

PUCRS

MAGAZINE

PONTIFÍCIA UNIVERSIDADE CATÓLICA DO RIO GRANDE DO SUL
No. 3 • Annual issue in English/2016

PUCRS
consolidates
its recognition
overseas

In the South Atlantic,
marine communities
may generate new
sources of energy
and medication to
fight cancer

Br. Evilázio
Teixeira takes
office, along
with the vice
president,
medical doctor
Jaderson da
Costa

The achievements of memory

InsCer's
findings
have added
up pieces to
our brain's
fascinating
puzzle





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Ana Paula Acauan
Vanessa Mello

PHOTOGRAPHERS
Bruno Todeschini
Camila Cunha

ENGLISH TRANSLATION
Lucas Tcacenco

REVISION
Silvana Silveira

INTERN
Júlia Bernardi

PHOTOGRAPHY ARCHIVE
Camila Paes Keppler
Márcia Sartori

CIRCULATION
Ligiane Dias Pinto

PRINTING
Epecê-Gráfica

GRAPHIC DESIGN
PenseDesign

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Avenida Ipiranga, 6681
Prédio 1 – 2º andar
Sala 202
CEP 90619-900

Porto Alegre – RS – Brazil
Phone: (55 51) 3320-3503
Fax: (55 51) 3320-3603
revista@pucrs.br

www.pucrs.br/magazine



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Commitment to quality

To revisit PUCRS' path throughout the year is one of the actions that contribute to the success of our institutional mission. Fundamental concepts, such as the ones of a Catholic and Marist university as well as education associated to research and development should always be ingrained in the university community. On top of that, it is of utmost importance to mention that the commitment to quality is an fundamental part of this mission.

Throughout the academic year of 2016, there have been many events that are worth mentioning. Within the religious and Marist realm, there have been liturgical celebrations, meetings for the *Reflexões*, *Energizar*, *Fé e Cultura* and *Vidamar* projects, retreats and the celebration of the La Valla Year.

An initiative of utmost importance, which has effects on the entire university, is the Academic Renovation, which introduces changes to the Organizational Structure of the Management and Governance Model – Reorgg. This renovation is geared towards the academic departments, or Schools. Just like the best universities outside of the country, the new structure will pave the way for interdisciplinary actions, several forms of learning and new managerial efforts. This process has begun with the School of Humanities. In 2017, new actions will be implemented at the School of Medicine, Law School and Business School. The experience with the School of Humanities has been bringing benefits to curriculum flexibility and to the expansion of knowledge, as the academic community has access to philosophy, history, literature ... Thus, the academic knowledge, which could be restricted to the limits of a profession, has had its horizons expanded.

Another aspect of importance to quality at PUCRS is internationalization, in its most varied forms. As well as the local and national commitments, the University has become a global society institution. This

can be attested by the recognized scope and considerable number of congresses, seminars, lectures and courses delivered in English as PUCRS. Besides, it is important to highlight faculty and student exchanges, as well as research carried out in its most different types.

Other aspects to be included are innovation and entrepreneurship, which permeate research and the interdisciplinary character of the university's actions. Duly united and geared towards the society, both foster social, scientific, cultural, economic and environmental development.

Research universities cooperate and compete with one another, thus contributing to the improvement of science, economy and welfare, without overlooking the educational aspect. PUCRS has shown dynamism in this regard: further interaction with companies, a larger number of patents, agreements, and scholarships. This is, partly, the Third Mission of the universities.

There is, however, an unquestionable requirement for the complete realization of the Third Mission: the development of attitudes that contribute to the exercise of civic consciousness. It is all about respect to people and to race, gender, culture and religious differences; it is all about the commitment to peace, justice, common goods and fellowship – real remedies for corruption, violence and exclusion. Without this commitment, which includes the entire society, scientific and technological development could be unnecessary or even harmful.

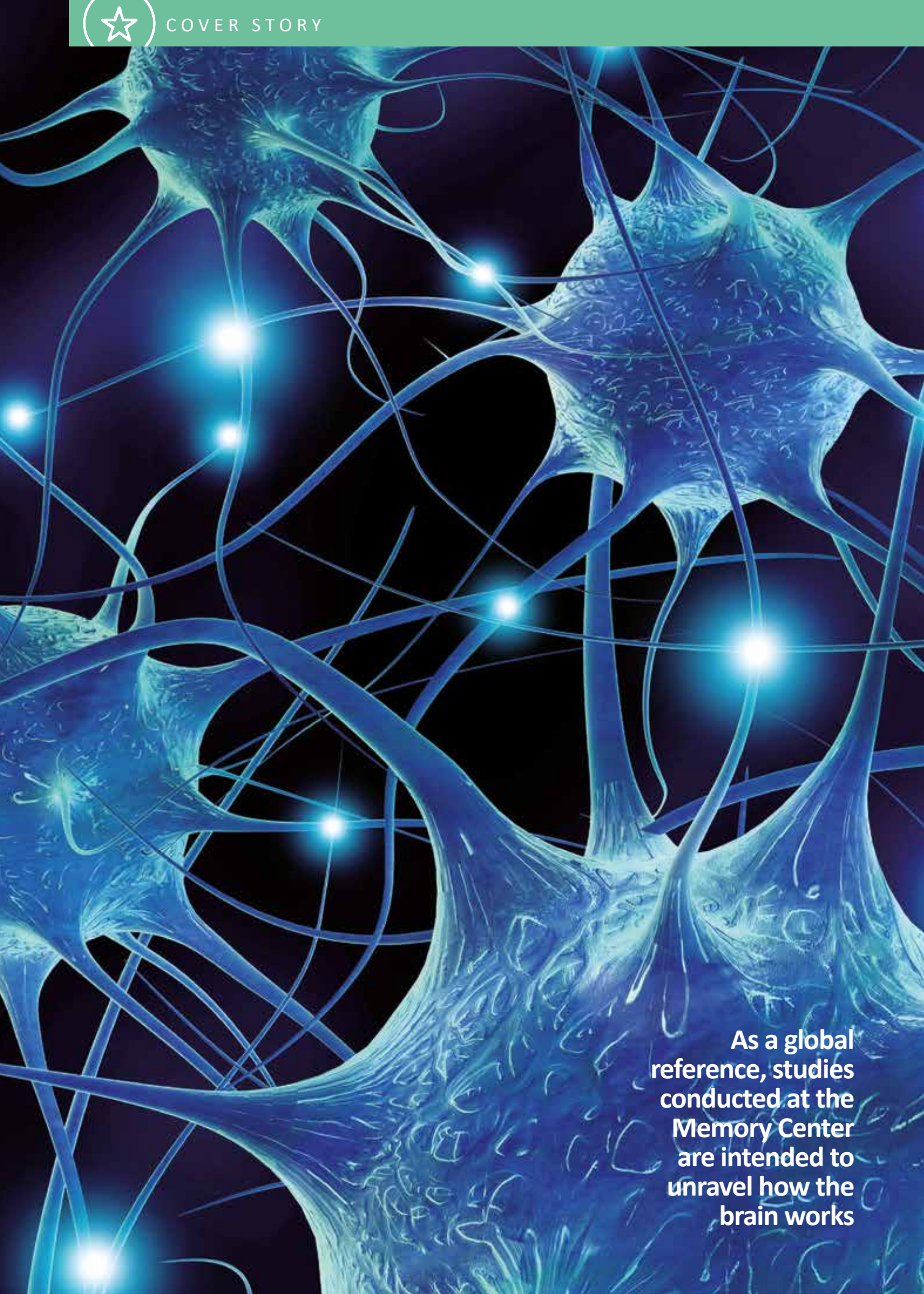
I would like to express my sincere gratitude to the university community, a tireless protagonist in this effort devoted to the Mission, in view of the recognized success for its awards, distinctions and the great position the university has enjoyed in international rankings.

Br. Joaquim Clotet

President of PUCRS
2004-2016

PHOTO: BRUNO TODESCHINI





As a global reference, studies conducted at the Memory Center are intended to unravel how the brain works

The mysteries of the brain

The complexity of the brain is fascinating! And that can be confirmed by researchers from the Memory Center of the Brain Institute of Rio Grande do Sul (InsCer). Professor Ivan Izquierdo, the most cited Brazilian scientist, has been an enthusiastic researcher on the topic for exact 50 years. He played a central role in addressing many of the remaining questions. He has shown the main molecular mechanisms of formation, evoking, maintenance and extinction of memories and the functional separation between short and long-term memories in animals. His most remarkable scientific paper, which has been cited more than 800 times, dates back from 1997, and addresses the changes in the hippocampus and other brain structures.

This year, he found that histamine is essential for evoking adverse memories. There has been a loss of the properties of this neurotransmitter when its production was inhibited in experiments with mice. This paper, written in collaboration with Professors Cristiane Furini and Jociane Myskiw, along with other Italian researchers, was published in the journal of the National Academy of Sciences of the United States.

Every discovery helps put this puzzle together. “Professor Izquierdo has been studying the role of histamine for decades and we still have more questions than answers. Many people all over the world, relying on different techniques, are working on the topic, and we have realized how complex it is”, remarks Jociane.

An overview of the challenges is presented in the book *Tempo e tolerância*. “This is what the reality of memory

researchers is like: we have the chemistry of the bricks in our hands, but the architecture on the table; we can also count on the feelings we have when we get into Westminster or Toledo, to Versailles or Schönbrunn, or to the caves of Mallorca or Minas Gerais – deep admiration for something that is beyond our actual understanding”.

– We’re often asked what is the purpose of a Memory Center. Here we point out possible targets in the hopes that, in a few years, this study might prove useful in the development of a cure. Nobody had thought about solving a cardiovascular problem until we found out how the human body works, how a blood vessel dilates. It is all about curiosity – says Jociane, a 36-year old newly elected affiliate member of the Brazilian Academy of Sciences – South Region, from 2016 to 2020.

“This opportunity brings young researchers closer to renowned researchers and an idea of the impact science has on our country”, remarks she. Izquierdo has been a full member since 1977.

At a time when things are tough, the Memory Center’s projects will go on. There are three researchers: Izquierdo, Jociane and Cristiane, advising six undergraduate researchers (most of whom from the School of Medicine), two Master’s degree students and four Doctoral degree students. “Things have been difficult in the country and this has consequences in the areas of science and education”, points out Cristiane.

There are situations in which our creativity pops up. “We will find alternatives. Students need to finish their theses and dissertations in order not to lose what they have accomplished so far”. For instance,

Our brain is fantastic.
It is easily adaptable.
It forms new neurons, which
are integrated into the
existing networks. As it tries to
compensate for its failures, we
find it hard to spot the errors.

Jociane Myskiw

as we wanted to have a reduced number of animals used in experiments, an image capture system has been designed, in partnership with the School of Computer Science.

“By using recorded images, it is possible to identify several aspects of a mouse, thus avoiding new tests.” The project, which was conceived by means of Edital Praias, from the Office of the Vice President for Research, Innovation and Development, was headed by Professor Márcio Pinho.

These partnerships made many investigations possible. Izquierdo has published papers in collaboration with researchers from more than 27 countries, even from Japan. One of the current funding sources is the National Institute of Science and Technology in Translational Neuroscience, comprising nine groups in the Country and headed by the Universidade Federal do Rio de Janeiro. Through Capes’ *Programa Nacional de Cooperação Acadêmica* (Procad), the Center heads joint research with Unipampa, in Uruguaiana, and Unicentro, in Guarapuava (Paraná). Other resources come from CNPq, Fapergs and *Programa Ciência sem Fronteiras*.



Late night work

Dedication to work is an inherent characteristic of researchers. Each one will write their part of the papers and when they are done, the paper will be sent to another peer for complementation. It is not uncommon for researchers to receive a reply to their messages at 3 am. Holidays and weekends make you “feel empty”. Students need some advising. They may need to catch up with their readings. There is never a reason to leave their projects behind.

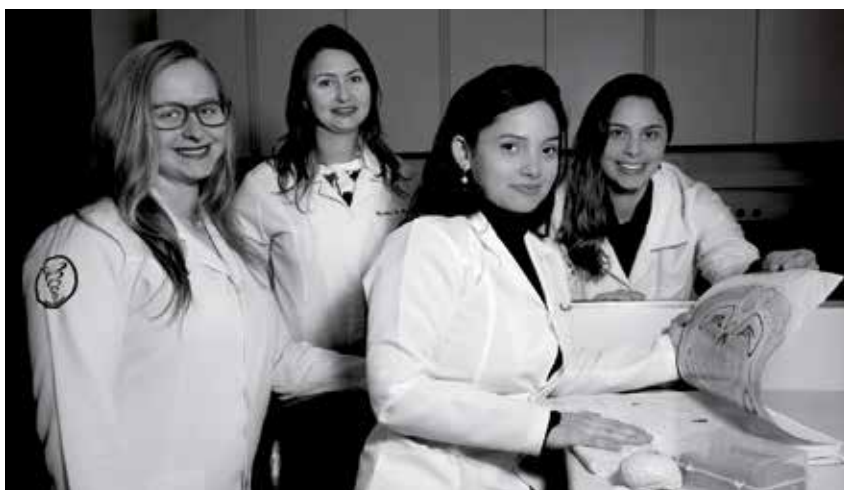
During their recent trip to Italy, Jociane and Cristiane devoted three days for presenting papers. In their free time, they spent some time checking maps and deciding on places to visit. Even with so many places to check out! “When I am asked about what is good for the memory I’ll say: ‘go on vacation have a good night’s sleep and be calm’, but some people just can’t. When we are free, I feel there’s something missing’, remarks Jociane.

Both professors always try to read fiction books in addition to scientific sources. Preferably, in English, in order to keep up with the language. *Doctor Sleep*, by Stephen King, and *The red door*, by Charles Todd, are in their reading lists. According to Cristiane, reading will make the brain screen every familiar word when we see a letter. “Books also make us imagine a context. By turning every chapter, we must recall the characters. And every time we resume reading, we have to remember the story.’



