Newsletter of the Centre for Genomic Regulation
Life @ CRG
Issue 8
October 2014

A RESOUNDING SUCCESS!

Around 20,000 people have visited the exhibition "Tree of Life. The complexity of life: from the cell to the living organism".

"When we suggested holding the exhibition, we didn't think it would be so well received" confesses Glòria Lligadas, head of communications at the CRG. "It is easy to think that science doesn't interest society but this exhibition, just like the rest of activities we organise, shows us that society really wants to know what the latest scientific advances are, as long as they are explained properly", she adds.

The **Tree of Life** exhibition was open to the public from September 4 to October 12 at Palau Robert in Barcelona. In this period almost 20,000 people visited, and there have been 14 workshops organised for school groups, the general public and teachers. A science cafe was also held where the different ways to interpret and obtain scientific images were discussed. A really hot topic, because interestingly the cafe took place on the same day three scientists, whose contributions have made super-resolution microscopy possible, won the Nobel prize.

Palau Robert is a facility belonging to the Catalan government that helps people get to know Catalonia through exhibitions, publications and other events. The exhibitions presented here deal with subjects related to science, culture, business, and other things. Santi Rifà, head of the publicity and exhibitions service at Palau Robert, commented that "The **Tree of Life** exhibition has been a surprise. It has been really interesting for us to see the interest expressed by the very diverse public. It is clear that the images in this display, and particularly the explanations accompanying them, have been a great tool for showing people part of the research that takes place in our country. I must acknowledge the great work of the CRG and the good eye that chose these microscope images".

The exhibition was made possible thanks to the support of Fundació Banc Sabadell and the loan of equipment by Leica and Hewlett-Packard. <

RESEARCH-ORIENTED MANAGEMENT AREAS PASS AN INTERNATIONAL EVALUATION

In the same way that the CRG research groups are evaluated every five years, the four research-oriented management areas have also been evaluated this summer by an international panel. It is the first time a research institute has evaluated these areas and many institutes are aware of this new initiative and looking to see whether they should implement it too. The areas evaluated at the CRG were the International and Scientific Affairs Office, the Grants and Academic Management department, the Technology Transfer department, and the Communications, PR and Sponsorship department.

An international panel was created for this evaluation, chaired by Prof. Veronica van Heyningen, also chair of the Scientific Advisory Board of the CRG, and composed of experts in the respective fields from leading research institutes throughout Europe. Their main conclusions show us that we are on the right track but there are still certain aspects that can be improved.

Congratulations to these four areas for their success and a positive evaluation! <

EDITORIAL

Timo Zimmermann
Head of the Advanced Light Microscopy Unit

SEEING IS BELIEVING? THE VALUE OF IMAGES IN BIOLOGICAL RESEARCH

In a biomedical research institute like the CRG, microscopy is one of the fundamental tools of most research lines and thousands of images and datasets are produced each year. In addition to the scientific value and their contribution to the output of publications, some of these pictures also have an aesthetic aspect that is recognised in the annual CRG image contest, which has been held over the last few years, and by the images exhibited along the walls of our corridors and in the online image gallery on our website.

The recent exhibition "Tree of Life", organised by the CRG in Barcelona's Palau Robert, presented some of this work to the general public. The exhibition lasted several weeks and was a resounding success both in numbers of visitors (almost 20,000) and because of the participation in the associated workshops and science café.

Images are one of the most direct ways to present our research, both to an expert audience, to illustrate a specific result, and to the general public as an introduction to our work. As one of the guest speakers at the science café it was an interesting experience to explore, together with a general audience, the various aspects of biological images. In a fortuitous coincidence the event took place on the day the Nobel prize for chemistry was announced for super-resolution microscopy. This allowed us to illustrate the scientific value of microscopic imaging and its very direct connection to quantitative results and the underlying numbers. But images are also one of the most complex forms of data as a property is not shown as an isolated result, but in its biological context. This includes its shape, size and position in relation to many other components. In this way, scientific images sometimes reveal aspects of beauty that appeal to artists. It was most gratifying to see the audience's keen interest in the different facets (quantification, complexity and art) which combine in a good scientific image. <

INSIDE

'LA CAIXA' FELLOWS RECEIVE THEIR DIPLOMA IN MADRID

The PhD students Hima Privanka Nadimpalli and Birgit Ritschka, who work in the Regulation of Protein Synthesis in Eukaryotes lab (coordinated by Fátima Gebauer) and the Mechanisms of Cancer and Ageing lab (coordinated by Bill Keyes) respectively, received their diploma on July 8 in Madrid.

