Oliveira Dias, from Quatro G, all took part in the project.

Another research project by this company established at Tecnopuc relates to lactase, an enzyme produced in the digestive system of humans which breaks down the main sugar found in milk (lactose) into smaller pieces, so that it can be absorbed by the organism. In this case, the collaboration happens with the Federal Institute of Education, Science and Technology of Rio Grande do Sul. Quatro G also aims at developing a kit for apoptotic cell staining (cells programmed to die, unlike cancer cells), which in the future could result in a routine test.

Nine students from the Master's Program in Molecular and Cellular Biology of PUCRS developed their theses based on projects from Quatro G. A doctoral dissertation, by Juleane Lunardi, with a grant from Fapergs, is currently being prepared there.

## Gaucher's disease

It is a genetic and progressive disease, the most common of the lysosomal storage diseases, so named due to the accumulation of debris of aged cells deposited in lysosomes (tiny cellular structures with enzymes essential to the balance of the organism). Rare and difficult to treat, Gaucher's disease is characterized by a deficiency of glucocerebrosidase, whose function is to "digest" a type of fat, the glucocerebroside, inside cells. Because of changes in the gene that produces the enzyme, its level is insufficient, and it cannot decompose the substrate, which then accumulates in the lysosomes.

Gaucher cells accumulate mainly in tissues of the liver, spleen, lung, and bone marrow. Kidneys, lymph nodes and the skin may also be affected On a smaller scale, accumulation also may happen in tissues of the central nervous system. The organs containing these cells increase in size, which leads to clinical manifestations of variable type and severity.

***Source: http://doencadegaucher.com.br***

# s its sgenic goat

*Gluca produces in its milk the protein to treat the disease*

PHOTOS: PERSONAL ARCHIVE

*The clone may serve as a basis for a herd and a large-scale production of the protein*

# Excellence in graduate stu

Capes' latest Triennial Evaluation (2010, 2011, 2012) has shown the advancement of our University's graduate programs, with almost half of our programs achieving grades 6 and 7 (international excellence) and 70.8% achieving grades from 5 to 7. Grade 5 indicates national excellence. PUCRS' average grade was 5.21, the best in the ranking of private universities and one of the five best universities in the country, among a select group including Universidade Estadual de Campinas (Unicamp), Universidade Federal de Minas Gerais (UFMG), Universidade de São Paulo (USP) and Universidade Federal do Rio Grande do Sul (UFRGS). Regarding grades 6 and higher, it has the greatest percentage among institutions with over ten programs, 47%.

**PUCRS is among the five best private universities in the Country**

Courses that repeated 6 or reached grade 7 will be part of the Capes Program of Academic Excellence (Proex). Consequently, they will be able to manage resources, receive funding for materials, equipment, grants and visitors' travel costs. In the 2007-2008-2009 evaluation, two programs at PUCRS had Proex and currently six are included in the Program.

The Vice President for Research, Development and Innovation, Jorge Audy, responsible for Graduate Studies in the period evaluated by Capes, stresses the policies adopted by PUCRS to promote and maintain that advancement: plan of faculty accreditation, reduction in the number of credits (less classes, more research), enhanced fundraising and investments to value researchers, both faculty and students.

Vera Strube de Lima, then coordinator of Graduate Studies, says each Program was closely watched, considering the number of supervisors and graduate students, internationalization, productivity (publication of articles in major journals) and faculty accreditation plans (according to the demands of each course). To Vera, this evaluation was consistent with "the excellent conditions of work and research" offered by PUCRS.

Proacad's Dean of Graduate Studies, Maria Eunice Moreira, stresses that the Institution provides professors with the opportunity to spend periods of time in foreign universities, establishes partnerships, encourages the consolidation of international and national groups and the granting of sandwich scholarships, and hosts visiting professors. She remarks that PUCRS is part of the National Program for Academic Cooperation (Procad), supporting other institutions in the fields of Letters, History, Law and Communication.

The results of strong and interconnected undergraduate and graduate studies in programs of excellence and innovation are reflected in those who enter the job market and offer solutions to society.

**Mágda Cunha, Vice President for Academic Affairs**

# dies

## Performance

| |
|---|
| Business Administration (PUCRS with UCS) – Doctorate: 4 |
| Business Administration – Master's: 5 |
| Biosciences (Zoology)**: 6 |
| Computer Science: 5 |
| Cellular and Molecular Biology: 6 |
| Criminal Sciences: 5 |
| Social Sciences: 4 |
| Communication: 4 |
| Law: 6 |
| Economics: 4 |
| Education**: 6 |
| Materials Engineering and Technology: 5 |
| Electrical Engineering*: 4 |
| Education is Sciences and Mathematics: 4 |
| Theology*: 4 |
| Philosophy**: 6 |
| History: 5 |
| Biomedical Gerontology**: 6 |
| Linguistics and Letters: 6 |
| Medicine and Health Sciences**: 7 |
| Medicine – Pediatrics and Child Health: 6 |
| Dentistry: 5 |
| Psychology: 6 |
| Social Work**: 6 |

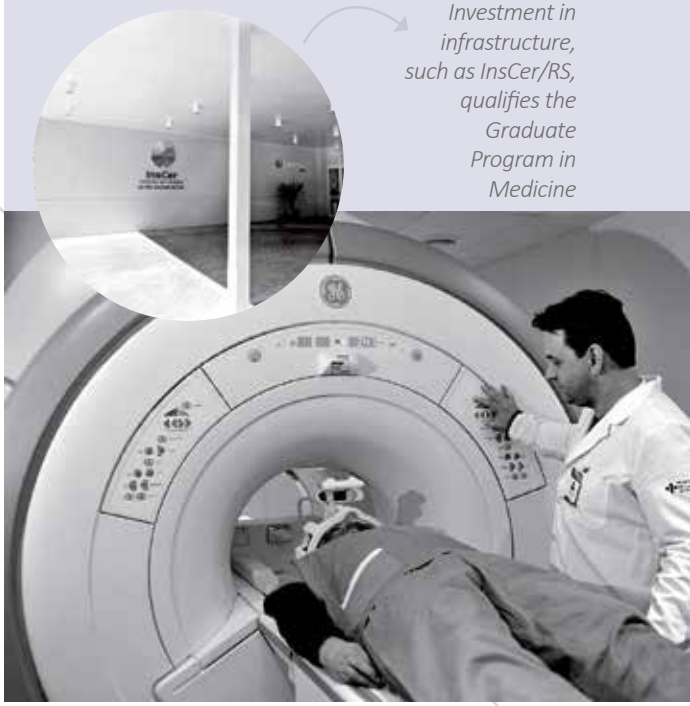
** Master's only*
*** Part of the CAPES Program of Academic Excellence, either for maintaining grade 6 or, in the case of Medicine, for reaching grade 7.*

## Medicine on the top

In sum, three factors explain the grade 7 (maximum) obtained by the Graduate Program in Medicine and Health Sciences: investment in infrastructure (for example, with the Brain Institute of RS, the Biomedical Research Institute, the Institute of Toxicology and Pharmacology, and the Center for Clinical Research), qualification then of researchers, and student efforts. According to the then coordinator, Magda Lahorgue Nunes, with this achievement, the Program consolidates its competence, respectability and visibility, being sought by more qualified faculty and students, from Brazil and abroad.