PHOTOS: CAMILA CUNHA

Fruitful partnership: Cristiane Furini (L), Ivan Izquierdo and Jociane Myskiw



Master’s and Doctorate students carry out research at the Memory Center

Key Discovery

Histamine, which is responsible for our dietary behavior, sleep cycle, wake and allergic processes, is essential for memory formation and modulation. A partnership with Università Degli Studi Firenze, in Italy, has allowed our Memory Center to look further into this relation, through the *Ciência sem Fronteiras* program. For the first time, we could testify that the absence of this system would hinder the evoking of adverse memories in mice. Consequently, the receptors of the neurotransmitter will become extinct too. Three papers were presented at the 45th Annual Meeting of the European Society of Histamine Research, in Florence (Italy), in May.

30 years ago, Ivan Izquierdo was one of the first scientists who thought about

the importance of histamine in his field of expertise. Back then, there were no pharmacological tools that would lead to conclusions. “It was thought that histamine did not play such a central role in the brain, but once this system’s receptors were discovered, investigations were centered on its role”, says Cristiane Furini. As histamine does not get into the cell, a target is needed in order to ‘pass on the message’, says Jociane Myskiw. Depending on the receptor, there will be a different function.

“These results may indicate possible therapeutic targets to treat diseases related to fear memories and adverse ones, such as phobias, panic attacks and post-traumatic stress”, says Cristiane.

As for the inhibitive allusive memory (the one you cannot avoid), researchers have shown that the brain needs histamine for up to six hours in the hippocampus and two in the amygdala. For object recognition, the three receptors will act within 30 to 120 minutes after learning. That was the area Clarice Borges da Silveira worked on her doctoral dissertation.

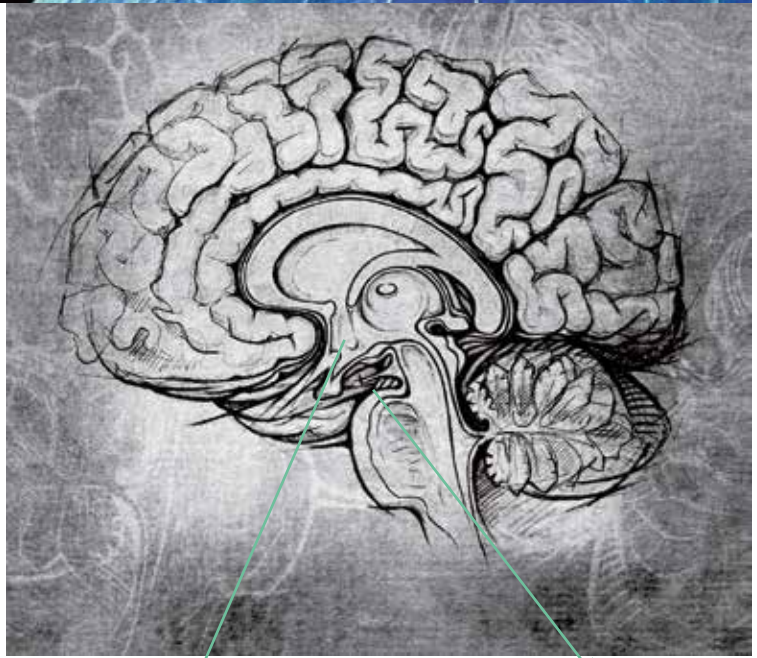
Italian researchers Patrizio Blandina and Maria Beatrice Passani were in charge of the study’s immunology and microscopy areas. Behavioral tests on mice were conducted at PUCRS. Roberta Fabbri came from Italy to do some doctoral courses at PUCRS and will return as a post-doc grantee on the *Ciência sem Fronteiras* program.

Tuberomammillary nucleus (where histamine is produced)

The role of histamine

Mice that had the production of histamine in their brains interrupted were not able to evoke the memory of fear they had previously learned. Once the levels of the neurotransmitter were set to normal in the hippocampus, the memory was then evoked. Additionally, the study has shown that the effect of histamine occurs by means of the activation of the H1 histaminergic receptors.

1. Tuberomammillary nucleus (TMN) of the brain
2. Histamine
3. Evoking memory of fear
4. No evoking of memory of fear
5. Hippocampus
6. H1 histamine receptors



Histamine production

Hippocampus

An important step in his career

Following an invitation from *Physiological Reviews*, one of the world's most important scientific journals, the Memory Center team brought together an overview of the existing findings in the formation and evoking of the memory of fear, as well as classical tasks to study the different types. "This publication can be considered a cornerstone in our careers. Only renowned researchers are invited to submit their papers", says Jociane Myskiw.

Among the Center's pioneering projects, the role of histamine in evoking and exposure to novelties for memory extinction has been mentioned. Overall, 791 references were pointed out by researchers over the last 60 years.

The memory of fear is essential for survival. Memories may be represented through caution, prevention or may help avoid accidents or several other dangers. The problem arises when people are overly concerned about robberies or other adversities, are

anxious, tachycardic, and diaphoretic, among other things. Social phobia, post-traumatic stress and panic attacks may happen.

Jociane explains that the extinction, which is also called exposure therapy, is intended to assist the formation of a new memory, by making sure that the negative event will not necessarily happen again when the person is at a given environment. "It's important to stress that the area is not so safe, especially for them to learn how to take better care of themselves, close the door and stop evoking", remarks she.

Therapy will expose the individual, little by little, to the elements but in a safe environment. "The goal is to avoid emotional stress. The memory will come but the symptoms will not." The Memory Center studies molecular targets to inhibit this response. An example of that is H1, a histamine receptor, involved in memory evoking.

Treatment for trauma

In the sessions conducted to treat post-traumatic stress, it may take months or even years for patients to get rid of the memory, that is, inhibit the memories associated with a robbery, accident or any shocking event. Experiments in animals conducted by the Memory Center have shown that the introduction of a novelty may speed up this process. Mice are placed in a different box, one they have never been in. The memory of extinction is formed more quickly.

Important facts come with major details. Nobody remembers what they ate last week but, if something memorable happens, they will be able to remember the time, the clothes they were wearing and much more. Jociane explains that, as neurons have thousands of synapses, short-term memory will not be formed, because they did not lead to plastic modifications, that is, protein synthesis. In case of significant events, there are

structural changes and everything related to this fact will be kept in our memories. "Exposure to novelties is a strategy that can be used before therapy, to speed up extinction", says the professor.

Tests carried out on humans by US researcher Elizabeth Phelps have confirmed this theory. Another Argentinean study with kids has shown that music during school recesses enhances learning.



> “The

In a room filled with paintings showing Buenos Aires at the time of his childhood, as well as a childhood drawing and photos of his grandchildren and his wife, neuroscientist Ivan Izquierdo claims that the most important things in life are the people and the things we love, but not everyone is aware of that, since they waste their time on unnecessary things. At the age of 78, he is the head of the Memory Center and will not be discouraged by the moment Brazilian research is going through. He states to PUCRS Magazine that there is no such thing as the subconscious and that “psychoanalysts are about to become extinct”. In his opinion, many of Freudian’s theories which did not rely on a physiological basis are obsolete.

In 2016, you will have been studying the biology of memory for 50 years, and researching for 60. What makes you prouder in your career?

I hardly ever use the word proud. I prefer to use the word satisfaction. Many things, actually. As a researcher, discovering the main biochemical mechanisms that are used to constitute memory in several brain structures makes me feel proud. Additionally, I will say that the difference between short-term and long-term memory also makes me feel proud. We have shown that these are two separate, parallel and non-consecutive processes. A short-term memory is formed and, at the same time, a long-term one is developed. Both of them will coexist, but after six hours, only the latter will survive. This is important because it provided some insights into the structure and treatment of some conditions, for instance, when the short-term memory is absent. Delusion, which is observed in some nervous diseases, is one of them, as well as some injuries in some regions of the parietal cortex. When it comes to long-term memories, one example is Alzheimer’s disease. As we tend to prefer brand new research, this year, Jociane, Cristiane and I, in collaboration with the Italian group, were able to show that there is a kind of key mediated by histamine in the brain which indicates whether the individual will evoke a memory or not. At least in mice, but definitely in humans because the structures

people we love are the foundations of life”

are very similar. Histamine is released from a nucleus in the brain and then onto the structures that are related to memory.

What would you still like to accomplish?

So many things. I would like to accomplish everything I still haven't accomplished ... but I won't have time.

You have been working at PUCRS since 2004. What are the most important things you have experienced here?

The quality of researchers. Currently I work with two extraordinary professors. They are as good as the best professor I could've had throughout these 60 years. We have outstanding students.

Has it been very difficult to do research in Brazil?

After the overfinancing offered by the *Ciência sem Fronteiras* program, which despite being useful, ended up by being irrelevant, we have been trying to get little funding. Surprisingly, this has been the worst moment in terms of money.

How about in your career?

Both in Brazil and in Argentina I have been through other difficult times. The beginning of the Collor era and the end of the Dilma era are very similar in the sense that both did not seem to care for science. Suddenly, it became political propaganda. Not anymore. I have recently heard that the virtual institute we have in partnership with São Paulo and Rio de Janeiro, which was essential for our funding, would be opened again.

In the book *Tempo de Viver*, you look at love as the greatest value of our lives. How do you save room for the people and things you love?

I let them take over. I am always open for them. Love is the basis of my life and everyone's life; but many people are not aware of that.

You claim that Biology scholars end up dealing with spirituality. How did you experience that?

I wouldn't like to speak for all of those who do not believe in anything. But yes, in my case, undoubtedly. I have experienced strong spiritual growth thanks to my devotion to science.

Do you believe in God?

Yes.

Our memory makes us the way we are. It determines our choices and establishes the concept of ourselves and of others. How do we filter this?

The brain does it by itself. The reasons and the mechanisms used are different for each kind of memory. In face perception, a filter is the resemblance with a person's loved ones from childhood. I certainly tend to follow, pursue and feel interested in faces that resemble my mother's than those of the neighbors. I've recently been to Croatia, her homeland and I looked for her in everyone's faces. I can't say I've found her, but many people looked like her!

Are we always aware of that?

We no longer call it subconscious. Psychoanalysts, who are under extinction, still use this term but we, neuroscientists, refer to it like implicit memories that do not

show up. We will only remember them when there is something that will remind us of them, when we repeat a word or when we get similar stimuli. My mother was brunette, and every time I see one, she will remind me of her. My granddaughter is blond and a similar thing happens.

To what extent do neurosciences impact psychotherapies?

If we don't have time for love, what do we want time for? If we don't have time, what do we want life for?

In many ways. For each memory, built and then stored in a certain group of synapses, in their own way. An example of that, which has been recently studied by us, is the interaction between novelties and the extinction

of the memory of fear, the synapses that process the former communicate through specific proteins produced therein, in the same hippocampus cells, with the synapses that are in charge of fear extinction. Each form of interaction between memories will use variables of this process and of others as well. There are millions of nerves and neurons involved in the formation of memories, all of which are different.

Is Freud outdated?

Yes, when it comes to most of his theories that had no physiological basis. In his time, these bases were largely unknown and impossible to be studied, which forced Freud to conceive non-physiological mechanisms for each one of them.

Do you plan to put together a memory book?

No. My memories will stay in everyone's minds. Memory never dies. My younger sister, who was three years younger than me, died recently and I will never forget her, nor will her husband or son. Her memory will remain similar to when we last saw her. It will not last forever, but it will stay for a long time. In Italy, I have been to the Roman Forum. It is 800 years old and now we realize how complete it would look with all its columns. Memory enables for the reconstruction of countries. These are signals represented through the ruins or remaining information.

Does memory reinforce the low self-esteem of Brazilians?

If we don't remember the atrocities, we are very likely to make the same mistake again. Many robberies have occurred in Brazil deliberately, now we have to make things right.

Freud's theories that had no physiological basis are obsolete

Brazil takes a lead in the fight against tobacco

The free and lone cowboy, the cheerful group of friends, the extreme sports, the intellectual and trendy people. Those who were teenagers before 1996 will be able to remember the creative cigarette ads on television, even during programs aimed at young audience. Subliminal messages relating healthy aspects and desirable situations to a product which is today regarded as a villain causing many illnesses and diseases, considered by the World Health Organization (WHO) as the main cause of preventive deaths all over the world. The fight against smoking gained momentum in Brazil in 1989 with the beginning of the implementation of controlling policies. Back then, 45% of males and 26% of females in the country were smokers. Today, these figures dropped to 10.3% and 7.3% respectively. Around 2/3 of smokers live in 14 countries, Brazil being one of them, accounting for 17.6%. Out of this total, the highest and the lowest rate of smokers among Brazilian cities in 2014 were to be found in Porto Alegre, with 12.8%, and in Macapá, with 2.9%.

José Miguel Chatkin, Professor of the School of Medicine, represents Brazil in the Ibero-Latin American group of smoking addiction control, comprising the following entities: Latin American Association of Thorax, European Respiratory Society, Spanish Society of Pulmonology, Brazilian Society of Pulmonology and Tisiology and Portuguese Society of Pulmonology, with their respective representatives. In 2015, he joined seminars in the Netherlands, Spain and Peru, as he presented the advances in Brazil, which has the lowest rate of smokers in the participating countries, dropping 30.7% in ten years.

Chatkin stresses that Brazil was the first country to sign the Framework Convention on Tobacco Control (an international treaty to join efforts intended to reduce smoking addiction based on a set of actions to be implemented by the countries), in 2003, ratified in 2005 and in effect since 2006. “We were one of the countries that achieved very significant results. Among the implemented actions are the ban on marketing and advertisement, increased prices through increased fees and taxes, as inhibiting factors to sales, prohibition of sales to minors, incentives to alternative agriculture, smuggling control and the ban

“**Porto Alegre has the highest rate of smokers among Brazilian capitals**”

on smoking areas. Our legislation is in the forefront with regards to smoking. This has brought about awareness, over the course of ten years and, today, smoking is seen as a politically incorrect thing.”