The Obra Social "la Caixa" held the annual diploma ceremony for 1st year PhD students in CaixaForum, Madrid. 69 fellowships were awarded in the 2013 call. "La Caixa" fellowships are awarded for a period of 4 years and provide the students with a competitive salary and additional funding for expenses related to their particular scientific and academic activities. <

INSIDE

JOIN THE MATHS CLUB!

Juan José Fraire

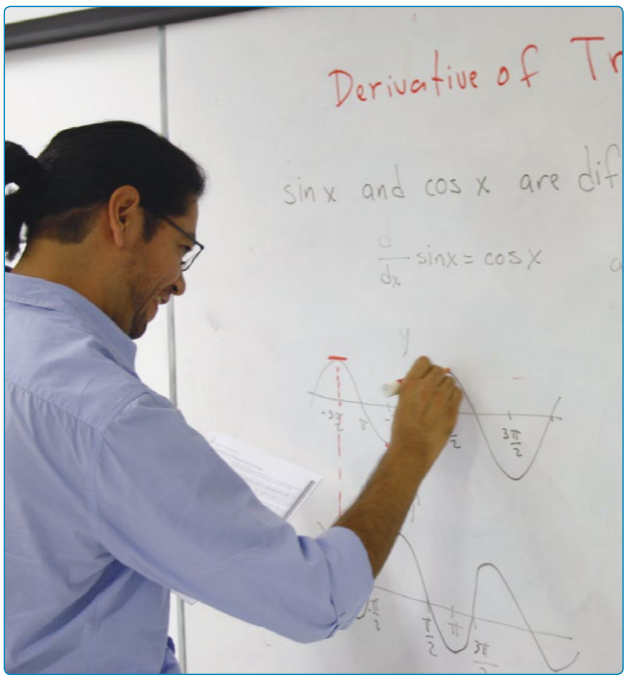
The Mathematics for Biologist's Club (or Maths Club) is a group of students and postdocs who meet regularly on Monday afternoons (at 4 pm) to review basic maths topics (with biological applications when possible). The goal is to achieve a basic understanding of maths that is useful in modern biology.

The initiative was started up about a year ago by a group of people in need of a common language to be able to actively collaborate in joint lab projects. Modern biology has turned into a highly interdisciplinary activity that has a greater impact when maths and physics are incorporated into it.

We are, therefore, training ourselves by studying with a book and presenting topics in an orderly manner. We decided to have a Maths Club (rather than a class) to make it fun and interactive, so participants take turns presenting. More importantly, there is no need to be an expert since there are others who help to explain the topic if something is not very clear.

As for me, I am a postdoc with a background in biology, and I have found this maths club to be very useful for increasing my understanding of the maths presented during seminars, data clubs and lab meetings.

The Maths Club is open to biologists who are strongly motivated to learn maths and to "patient" non-biologists who want to learn about the biological application of maths. The objective is to slowly train ourselves to better interact in interdisciplinary groups. <

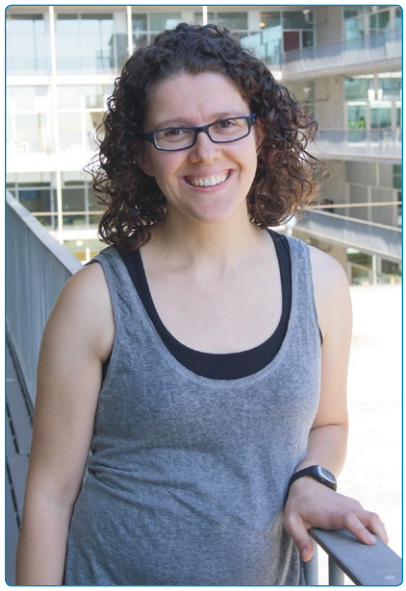


THANK YOU PROTEOMICS UNIT!