One of the goals is to renew the faculty due to the high demand for scientific production and supply areas of great demand, like neuroscience and surgery. This year, international visiting professors will be teaching courses. The Program has joint projects with several institutions, involving co-supervision of students. Some of these institutions are Harvard University and the Mayo Clinic (USA), and the Mac-Gill universities of Montreal and Toronto (Canada) and Oxford (England).

> We must keep focus on lines of research and publication of results, guarantee a continuous flow of renewal of the faculty, and be fast and competitive in fund raising.
>
> **Magda Lahorgue Nunes**



*Investment in infrastructure, such as InsCer/RS, qualifies the Graduate Program in Medicine*

*Pediatrics attracts students of various backgrounds*

# Education has 1.2 thousand theses and dissertations

The Graduate Program in Education has had 1.2 thousand theses and dissertations defended over 41 years. Along its history, it has contributed to the production of scientific knowledge and the training of professionals. "Our alumni take outstanding positions in the job market", affirms Dean Isabel Carvalho. "We have a path marked by collective commitment to excellence in research, responsibility in teaching, and concern about the social aspect." This year, an exchange will take place with the University Paris 5, and outbound mobility students will go to Europe and the US. The Program will also take part in the national debate about regulation of ethics in research.

# Zoology combines tradition and innovation

Tradition and innovation in research. That is how interim Dean Sandro Bonatto defines the Graduate Program in Zoology. "We have renowned senior professors, as well as young faculty members whose production impacts new fields of study". For instance, the group led by Dr. Eduardo Eikirik has discovered a new species of wild cat, called *Leopardus guttulus*. The study was published in the Current Biology journal. Molecular DNA analyses have shown that the small wild cat of the Brazilian Northeast is different from the one that inhabits the South and the Southeast, with no evidence of crossing.

Dean Bonatto also remarks the quality of the students and joint projects with institutions in several countries. "We have even managed to include a foreign member in our Faculty", says Bonatto. With studies developed in Sweden and the US, Spanish biologist Santiago Fischer works with reptiles and amphibians. Next, a paleontologist will also be included in the staff.

Leopardus guttulus *is new species of wild cat*

# Health Area stands out

All PUCRS programs in Health have achieved the level of national (Dentistry) or international excellence (all others), standing out in scientific production and visibility, with publications in world-renowned journals, faculty qualification, and cooperation with foreign institutions.

The Biomedical Gerontology Program is in the 2.7% of 226 interdisciplinary programs in Brazil having achieved grade 6 (none has yet achieved 7), and the only one in that group developing studies on aging.

Dean Irênio Gomes da Silva Filho underscores advancements in cooperation agreements. In the Country, by initiative of the University, a network will be formed with seven programs in the area to foster research and academic mobility.

Among the 12 Pediatrics and Child Health Programs in Brazil, PUCRS and USP – Ribeirão Preto have the highest grades. "Our course is very diverse, with areas of concentration in respiratory diseases, neurology, imaging, intensive therapies, physiotherapy and biology. We have students with various backgrounds who manage to get good positions in the market. This title is highly valued", summarizes Dean Renato Stein.

Regarding the Program in Molecular and Cellular Biology, Dean Nadja Schröder says that is has reached a high level of internationalization. "Professors work as reviewers and members of the editorial board of journals, consultants in foreign funding agencies, and in cooperation projects with leading institutions". She notes that 85% of the supervisors (in the permanent staff of the program) have CNPq productivity scholarships, while the average in the field is of 59.3%. Its goal, she says, is to enhance inclusion of graduate students in activities to train them to work at basic and secondary levels and in science popularization.

In Social Work, close integration between the undergraduate and graduate levels and partnerships in Latin America, Europe and the US are to be highlighted. "We have tradition as a training center and we articulate with governments, councils and social movements", says Dean Jane Prates. According to her, this is a joint effort of committed students, solicitous staff, and university facilities that support and favor research.

Among 69 Psychology programs, only 2.9% were graded 6 – like PUCRS – and 4.3% were graded 7. To Dean Christian Kristensen, this is mostly due to efforts in planning and management. Another important point is its overall production, twice as large as the required for the area, with 51% of the articles in foreign publications (the average for Psychology is 14%). "Seventy percent of the teaching staff are CNPq productivity research fellows and 60% have completed post-doctoral projects abroad".


*Heloísa Delgado (L) and Ana Eliza Bocorny: the development process required creativity, research, concentration and harmony*

**Learning Objects motivate students**

PHOTO: BRUNO TODESCHINI

# To learn english and portuguese

In a globalized world, studying a foreign language is essential. And this knowledge is increasingly being requested. PUCRS recognizes this need and helps those who wish to learn or improve skills in a foreign language. By means of Learning Objects (LOs) of English and Portuguese as a second language, developed by the Learning Lab in partnership with professors of the School of Letters, anyone can access interactive and educational materials that facilitate comprehension and encourage self-learning.

According to Dr. Valéria Raymundo who, jointly with professor Silvana Silveira, was responsible for guiding and reviewing the content of the LOs, one of their distinctive features is the approach adopted. "We know the doubts of students, their weaker points, what they usually strive to understand because of their native language. Bearing that in mind, we have chosen the contents", she explains. "We have conducted an extensive survey to achieve this result; and team work was crucial", she adds.

"The aim was to create learning situations that simulated moments in the classroom", explains Dr. Heloísa Delgado, who authored the English Language Learning Objects with her colleague, Dr. Ana Eliza Bocorny. Both stress that the development process required creativity, research, and specific knowledge and experience in teaching the language. "We thought of means to attract students and encourage learning.

We formulated clear explanations and exercises to stimulate reasoning and autonomy of users", they explain. The content presented include: verb tenses, modal verbs, phrasal verbs, aspects related to vocabulary: cognates and false cognates and word categories. They are categorized into basic and intermediate levels. Regarding the Portuguese language learning objects for foreigners, some themes are: particularities of oral and written language, principles guiding the use of crasis, the concept of parallelism, and adequate usage of the "porquês". Materials have abundant illustrations, animations, interactive activities and self-explanatory exercises. Some also rely on audio and/or video resources, making the learning experience even more interactive and pleasurable.

Professor Carlos Ricardo Rossa used the objects in the English Language II sequential course and the initiative was approved by students. "The tasks allow practicing different skills: listening, reading and writing", notes Bruna de Jesus. Daniria Collaziol also stresses autonomy in the exercises. "It is possible to do the whole activity alone, since exercises have a feature to translate instructions and some sentences", she remarks. Rossa hopes this method will become a common practice among professors of the School of Letters. "I find this material extremely valuable, it was very carefully prepared and achieves proposed goals", he affirms.

According to Valderez Lima, general coordinator of the project, the LOs contribute to the University's plan for internationalization. "The Institution recognizes the value of academic mobility for the internationalization of students and seeks to adapt to contemporary demands", she says. In this context, adaptation to new technologies is also comprised. "We have noticed increasing use of smartphones and tablets by our students. Now, this support tool can be accessed from mobile devices as well, she adds.