The professor claims that a totally different scenario is seen in many countries, such as in Portugal, Spain or Eastern Europe, parts of the globe where people smoke a lot. According to him, 50% of the population of Russia are smokers. “In Brazil, 10% to 12% of the population are smokers, and over the course of the past three years, former smokers have outnumbered current smokers. People have been quitting.” “In

Amsterdam, several participants of the seminar questioned me whether the results were indeed correct because they did not believe the huge step forward we had taken.”

Another hotly debated aspect was the number of lawsuits against the tobacco industry. Brazil ranks 4th, behind the USA, the UK and Australia. Chatkin studied the cases filed over the last five years and concluded that the tobacco industry lost the majority of them. “But we expected something different, it was something like 60% to 40%. We still have a long way to succeed in every case.”

The existing differences among the Latin American countries which are part of the group was also stressed. For instance, the number of smokers is still very high in Argentina and in Chile. Last seminar, in Lima, new predictions were made for the year 2016, involving other South American countries; additionally, new actions geared towards Central America have been designed.

In Madrid, the idea was to assess strategies to enhance educational programs against smoking addiction in the undergraduate programs in Medicine and in medical residency programs. PUCRS, through the School of Medicine and São Lucas Hospital, played a central role, since most schools and countries represented do not address the theoretical and practical insights into this area in their curriculum. The goal “Tobacco-free PUCRS” is still progressively successful. Currently, smoking is prohibited in closed areas across the campus, in accordance to the national legislation.

**The country
takes one step
forward against
the main cause
for preventive
deaths**

Joint efforts against cigarettes

Current medical literature has shown that in order for a treatment to be effective, it must consist of both medication and counselling work. “These techniques do not work well when applied alone. We conducted a study with 1.100 people and the results were similar”, remarks José Miguel Chatkin. As well as that, multiple drugs should be administered. If regarded as a chronic disease, such as diabetes and high blood pressure, smoking addiction treatment might possibly be administered for a longer period of time. “What is being done today lasts for about six months and may not be enough, since there is a very high rate of relapses.”

Chatkin’s research addresses genetic aspects, showing the existence of a significant hereditary component. Even when a child’s parents are not addicted to tobacco, there is a genetic code which may be passed on onto their children which will induce them to smoke. “A mutation of a certain gene makes the individual need to

have a larger number of neurotransmitters released which will make them feel comfortable and calm. There may actually be innumerable mutations.”

The role played by nutrition is another area of interest for the PUCRS group. The investigation on the ingestion of Omega 3, carried out by Nóri Coimbra, a PhD student of the Graduate Program in Medicine and Health Sciences, has shown that people who take in at least three servings of fish every week, especially salmon, tend to smoke less. In order to compare a group which eats fish to another that does not do it regularly or does it in small quantities, Nóri conducted a visit to a fisherman colony, but found out that they used their income to buy red meat. She, then, headed to Toronto, in Canada, on a Capes grant (*Ciência sem Fronteiras*). She began her investigation on the eating habits of 100 members in each group and the difference was so big that she needed to expand her sample: from 10% to 15% of smokers in the fish-eating group and above 40% in the group which takes in an insufficient amount of Omega 3.

“Factors such as a healthy lifestyle, more physical activity, less alcohol and higher sociocultural and economic level, stressed the importance of Omega 3, which releases neurotransmitters into the brain, reducing the need for cigarettes”, remarks Chatkin. For a larger concentration of Omega 3, the fish must come with their skin and come from the ocean and cold water. The professor intends to continue with his studies, along with other PhD students, in order to evaluate the effects on smokers who start eating salmon or taking Essential Fatty Acid pills, and wish to stop smoking.

“There is a genetic code which may be passed onto our children which will induce them to smoke

PHOTO: SHUTTERSTOCK



Projects the lov



Blood samples analyzed at the Biochemistry Laboratory, Molecular Genetics and Parasitology

Strategy teams, have been trained at PENCE, headed by Gomes. Blood samples from the elderly, collected for genotyping, are collected at the Laboratory of Biochemistry, Molecular Genetics and Parasitology, of IGG, with the collaboration of the Master's degree student Cristiane Borges. Other interventions take place at community health centers.

the country which is investigating the role of oxytocin and the polymorphism of the receptor gene of the depression hormone in the sexual and dietary behavior of the elderly. At the end of last year, the three of them published

Camila intends to include 400 patients in the study, and to compare a healthy group with one showing symptoms of depression. The idea was conceived from discussions with Von Gunten, the program's visiting professor. The psychiatrist studies the factors that determine the clinical expression of dementia, behavioral and psychological syndromes, in particular.

Nutritionist Laura will investigate the relationship between hormones, obesity, and dietary and sexual behavior. "We want to conclude whether the obese or sarcopenic (those who lose mass and muscular strength) elderly show alterations in oxytocin and food habits". One of the hypotheses is that polyphagic syndromes (excessive increased appetite) occur when oxytocin is less active. Results from these studies will be disclosed in the beginning of 2017.

An elderly individual who has a good relationship network seems to be less prone to diseases or better capable of dealing with them. Social interaction makes you feel good. Everyone knows that. But the thing seems to be the release of the love hormone, oxytocin. That is why a lacteous compound is not enough for the diet of a newly born. Breastfeeding stimulates the production of the substance, which strengthens the connection between the mother and her baby and has an impact on their overall development. "Human nature is based on relationships and contacts. The elderly are supposed to encourage affective and social connections, by hugging and kissing friends and family members, and keep their sexual life active and pleasing", stated Professor Maria Gabriela Gottlieb, a post-doc grantee from the Graduate Program in Biomedical Gerontology.

The researcher and her PhD students Camila Jacondino and Laura Rosemberg, as well as PUCRS Professor Irênio Gomes and a Swiss psychiatrist, Armin Von Gunten, are part of a pioneering group in

two chapters in the book *Advances in oxytocin research*, by Nova Science Publisher (USA).

Camila, who is a nurse, tries to work on the polymorphism of oxytocin's receptor gene in the elderly who are assisted by the Brain Aging Program (PENCE), from the Institute of Geriatrics and Gerontology of PUCRS through a partnership with the Municipal Department of Health. The aim is to find a connection between these findings and the symptoms of depression. Patients will have an appointment with the psychiatrist, at São Lucas Hospital. Health agents, as well as other nurses and medical doctors from the Health and Family

Pioneering group: Maria Gabriela (L) and PhD students: Laura and Camila



PHOTOS: CAMILA CUNHA



help unravel the hormone

Group looks into the role played by oxytocin in depression and in elderly behavior

Connections and affection

Produced by the hypothalamus, a region in the encephalon, and stored in the neurohypophysis, oxytocin causes muscular contractions in the uterus in order to start labor, and it is administered after delivery for minimizing bleeding. It stimulates the

production of mother's milk, develops attachment and empathy between people and is strongly connected with pleasure. Some specialists recommend the intranasal administration of this substance in order to stimulate breastfeeding. Maria Gabriela

highlights the importance of motherly well-being during pregnancy and of parental care after birth and during childhood. "These are crucial stages for the development of the central nervous system, where oxytocin plays a central role."

More about polymorphism

Blood types and the left-handed/right-handed variations are two examples of genetic polymorphism. In a single species, genomes are very similar, but in certain

parts of the chromosomes, the DNA sequence may show some variation. If this happens in more than 1% of the population, it will be called polymorphism. Oxytocin's

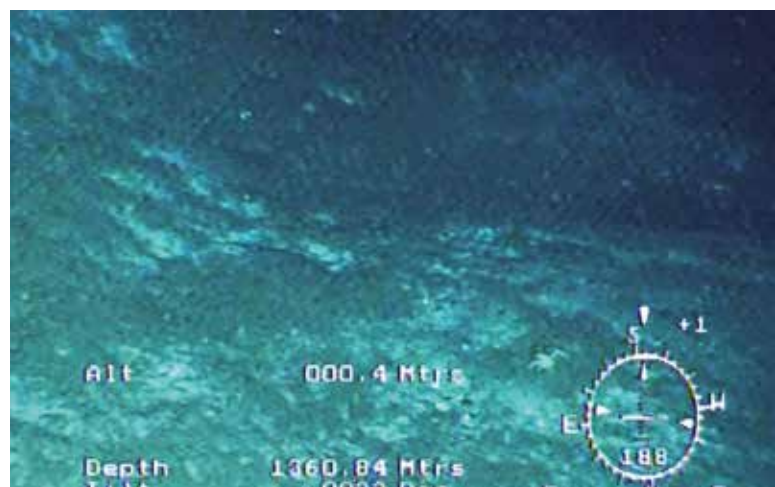
receptor gene and other polymorphisms have been investigated in the elderly due to their connection with non-transmissible aging-related chronic diseases.

The will to carry on

Marta Sueli Pinheiro, 68, a dweller of Partenon, in Porto Alegre, has decided to book an appointment with a psychiatrist at the health center she goes to, for a very personal reason. "I want help in order not to lose strength and keep going", says she. When I feel sadness is coming, "I'll keep it out". Retired, she continues to work at other people's homes. She has been working as a baby-sitter since the age of 10. On weekends, she enjoys eating some barbecue, and drink beer with friends.

Marta: When I feel sadness is coming, "I'll keep it out".







Missions in the Pelotas River Basin have led to discoveries that may bring about new energy sources and even medicines

Life in the depths

For the first time in the Southwestern Atlantic (including part of the Brazilian territory and South America), crabs, mollusks, annelids and bacteria living in the depths of the ocean have been found; such creatures do not rely on the sun as their primary source of energy. At 1,300 meters deep, amid the darkness and mud, an oasis of foods and substances coming from the inside of the Earth enable the existence of these chemosynthetic communities. The Institute of Petroleum and Natural Resources (IPR) of PUCRS has found unknown microorganisms and animals 250 km off the coast, in missions carried out in the Rio Grande Cone, within the Pelotas River Basin, in Rio Grande do Sul. Projeto Conegas, funded by Petrobras, was intended to find gas hydrates, an important source of energy for the future. In addition to these

exploratory issues, another goal will be to find out more about these living beings and, based on the studies carried out, raise awareness of how society can benefit from them, by drawing inspiration for the production of new medications.

These chemosynthetic communities live in depressions or concavities, called pockmarks, which can be up to 1km wide,

and are related to associations of gas hydrates. "It is a largely unknown biological diversity, which makes it of a spectacular unique richness", says the director of IPR, geologist João Marcelo Ketzer. The applications of such discovery are multifold. In the event of an oil leak in the sea, bacteria that feed on the substance may, for instance, clean out the area (bioremediation). Obtaining methane from CO₂ is another possibility that has economic (resulting in fuel) and environmental implications (reducing greenhouse effect emissions into the atmosphere). Studying these microorganisms – and learning how much gas they produce (and how much from it comes from the underground) – may be helpful for the understanding of distribution of gas hydrate in the region.

"For the Brazilian science, it is important to describe species in unexplored areas in the country, because we can protect our genetic heritage, which is constantly harassed by international researchers", says Professor Renata Medina, from the School of Biosciences, as she refers to

We can establish an analogy between what the Amazon represents in terms of new discoveries and the inspiration for producing drugs and what marine communities will be like in the future.

**João Marcelo Ketzer,
director of IPR**

the importance of the publication of the article in the scientific journal Deep-Sea Research. "We understand our biodiversity. Once we know it, we can preserve it." Renata goes on to commend the participation of both undergraduate research and Biology Tutorial Education Program (PET) grantees in

several stages, from the ship mission to the investigations carried out at our laboratories. Additionally, these project's findings are described in the dissertation of Taiz Simão, advised by Professor Eduardo Eizirik, from the School of Biosciences, in collaboration with the coordinator of IPR's Laboratory of Geobiology, Adriana Giongo.

Eizirik, who co-wrote the paper, commends the scientific impact because this is the first community of this sort to be documented in Brazil. "They are very similar to microorganisms and animals from other regions, but none of them has been so fully described the way ours have been." They are all related to specimens found either in Japan or in the Baltic Sea, leading researchers to believe that they travel widely around the globe on ocean currents.

Connected to the ship, the robot is equipped with claws and containers to collect materials and still can record videos and take pictures at 1,300 meters under the water



Researchers conduct chemical analyses of the water extracted from deep-sea mud

“Few groups will survive in these areas. That is why, the composition of

this microbiota is found in different places”. As for the article, he points out its scope and cross-sectional character, covering areas such as biology, geology and chemistry.

Not many groups in the country or all over the world are so committed to the study of chemosynthetic communities because, not only are they rare, but they are also found in remote spots of the ocean, thus requiring substantial financial resources for the conduction of the investigation. “It’s very hard to get to. Our whole team made it possible”, says Adriana.

cameras and a video recorder. As it was connected to the ship to some sort of umbilical cord, and manipulated using a joystick, the robot is equipped with claws and pots to put different types of materials. On another Projeto Conegas mission, a submarine put together a mosaic of deep-sea images. The result was 75,000 pictures and maps showing the deep-sea in great detail, something that had never been attained at the Pelotas River Basin.

A different method of collection is used if the focus is on the extraction of DNA or microbial cultivation. Upon the ship’s arrival, the containers are stored at the IPR at room temperature, refrigerator (at 4° C), -20° C, -80° C or even liquid nitrogen (at -196° C).

“When on earth will a university rely on a submarine to go down 1,000 meters deep?”, ponders Ketzer. A mission of this type, 20-day long, will cost up to R\$ 5,000.000. During the fourth expedition, conducted in June 2013, the team relied on an unmanned French submarine equipped with

One of the goals is to understand what the bacteria feed on, the kind of adequate means and temperature, their role in the ecosystem and what molecules they produce. Analyses conducted up until now have shown 130 types, out of which 40 will feed on the consumption of methane only. Gender analysis will be conducted now. The bacteria are stored in places that resemble the sea environment. “But the pressure, the sediment, everything is very different”, says Renata. Later in the future, they will be cultivated in a special hood, without oxygen and which can be suitable for the introduction of gases.

We still have not been able to tell how old this chemosynthetic community is. However, Ketzer estimates that it could be from 10,000 to 20,000 years old, as there were indications of accumulations of gas hydrates in the region.