Maribel Merchan

I am a teacher at the Institut Bonanova and I give, among others, training classes in instrumental techniques in clinical diagnosis. This credit is perhaps one of the most difficult for students because it includes many different analytical techniques which are quite tricky. To keep up to date with the latest technology, have a real and practical vision of the usefulness and applicability of the techniques and obtain interesting material from a pedagogical point of view, the teachers at our training centre try to find courses in different labs or services related to the content we teach.

This September I was lucky enough to spend three days in the Proteomics Unit at the CRG and UPF. The experience was very positive in many different ways. The expert personnel in the unit welcomed me as if I was one of the team; I even went to a lab meeting. This gave me a better understanding how the unit works, how the work is organised, what kind of problems might arise and how to deal with them. I also saw and learned how to process samples according to type and what it is that you want to analyse. They showed me the different apparatus they have, their characteristics, differences and uses, and how they analyse the results. They gave me very personal treatment, always explaining everything so I could understand it, with clear diagrams on paper, or using the screens on the apparatus or the programmes that they use. They also allowed me to make a photographic and visual record of the material, apparatus and techniques so I can use them in my classes.



It was, then, an extremely interesting and gratifying experience, not only from a professional, but also from a personal point of view. Thank you very much! <

INSIDE

TRAIN YOUR MEMORY WITH THE NEW CRG APP

Scientific images from the CRG are now available via the app *"CRG Memory Game"*. This brings together scientific images with the aim of "playing" with them and sharing, not only the work that is done at the centre, but also the beauty and uniqueness of the images and the parallels and synergies between art and science.

The app is based on the classic matching pairs game and uses photos taken by CRG researchers. After playing, the users can access a description of each of the photos they have seen in the game.

"CRG Memory Game" is available for iOS and Android and you can download it for free. It has been made possible thanks to funding from the Spanish Foundation for Science and Technology of the Ministry of Economy and Competitiveness. <

BUILDING THE CRG ALUMNI COMMUNITY

The CRG Alumni Engagement Project has just been launched. The aim of this project is to establish a programme that will provide a focused and strategic approach to building a supportive and responsive alumni community. The approach will be outcome-driven, to clearly benefit the centre. The CRG is teaming up with NOYO Global Engagement for this project.

To develop this initiative successfully, we need your ideas and comments. Through a cross-section of the CRG community we will build this project from the bottom up. It will happen in two parts. The first will be an objective review of the potential for an ambitious alumni engagement programme. This review will come from interviews between the NOYO experts and members of the CRG community. The second part involves translating the phase one report into a practical strategy through co-creation workshops. Always with an eye on generating an engaging and participative project. <

IGNASI FINA AWARDS FOR PREVENTION STAFF AT THE PRBB CENTRES

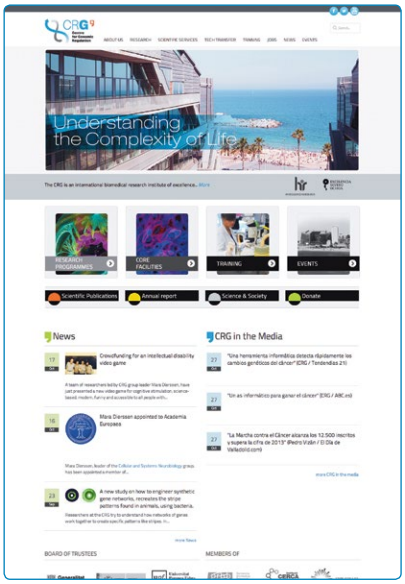
The technical prevention staff at the PRBB centres presented a joint project to this year's edition of the Ignasi Fina Awards, given by the City Council, based on the Prevention Workshops organised every year during the Open Day.