# Technol inno

**Four professors received acknowledgment from Apple for activities with the *LabsMóveis* project**

Technology can be a great ally to make the difference in the processes of teaching and learning, making use of simulations, and providing realism to the classroom. Project LabsMóveis (*Mobile Labs*), of the Office of the Vice President for Academic Affairs (Proacad), meets modern practices, and by working with mobile devices, aims at building innovative pedagogical practices. Launched in 2012, today it serves 22 undergraduate courses. Each unit designates professors as representatives to participate in a study group, whose activities include training on the pedagogical use of the devices, besides creating, applying, and assessing new methodologies that can be adapted to various courses.

The project has called attention at Apple, which invited Professor Letícia Leite, Coordinator of Education and Academic Development, to present the case of the University at the Apple Education Leadership Summit, in Miami (USA), last May. The event gathered researchers and educators from several institutions in Latin America – about 209 managers from seven countries. Letícia says that the company highlighted the integration of mobile devices with different spaces used by each of the knowledge areas. "We were the only Brazilian higher education case in the conference," she affirms.

Video recording and editing, production of e-book materials, analysis of hospital procedures, creation of blogs and WebQuests are some of the activities developed by using the tablets, integrating different sound, image and test medias. Creativity in the production of new methodologies has given PUCRS four nominations in the Apple Distinguished Educators program. The recipients were Ana Elizabeth Figueiredo and Raquel Dias, professors at the School of Nursing, Nutrition, and Physiotherapy (Faenfi); Eduardo Pellanda, a professor at the School of Communication (Famecos); and Sônia Bonelli, a professor at the School of Education (Faced). The program rewards educators for their innovative use of technology by the American company in classroom. In 2015, all the selected individuals will meet in San Diego (USA) for the election of the world's best case.

*PUCRS was the only Brazilian case of higher education presented in the Apple Education Leadership Sum*

PHOTO: BRUNO TODESCHINI

# logical vation in the classroom

## A new world

Ana Elizabeth Figueiredo, a Professor at the School of Nursing, began using tablets in the classroom in 2012. When she was invited to take part in Project LabsMóveis, she thought: "It is a teenage thing!" But by the end of the first week, she also had bought one to get acquainted with this tool. "I discovered a new world. I learned video editing, how to add subtitles, how to separate the audio from images, how to make transitions, and how to add effects and soundtrack. First I tested most of the apps on my tablet, then I asked the School of Nursing to install on the LabsMóveis devices for students to use in the laboratory," she reports.

Figueiredo points out that in the healthcare field, it is necessary to teach technical skills and communication. For example: how to administer injections, pass a probe, deal with family members of patients, request information, and collect data. Ana made tutorial videos to demonstrate some techniques, and students can watch these videos whenever they want, using the Human Care Laboratory to practice with dummies. "We also use the videos as a critical and reflective methodology. The students are filmed, and they later analyze the video in regard to vocabulary, approach, and technique," she says.

Ana discovered a cardiac and pulmonary auscultation app. With the help of Professor Márcio Pinho, from the School of Computer Science, she connected an amplifier to a stethoscope, which once connected to the tablet generates the impression that the sound comes from the dummy. "Thus, I am able to assess the technique of the students when they carry out physical examinations and also their skills in interpreting sounds. By simulating diseases, we take realism to the Human Care Laboratory, which is something we were not able to do in the past," she affirms.

An example is the simulation of cardiac monitoring in critical and emergency situations, in subjects of the Nursing course. Kelly Barcelos and Katrine Scolari, students in the 7th semester, had a class with the app and could experiment the "death" by cardiac arrest of a dummy. "We have combined the audible and the palpable. Seeing the heartbeat stopping in the monitor and hearing it at the same time makes a big difference. The whole class was impacted by the situation, and we had to deal with this emotion," Katrine recalls. "We record

PHOTOS: ARQUIVO PESSOAL

*Ana Figueiredo: "The realism we bring to classroom today was not possible in the past"*

ed the procedure and watched the video later. We had an idea of how we act and were able to assess our technique. It was more dynamic and more real, and we had faster feedback," Kelly adds.

By creating a real-life environment inside the laboratory, Ana believes that patients will benefit from nurses who will be more confident and well-trained. "I can see the growth with the use of iPads, and I can see a change in behavior during practical classes, a greater attention to detail. Such realism makes both teaching and learning easier. We are training students who have a more concrete idea of things that were abstract before," she affirms.

The auscultation and clinical simulation activities resulted in the Professor being awarded the Distinguished Educators. "I started using LabsMóveis in 2012; the filming boom was in 2013; and the results came in 2014. This award changes the outlook on teaching classes. Being acknowledged by a new activity gives you more motivation," she says.

# LabsMóveis

Each PUCRS School in the LabsMóveis project receives 30 mobile devices, at their choice. The project began in 2012. After choosing between a notebook or an i-pad, each School designates a professor to be part of the group who develops methodologies for the pedagogical use of these tools. "The professors develop, apply, and evaluate the methodologies created. We also follow the evaluation of subjects that are part of LabsMóveis, and the satisfaction rate is higher than the general rate of the University," Professor Letícia Leite stresses.

Mágda Cunha, PUCRS Vice President for Academic Affairs, highlights the importance of including students in the technological world and the need to discuss education with intense technological mediation. "Professors are encouraged to realize that students do not come to the classroom as blank pages. They have broad access to the Internet and to information, which brings positive input and affects learning", she points out.

# Production of knowledge

Encouraging peer interaction, learning by means of research, and work, besides the content, attitude and professional competence. These objectives were met at the School of Nutrition, during the Maternal and Infant Nutrition course, taught by Professor Raquel Dias and other five professors. Raquel has also been awarded the Distinguished Educators, replacing traditional seminars with production and presentation of videos.

With the videos produced with the tablets, students found a distinguishing language. They were given a text about breastfeeding and had to search for more information, terms, and concepts on the Internet. Based on that, they learned how to deal with the device to research the topic, shoot, and edit the images. "They decoded the knowledge acquired through the research in a more direct and accessible language. The videos were presented to their classmates and posted on YouTube. Sharing the contents produced in network has added even more responsibility to the tasks performed, as they can be accessed by anyone searching for this subject," Raquel says.

She reinforces that autonomy in knowledge production helps a future professional to be prepared for a real situation. "They had to discuss the subject and select the essential information for the video. They will have to deal with a time limit to pass information while advising a patient," she affirms.

Daniele Schneider, a student from the 7TH semester, enjoyed the new experience. "It was very practical: we recorded it and in that same afternoon it was already published in a video channel. In the School of Nutrition, we use the tablets quite frequently in class, and I believe that there is no way to separate teaching from technology anymore. We are all very much connected, and it makes everything easier. The learning gets lighter and entertaining once we are really involved in it," she explains.

*Raquel (R) and Daniele approved the experience in sharing contents on the Internet*



*Facebook is an ally when the concept of a balanced diet is addressed in the Nutrition and Physical Activities subject*

# From tablets to plates

The School of Physical Education is another school that benefits from technology and LabsMóveis. In the first half of 2014, it was time for the Nutrition and Physical Activities course, also taught by Professor Raquel Dias. In addition to tablets, she also used Facebook to work with the concept of balanced nutrition, creating a group for the class in that social network.

On Facebook, students had to post about the process daily, and the participation was very surprising. José Henrique Selau, a student from the 7TH semester, built a profile for the activity on the site and became one of the most active representatives in the posts. "I have never been so involved with technology, but after I attended some courses that used these resources, I realized that it is an interesting tool for the knowledge and growth of students," Selau, who tried a gluten-free diet, admits.