As the team is committed to working on these samples, it is intended to compare the findings from the Rio Grande Cone and the mission at the Amazon River Cone, carried out from July to August last year. The idea is to go back to the North of the country, where there are indications of chemosynthetic communities and gas hydrates. Through a partnership with SeaSeep, a service provider for the petroleum industry, the mission intends to preserve and analyze the gas hydrates samples.

Gas hydrates

They are considered non-conventional gas reserves, found in the deep sea, at great depths. Resembling ice rocks, they are formed by water molecules, forming a solid structure that is stabilized by gas molecules (methane, butane, propane and

carbon dioxide). The quantity found on our planet may be larger than that of all resources of fossil origin (coal, petroleum or natural gas) put together. The big question is how to dissociate hydrate to get the gas. Japan already relies on sea production experiments.



Integration between biologists and geologists

Chemosynthetic communities have been found in two areas, each of which being larger than 10 km long. The integration between biologists and geologists is a highlight for the Institute of Petroleum and Natural Resources (IPR). It gives the expedition a multifaceted character. Besides the data sent by Petrobras, the team conducts an underwater landscape map (relying on the aid of a sonar and a seismometer), showing areas that have an accumulation of gas hydrates and the concavities, where the chemosynthetic communities live.

Professionals exchange ideas on the ship

Trying to discover medications

As every bacteria is formed by thousands of molecules and these deep sea microorganisms are unknown to science, we expect to find materials which can be of use to the pharmaceutical industry as research advances. Professor Dyeison Antonow, from the School of Medicine, works at IPR along with Rogério Lourega, from the Institute of Chemistry, searching for biologically active molecules, especially anticancer ones. Metabolites, chemical substances released by the bacteria, are extracted from them, and will be used in cellular cultivation. Those that mitigate or hinder the growth of these cancer cells will be subject to other tests.

Another goal is to find out in which part of the cancer cell the molecules are active, so that we could sketch clinical studies

following the biomarker-based diagnostic monitoring, in the near future. "It is possible to anticipate on what kind of patient this experiment will bring about the desired effects", says Antonow. The group needs resources to start the project this year.

An area which will enable the application of methodologies for the several tests employing the cultivation of cancer cells will be built inside the Geobiology Laboratory. "It will be safe and equipped with the necessary equipment for this purpose", says Adriana Giongo.

In an article published in the American agency National Oceanic and Atmospheric Administration, Professor Kerry McPhail, from Oregon State University, has found that, over the last 25 years, more than half of the chemical substances accredited as medications originated from natural products, resulting from the metabolization of organic compounds. Their diverse and complex structure connects to cell targets to penetrate into their membranes or remove

them. McPhail is committed to the study of organisms from hydrothermal communities, located in volcanic areas.

Bacteria, which are the nutritional basis of polychaetes, are being investigated



PHOTOS: BRUNO TODESCHINI



The robot

An unmanned French submarine equipped with cameras and video recorder

A mollusk

The interest of the group of biologists arose when one of the researchers saw a weird animal moving in a sample collected in the deep-sea and which had been drawn from the research ship's deck, in a mission conducted in 2011. Actually, it was a part of the mollusk Ancharax. It has been hotly debated at the School of Biosciences and at IPR for almost two years. Analysis of the DNA sample showed it was a fairly unknown mollusk, bringing the controversy to a close. Another mission dealt with the shell

of an animal of the same kind, which can only be found in chemosynthetic deep sea environments. The mollusk feeds on molecules from bacteria that live on their gills (respiration organs) and consume gases such as methane in order to generate energy. Ancharax has not been found in many areas up until now and it is unknown whether the species are similar. Generally, the collections are not complete, which makes it difficult to conduct a comparative morphological analysis, according to Eduardo Eizirik.



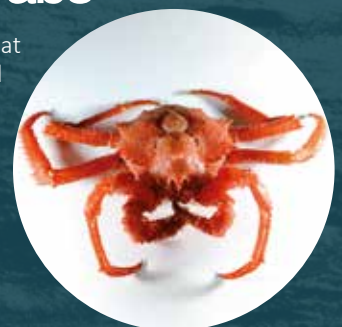
Polychaete

Polychaete, annelids similar to leeches and worms, have been found. They are examples of a species that lives in this type of environment, and which are rich in methane. They also feed on endosymbiotic bacteria (closely connected to animal tissue).



Colorful crabs

Colorful animals, at the top of the food chain, are found in environments with gases. They are of the Paralomis species, which have been found in other parts of the planet.





CeMBE relies on a qualified team and excellent structure

A reference in animal care

PUCRS hosted the 14th Congress of the Brazilian Society of Laboratory Animal Sciences (SBCAL) and the 3rd Latin American Conference on the topic. The university, which is a reference in the area, relies on the Center of Experimental Biological Models (CeMBE), with an excellent structure and qualified personnel, which includes biologists, veterinarians and undergraduate students. Four of the coordinators are PhDs and two of them are specialists. “We did not make any changes to the existing structures in order to be in accordance with new standards. We started from scratch and are in accordance with the law. The institution set its goals with the experiment, we designed a project and made investments with an eye to animal dignity and welfare”, says the Center’s director, Emílio Jeckel Neto, Professor of the School of Biosciences.

The technical coordinator, veterinarian Luísa Macedo Braga, stresses that every project designer who makes use of animals must attest that there is no other scientifically validated alternative method for that purpose. “When we need to do research or teach, the idea is to discipline people in order to conduct their actions intent on minimizing the suffering”. Luísa coordinates CNPq’s National Network of Animal Laboratories for Production and is ending her term as the president of SBCAL.

According to Jeckel, the institution’s decision will lead to the conduction of high quality research and, most importantly, will contribute to student development. “There is great educational potential. They learn the right way to do their job since very early

and earn their own sense of responsibility. This can’t be taught in a class, only practical experiences can give you that”.

24 hours

CeMBE is the only department at the university that is able to get animals for research, make use of them and provide care for them. At the moment, 156 projects are being carried out involving experimental models. By means of a computer system, the Center will only recognize them once they earn approval from the Ethics Commission in Animal Use (Ceua). In addition to a space for raising and maintaining rats, mice, bees, fruit flies, zebrafish and crustaceans, there are rooms for researchers and grantees to carry out the essential procedures for their projects, during the day or at night. The only requirement is to book your slot. Every area is access-controlled.

The CeMBE team is in charge of providing care to animals. Depending on the nature of the research, it will meet the project’s protocol, for instance, on issues related to dieting, water consumption and inclusion of elements to enrich the environment.

When it comes to rats and mice, air, temperature, moist and lighting control are completely under control. Light bulbs will simulate sunrise and sunset. The cages, containing four or

five animals, receive individual ventilation and, because of their transparency, will allow them to see one another. “The space reserved for each one of them is in accordance with international standards. Everything is conceived in order to minimize stress”, says Jeckel. Never will a rat or a mouse be placed in a cage with animals other than those of their social group.

Luísa claims that CeMBE stands out for its total integration into animal care standards. “Only trained individuals can do that. Researchers will only be concerned with conducting the experiment.” According



International standards in the area of rats and mice; filtered air, controlled lighting and temperature



PHOTOS: BRUNO TODESCHINI

to her, a committed and coherent team, comprising experts in the area, is essential. “Changing cages every day may sound monotonous, but we must pay attention. The staff knows each animal and can testify whether their behavior has changed.”

Additionally, the Center relies on wild rats, to carry out studies on parasites, by Professor Carlos Graeff Teixeira. “Once we received Ibama inspectors, who were impressed with the behavior of these animals, as if they were domesticated”, says Jeckel.

In order to conduct experiments with fish, the chlorine has to be removed from the water before it is filtered. PVC roof helps control moisture in the tanks and experiment rooms. In addition to store-bought food, zebrafish feeds on protozoa and other living beings cultivated at CeMBE.

Embryos

Because of the structure, the Institution can have small colonies, thus avoiding the need to keep a large number of animals. For this year, one of the plans is to reduce production even more drastically, with the establishment of the department of cryopreservation of embryos. “We’ll have frozen embryos of different lineages and, as they are requested, we’ll use the necessary number of them in females”, says Luísa.

Two level 2 security procedure rooms are expected to be built in Building 14. Models with pathogenic agents will be studied, those which will only contaminate individuals of their own species.

Impact on Biomedical Research

The director of the Institute of Biomedical Research, Paulo Pitrez, adds that these investments will grant PUCRS the recognition as a cutting-edge university in Latin America. “The management and precaution taken in the processes represent an evolution in terms of biomedical research.” He believes a higher level of trust will be given to the university when working on projects with other industries.

At Centro Infantil, Pitrez deals with experimental asthma models working on new treatments. One of the studies looks at the relationship between the parasitic infections and the disease. “Children, especially the most disadvantaged ones, who are exposed to worms, seem to be more protected from asthma and diabetes.” The idea is to find molecules from parasites that are effective against the respiratory disease.”

The 3 Rs

International legislation must meet the 3Rs principle for vivarium operations: replacement, refinement and reduction

Source: Luísa Braga

A little bit of history

Emílio Jeckel Neto was working on his PhD in Japan in 1991 when he received a fax from then PUCRS president Norberto Rauch requesting him to find more information about vivariums. His Japanese advisor, Tsuneko Sato, designed a course especially for him as she admired the president’s vision of future by laying the foundations of biomedical research at PUCRS. After visiting some institutions and attending congresses, Jeckel put together a sketch.

By virtue of his experience in the East, he noticed how respectful their culture is to animals. He made use of a hundred mice in his project, which served as models for other ten projects with several researchers from the same university. All of that came from a very well-conceived plan. Every year, Aichi Medical University promotes a Buddhist memorial service honoring the animals used in research. Back to Japan, Jeckel put together the team for what CeMBE would come to be, which helped him define how it would operate.



Mannequins simulate cardiac arrests, respiratory problems and other diseases

Classroom alternatives

PUCRS has not made use of animals in classrooms for ten years. At the School of Medicine, they would be used in the conduction of training sessions on surgical procedures. But it was only possible to learn how to evaluate patients if one observed how the hospital worked. Now, there are mannequins that simulate cardiac arrests, respiratory problems, blowing and a series of other diseases. "It is incredibly realistic. The mannequins moan, have convulsions, have deformation in their eyes, a cyanotic

mouth (purple)", says the director of the School, Jefferson Braga da Silva. In his opinion, we can benefit greatly from error and trial.

Upon orientation and permission from Ceua, animal carcasses, coming from slaughterhouses, are another alternative. A pig's thorax, head and cervical spine, whose anatomy is similar to that of humans, are useful for students to train sutures, use of drains, intubation and spinal anesthesia, among other procedures.

New Research Methods

By using alternative methods in toxicological and pharmacological tests, PUCRS must have seen a reduction of 50% in the use of animals over the last five years. The estimation was made by the director of the Institute of Toxicology and Pharmacology (Intox), Maria Martha Campos. In 2014, the National Board of Animal Control and Experimentation (Concea) put out a normative resolution listing 17 methods to substitute or reduce living models in toxicological tests. These models must be adopted by Brazilian laboratories within five years. In accordance with international norms, the University conducts most of those tests.

Cell culture could be applied in a variety of contexts, such as in testing the toxicity of compounds. When assessing whether a molecule is anticancer or anti-inflammatory, in vitro experiments are carried out initially, and then we move on to animals. Vero cells, an immortalized lineage of a monkey's kidney, for instance, are used in the production of vaccines and new drugs against tuberculosis.

Intox has been committed to the implementation and validation of these methodologies for the purposes of research and provision of services. Martha will go on to say that, besides the ethical issues, this type of testing is less costly.

The use of images to avoid repetition

The Memory Center relies on a special area in Building 64 to carry out behavioral tests in mice. This is mostly due to the fact that any noise, smell or visual stimulus may interfere in the results. An experiment needs at least six days, half of which just for the animals to adapt to the room and to the researcher. Soon, all procedures will be recorded. From a project in collaboration with the School of Computer Science, headed by Professor Márcio Pinho, through Edital Praias, from the Office of the Vice President for Research, Innovation and Development, researchers have developed an image-capture system that can be analyzed by software. The idea is to reduce the number

of animals used, minimize the interference during tests, since the mice will be alone in the room, and conduct training sessions with students.

According to Professor Jociane Myskiw, scientific paper reviewers ask us many details, which would require, many times, a repetition of tasks. "If we have everything recorded, we'll just go over the footage, and then avoid the need to use animals." Another advantage will be posed when it comes to teaching and experiment assessment. "A mice's reaction to known

memorized objects and to new ones is expressed in their behavior. On that line, we have analyzed their mobility and curiosity. By checking the footage, new parameters may appear."

Behavioral tests in mice will be recorded





*MicroPET/CT:
footage of living
rats and mice on
microtomography*

State-of-the-art **technology**

The Center for Pre-Clinical Research of the Brain Institute (InsCer) offers cutting-edge exams which enable the conduction of experimental studies of neurological and cardiovascular diseases, cancers, among other things. “It is possible to design longitudinal studies, that is, monitor the etiology and progress of a disease over time, as well as to assess the response to a certain treatment in an experimental model”, says researcher Gianina Venturin.

The institution is the only one in the south of the country to rely

on a microPET/CT. The technology releases images from positron emission tomographies and microtomography in animals. Additionally, the equipment relies on a gamma counter in order to study the distribution of radioisotope-marked molecules in our body. Another machine produces bioluminescence and fluorescence imaging. For instance, tumor cells can be modified to express a gene that codifies a fluorescent protein, such as GFP (green fluorescent protein, which has been identified in a cnidaria). Once

specialists are able to see them, it would facilitate the process of monitoring of tumor growth and assess the response to a treatment.