In commemoration of the 10th anniversary of this award, the organisation made a special mention of the best initiatives during this time. The prize-winning project "Information Model for integrating prevention in a building shared by several biomedical research institutions: from legislation to the lab bench", by the prevention group at the PRBB in the 2010 edition, is considered to be one of the four best works over the last 10 years. <

NEW IMAGE IS LAUNCHED ON THE WEBSITE

In order to adapt to new technologies and move forward with our corporate image, the CRG has changed the website image. The new CRG website allows you to access the content in a more visual and intuitive way, as well as making it easier to navigate from both computers and other devices, like mobiles and tablets.

We hope you like our new home page and, as always, remember that you can send your suggestions to: comunicacio@crg.eu <



FEATURING CRG

BIOINFORMATICS AND GENOMICS PROGRAMME

Roderic Guigó

Life is a computation. The unfolding of the instructions encoded in the genome is initiated by the computation, by the RNA polymerase of the primary RNA sequence from the DNA sequence, and its subsequent post-processing to messenger RNA (mRNA). The mRNA exported to the cytosol is again computed by the ribosome to produce the amino acid sequence of the proteins. This is not only a powerful metaphor; it is actually possible to build computers based on DNA, and DNA computing is an emerging field of research. While surveillance mechanisms exist, DNA computations are prone to errors, and, thus, the underlying code can evolve.

Generally, the overarching goal of the groups in the Bioinformatics and Genomics programme (BiG) is to understand the encoding of biological information in the genome sequence (i.e., the complex relationship between genomes and phenotypes), and how evolutionary forces have contributed to shaping this codification.

Guigo's group is interested in understanding the sequence of patterns that instructs the molecular pathway leading from the DNA to protein sequences. Tartaglia's group focuses on the mechanisms by which the outputs of this pathway (RNA and proteins) interact to confer functionality at the molecular and cellular level. Notredame's group develops basic alignment methods tailored to functional genomic domains exhibiting specific sequence conservation patterns. Kondrashov's group is interested in uncovering the very basic molecular events that govern the evolutionary processes. The Gabaldon group investigates how the evolution of these domains correlates with the evolution of encoded phenotypic traits. Finally, the Estivill and Ossowsky groups are interested in the phenotypic (medical) impact of the mutations that alter the DNA code. Estivill is particularly interested in rare and common diseases, while Ossowky is looks at the interplay between genetic and epigenetic factors that contribute to disease.

As computation is an increasingly important part of biology, the programme plays a central role in the overall research at the CRG, and more than 10% of the publications from the groups in BiG involve other groups at the CRG. <

A SHORT JOURNEY TO SOUTH AFRICA

Michela Bertero

Last year the CRG launched a pilot initiative for promoting researcher mobility together with Novartis and the Wits University in Johannesburg. This initiative allowed three PhD students from South Africa—Jackie, Nikki, and Kiashanee—to carry out their research projects in CRG labs for six months. The overall outcome was quite positive, at personal and scientific level. "I had great time, and I learned how to approach my project differently, with a broader genome-wide perspective" commented Kiashanee after finishing her fellowship.

We think it's very worthwhile to continue with this initiative and would like to expand to more researchers. To do this, I took the opportunity to visit few institutes, and hospitals in Johannesburg and Cape Town this last July.

What was clear is that several excellent universities and infrastructures are emerging in South Africa, boosting their research and innovation system. There is a strong focus on diseases that affect the African population (where HIV and tuberculosis, alone or in a deadly partnership, are still top killers). On the other hand, it is also evident there is still an important gap between advances in research and those in health care. My visit to the Chris Hani Baragwanath Hospital,

one of the largest in the world with more than 3,000 beds that serves exclusively poor populations, was a very emotional and difficult experience.

As a direct outcome of this trip, we have received numerous applications for the three fellowships that will be awarded in 2015. The ambition is now to launch the CRG-Novartis-Africa mobility programme to reach out to enthusiastic junior researchers in other countries in Africa, and we look forward to experiencing these exchanges along with the researchers. <

CURTIS KEITH
Chief Scientific Officer at Harvard University

"Funding from companies can, in some cases, actually support more risky research"

In the framework of the ETTBio European Project and the new training programme, CRG Star, we held last September the 1st CRG Bio Business School. This course aims to train researchers in technology transfer and related areas (entrepreneurship, patents, and bio-business). Here we present an interview to one of the lecturers as well as some impressions and comments from both organisers and participants:

Communications: From your experience, what could a Tech Transfer office offer to scientists in an institute like the CRG?