# The culture of smiling

**Philosopher Pascal Bruckner talks about the discourse of happiness**

What is happiness? As said by Guimarães Rosa in *The Devil to Pay in the Backlands*, happiness happens in short moments of distraction. According to French philosopher, novelist, and essayist Pascal Bruckner, happiness is not simple, and it is not possible to control its arrival or departure. For him, what is important is to know how to recognize it. "Many people, especially young ones, hope for an extraordinary fate, and do not know how to enjoy happiness when it arrives to them or while they have it. The art of living perhaps lies in the acknowledgment of the short moments of happiness, without expecting some sort of magical redemption, which causes so much suffering," he says.

Author of 15 books, recipient of important European literary awards, and Doctor in Letters at the University of Paris 7, Bruckner has taught in New York and San Diego, and is a collaborator of the *Nouvel Observateur* magazine. His book *Bitter Moon* was adapted to screen by Roman Polanski. He came to Porto Alegre for a conference during the Frontiers of Thought High Studies Course, which has PUCRS as cultural partner, and visited the University, in October, while taking part in the Extension Forum. On that occasion, he gave an exclusive interview to PUCRS Magazine.

**Has capitalism transformed happiness into an obligation and a consumable product? How to break this cycle?**

Happiness is not simply a product to be bought. If that were the case, it would be very easy to reject this obligation. The obligation of happiness transcends consumerism; it is something bound to the image that we have of ourselves; it has more to do with personal constructivism than with a simple action of a buyer in the supermarket. Thus, we are summoned to build ourselves our happiness, day by day, from cradle to grave. A change in the economic system would not change that obligation.

**If a person sets goals that have happiness as purpose, does this person run the risk of becoming indifferent when the goals are reached?**

Yes. Therein lies the irony. Happiness retreats as we try to reach it, and sometimes it happens in very small things and eludes us when we set lofty goals. There are no means to predict it. We can set a trap to try catching it, like a bird, but we cannot be sure if the happiness bird will land there, even if we make every effort to do so. Quite often the preparation for happiness takes more time than happiness itself lasts, and when it arrives, we are exhausted.

**Is real happiness too different from that shown in social networks? Does this representation that people use, this urge to show how happy they are, interfere in it?**

It is a code for a representation of themselves, which presupposes a type of permanent euphoria, just like in an election, when candidates present themselves always smiling, always friendly, kind, human. Likewise, there is some sort of perpetual smile on our face today. We must all be fine, nice, and open, and this is, obviously, a purely artificial language. It is the culture of smiling.

**Is the wish to be happy not more than an ideology? Is it not intrinsic? Is it possible not to seek happiness and live with this choice?**

I think that what is inherent to us is the escape from unhappiness, to avoid loneliness, suffering, abandonment. Happiness is not simply the absence of unhappiness, it has an additional quality, related to a particular moment in life. So while we try not to be unhappy, we also aim at escaping from boredom. And we try to live a more intense life.

PHOTO: GILSON OLIVIERA

# PUCRS will have an aeromovel line

**The vehicle will go across Ipiranga Avenue from the Event Hall to the Sports Center**

A clean, safe, sustainable, and efficient vehicle will interconnect the Campus. Like in a horizontal elevator, people will go cross Ipiranga Avenue in 1.2 minute, from the Event Hall to the Sports Park. The University will have a laboratory-line for tests of new mobility technologies related to the aeromovel. The vehicle, which has a capacity of 150 people, is ready and is in São Leopoldo, at the headquarters of Aeromóvel, the company in charge of its manufacture. It will serve as a development environment for commercial projects in Urucu (Amazon rainforest), Canoas (on Boqueirão Avenue and Mathias Velho, as feeder lines to the metro) and Nova Iguaçu (Rio de Janeiro).

The works are scheduled to begin in 2015. This year, after the initial support from the Funding Authority for Studies and Projects (Finep)/Ministry of Science, Technology and Innovation, executive engineering projects will be carried out. This second stage has an investment of BRL 5.5 million. This is a joint project between PUCRS, UFRGS, Finep, and Aeromóvel Brasil. Before the construction begins, the projects must be approved by the City and CEEE. This stage will take three years. The first stage ended with the hiring of the Metro – Airport line, built for the World Cup.

According to the institutional coordinator of Project Aeromóvel of the PUCRS Campus, Professor Edgar Bortolini, the initiative will enhance the movement between both sides of the Campus, reducing vehicle traffic and allowing the use of the car parks more effectively. The tests performed show that the energy consumption per passenger is very low compared to other modes.

There will be a urban mobility laboratory at the Event Hall station. In addition to studies about atmospheric railways (comprising the generation of energy through other sources, such as photovoltaics, wind power, and biomass), the space will be dedicated to research of new technologies concerning efficient urban transport, such as electric and autonomous (robot) vehicles.

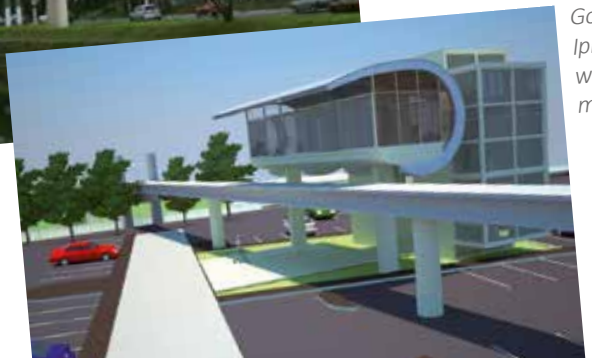
The University was chosen to host the laboratory-line due to the Campus' characteristics, which allow the reproduction of a metropolis, including in its design all the particularities of a city layout. The ease of access, location and visibility were also decisive factors. "An average of 50 thousand people visit the Campus daily, and a part of them will be able to take advantage of the speed and efficiency of the aeromovel," Bortolini affirms.

The project began in 2007. At PUC, the first stage involved research in 17 areas, such as the impact on the population's health, the environment, energy consumption and energy efficiency. The Schools of Engineering, Architecture and Urbanism, Business, and Computer Science all took part in the plan. At the second stage, which includes the projects and the beginning of the works, the Engineering and the Engineering and Architecture Division of the Office of the Vice President for Administration and Finance will get involved. Stage III will provide for the expansion of the line throughout the PUCRS Campus.

> This partnership is very important, as it involves urban mobility technologies that will cause deep impact on the future of cities.
>
> **Jorge Audy, Vice President for Research, Innovation and Development**

ILLUSTRATIONS: PROJECT AEROMOVEL

*It will be able to carry up to 150 people*



*Going across Ipiranga Avenue will take 1.2 minute*

LEARN MORE AT:
www.pucrs.br/aeromovel

# Where fict come

## Researchers design and build a bionic hand and a piano-playing robot

A bionic hand takes shape in a 3D printer and is able to reproduce the Brazilian Sign Language (Libras). A robot plays the piano and can assist in the development of children with disabilities. A vehicle is remotely operated to work in inspections and ensure safety. These are not examples of movie or novel plots. They are devices developed in the School of Engineering, where science fiction becomes reality in the Laboratory of Excellence in Electronics, Automation and High Reliability Embedded Systems (Ease).