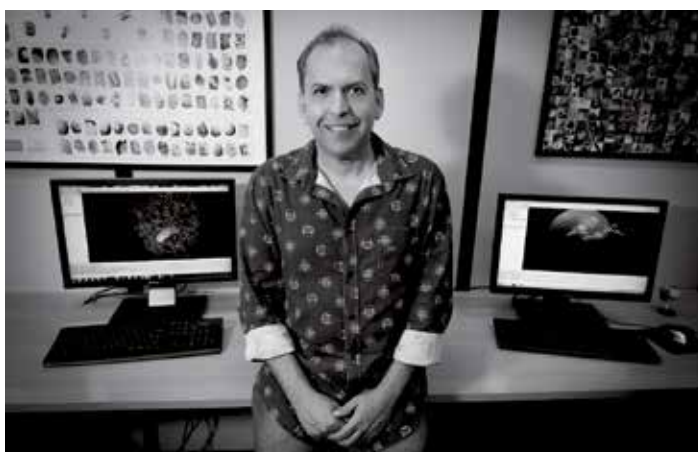
At the site, projects between PUCRS and other institutions are carried out. One of them, which features professor Léder Xavier, from the Department of Biosciences, assesses the use of ketamine in depression. Another project, headed by InsCer’s director, Jaderson Costa da Costa, seeks to understand the operation of an epileptic brain.

Computer simulations

At the Structural Biochemistry Laboratory, at the Biosciences Institute, potential drugs to fight cancer and HIV have been under investigation. Based on computer simulations, the interaction of proteins with compounds originated in the nature is being studied. One of the investigations, conducted in collaboration with the University of California – Berkeley (USA), is intended to find targets for melanoma, an aggressive skin cancer. Up until 2017, the group is expected to select ten molecules to be studied in animals. The database comprises 100,000 compounds. “It’s as if the protein existing in our body was like a lock. We need to find keys that fit into this 3D model”, says Professor Walter Figueira de Azevedo Júnior.

*Azevedo Jr.:
the quest for
new drugs
using computer
simulations*

Finding new drugs to fight HIV is one of the goals of this laboratory. But there is a scientific interest underlying that. “To understand the molecular puzzle of life is a challenge. Every time we understand how the keys to the lock work, we place a small tile in a large mosaic of knowledge.”





Queen bee and worker bees in a beehive at CeMBE

A threat to **bees**

Contamination by pesticides puts native bees at risk

The populations of bees have been on a considerable decline all over the world. This is mostly due to human actions such as habitat fragmentation, the use of natural environments as agricultural or urban areas, and the use of pesticides, which compromise the abilities of feeding, navigation, memory and return to hives. This issue has been addressed and given proper attention by specialists and now unprecedented results from research carried out at PUCRS have been revealed: in addition to these known damages, pesticides may alter the castes in the colonies, as is the case with some *Plebeia droryana* stingless bees that were supposed to be queen but turned into workers. In the long run, this may lead to the extinction of some species.

The study coordinated by the director of the Institute for the Environment (IMA) and professor of the School of Biosciences, Betina Blochtein, in an initial

stage, conducted tests using six different concentrations of pesticide Chlorpyrifos, used in Brazil to fight off insects considered to be agricultural plagues. The materials used in the dosage administered in the bees' foods were collected from the nature, according to previous scientific publications. Every tested concentration was much smaller than the commercially recommended dosage for the product use, as it would only simulate residual contamination in plants visited by the bees rather than direct application.

Around 450 bees have been tested under this investigation. Only 1/3 of them has survived (the larvae has grown into the adult stage), and 1/3 of that has become worker bees. "We were expecting they would behave differently, showing alterations in tissues and ovaries, but not that they would become workers. This is new. Caste determination is not flexible. A queen will always be a queen; a worker will

always be a worker unless some disorder occurs. We have seen that this disorder has been caused by the use of pesticides and this has a considerable impact on the survival of these bees", claims Charles Fernando dos Santos, a post-doc grantee (PNPD/Capes) from the Graduate Program in Zoology.

The investigation relied on a control group, which was given pesticide-free food and, six other groups, which have been given different concentrations. As expected, the control has resulted in 100% of queens. However, within the group given the smallest dosage of pesticide, only 66% of the bees turned into queen. All the bees that were given the highest concentration of pesticide, 0,0880 micrograms, turned into workers. "This is a much inferior dosage compared to the recommended dosage of pesticide, but keeps bees from turning into queens. The dosage applied in crops will kill bees", says Betina.

The effect of pesticides

The concern with the effects of pesticides is due to the fact that this group of stingless native bees relies on only one queen per nest. The administration of higher dosages will cause death, and of lower, sub-lethal ones will cause damages that compromise future generations. In this group of stingless bees, natural reproduction is low, there are few colonies per hectare and the density of nests is low. "If a hive is not able to produce new queens, in the medium run, it will become extinct. In the absence of a queen to replace that one that is aging, or even queens that could form new colonies and reproduce, we are talking about damages to populations in the medium run, since they tend to decline or even die out", claims Betina.

Pesticides have an effect on the insect's nervous system. The administration in high dosages will lead to death. As for the administration in residual quantities, we are yet to find out about the damages it causes to the brain. "Some hypotheses could be explored: bees that were supposed to be queen may have become workers because they supposedly ate less food because it was not palatable, or the energy they would allegedly spend for growing would be used in the process of metabolization of the contaminated food and to detoxify their organism, or even, pesticides may have caused physiological damages in these bees' brains, thus keeping nervous impulses from being sent, thus bringing about paralysis. We will try to look into all hypotheses", claims Santos.

There are 20,000 species of bees all over the world. Only 5% of them are sociable, form colonies and store honey. Other than that, the others are solitary bees that do not form colonies. "In Brazil, there are about 400 species of social stingless bees. Those that rely on the same mechanism of caste determination are subject to the same risk", ponders Betina.

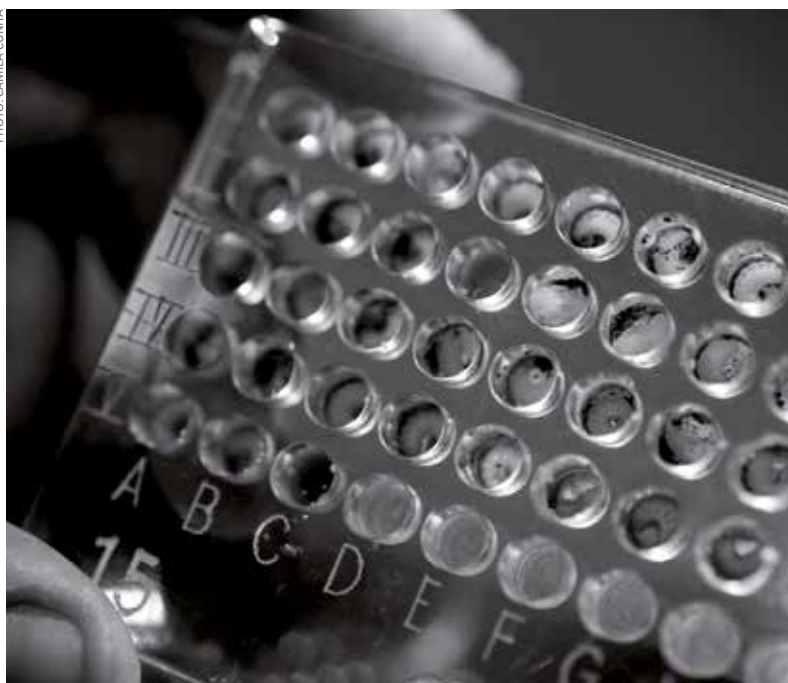
All tests were carried out in a laboratory, with bees bred at the Center of Experimental Biological Models (CeMBE) of PUCRS. Another highlight of this study is the heterogeneity of the group, formed by an undergraduate research grantee, a doctoral student, a post-doc researcher and a professor, all of whom of distinct academic levels of the University, as well as a collaborator from USP.

PHOTO: BETINA BLOCHTEIN



Plebeia droryana queen and worker

PHOTO: CAMILA CUNHA



Tests show how pesticides can compromise future generations



Why should we use products which are prohibited in other countries? Farmers can make judicious use of products, choose products that have lower toxicity to non-target insects (bees), comply with the indicated dosages and expiration dates, avoid mixing different products in application tanks, thus refraining from creating interactions between substances which are not even known.

Betina Blochtein



Next steps

The initial stage of the study conducted tests with organophosphorates. Chlorpyrifos is widely used in Brazil, but has been banned in both the USA and Europe for the damages it causes to bees. Now, the team's intent is to study the effects of another group of popular products, the neocotinoids. They have a different mechanism of operation and are more popular all over the world. They can be injected onto the plant's seed, without the need for spraying. "We want to see the effects on adults, any behavioral alterations, and also whether the queen can mate, lay eggs and how long they will live", explains Santos. Some countries are trying to ban it.

"We were very careful. We can't deny how useful pesticides can be for agriculture, but we need to be aware of their negative effects because, in addition to keeping off

plagues, they kill other beneficial insects, such as bees", she adds.

Research team:
Andressa Dorneles (L), Charles dos Santos, Betina Blochtein and Patrick dos Santos

The research for risk analysis of pesticides in bees has gained attention in an

international publication, with an article published in Scientific Reports, by Nature. "Although we are looking at a Brazilian species, we have shown the world that whatever happens to these bees can happen to others", highlights Santos. According to Betina, the methodology used is very useful because it can be used to evaluate other products and different

dosages of contamination. "We want to employ this method in other native species of stingless bees that we have bred in our scientific meliponary. Two other species will be evaluated in order for us to confirm whether the effects of insecticides are similar. Once again, it will be something unprecedented", she says.

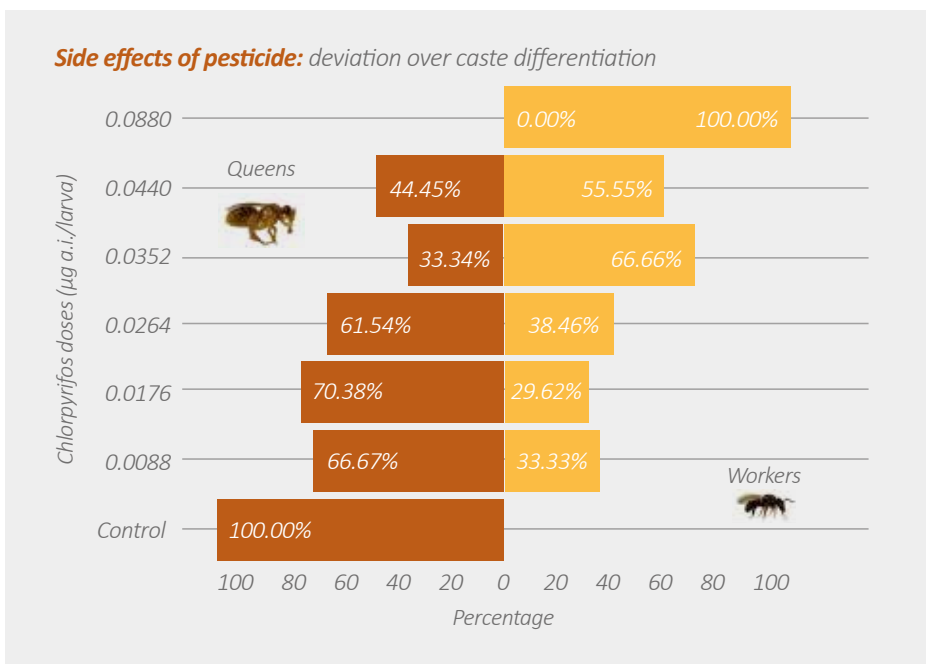




PHOTO: VISUAL HUNT

Good practices

On the one hand, pesticides are useful for the reduction of plagues that bring about economic damages. On the other hand, they affect beneficial insects, such as bees, which are the nature's main pollinators. What should we do about it? Professor Betina lists some good practices. One of them is to choose products that have lower level of toxicity for pollinators. "In view of the wide variety of products available for controlling certain diseases or plague, an idea is to look for those that cause lower impact, but people are still unaware of the need for this kind of precaution. The agricultural market is still not aware of nature conservation, biodiversity and pollinator issues", claims she.

Another suggestion would be to pulverize the areas during the period of flower blooming since, as bees are usually associated to flowers, there would be a much lower impact. It would also be possible to monitor the times of application of products, by avoiding the periods with higher concentration of bees. "On colder days or during the afternoon hours, there is a smaller number", says Betina.

There is a strong trend in Brazil, especially in Rio Grande do Sul, for farmers and agriculturalists to use

bees to pollinate their crops, as a kind of partnership with beekeepers. In this case, in order to avoid the contamination of the bees that received pesticides, it would be possible to alternate between the use of the product and scheduled visitation of bees. "The partnership with beekeepers is an interesting trend to optimize the production in agriculture and may be compromised if we do not take precaution", comments Santos. "Additionally, we need to think up good practices for wild bees, those that live in tree hollows or in underground nests, and not only for those that received treatment in hives", complements Betina.

It would still be possible to conduct an action of integrated management of plagues, with the production and dispersion of parasitoid insects. That is, predators of certain plagues that do not cause any problems to cultivation. For instance, in apple crops it is possible to have wasps that reduce the quantity of plagues. "This is a consolidated practice all over the

world, which avoids the use of pesticides, but which still has not gained momentum", comments Santos.

The best practice, according to the IMA's director, is the conservation of semi-natural areas, that is, areas in which pesticides have not been used. "If farmers respect legal reserves, which is mandatory in every property, and protect permanent areas of preservation, such as riversides and very steep regions, which are shelter to bees, part of this biodiversity will be protected", claims she. More recent and sustainable measures include the use of living fences using plants that can offer natural resources for bees, instead of wire fences. "It may sound romantic to grow flowers for bees, but it is a means to avoid food shortage", states Betina.

Natural pollinators

Bees provide essential services to the environment. As natural pollinators, they ensure the preservation of ecosystems, thus enabling the reproduction of several species and consequently, the diversity of wild plants. Distinct plants present distinct levels of dependence on pollinators. Apples, for instance, need up to 90% pollination from bees. As well as this, as they collect and take pollen to the female part of flowers, they increase the quantity and quality of fruits and seeds, thus contributing to the production of foods for many animal groups, such as insects, bird and mammals.

The innovative Chordata method

What is your aspiration in life? Some people would say they would like to be a successful professional, others would choose to travel around the world, start a family or make a difference in life. But for many, their goal is to be able to walk again, or walk for the first time. Veronica Baptista Frison, a Professor

in the Physiotherapy program, has been devoting her time to help patients who want to accomplish this dream, for 15 years. She designed not only the unprecedented Chordata Method, but also a specific machine and a set of exercises, both designed by her.