Curtis Keith: Sometimes, our role in the office consists of understanding the most effective way to commercialise research and technologies, in that way discoveries can get to patients more efficiently. Especially, in the case of developing new drugs or diagnostic tests, costs are too high, so bringing in industry, even before clinical development, is required to improve the chances of success.

C: Imagine I am not very interested in business…Why should I spend time with someone from the Tech Transfer office?

C.K.: One of the additional benefits that we bring to our faculty is helping them bring in additional funding for their research. Even if what they're doing seems to be far from having an application because it is at an early stage, it could be of interest to companies. We could maybe get industry-sponsored research, and bring in money into their labs anyway.

And in fact, in the US now, there's a sense that NIH funding has become very conservative and very conscious and risk averse, and that money from companies can, in some cases, actually support more risky research.

1st CRG Bio Business School sponsors:

biocat · ETTBio Effective Technology Transfer in Biotechnology · INTERREG IVC Innovation & Environment Regions of Europe Sharing Solutions · European Union European Regional Development Fund

C: When should I start thinking about translating our science into products, services or any other benefit for society?

C.K.: Usually, most of our researchers want to know right from the start whether or not there is a path to providing benefit. It doesn't necessarily mean that they are always focused on that but I don't see any disadvantage to starting at the very beginning. It could be done in a way that does not distract from the research focuses you have otherwise.

C: What is your daily routine in the Technology Transfer Office?

C.K.: I think the most exciting part of my job is that I get to go out and be in touch with excellent scientists and researchers doing cutting-edge and innovative research. The flip side of that is I get to balance it with the next stage. I go out and meet with investors, to try and see how you can benefit from commercialising and developing technologies based on that innovative research. And so I get to see the best of both worlds.

C: How did you develop your career path?

C.K.: Originally I was a scientist, an undergraduate student at Harvard doing research in an academic setting and then, during my PhD, I realised I was really interested in getting a little bit closer to the application and seeing how quickly you could start to translate research into medicine. So I ended up

founding a start up company with some other people from Harvard and I worked as the head of research at that company for 8 years. After 8 years I wanted a change. The company was going very well, I was very pleased with the experience and what I learnt, but I wanted to come back to Harvard to help start up companies and develop technologies there.

C: How do you think the Bio Business School can help scientists to identify and understand the business potential of their ideas?

C.K.: I think there are a couple of parts to this, one is to motivate and excite the students with the idea that it is possible to set up companies and that they can market their work and have a real interface.

The second part is really related to giving some understanding of what it is that industry really wants to see and how industry thinks about research in developing technologies and products. They have a certain way of understanding the market for technologies and analysing the risk of developing a technology's proof of concept.

C: How long does it take to build an entrepreneurial culture?

C.K.: The experience in the US is that it can certainly take decades for it really to happen. However, I think once it starts happening, it can be like a snowball - it can accelerate because when you start to have excellent research and institutions, companies begin to spend and investors come in, then larger companies want to join and see what's going on, it is a positive feedback cycle. So it can happen quickly once it kicks off.

Pablo Cironi
Organiser and head of the CRG Tech Transfer Office

"In the CRG´s Tech Transfer Office we are convinced of the importance of generating Business and Technology Transfer awareness in life science, not only to foster entrepreneurship but also to provide the scientific community with training in business knowledge in order to support scientists who wish to pursue careers outside academia. The success of this first edition of the BBS was due to a combination of different factors: the diversity of applicants, the variety of projects/ideas proposed, and the experience and quality of the international speakers. Our workshop had two particular aspects that were highlighted by both participants and speakers: the workshop format that included sessions discussing real projects and a round table with investors, which provided feedback for participants' projects, and which has motivated a series of follow up conversations. This first edition of the Bio Business School, sponsored by Interreg IVC, has been a complete success and we will definitely repeat it in the coming years."