Officially opened in October 2013, the laboratory brings together researchers from the Systems, Signals and Computing Group; the Automation and Control Systems Group; and the Integrated System Optimization Group. With advanced analysis techniques and control systems for mobile robotics, unmanned autonomous vehicles, and residential or industrial automation, the laboratory develops projects that can be applied to specific purposes, such as aerospace, the military, motor vehicles, and medicine.

Made in a 3D printer of the Webtronic company, the articulated hand is controlled by a wired glove, a computer or a cell phone, and performs predetermined basic movements. Five servomechanical gears make the fingers bend and stretch. This experiment was introduced at Feira Mostratec, which took place in October 2013 in Novo Hamburgo, and is part of the final paper in Electrical Engineering of Vinicius Stoll, who is currently in Australia through the Science without Borders program. “The first prototype was made by him, and I improved it. When he comes back, he will finish it and present it as his capstone paper,” the Chair of the Undergraduate Program, Professor Anderson Terroso, affirms. Professor Terroso also says that the bionic hand project is based on that of Gael Langevin (InMoov), with a reproduction authorization.

According to Terroso, the next step is making the hand as intelligent as possible, by adding sensors that allow the sense of touch. “It will be modified for use with the hearing impaired. Because Libras frequently demands broad movements, we want to develop the whole arm,” he plans. This step is carried out in association with Professor Márcia Campos, from the School of Computer Science (Facin), and will include prototype making, testing with users, and product validation before being finished. “The idea is that the hands have articulation and movement, and are connected to arms, trunk and face. They could be used in Libras courses and translations,” Márcia illustrates.

# tion es alive

## Musical notes and tic-tac-toe

The bionic hand is not only for communication in Libras. Soon it will also have a musical application. Based on it, the robot-pianist project was born and is currently under development. Equipped with a camera on its head, the robot will be able to read musical notes on a display – by means of image processing – and play them with its fingers on a keyboard. Initially it will use the seven musical notes, then in the second stage it will do the octaves and run its fingers – which will also have built-in cameras – through the keyboard. "It could be used as a learning tool for the elderly, through the observation of movements," Terroso explains.

Due to the partnership with Professor Márcia Campos, the robot may be used in activities with the visually impaired. "A different proposal relates to the development of the mechanism inside the piano, so that the keys are lowered according to the note. Therefore, the person reads the score in braille, listens, and recognizes the position of the note on the keyboard," Márcia explains.

Image processing is also very important for the operation of this delta-robot with servovision, developed by Professors Aurélio Salton and Jeferson Flores. With architecture from the 1980s, it consists of three mechanical arms attached to a base, powered by a computer. With a lightweight structure, and easily built, it is a great alternative to moving in three dimensions (depth, width and height).

The robot draws things like the Brazilian flag and plays tic-tac-toe with the aid of a camera to identify the board. According to Professor Anderson Terroso, the machine is unbeatable. "No one can beat it, maybe only draw the game," he says. In the future, the project will be adapted for 3D printing, so that it can be used at Ease and the School of Engineering.

PHOTOS: BRUNO TODESCHINI

*Anderson Terroso and the hand that uses Libras and will have sensors for touch*

# International partnerships

When electronic circuits such as chips or computer boards are exposed to radiation, embedded in satellites, for example, they undergo changes in its functioning, and age prematurely. The researchers from Ease developed a platform for the assessment of the combined effects of electromagnetic interference (EMI) and total ionizing dose (TID). The objective is to measure degradation and ascertain hardware durability and reliability in these situations. The project in progress has the participation of Chrístofer Caetano de Oliveira, a Master's student in Electrical Engineering, and Professors Juliano Benfica, Fabian Vargas (Coordinator of Ease), and Leticia Poehls (Chair of the Graduate Program in Electrical Engineering). It is carried out in collaboration with the University of Buenos Aires.

Likewise, and in association with Politecnico di Torino (Italy) and Tallinn University of Technology (Estonia), hardware-based techniques, capable of increasing the robustness of integrated systems in relation to aging, were created by the same team of professors and by Master's students Thiago Copetti and Marco Túlio. The project in progress, funded by Fapergs, deals directly with the effects of the Negative-Bias Temperature Instability (NBTI) phenomenon, with delay in the transistor system and memory incapacity. The objective is to ensure the desired levels in embedded systems to critical applications in different operation scenarios.

The Ease laboratory is able to operate in four areas: Test and High-Reliability System Engineering; Control Engineering; Data Fusion and Monitoring; Design of Optimized Integrated Circuits and EDA Tools (Microelectronics). Moreover, it also handles projects with professors from the Schools of Physical Education, Pharmacy, and Computer Science.

# Mobility without bends

It walks diagonally, sideways, in all directions, without making curves. The omnidirectional platform, developed at Ease, uses individually activated wheels, which enables the autonomy of direction. This device was created by Diogo Silveira for a final paper in Control Engineering. Supervised by Terroso, it is controlled by accelerometers from a smartphone running Android, via Bluetooth. It can be used in the locomotion of people with disabilities, in the moving of materials and objects in an industry, and in many other situations. "The idea is to develop a wheelchair based on this prototype in the future," Terroso explains.

Mobility is also the focus of project segway: a two-wheeled, self-balancing electric vehicle that uses the principle of the inverted pendulum. Invented by Dean Kamen, from the United States, and introduced to the world in 2001, it is used for locomotion based on balance. The mechanical structure, electronics and construction, as well as the algorithm granting the balance of the prototype, were designed at Ease by Gabriel Torige, a Control Engineering graduate, supervised by Professors Aurélio Salton and Jeferson Flores.

The dicycle has an accelerometer and a gyroscope as sensors to detect the inclination of the vehicle. It also has modules for processing and controlling, and two electric motors to make movements. The production cost of the equipment at Ease is rather below the market. "The laboratory is not a product development center, its primary focus is research and education. We discover new technologies, try concepts in prototypes, and publish scientific papers. Our direct impact is on students, but some of our results may be useful for industries," Salton stresses.

In 2013, Ease gathered about 60 scientific initiation, undergraduate, and master's students, and volunteers seeking specialized knowledge. An agribusiness company is currently analyzing the use of concepts developed in the laboratory to solve problems in agricultural automation and precision agriculture.

With didactic purposes, the hexapod is another project from Ease dealing with a moving system. This spider-shaped device, with six legs and three motors for each leg, can be controlled by a cell phone running Android, and is able to run on any type of surface, even irregular ones. The robot can be used by people with some sort of locomotor disability, or for the transportation of military cargo, for example. Paulo César Gross, a Computer Engineering student, is currently developing a new model equipped with a camera. The project is part of his course final paper, and should be ready by July 2014.