When she earned her degree in Physiotherapy, 15 years ago, Veronica noticed how hard it was for people who had suffered from a neurological injury to receive some treatment, since results were scarce and patients were demotivated. When she was working on

her Master's in Neurosciences, at UFRGS, she conducted research on neuroplasticity, which is the capacity of regeneration of the nervous systems after a neurological injury. She looked into what could possibly cause the nervous system's neurons to regenerate and found out that massive repetition of exercises as well as different types of contractions and movement angles could restore them. So, in order for these so-called facilitating properties to be available to the population, Veronica designed a machine, which is now in its sixth version.

The method makes use of two types of exercises, tilting and suspension, thus enabling the suspension of body segments and lifting up the patient's full body. The sessions can be carried out with a lying, standing or sitting patient, emphasizing the repetition of the movements and resistance for a longer period of time. "In view of that, I worked on exercises that were biomechanically and neuroscientifically reasonable. I noticed that patients would produce different results when they made use of the equipment compared to when they made use of traditional physiotherapy", remarks Veronica.



Physiotherapy professor, Veronica Frison, has designed the method, equipment and exercises

Restored Hope

Based on the Chordata Method, a set of investigations embraced by the Physiotherapy Program began in order to testify the effectiveness of the technique. Around eight undergraduate thesis, a Master's thesis, advised by Professor Irenio Gomes, from the Institute of Geriatrics and Gerontology (IGG), and a dissertation involving 120 Parkinson's patients have been written. "I've got many students involved and the clinical response has been positive", remarks the Professor.

When she was working on her PhD in Medicine and Health Sciences, at PUCRS, Veronica conducted clinical tests on 26 individuals on wheelchairs, aged 18-65, within no more than three years after they had a spinal injury. She certified the effectiveness of the method in improving the trunk's extension force,

in the activation of muscular groups situated below the injury spot and in functional range tests. After conducting 16 sessions, many were able to walk again. "These results make us believe that if more sessions had been conducted focusing on the lower limbs, it would be possible to activate those muscles. That's what happens with private patients, who undergo heavier and more intense training sessions, and we were able to achieve clinical results as they were able to walk again", she remarks. The dissertation will be defended in August 2016.

Some patients were so motivated that they continued with the treatment at the Professor's health center, called Instituto Método Chordata. One such patient is Bruno dos Santos, 25 years old, who has a thoracic trauma due to firearm injuries.

After 15 days in a coma and spending three months in a hospital, he began conventional physiotherapy, learned the basics of wheelchair life, how to move from the wheelchair to a car or to the floor, and vice-versa, but he had a different goal, he wanted to walk again. "God sent Veronica from above. I began to have hope. Before the treatment I could not feel anything from my nipple downwards, now I can feel my back. I can go to places more easily and have gained muscles. My life has changed dramatically", reports the young man who travels alone from Canoas to Porto Alegre, on a train and a bus, and is committed to learning how to walk again. "We must be aware that this is a long and painstaking treatment, it requires dedication and a comfortable body. If I take good care of myself, I believe I'll make it".

Unprecedented therapy proves to be more effective and help patients to walk again

Bruno dos Santos has a thoracic trauma and is determined to walk again



PHOTOS: CAMILA CUNHA

Quality of life

The study on the elderly population involved 72 people who, after 16 sessions, showed improvements verified in tests such as *time up and go*, Bergen's scale and reach test. "Compared to other techniques, the fact that we have achieved better results from 16 sessions shows its effectiveness with a significant gain. Even before the end of the test, we could see improvements from participants' testimonials. They claim to be stronger and be able to stand up", remarks Veronica.

Parkinson's disease causes muscle degeneration, impaired balance, falls, muscle and joint stiffness and loss of movements. For this study, the type of exercises which

were applied are the same that are used on the elderly who, hanging in a tilt, worked on articulatory mobility, gain of force and balance. "Considering the losses caused by the disease, there is a significant gain in terms of quality of life for a longer period of time."

The paper is not finished yet. At the end of 2015, 10 people aging up to 65 years old, who were diagnosed by doctors at the Hospital de Clínicas de Porto Alegre, joined the treatment and control groups. "Following these three investigations, we were able to attest that, after 16 sessions, we can get a significant gain in terms of muscles, functionality and balance", reports the creator of the Chordata Method.

PUCRS professionals

The equipment designed by Professor Veronica Frison is made of steel, springs, tissues, vests and belts. It became a reality after many studies that involved engineering and design, which included prototyping, testing and her own funding, came about due to her partnership with various companies related to material production. She's the one who puts together the equipment, designs the exercises and owns the

method's patents. She conducted training sessions with 9 PUCRS graduates from the Physiotherapy Program. Many of the students go to the institute to carry out research. Patients taking part in the tests are not charged any fees.

The equipment will lift their bodies as a whole. As the person does not need to lift their body to move, it will bring about more resistance in the muscles which gain force over time, as they will

be able to stand and walk. Veronica explains that the method can be applied to treat any injuries that bring about any form of paralysis, regardless of what originated it (stroke, accident, cancer, brain injury or disease) or the person's age. "Clinically speaking, the patient will be able to walk again, with some degree of difficulty, but they will be able to drive, work and go back to their normal life".

Veronica and her team: seven out of the nine physiotherapists earned their degrees at PUCRS





Specialization and extension programs address topics of influence on people's health

Religiosity and spirituality in clinical practice

Since 1984, spiritual well-being has been embraced by the UN as one of the definitions of health, along with physical, emotional and mental well-being. Similarly, religion plays a major role in Brazilian life, as almost 92% of the population claimed to believe in God, according to the 2010 census. Although these beliefs have been under scientific investigation for some decades, they are still underrepresented when it comes to clinical education. Just like doctors who need to monitor their patient's diet, it is necessary to identify how religiosity and spirituality can have an impact on physical or mental health. If a health-care professional does not address these aspects during their undergraduate training, how could they provide qualified services in this sense? If these are topics of major importance in people's lives to the point that they have an impact on

their health, why not conduct a scientific investigation on them?

Based on these questions, PUCRS will be offering two new programs: the specialization program in Religiosity and spirituality in clinical practice, to be offered entirely online, and the extension program Religious/spiritual experiences and anomalous phenomena: diagnosis, management and research. Both are connected to the undergraduate program in Psychology of the School of Humanities. The idea is to equip professionals to listen, understand and have good rapport with their patients, to address religiosity and spirituality the same way they address sexuality, food habits and physical activities. "Today we work on the concept of religious and spiritual coping, which acts as a way to face stressful situations. Positive coping is related to health and helps give significance to the experience one is going through, such

as a disease, by making patients feel calmer, and playing a role in communication, in the administration of the treatment prescribed and in the patient's confidence", says psychologist Leticia Alminhana, extension professor and specialization program founder.

Clinical practitioners, be them psychologists, psychiatrists, nurses or physiotherapists may witness patients reporting phenomena related to spirituality and we must know how to deal with that. By addressing those phenomena with the patient, health-care professionals strengthen their ties, thus opening up relationship channels, making the patient feel comfortable to report something that may have an impact on their health to the doctor. "This is valuable information but, unfortunately, overlooked and looked down upon. People are afraid to express themselves", claims Leticia.

Quality of life

Spirituality is a dimension of quality of life, something broad and comprehensive which is not related to any institution. One of the means to exercise it is through religiosity. It is the connection with religions, and is more linked to organizations, institutions, dogmas and rituals, which may include spirituality. "Religion is both a belief and a science. It brings principles which must be abided in our daily lives, and they are as legitimate as the psychology theories defended by professionals, however that relation is overlooked. Due to historical issues, religion is kept separate from science, and they are seen as opposing phenomena. However, some studies call for the importance of bringing them together", claims the coordinator of the specialization programs and extension, psychologist Leonardo Silva.

The idea of the specialization program is to conduct irreligious and non doctrinal studies, but which legitimize religious beliefs as any other human beliefs, bringing them together. "Spirituality is among our values, as an institution. We rely on a solid scientific basis in order to provide professional training, equipped with tools that will enable us to see spiritual and religious manifestations more clearly in order to expand our awareness, and then identify problems and have qualified professionals deal with them", ponders Silva. Religions, according to him, are the most concrete, ritualistic and symbolic base for people to exercise spirituality, which is their ability to transcend. "When we connect to the sacred in order to exercise spirituality, we may make use of religion. In this sense, it is important to study religion, too", he adds.

Anomalous experiences

There is a large number of experiences that can be considered spiritual/religious, such as mediumship, contact with extraterrestrial life, near death experiences, premonitory dreams, visions, communication with dead people, and out-of-body experiences. There is no such thing as a rule that defines them as either religious or spiritual. It depends on how people contextualize them. This extension program will provide deeper insights into those themes. "We often call anomalies the things we don't understand. It is now possible to question whether these are pathologies and whether they can be healthy. Then comes the role of positive and developmental psychology", says Letícia.

She stresses that a large number of anomalous experiences have been reported among the general population. Findings from research carried out in 2012, from the World Health Organization, in 52 countries, have shown that 12% of people have reported at least one anomalous experience, without a diagnostic of mental disorder. "In Brazil, 32% of population have reported anomalous experiences without being under the influence of drugs or sleeping", she points out.

“ We often call anomalies the things we don't understand. It is now possible to question whether these are pathologies and whether they can be healthy. Then comes the role of positive and developmental psychology.

Letícia Alminhana





Health models

When people can relate such experiences to a network of meanings, giving them context, we can associate health to well-being. Their ego will be preserved and patients will have the power of judgment. “People who wonder whether they are crazy are usually the healthiest ones. The main point of what I call maturity is the ability to do self criticism and assume responsibility instead of blaming the world and others. Overall, this shows a level of maturity of personality observed in less stressed people in relation to anomalous experiences”, reveals Letícia.

For Silva, human beings who have gone through introspective

anomalous experiences tend to be healthier than others because they have been able to access realities or levels of consciousness that others have not. “I wonder if these people, rather than being called crazy, could be considered healthier than us because they can do things we can’t. We have to study the phenomena deeply and the future might pave the way for that. Instead of prescribing antipsychotics, health care professionals will have this individual address these abilities more fully. Or rather, patients who have not experienced these phenomena may be instigated to pursue them”, suggests Silva.

He claims that health models

rather than disease models will be given attention. “We don’t have many health models in psychology, which is still very much influenced by neurotic and psychotic diseases. Not many theories instigate us to look at the resources, to focus on the quality of life, happiness and completeness. But there is a trend to label them as something healthy. And this has serious implications. If we study and understand how people can go this far, in the long run, we will be able to become professionals who promote them rather than ones who spot the dysfunction. This may become a major turning point, but we are still in an initial stage”, he claims.



PHOTOS: FREEIMAGES

Differential diagnosis

Among the topics addressed in the specialization program is differential diagnosis, which allows us to identify whether the experience reported could be treated as a pathology (when people are unresponsive, distressed and confused and need to be sent to a psychologist or psychiatrist), or could a possibly developed human potential.

“We have scientific justification for that. We are aware that consciousness is not to be found in the brain only. We have a long way to go to address this issue without giving up on a religious perspective”, assesses she.

According to Silva, when professor Letícia Alminhana arrived at PUCRS in 2015, we saw an opportunity to implement programs in this area, since she had completed her doctorate with the largest research group in the country, in Juiz de Fora (MG), the Brazilian Research Group in Spirituality and Health, which is now partners with our University. “This know how has enabled us to offer a scientific program and supply a market demand”, comments she.



PHOTO: BRUNO TORRES/SHIRAZ

Medicine and Language Arts together: Bartira (D), doctoral student Débora and Heloisa

Three in one

Doctoral research combines interdisciplinarity, innovation and internationalization

Doctoral research conducted in support of the Graduate Program in Medicine combines three important pillars of the University: internationalization, innovation and interdisciplinarity. The study, a partnership between the School of Medicine and the Language and Literature program, is intended for the improvement of the oral skills of the English language of PhD medical students relying on an app for full-time extra-class learning as an educational support.

The Graduate Program in Medicine has been awarded grade 7 by Capes, and internationalization has played a major role in this level of excellence. In this scenario, medical students must be prepared for scientifically correct and linguistically appropriate communication when attending congresses or meetings overseas. “We want to produce researchers who are able to establish partnerships with national and international peers in order to find collaborators and collect funding for

research. In this sense, being able to speak fluently and adequately, as a starting point for internationalization, has become crucial for establishing this connection”, says Bartira Costa, the advisor.

Doctoral student Débora Montenegro Pasin has a degree in Language Arts and Literature – Portuguese and English from PUCRS, is a specialist in translation and has been teaching languages for 20 years. In view of her background, she has been invited by Professor Bartira to join this interdisciplinary journey, under the co-advising of Professor Heloisa Delgado, from the Language and Literature program.

Three volunteers, out of more than 70 doctoral students at Famed, will be recruited to take part in the study. “We have used B1 level of the Common European Framework of Reference as a linguistic reference, and we aim at making them reach level B2, which is required by most universities overseas”, says Débora.

Volunteers will have 30 meetings in order to practice speaking, as part of the investigation. Débora will record the 100 most common expressions used by students and the context they are employed, thus putting together a customized terminology archive on the app. “This method can be applied to other areas of knowledge. The pronunciation of the expressions can be checked on the app, and this will facilitate the learning of the pronunciation of everyday words”, says Bartira.

The app will be designed in the second semester of 2016 by Carlos Santos, a Master’s degree student at the School of Computer Science, who is now in close contact with research groups at Fale. “We are planning on bringing the app to the Technology Transfer and making it available on Android and iOS. We want every unit to benefit from this innovation”, highlights Heloisa.

New Course

The participants’ development will be compared to the other doctoral students’, which may have achieved a similar linguistic level through other means. “We don’t think this is the only way, but as an educational institution we must provide it in a systematic way, without expecting that students achieve this level solely through their own efforts. We want to make progress in terms of the speaking ability, which is the most critical one when you want to prepare people to have international influence”, says Bartira.