Elias Bechara
Organizer and CRG Training Officer

"Among the CRG training activities, the Bio Business summer school was a great initiative that raised lots of interest among the CRG community. The participants had the opportunity to interact with excellent speakers and they all recommended that this workshop be repeated. It strongly reinforces the CRG's commitment to training and addresses a topic that often seems distant from basic research scientists. We are really proud to open the CRG up to new ways of doing things and proposals for truly transversal and multifaceted scientific training."

Salvador Capella
Participant and postdoc researcher at the CBS Fungal Biodiversity Centre in Utrecht

"I believe that combining lectures with time for working on a practical case is very good. Seeing how an idea develops, and how it unfolds in the business world from different points of view is great. We had the opportunity to listen to members of tech transfer offices, successful entrepreneurs and, also, the opportunity to get to know what is happening in Boston, one of the most entrepreneurial cities as far as the biotechnological sector is concerned. Finally, hearing feedback from investors is, in my opinion, an excellent experience, because it gives you the opportunity to know what type of questions would be asked in a real situation and, also, you see how to get them to focus on what you are presenting. The course has definitely been useful and I totally recommend it. The views of the world of science on business ideas are often very far from reality. I strongly believe that the Bio Business School is an ideal place to make this first contact with the business side." <

ALAN TURING AND FINGER FORMATION

Alan Turing, the British mathematician, is famous for a number of breakthroughs which altered the course of the 20th century. His contribution to mathematical biology is less famous but was no less profound. He discovered that a system with just 2 molecules could, at least in theory, create spotty or stripy patterns if they diffused and chemically interacted in just the right way.

A group or researchers from the Multicellular Systems Biology laboratory, led by ICREA research professor James Sharpe, has provided the long sought-for data confirming that fingers and toes are patterned by a Turing mechanism. The approach taken was that of systems biology – combining experimental work with computational modelling.

This result answers a long-standing question in the field, but has consequences that go beyond finger development. It addresses a more general debate on how the millions of cells in our bodies are able to dynamically arrange themselves into the correct 3D structures, for example in our kidneys, hearts and other organs. This work highlights the fact that local self-organising mechanisms may be much more important in organogenesis than previously thought.

Correctly understanding multicellular organisation is essential if we are to develop effective strategies for regenerative medicine, and one day possibly engineer replacement tissues for various organs. <

SEX MATTERS

In many species, males and females have different sex chromosomes. CRG researchers have been studying how cells try to compensate for this difference in chromosomal content so that both males and females maintain basic cell functionality and are not affected by duplication or loss of chromosomes.

Researcher Fátima Gebauer and her lab carried out their work on the fruit fly, *Drosophila melanogaster*. The scientists, in collaboration with other laboratories in Germany, have been studying a protein that interacts with an RNA fragment and forms a complex that is responsible for dosage compensation in sex chromosomes. "Studying this mechanism has allowed us to find out more about the UNR protein. We have been able to determine how UNR acts in relation to dosage compensation and we have also been able to describe a new kind of binding between proteins and RNA that will help us improve our knowledge of many other gene regulation mechanisms", explains Fátima Gebauer.

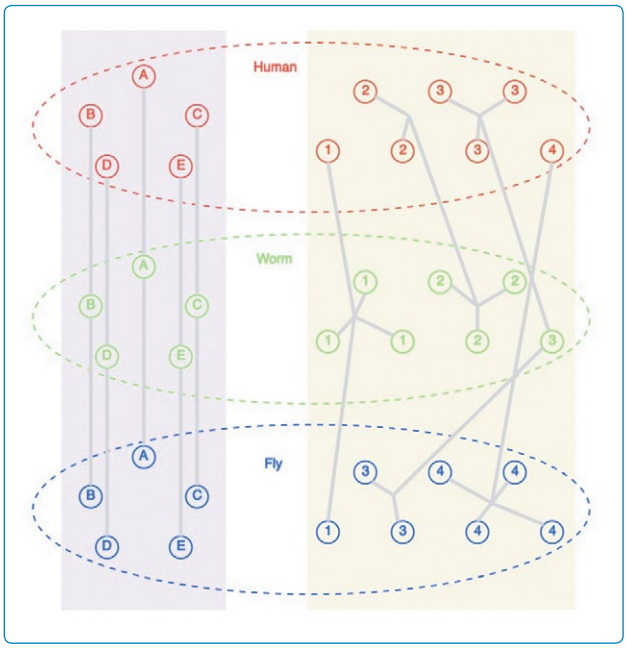
The discoveries have been published in two articles in the scientific journals *Nature* and *Nature Communications*. These two papers represent an important contribution to basic biomedical research. On the one hand, they have clarified a gene regulation mechanism, in this case, related to dosage compensation in the different sexes, and on the other, they have described a new form of binding between proteins and RNA fragments that offers a whole range of new possibilities for gene regulation. <