*Benfica and an unmanned aerial vehicle: a promise for agriculture*

# Hedgehopping

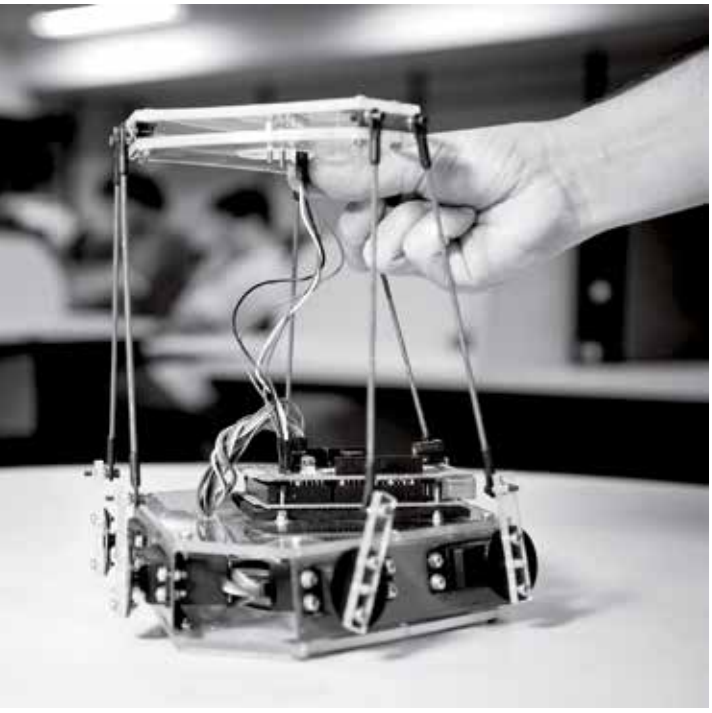
The researchers at Ease have special interest in unmanned aerial vehicles (UAVs), particularly quadricopters, as those are versatile and easy to build. A small vehicle is being developed by Leandro Lisboa, Thiago Trolle, Nelson Bedin, and Rafael Castro, Master's students in Electrical Engineering. It has four engines, and will be able to take off and land vertically. It is equipped with a high-resolution camera for remote monitoring, it flies low to photograph and map areas, and enables the classification of information through image processing. The project is being supervised by Professors Salton, Flores, Terroso, and Benfica.

It can be used in monitoring power lines, controlling pests in crops, monitoring areas with high concentration of people, securing buildings, patrolling borders, among other purposes. "In precision agriculture, for example, the vehicle can fly over a large area in less time. Nowadays, to see the crop, a farmer goes through miles of plantations with a truck in order to take samples. And with a regular airplane, it is not possible to fly so low," Salton affirms.

The students took part in a sandwich Master's course in Argentina, in 2013, and resumed the project in December. Lisboa returned from the trip with a new proposal for control technique, which will be the subject of his thesis. "The vehicle will have GPS coordinates and will be autonomous. Based on a map, it will move by itself, without the need of being controlled. It performs the task for which it was programmed, such as the identification of pests in a plantation, and returns," Salton affirms.

The project should be completed in 2016, and will be funded by the Prêmio Pesquisador Gaúcho of Fapergs, for a 100% PUCRS-based technology design, including parts, the circuit, and programming. "This technology already exists; it started for military purposes, but still needs to be introduced to the market with reliability and the expected outcome to farmers. In ten years, it will be used in mass, especially for monitoring," Salton says.

*The omnidirectional platform*



*The hexapod is able to traverse any type of surface*

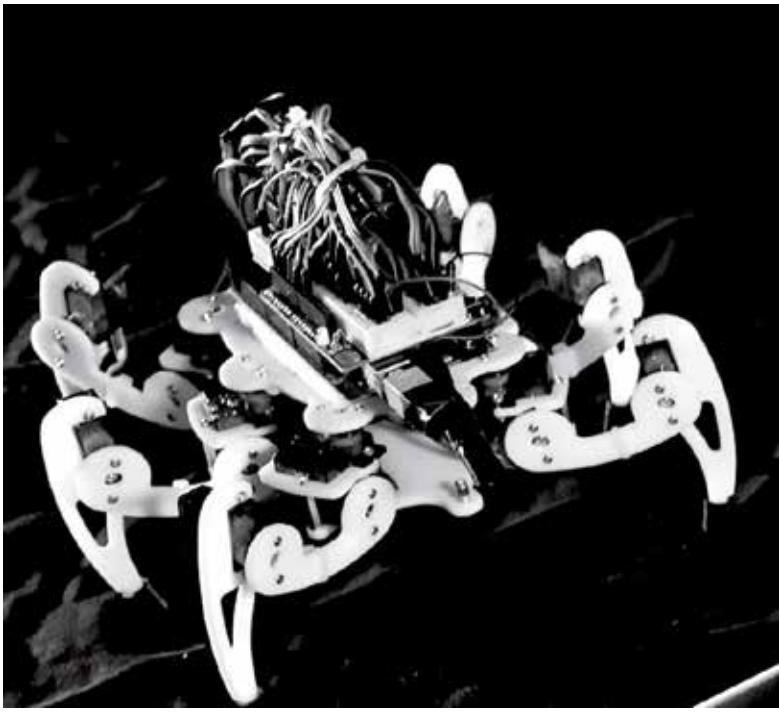


PHOTO: BRUNO TODESCHINI

*Partnership favors studies in different legal cultures: Fabio D' Avila (L) and Uriel Moeller*

**Joint programs with the University of Osnabrück encourage exchange**

# Between Brazil and Germany

The German student Uriel Moeller, 27 years old, has chosen PUCRS Graduate Program in Criminal Sciences to develop half of his doctorate. Since August 2013, the European student, whose mother is from Rio Grande do Sul, has studied in the Law School through a joint degree program agreement with the University of Osnabrück. "My dissertation studies crimes of abstract danger. I try to establish a sort of dialog between the German and Brazilian doctrines", tells the doctoral student, who is supervised by professor Fabio D'Avila.

"Such an agreement is fundamental, as it allows training students in different legal cultures, fostering cooperation and the establishment of strong ties. That conjunction becomes even richer in the process of preparing a dissertation", notes D'Avila. "Here, in Brazil, Moeller is in contact with a reality that he would never experience in his country", he added.

In 2008, Moeller studied Law at the University of Hamburg, but decided to work as a trainee in a law firm in Porto Alegre to get in touch with his gaúcho origins. Thanks to a recommendation by classmate in the scientific program scholarship at the University, he became part of PUCRS Contemporary Criminal Law Study Group, led by D'Avila. Soon afterwards, it was the professor who received an invitation from the University of Osnabrück to participate in an international project about conflict of jurisdiction in transnational crimes. "It was necessary to set up a research team with students who also had German language skills", he recalls. Moeller joined the group and contributed to the academic work for three years. "In 2011, in order to strengthen relations between the institutions, we created the Joint Studies Program", adds D'Avila.

After standing out in research and in state exams taken in his country of origin, both institutions were sure of the potential of the doctoral student. "In a way, he is an institutional bet of both universities. We trust his quality, which is exceptional", praises the professor.

> Such an agreement allows training students in different legal cultures. That conjunction becomes even richer in the process of preparing a dissertation.
>
> **Fabio D'Avila**

Moeller will be in Brazil until December. Afterwards, he will go back to Osnabrück to complete his doctorate. "I have met many bright classmates and the experience is being incredible. I find that this kind of opportunity helps thinking about Law. Discussing, hearing and reading different ideas and perspectives is enriching", he remarks. He also jokes and says: "I also like the sunny weather and the kind people here." As regards his plans for the future, he thinks of pursuing an academic career in Germany, but is now focused on the present. "Right now, all I want is to write a good dissertation."