If this method proves to be efficient, the idea is to offer a cross-sectional course for students in the Graduate Program in Medicine. Therefore, the course will address topics in technical and scientific academic English, focusing on speaking. Thus, graduate students from any program

in the University could join. “The idea is to replicate the study to serve as a model for other researchers”, ponders Heloisa.

Proof of reading proficiency in a foreign language is the sole language requirement for admission into a graduate program. By papers and articles throughout the course of their program, they get acquainted with many common expressions in their area of study, but maybe without having even heard them. The plan is to use the expressions in a contextualized and correct way with emphasis on pronunciation and speaking. “The project has got potential to be developed in any School, so that internationalization be at everyone’s reach through this tool. Our proposal is the pilot project”, says Bartira.



**CriaLab
makes use
of creativity
to enhance
products and
services**

A laboratory for you to put your creativity to test

Creative thinking is one of the trends of problem-solving. Upon celebrating its fifth anniversary, Tecnopuc's Creativity Laboratory (CriaLab), through a partnership with HP and Hewlett Packaging Enterprise, takes on a new role in a bustling scenario of innovation. Its coordinator and Business School professor, Luis Villwock, asserts that the laboratory's philosophy is still the same, but takes on a structure and personnel to broaden its scope of operation. "A larger environment and permanent team will enable the development of more projects."

The area located at Global Tecnopuc enables everyone to explore their creativity extensively. "However, CriaLab's main mission is not related to technology, nor the environment, but the people trained under the methodologies we work on". CriaLab is intended to encourage, stimulate, organize and provide support to teams for them to be disruptive.

Study of the **environment**

CriaLab is specialized in the construction and development of environments to trigger innovation and creativity. The new area consists of an environment that resembles a CriaLab 2.0 in which each area has its own purpose. Literature

research, internet research and searches conducted in similar places in Europe, Asia and the USA were the sources of inspiration for the current environment. The team is headed by Luis Villwock and seven other professionals.



CriaLab for students

Villwock will go on to say that CriaLab is not only a cool place for people to study and find inspiration. "It is a laboratory", as he defines it. The Open CriaLab will be available, on a pre-established schedule, for students to work together with the CriaLab team. Visits as well as introductory sessions on the environment and its methodologies will be conducted. CriaLab Cultural is being designed and will consist of open lectures and fun activities.

For those who want to join in as creators, they will just have to contact the laboratory, present their project and discuss it with the team. "At a meeting, we will decide whether it is an area of interest to us and if we have time and personnel to help". "Relevance, impact, creativity-relatedness, space and financial resources are the main criteria". Students will take part as grantees and collaborators for the demands. The activities are free of charge for students.



PHOTOS: BRUNO TODESCHINI

Laboratory
team headed
by Luis
Villwock

Multidisciplinary work

The laboratory addresses four distinct themes. The first one is education and deals with capacity-building, training sessions and workshops for the use of new tools and methodologies. The target audience consists of employees from Tecnopuc companies, but some of the activities are offered to the university community and also to the public in general.

The second one focuses on projects in partnership with companies. "We make use of more practical design, on the lookout for trends, as we do market, field and empathy research, among other things". Staff training is also delivered outside of CriLab's doors. "We can go to companies and work with people at their very workplace", explains he. Demands are submitted to Villwock, who will assess each one of them with the assistance of his team. The laboratory is open to any companies in the market. We have been currently working on projects with HP, Hewlett Packard Enterprise and DBServer.

Research brings together the group of CriLab researchers and addresses the

fundamentals that facilitate the triggering of creativity. The group comprises psychologists, anthropologists, linguists, philosophers and engineers. "We are focused on the phenomenon of creativity: how it happens in people and how we can strengthen it in order to bring new insights into our methodologies".

The last one is the hub, the idea of having a group of people working on a joint project. "When we talk about creativity, it is important to share information within a multidisciplinary group. It may include students, professors, consultants, companies, even High School students depending on the activity", says Villwock. The laboratory is responsible for conducting a creativity network management from social networks calling on people to pay their contributions to a certain study. These collaborators, upon having contact with the methodologies, are accredited and will be renamed CriLabers.

An example of a project designed at the hub was the revitalization of the Arroio Dilúvio, which relied on the support

of technical staff from the Municipal Governments of Porto Alegre and Viamão as well as UFRGS and PUCRS professors and researchers. CriLab was home to this project from the idea conceived by Villwock, who saw something similar in South Korea, with positive results. There can be a wide variety of themes: how to improve urban mobility, how people will communicate and travel, how to minimize the problem of public security, among others. "The connection will be dependent upon people's interests and spaces available in the market." External consultants can join in, depending on the issue.

Contact

- Global Tecnopuc – 2º level Torre Leonardo da Vinci
- Telephone: (51) 3353-6372
- crialab@pucrs.br
- www.facebook.com/crialab



The challenges of a Catholic university

The president of PUC-Chile, Ignacio Sanchez, talks about the actions that have earned recognition to his university in this continent

The Pontificia Universidad Católica de Chile (PUC Chile) has developed has achieved a prominent position in Latin America. In 2014, it topped the QS Quacquarelli Symonds ranking as one of the best higher education institutions in the region. The ranking shows the 300 best Latin American universities based on indicators such as academic reputation of international research and the job market, the relationship between students and the university, citations in research, ratio of international students and international teaching faculty. Ignacio Sanchez, a medical doctor, has been the president of PUC Chile since 2010. He came to PUCRS in July, for the celebration of the Champagnat Day, for a conference on the Identity of Catholic universities. In an exclusive interview, he mentioned the challenges faced by Catholic universities and their operation, which are founded on strict, permanent and continuous work involving the entire academic community; drawing human talent of excellence in every dimension: students, professors, staff; and the pursue of international qualification.

What is the main challenge Catholic universities face today?

One of the main challenges lies in the permanent connection which must be established between reason and faith, and which must gain momentum. Hence, it is necessary to combine the insights arising from each area of knowledge with the insights we gain from Theology, which is where its real significance comes from. This is not easy because it makes us abandon our comfort zones so that we can establish close connections with students who make use of other perspectives and languages in order to address similar phenomena. This challenge is a sign of the development of a university community.

Is quality a permanent challenge?

Yes. And one cannot conceive a Catholic university if it is not constantly seeking excellence in order to excel and transcend. On the other hand, we have to be aware of the commitment we have towards the development of professionals who are not only competent in their areas of expertise, but are also aligned with our identity. Our alumni are recognized as individuals who are fully qualified, as they are guided by Christian values and who appreciate the concept of family, who value ethics, who have comprehensive culture, who have critical and propositional attitude, who have aptitude for the common good and who are aware of sustainability in view of inclusive beliefs and attitude.

What is the real identity of a Catholic institution? Are we going through a crisis?

The real identity is not only what

makes us different, but also what inspires us. And, in this sense, this identity, this inspiration, is granted by the Ex Corde Ecclesiae Apostolic Constitution, which defines it as “an academic community which, strictly and critically contributes to the safeguard and development of human dignity and of the cultural heritage through research, teaching and several services offered for local, national and international communities”.

How does that relate to PUC Chile?

At PUC Chile, this relates to the construction of a community which, adopting freedom of teaching, contributes to the generation, dissemination and expansion of universal knowledge and, in particular, of each area, as well as the scientific and professional development of the youth, through research, generation of knowledge and undergraduate and graduate studies. This can be accomplished in view of its own identity and respect to the dignity of people. In moments of crisis, Catholic universities face a permanent challenge to be connected with the world, in view of the challenges our society poses us. The university, in Catholic terms, must be comprehensive and inclusive. It must face the real problems and provide solutions with a sense of reality, warmth, always keeping its fundamentals in mind: the New Testament, the teachings of Jesus Christ that we have to enjoy and disseminate.

What are the main strategies PUC Chile will make use of in order to achieve a top position in Latin America?

Our Development Plan, which has



In moments of crisis, Catholic universities face a permanent challenge to be connected with the world, with the challenges our society poses us. The university, in Catholic terms, must be comprehensive and inclusive.



PHOTOS: BRUNO TODESCHINI

long been based on strict, permanent and constant work and involves the entire university community. The key for a high-quality university is to attract human talent of excellence: good students, qualified professors, internationally educated, and a professional and administrative staff highly identified with the institutional mission. This constant and painstaking work allows us to be part of recognized international rankings and lists, thus consolidating the international prestige of the university. When it comes to the strategic plan, with emphasis on teaching and research, we can add internationalization and interdisciplinarity, which will allow us to conduct actions of excellence, propelling us to an international level.

What is the importance of internationalization for higher education institutions?

As for PUC Chile, internationalization is directly connected to research development. This has consequences on new faculty hires, on post-doctoral research and on attracting doctoral students, not only from our country, but from the world over. Although more than half of our publications are jointly conducted with international universities, we can still take one step further. Something similar occurs with exchange programs. Today we are a leading university in our country concerning the number of undergraduate exchanges, both in and out. This cooperative work with the best universities, as well as with the increased popularity of PUC Chile in international

rankings, sets up a solid base for us to establish broader cooperative relations, aiming to create inter-institutional research groups, with access to international funds and doctoral exchange programs. For example, students who begin their program at PUC Chile, go on an exchange for a year and come back to work on their dissertation with us. Similarly, we are primarily involved with



The key for a high-quality university is to attract human talent of excellence: good students, qualified professors internationally educated, and a professional and administrative staff highly identified with the institutional mission.

hiring international-level professors to bring experience and talent from several universities all over the world. Currently, 15% of our teaching staff is comprised of international professors. This has greatly enriched our educational project.

How does research impact on quality?

Research and knowledge creation are

the grounds for a high-quality university as it can contribute to society. Research is one the main activities within a university complex such as ours and knowledge creation must encourage growth and have a stronger impact on our scientific and artistic production. Consequently, we must change our relation to different areas within our institution, by addressing problems of our society and of our country from a collaborative and interdisciplinary point of view. All this has brought in a new corporate culture, which results in higher quality of knowledge generated and the relations between students and professors, as well as the public and private assessment of the contribution of what is created at the university. Lastly, it is important to note that a key element to the development of research is the internationalization of universities.

What actions must a university undertake in order to increase academic productivity?

Academic productivity is encouraged by means of constant teaching and research as well as ties with the society. This must be evidenced in faculty innovation, projects and publications in different areas of knowledge and expression of community, with the necessary connections relating us to the needs of the country. Academic career, teacher encouragement, promotion and recognition of students will enable the development and encouragement in order to reach the proposed goals.



Open do to the world

PHOTO: SHUTTERSTOCK

What pops up into your mind when you hear about internationalization? Scholarships for universities in several countries, renowned worldwide researchers, courses in English, seminars delivered by specialists from several nations, courses and lectures featuring global topics, the Buddy Program from Academic Mobility?

Actually, it encompasses a lot more. Exhibits at the Museum of Science and Technology held through partnerships with international organizations, the *Festa das Nações*, the presentations by the Philharmonic Orchestra featuring special guests from overseas, the international career marathon offered by the Career's Office, which also relies on a program geared towards international experiences are also features of internationalization. There's much more to it, though! A technology park, a reference in Latin America, which relies on international cooperations, internal and external communication actions on international activities, inbound and outbound mobility students and their stories as well as visits made by representatives from worldwide universities. Internationalization accounts for all this multiculturalism, experience exchange and relationships.

An environment open to the world, reaching out to different peoples, with distinct thoughts and cultures, with more tolerance and flexibility, enables cross-sectional, multiprofessional, multicultural and even skype conferences and group work. Internationalization means much more than crossing physical borders for living in other countries.

Then Dean of International Affairs, Rosemary Shinkai, points out that PUCRS embraces a great deal of these actions through activities and events, international professors, classes and lectures addressing international topics, which make it possible for everyone to have global experiences, especially those who have not had a chance to go an exchange.

Today PUCRS relies on 333 existing agreements with 217 institutions in 36 countries. "The process of internationalization in an institution willing to produce not only a professional but a world citizen is essential, and should have implications in teaching as well as in research, extension and administration, by means of exchanges with international partners, by implementing good practices and, most importantly, by introducing the concept of globalization into the campus", remarks Rosemary.

PUCRS promotes internationalization on campus

ors



New possibilities

In 2015, the Academic Mobility Office implemented a series of actions that enlarged the possibilities of inbound and outbound exchanges. Now, international students can also come to PUCRS to do internships. For three months, Montserrat Quesada Rojas did an internship at the School of Medicine, dealing mostly with anesthesiology and urology. As a senior student in the Medicine program of the Escuela Nacional de Medicina of the Instituto Tecnológico de Monterrey (Mexico), she chose Brazil because she wanted to learn about the health system of a large country.

Montserrat, who had already finished her degree, told us that she learned a lot

of things she had not yet seen in Mexico, such as how to perform operations and treat certain kinds of patients. During her stay, the 24-year old student rented a room with a host family, living with a Brazilian couple, a Japanese woman, a Swedish woman and a dog. "All of them were very kind to me. They would explain to me how to get to places or would even take me there,

Montserrat, a Mexican student, came to PUCRS as an exchange student to learn about the Health System in Brazil

they would teach me words in Portuguese, take me out to lunch, would be concerned about the progress of my learning and whether I understood why a certain kind of treatment had been chosen", remarks she.

PHOTO: CAMILA CUNHA





Courses in English

Offering courses in English is among the actions of curriculum internationalization at PUCRS. The following schools currently rely on courses in English: Architecture and Urbanism, Communication, Law School, Engineering, Pharmacy, Nutrition and Physiotherapy, Computer Science, Letters, Business School, as well as the Geography and Social Work programs, of the School of Humanities.

The course on Fundamentals of Digital Entrepreneurship is being offered for the third time and promotes a group dynamics between PUCRS' and international students, both at the undergraduate and the graduate level. Classes are delivered in groups, which will always include an international student, thus making English the language of

interaction. We need to work on the idea of a digital product and validate it to potential clients. So, everyone is expected to tour around the campus and interact with the community.