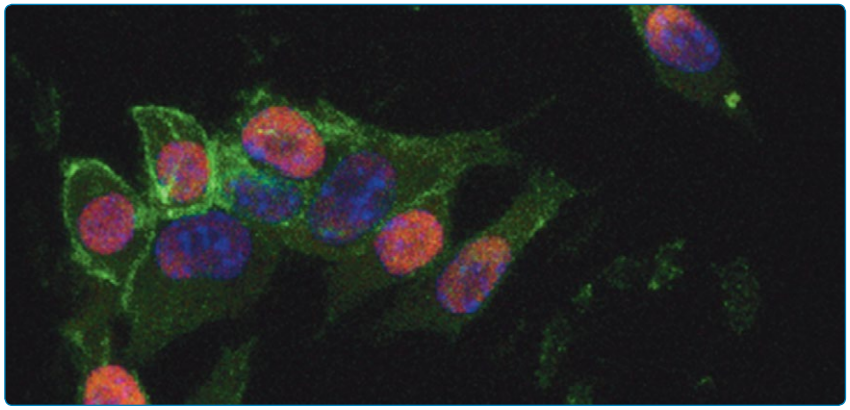
LOOKING ACROSS WORM, FLY AND HUMAN GENOMES

Genomes accumulate changes and mutations throughout their evolution. These changes have resulted in a huge diversity of species and traits. But animal cells, whether from a fly or a human, work similarly: they have common molecular mechanisms.

Based on this premise, an international consortium including CRG scientists has compared the transcriptome (the RNA complement of a specie's cell) from different animal species. They used data from two big research consortia: the Encyclopaedia of DNA Elements (ENCODE), which gathers information about human functional elements, and the Model Organism ENCODE (mod-ENCODE) which contains the corresponding information on flies and worms. As a result, they have determined sets of genes that are likely to work together, independently of the organism in which they are found, and must therefore be essential for the entire animal kingdom.

The project highlighted key sets of co-expressed genes that may be fundamental for animal cells. Scientists compared three very evolutionarily distant, yet well studied model organisms: the worm *C. elegans*, the fly *D. melanogaster* and the human *H. sapiens*. They found sets of genes that are co-expressed in each of the three species, all of them principally involved in development. The results were published on 28th August in the prestigious journal Nature. <





NEW PROTAGONIST IN CELL REPROGRAMMING DISCOVERED

The protein Nanog, a transcription factor, is the key to maintaining stem cells in a pluripotent state. CRG researchers in Pia Cosma's laboratory have been investigating the role of this protein, and have published an article in the prestigious journal *Cell Reports* where they reveal the mechanism whereby Nanog acts.

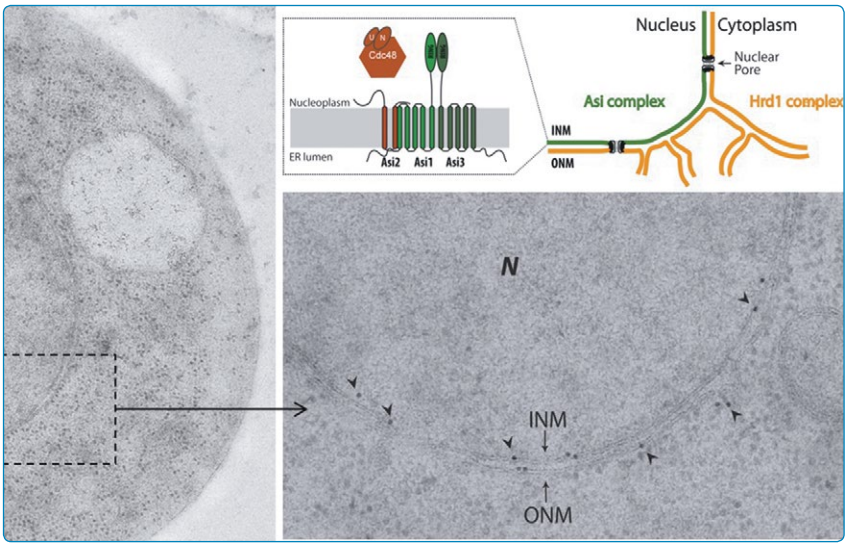
The scientists have discovered that Nanog involves other agents and they have been able to detail their dynamics. In particular, by studying another protein that is also involved in cell reprogramming (beta-catenin) they have been able to improve our knowledge of how Nanog works.