Among the benefits of the partnership between Brazil and Germany, the internationalization of the University can be highlighted. "That is not an interest of PUCRS alone, but also of all organizations that wish to grow", Moeller states. According to his supervisor, establishing partnership with one of the most disting wished Law Schools worldwide is extremely relevant. In this context, D'Avila stresses that other scholars can also benefit from this agreement. "It is an open channel. The goal is increasing the number of incoming and outgoing students, he adds.

PHOTO: PERSONAL ARCHIVE

PUCRS' undergraduate students in Portugal

**Seven students from the School of Letters have just returned from a double-degree program which took place at the University of Coimbra**

# Twice the teacher

Who would not want to be awarded a double degree right at the first stage of academic life? Seven students from the School of Letters had the opportunity of studying for four semesters at the University of Coimbra, Portugal, during their undergraduate course. In August 2014, they returned to PUCRS to finish their last year (just a few months for some of them) of licentiateship. Upon graduating, with a concentration in Portuguese language, they will get a degree from both institutions.

The experience of Rogério Sant'Anna, Aline Cargnelutti, Franciely Tarouco, Bárbara Bandeira, Leonardo Batista, Deisiane Carlesco and Vinícius Cabrera is due to Project PLI (International Licentiateship Program), funded by Capes (Coordination for the Improvement of Higher Education Personnel). According to the Dean of the School of Letters, Regina Kohlrausch, the initiative promotes the contact with other cultures and encourages the academic growth of all involved. "It stimulates the improvement and enhances the education of future professors. The knowledge acquired can be applied in classroom, during their professional practice," she affirms.

The announcement of the program was made in April 2012. "Shortly after, we had a meeting with the Academic Mobility and we carried out a survey to identify all the students who meet all the requirements to participate in the selection process," Regina explains. To qualify for admission to the project, university students must have gone to primary and high school in public schools, or in private schools with full scholarship. "We had enough participants, then we began an application period," she says. "As requested, 14 students were selected based on assessment and performance criteria," she explains.

The seven students who had the highest grade averages in all subjects were able to join the program. As it seems, it was an enriching experience. "The classes would meet almost every day, at different times. I tried to participate in most activities that were available, such as colloquia and seminars," Aline says.

In regard to adaptation, the students said they found it a little difficult at first to understand what the professors was saying, "especially when it was very fast," Leonardo recalls. "But even so, before long we got accustomed to the language differences. The city is cozy and the climate is similar to that of Porto Alegre," he adds.

In addition to exalting licentiateship, the program is a unique feature in the curriculum, and it has left marks that transcend the mere intellectuality of its participants. "The benefits I had are immeasurable. I managed to visit beautiful places, rich in history, and above all, I had the opportunity of living with people from different parts of Brazil and the world, exchanging experiences, learning new points of view, and making many new friends. If I could, I would do it all over again," Aline concludes.

# Santander Awards

The project *Computational crowd simulation: predicting and avoiding disasters*, coordinated by Professor Soraia Musse, from the School of Computer Science (Facin), has earned the University the Santander Award for Science and Innovation in the Information, Communication and Education Technology category. The *Crowd-Sim* tool, which simulates the behavior of people in environments with large crowds, was funded by Finep (*Funding Authority for Studies and Projects*), and was developed by the Laboratory of Virtual Human Simulation, at Facin, which is associated with the National Institute of Science and Technology in Critical Embedded Systems of CNPq (*National Council for Scientific and Technological Development*). The software can be seen at http://j.mp/1bOOIBx.

# TEDx

An event that travels the world to spread good ideas, the Technology, Entertainment, Design (TEDx) was hosted and supported by PUCRS. "We are humanity" was the subject of the 12TH edition of the event in Brazil – TEDx Laçador –, which aimed at strengthening empathy in interpersonal relationships in the pursuit of a better world. Among the speakers were Sociologist Samuel Richards (photo), a Sociology Professor at Penn State University (USA) and cofounder of World in Conversation (www.worldinconversation.org), which promotes dialog around the world.

PHOTO: GILSON OLIVEIRA

# Harvard

The School of Letters has welcomed 17 students from Harvard University (USA) for a Portuguese for Foreigners and Community Services course, with linguistic, social and cultural immersion. In order to broaden this experience, the Office of the Vice President for Extension and Community Affairs, with the support of the Office of International and Institutional Affairs, has selected families of students from PUCRS who wanted to host foreigners.

# Online learning

PUCRS has signed an agreement with MiríadaX, the first e-learning platform in Spanish and Portuguese in the world, which has 990 professors and 750 thousand students enrolled. This resource is based on collaborative learning, and offers free online courses, open to the public. Only three universities in Brazil have agreements with MiríadaX (www.miriadax.net). Altogether, there are thirty-three Latin American universities, which offer more than 150 courses through this partnership. President Joaquim Clotet was among the authorities who attended the presentation of the platform at the 3RD Universia International Rectors Meeting.

# Anti-Cancer Vaccine

Fernando Kreutz (photo), a professor at the Graduate Program in Pharmaceutical Biotechnology of the School of Pharmacy, has passed through one more stage for the patenting of a new anti-cancer vaccine with the publication of the deposit at the United States Patent and Trademark Office.

The product is now at clinical stage (studies on patients), has presented excellent results, and, according to Kreutz, should be in the market within three years. The vaccine is made with a patient's own tumor cells. It was developed by FK Biotec, hosted at Tecnopuc.

PHOTO: BRUNO TODESCHINI

# ACERTA

Project ACERTA, by the Brain Institute of PUCRS (InsCer/RS), is the newest research and innovation partner of the University of Jyväskylä, from Finland, for the development of the Brazilian Portuguese version of the Graphogame software. It is a "tutorial" program, which helps in the process of literacy and reading learning. This collaboration project aims at developing the software in Portuguese for the schools of Project ACERTA in Brazil, and at developing a new version of the software, adapted for functional magnetic resonance imaging (which enables the investigation of how the brain of a child works during the teaching of basic literacy). Recently, the project was given special prominence in a seminar on innovation in Helsinki, where it was introduced to Finnish researchers and entrepreneurs.

# MicroG in Lisbon

The Microgravity Center (MicroG) is forming a network around the world to facilitate joint research on space, aviation, and telehealth. The first step was creating MicroG Lisboa, in association with the Institute of Physiology/School of Medicine of the University of Lisbon. During the visit of Thais Russomanno, Coordinator of MicroG/PUCRS, to the Portuguese capital, the first projects were planned in partnership, including virtual and classroom courses. Russomanno and Isabel Rocha, who heads MicroG Lisboa, also visited the Portuguese Air Force, which will also operate in the academic and research activities.

# In the world

Nine students from PUCRS took part in an internship program of Host Broadcast Services (HBS), a Swiss company dealing with communication and technology, which was the host broadcaster of the 2014 World Cup. Responsible for broadcasting all games to billions of people worldwide, HBS has created a team of 2,500 people. With the assistance of PUCRS' Career Office, HBS selected students from the University who were interested in joining this international team. This group of students worked in the fields of engineering, technology, communication, and tourism.