"In addition to the opportunity to speak English, we can exchange our cultures. In such a globalized world, we need to learn an additional language. It makes a difference in the market", remarks Professor Rafael Matone Chanin, from the School of Computer Science.



PHOTO: BRUNO TODESCHINI

PUCRS' and international students learning the language in a more dynamic way

PHOTOS: CAMILA CUNHA



Spanish student Victoria Llano (L) and PR student Raquel Bins

Buddy Program

Another action of internationalization around the Campus is the Buddy Program. The university encourages PUCRS students, both at the undergraduate and at the graduate level to take part as volunteers assisting international students during their stay at the university. Experience and culture exchanges are enriching for both and may result in close friendships. Victoria Herrá Llano came from Spain in 2015/2 to do a one-year exchange in the Advertising and Public Relations Program. She says she likes the University very much, that people are 'tri legal' and that she was given a very warm welcome by Raquel Bins, a buddy Public Relations student. "She is the best.

We did some courses together and that has helped me a lot. In addition to that, she gave me some general tips about the city and PUCRS. We became close friends and I invited Raquel to come visit me in Spain," says she.

Raquel was very helpful in dealing with bureaucratic issues related to the exchange as well as cultural and language adaptation, for example, explained what CPF, RU and TRI stand for. Victoria learned a lot, taught a lot, and will commend her friend. "She has changed my life. I have a different look to everything that is related to my training and international issues related to my program and professions".

The cherry of the pie

Among the many activities conducted by the Careers Office, there are those geared towards students, both Brazilian and international ones, who want to pursue an international career. When a PUCRS student is on an exchange, he or she will rely on our remote support. "We have a list of companies that frequently hire Brazilians. We recommend they apply for the ones offering postings in their area. If they are selected for an interview, we'll advise them through skype. We'll also adapt their resumé and LinkedIn profile to the standards required by the country in both languages", remarks Rafaela Bello.

Similarly, Mobility offers career counselling sessions to international students at PUCRS, advising them to adapt their resumé to the Brazilian context, conducting interview preparation sessions and mapping out some companies. Earlier

this year, Rafaela advised more than 17 international students." The cherry of the pie are the international internships. We rely on a strong partnership with Tecnopuc and its companies. Able Center has interviewed three students at two stages of the selection process. Toth Technologia is selecting three students".

US student Yashiel Torres left his University in Orlando where he was going to the Mechanical Engineering School, to study at our School of Engineering for one year, in 2015. In addition to the classes, he did undergraduate research and was an intern at Dell. "We did the mediation with the company and

he earned very positive results in his career. I've also advised him on how to get an undergraduate research grant. We expect that international students have not only an academic experience, but also a market experience", says Rafaela.

PHOTO: PERSONAL ARCHIVE



Yashiel Torres left Orlando to study Mechanical Engineering

International connections

At the Center for Higher Education, students from the Graduate Program in Education (PPGEdu) have joined the seminar *International Connections*, as they report their post-doctoral internship experiences overseas and international students tell stories about their countries. Another moment they can exchange information is during the meetings carried out every month with students. "This is how we can build a culture of internationalization. Every exchange student becomes an institutional relationship and an open door for other students and professors", remarks Isabel Carvalho, the program's coordinator.

This year, PPGEdu has implemented changes in the process of admission in order to receive international students. For the first time, the exam was held in the candidate's home country, as professors from local universities were selected to invigilate the exam sitting, scan a copy of it and send it by email. Interviews were conducted via skype. Chinese student Luoyuan Liu (Aida, in Portuguese) joined this type of selection, passed it and is working on her Master's. "When I was in the last year of the Portuguese/English Teaching Program, one

Master's degree student: Luoyuan Liu: first time outside of China



of my Brazilian professors, Amilcar Bettega, a local writer and a PhD from PUCRS, recommended PUCRS for it has received a very high grade in the area of Education by Capes. I applied for it and went through every stage. With the use of technology, this process is made easier and communication is expanded".

Aida, who has been in Brazil since March, is having her first experience outside of China. In her opinion, this experience will be essential for her to become a citizen of the world, capable of adapting to a new environment and living in today's global society. "I want to bring the culture and the voice of today's youth. I intend to return to China having deep knowledge of Brazil and help the peoples from both countries to better understand one another, making a Chinese-Brazilian friendship stronger and more solid".

Arrivals and Departures

Undergraduate, graduate and faculty exchanges are one of the pillars of the internationalization of education. It enables students to acquire technical competences that will help them thrive in the job market, such as double majors, second language competences, insertion into other cultures and the understanding of different realities. "Nothing else can be more valuable to a professional's thorough development such as the development of autonomy as individuals learn to respect differences, improve communication and get by in another language in distinct situations", says Flávia Thiesen, Academic Mobility coordinator.

Luciele Comunello began her PhD in Education in 2013 and had planned to conduct part of her research overseas. In April 2015, she arrived in Scotland to stay at St. Andrews for one year, as she researched Ecovila Findhorn. Popular among the new age world, the community is a reference in the quest for a more sustainable world, with minor environmental impact. The opportunity came out of a partnership between the Interdisciplinary and Inter-Institutional Study Group Sobrenaturezas, headed by Professor Isabel Carvalho, Luciele's advisor, along with Professor Timm Ingold, from the University of Aberdeen.

"It was from the works conducted by this professor that I met Professor Christina Toren, my advisor at the University of St. Andrews. She is a reference in Anthropology and deals with topics related to learning", according to Luciele.

Pascal Thorbjörn Schmidt left the University of Bonn, Germany, in 2015 to come to PUCRS for one year. The Social Sciences and Language Arts student wants to contribute to intercultural communication and experience a new academic environment. "It makes me think a lot about cosmopolitanism. We're all children of God, growing in different countries, in the most diverse cultures and religions, speaking distinct languages, but actually there's only one humanity".

Last semester, the 22-year old student joined a volunteer project at the Pastoral and Solidarity Center. He visited the *Pequena Casa da Criança*, where he taught Spanish. "It's been a particularly

beautiful and inspiring experience to get to know all those kids, most of them from vulnerable families, but who seemed to be willing to change the world with their smiles".

PHOTO: PERSONAL ARCHIVE



Luciele Comunello worked on her PhD in Scotland

PHOTO: BRUNO TODESCHINI



Pascal Schmidt came from Germany to study Social Sciences



PUCRS has a new president

The reinforcement of the Marist identity and the promotion of interdisciplinarity are the current priorities

Over the course of three decades, PUCRS' stellar growth has made it one of the most important universities in Brazil. Not only it is open to the world, as it is well represented across the globe by its professors and students. Cutting-edge research with large impact on society is carried out at the university. Its graduates are equipped with the necessary skills to do business and make a difference. What should we expect from such an Institution of excellence in the coming years? To continue growing, but also to look at itself internally. Grandeur calls for a careful look at details. Its comprehensive and complex infrastructure as well as its quality are a role model to be followed. What makes it different? Who are the students and staff behind its success? Over the next years, under the term of Br. Evilázio Teixeira and professor Jaderson Costa da Costa, PUCRS will be looking at itself and reinforcing its marist identity.

Br. Joaquim Clotet's 12-year term as president has earned the University an entrepreneurial position and international recognition. Encouragement to innovation, academic mobility and partnerships have earned PUCRS a top position in higher

education rankings all over the planet. A priority from now on will be to continue with the implementation of the new administrative framework, thus making it more agile and fostering interdisciplinary work. The gradual fusion of 22 academic departments will give rise to 8 schools. The School of Humanities was the first to be implemented. In 2017, three other Schools will be implemented: Business, Law and Medicine. This process will be completed by 2018.

Br. Evilázio Teixeira, PUCRS' newly announced president, claims that his mission is to serve the church and the university with the challenge of keeping the legacy of Marcelino Champagnat, the founder of the Marist Institute, based on the concept of family and simplicity. "I love when people say: 'PUCRS is our home'. This means we have a common cause and we can make a difference", he claims. Both the president, and the vice-president, Jaderson da Costa, will be taking office on Dec 9.

Br. Evilázio has completed three Bachelor's degrees (Theology, Philosophy and Law), two Teaching degrees, two Master's degrees and two Doctorates (one in Theology and another in Philosophy,

completed in Italy), as well as courses on university management, an internship in Canada and, more recently, a course on leadership and business from the University of Georgetown (Washington, USA). As for his administrative character, he claims he will be very committed to his job and considerate to others. He has been at PUCRS for two decades. He served as vice-president during the term of Br. Joaquim Clotet.

Neurologist Jaderson Costa da Costa, the new vice president, joined PUCRS in 1973 to help professor Roberto Guerra Santiago implement the course of Neurology at the School of Medicine as he was still a resident in that area. In 1978, he went to the University of Harvard (USA) to continue his studies and met many renowned scientists. He has been the head of the Neurology Service at São Lucas Hospital since the 1980s, a feat which has made it a national and international reference. After that, he served as the first director of the Institute of Biomedical Research. And lastly, he has been the head of the Brain Institute (InsCer) since 2012, an institute he has helped design and implement.



PHOTO: BRUNO TODESCHINI

The new president invites the community to embrace a common cause

“We must reinforce our identity”

Check out the plans of the new president, Br. Evilázio Teixeira, for the future of the institution.

What is the legacy of Br. Clotet?

I've worked with Br. Joaquim Clotet throughout these 12 years. We shared a common mission in the Marist Institute. He is leaving us a historical legacy. During his term, PUCRS took a giant leap. Every time prominent figures in sciences, politics, business and several other areas visit us, they come out impressed by the institution. The president promotes PUCRS internationally and brings the world to the university. Another aspect to mention is entrepreneurship and innovation. We have also been concerned with excellence, especially in research – which has stepped up dramatically. The university enjoys a top position in national rankings and is doing a very good job in Latin America and all over the world.

What are your priorities?

My first priority is to continue with the ongoing projects stated in the 2016-2022 strategic plan and finish implementing and consolidate the new academic and organizational structure of the management and governance model. We need to improve and strive for excellence in all of our actions. Another important issue to be concerned about in view of the position we have reached in such a globalized world is

internationalization. It is equally important to address innovation and development, which are the foundations of our strategic plan for the coming years. Knowledge must have an impact on society. In order for us to accomplish all that, we need economic and financial integrity and solidity.

What's your other priority?

It is about the values, soul and mission of the institution. Our world view finds its inspiration in the humanist Christian tradition. To illustrate that, we can mention the earliest inspiration of founder Marcelino Champagnat, which originated the Marist

charisma, aiming for a commitment towards a comprehensive and civic development. Values such as loving your work, feelings of belonging and, obviously, one which not only offers technical and professional development, but also a sense of life and commitment to the construction of a better world, will make the University stand out.

How will the fusion of programs and structures reflect upon interdisciplinarity?

This work relates to a study of scenarios observed all over the world which has been implemented by the best universities. The big question is: what can we do to ensure that the institution keeps going and consolidates its excellence? Throughout three years, we were aware that the remodeling of PUCRS' structure does not have implications only on the administrative framework, but also to the academic realm, as we address every field of knowledge and provide a more comprehensive training to students.

What legacy do you want to leave?

This is such a complex and profound question. I would like to work on behalf of the church and the institution. I must ensure PUCRS fulfill its mission. In view of the new scenarios, I seek insight. When I meditate, I ask God for protection and illumination. I find inspiration in Jesus of Nazareth and in his leadership model: a mixture of firmness and tenderness, closeness and justice.

Producing good professionals wouldn't be enough for our university. We also want to prepare civically conscious individuals for a better society. We need to restore the real meaning of the word community in the sense of belonging and engagement.



Envisioning the future

**Br. Evilázio Teixeira,
President of PUCRS**



PHOTO: BRUNO TODESCHINI

The scenario of the current Society of Knowledge presents us new challenges for Higher Education. In this regard, we have developed the University's new strategic plan for 2016-2022, which is aligned, with the actions of the Província Marista Brasil Sul-Amazônia.

We are going to have a lot of work over the next few years and we count on the participation and commitment of the university community in the construction and implementation of specific actions in different Schools, which are both essential for us to achieve the proposed goals.

The Project for Remodeling the Organizational Structure and Management and Governance Model (Reorgg) comprises 26 projects that will the University's activities to be managed more effectively. This project aims to bring the different fields of knowledge together focusing on interdisciplinary work, thus maximizing the competences of our leaders, professors, researchers and administrative staff.

We are motivated to carry out this project due to the following aspects: 1) Meeting the goals of the Mission – ensuring the institutional requirements for continuously meeting its Mission in

We are going to have a lot of work over the next few years and we count on the participation and commitment of the university community in the construction and implementation of specific actions in different Schools, both essential for us to achieve the proposed goals

an environment of transformation, in the 21st Century, thus initiating the necessary process of renovation to face the new demands of our society; 2) Achieving Academic Excellence – by implementing a new organizational structure and a new management and governance model at the University, intended to support the continuous quest for academic excellence from interdisciplinarity, innovation and internationalization; 3) Envisioning the future – by creating conditions for the

consolidation of PUCRS as an internationally recognized institution of teaching and research, as it enjoys a leading position among the most important Higher Education institutions in Brazil and all over the world.

Therefore, the changes proposed are very significant, due to the relevant improvements made for the academic community, such as: the identification of opportunities for the offer of new services; institutional interfaces with society in order to prioritize our goals; improvement of organizational structures; agility and quality in decision-making; creation of management processes for the gain of information and autonomy of decision for managers; maximization of the competences of professors and administrative staff.

The activities of the first School, namely the School of Humanities, have already begun. The School of Medicine, the Law School, and the Business School will be implemented throughout 2017. The remaining Schools will be implemented gradually. Everyone's commitment in this journey is important, for our success will depend on each one of us.



THE GREATEST IDEIAS NEED
A INTERCONNECTED CAMPUS
TO FIT EACH OTHER.

New ideas that are conceived, developed and renovated every day have their roots in PUCRS' hallways, classrooms and laboratories. This is the strength of a campus that embraces different areas of knowledge: the possibility of meeting different people, projects and dreams. This is how we see the future.



PUCRS