# Top

Best higher education institution among private institutions in Brazil. Innovation leader in the field of education in Rio Grande do Sul. The first brand that comes to the minds of Porto Alegre inhabitants in terms of private universities and museums of science and technology. First place in the memory and preference of Rio Grande do Sul inhabitants in terms of private undergraduate and graduate programs. Those were the latest awards won by PUCRS. The first award above was given by Folha de São Paulo University Ranking. The following two were given by Amanhã magazine, and the two others, by *Marcas de Quem Decide* research, carried out by Qualidata Informações Estratégicas, in association with Jornal do Comércio.

# Germany

Professor Draiton Gonzaga de Souza, Dean of the School of Philosophy and Human Sciences, met with the Chancellor of Germany, Angela Merkel, in Brasília, last June. Before the commemorative dinner with President Dilma Rousseff, Angela talked with three scholarship holders from Alexander von Humboldt-Foundation: two of them were new, and Dr. Souza represented the alumni of Humboldt in Brazil. Some topics of the meeting were scholarship programs in Germany, the experience of studying in that country, and the scientific cooperation between Brazil and Germany.

PHOTO: PERSONAL ARCHIVE

# World reference

Dr. Iván Izquierdo, neuroscientist and Director of PUCRS' Memory Center, is the first Latin American researcher to reach 20 thousand citations in the database for multidisciplinary scientific papers *Web of Knowledge*. Working as a researcher for over 50 years, Dr. Izquierdo is a reference in the world scientific community when it comes to physiology of memory. Among his most relevant findings, are the molecular mechanisms of formation, retrieval, persistence, and extinction of memory.

PHOTO: GILSON OLIVEIRA

# Museum

The Museum of Science and Technology of PUCRS is an excellent choice to test one's knowledge, to learn new things, to see curiosities, to interact with experiments, and to experience a world of innovation. The exhibits and attractions appeal to all ages and groups, from children to adults, from families to tourists. And as the development of science, education, and culture never stops, this area for learning and information is always renewing itself. One of the new features is an area dedicated to marine mammals. About 15 meters long and comprising 95% of original bones, the exhibit of the complete skeleton of a Bryde's whale enables visitors to imagine the functioning of the organism and the habits of such large cetacean, besides making comparisons with other living beings.

PHOTO: BRUNO TODESCHINI


**Access**
The iOS application will be available in the Apple Store (free download)

**Content available in an app**

PHOTO: CASSIANA MARTINS

# Football glossary in three languages

The application Globall Football Glossary will be available to journalists covering the World Cup in Brazil, interpreters, tourists who will come watch the games and other professionals interested in soccer and languages. In Portuguese, English and Spanish, the material was developed by the Schools of Physical Education and Sports Science (Fefid), Letters (Fale) and Communication (Famecos). Spanish historian Juan António Simón, a professor at Universidad Europea de Madrid and retired professional player, voluntarily translated the material into his language. Five scholarship students, funded by CNPq, Fapergs and the Praias/PUCRS call, participated in the project.

The 300-term glossary was divided into semantic fields: people involved, positions in the field, rules, plays/actions and clothing, among others. There is a definition and context for each word, with examples of usage in articles published by specialized websites and magazines. "We have opted for using the most popular and current forms in the South of Brazil. The "meia-lua", in other states, is called "drible da vaca", exemplifies Nelson Todt, the professor at Fefid who coordinates the Research Group in Olympic Studies (GPEO). Some plays are shown in photo sequences. The pronunciation of terms is also provided in audio files in the three languages.

At Fale, the initial challenge of professors Cristina Perna and Heloísa Delgado was to get familiar with the subject. After finding the path, they promoted late-night efforts to complete the work. The main objective is to improve stardandization and suitability of the terminology used in the World Cup coverage by broadcasting agencies, as well as translators, interpreters and revisers.

The construction of the application was under responsibility of the Research Laboratory in Mobility and Media Convergence (Ubilab)/Famecos. The students were supervised by professors André Pase and Eduardo Pellanda. This free app will be available for iOS and Android. After downloading, the material can be accessed offline. For the pictures, professor Eduardo Seidl, from Famecos, collaborated by supervising the students.

The GPEO, with Fale and Famecos, is also preparing an Olympic bilingual dictionary (Portuguese-English) for 2016, when Rio de Janeiro will host the Olympic Games.

## Scholarship on multiple fronts

Cassiana Martins, 21 years old, was a scholarship holder (CNPq) in the project both in Letters and Communication. At first, she worked in the phase of linguistic observation, during which researchers considered which methodology to use and how to organize a database. Afterwards, studying Journalism (she is currently in the 6TH semester), she took pictures, recorded audio for terms in Portuguese, and updated online information.

To edit the pictures, she counted on the help of colleagues from Espaço Experiência/Famecos, mainly in naming the files. "They were the advisors for football matters." She supports Juventude, but that is her sole connection with the sport. Physical Education students participated in image production and acted as models. "People forget that the moment of the click is just part of the photograph; it is necessary to edit and retouch the material too."

When I studied Letters, I was focused on Literature and I never thought of pursuing studies in Linguistics. "Four years later, the funny thing is that now I want to develop graduate studies in Letters after my graduation in Journalism."

PHOTO: HEIKE KNEBEL

**Mágda Rodrigues da Cunha, Vice President for Academic Affairs**

# The practice of planning and identifying excellence

The identification or construction of excellence is fundamental in any area, as there are many possibilities and models available. And that is no different in higher education and in all activities of a university. Among multiple distance-education possibilities and modern classroom methodologies, alternatives abound. In this scenario, when we think of plans, one of the first items to be considered is the identification of excellence.

We live in a society where information is everywhere and the power of teaching/learning, historically delegated to the most traditional institutions, has gained new nuances. A question arises in the horizon: is the experience acquired in a university fundamental for the training of individuals or can they learn alone, connecting information available in multiple sources?

Education is part of a context where autonomy, internationalization, technology, innovation, and collaborative learning are relevant aspects, just to name a few. Institutions must be bold and take an inner look at their practices, inspired by external prompts, because, when we analyze our history and work at a high level, we should not fear any evaluation. The objective is to improve and to be prepared for times that are unlike any other in our history.

When we speak of excellence, we must identify our best in order not to lose our essence. It is critical that institutions will revisit their mission and define their stances. Therefore, thinking of the future is crucial. The future, one should note, is already taking shape. Which society do we want for future generations? Which will be the University's capacity to understand, impact and change the world? In ten or 15 years, what will the professions for which we prepare our students be like? Will they all be exactly the same? A university that exerts no social influence, either through the training of professionals or through research, is giving up its main role.

In a distinguished higher education institution like PUCRS, thinking about all that is rather simple, as we are in a privileged situation. And that is precisely what makes reflection complex, due to the actions and risks involved. Our distinguished features is that we are a University of excellence. Every day, in some of the many spaces on Campus, there is someone researching and finding the cure for a serious disease, studying solutions for safer construction, or reflecting upon the turbulent times we are living. These are multidisciplinary solutions (we are aware that approaches limited to one area no longer respond to contemporary educational and social needs), capillarized by the classroom. Our faculty and students are the ones who build all that, keeping the features of our culture while globalizing its features, embracing the mission of building a fraternal and fair society.

> In ten or 15 years, what will the profession for which we prepare our students be like? Will they all be exactly the same? A university without no social influence, either through the training of professionals or through research, is giving up its main role.

PHOTO: BRUNO TODESCHINI

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