In order to understand and define parameters for the activity of both proteins, the researchers have developed a mathematical model that could explain this dynamic. The model could be useful for understanding the behaviour of these proteins in the cell both over time and in different situations.

The scientists want to understand the mechanisms that allow stem cells to either differentiate or remain pluripotent. There are also many current studies that seek to reverse this process, to enable already differentiated cells to be reprogrammed and become pluripotent. Knowing all the players in these processes is of vital importance for understanding how stem cells work and enabling progress in regenerative medicine.

The work has been made possible thanks to funding by the HFSP and the EC through an ERC Starting Grant. <

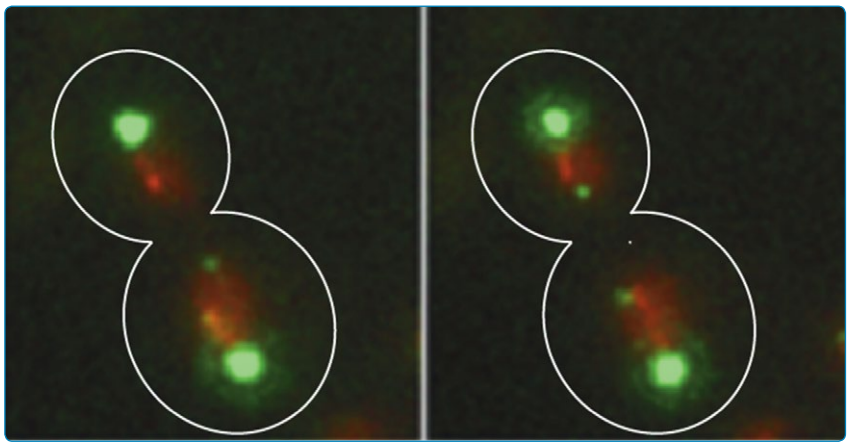
A NEW QUALITY CONTROL PATHWAY IN THE CELL



Proteins are important building blocks in our cells. They are involved in everything from structural to regulatory aspects in the cell. Proteins are constructed as linear molecules but they only become functional once they are folded into specific three-dimensional structures. Several factors, like mutation, stress and age, can interfere with this folding process and induce protein misfolding. Accumulated misfolded proteins are toxic so to prevent a build up, cells have developed quality control systems just like any other production chain or manufacturing process.

A team of CRG researchers has published a paper in *Science* describing a new quality control system in our cells. It is specific to the inner nuclear membrane, a specialised part of the endoplasmic reticulum (ER).

Ombretta Foresti, Victoria Rodríguez-Vaello and Pedro Carvalho, from the Organelle Biogenesis and Homeostasis laboratory describe the quality control system, which protects the nucleus by targeting foreign proteins that could enter by mistake. This could be particularly significant in non-dividing cells where the inner nuclear membrane is isolated from the rest of the ER for long periods of time. <



UNRAVELLING CELL DIVISION

At this very moment thousands of our body's cells are duplicating and dividing. This is the mechanism by which the body repairs damaged tissues and regenerates others like skin and hair. It involves a fairly complex process known as "mitosis", during which the cell duplicates its genetic material and separates it into two identical halves, which are then split apart. It is crucial that this process works well each and every time it takes place, as otherwise it could give rise to mutations that might trigger diseases such as cancer.

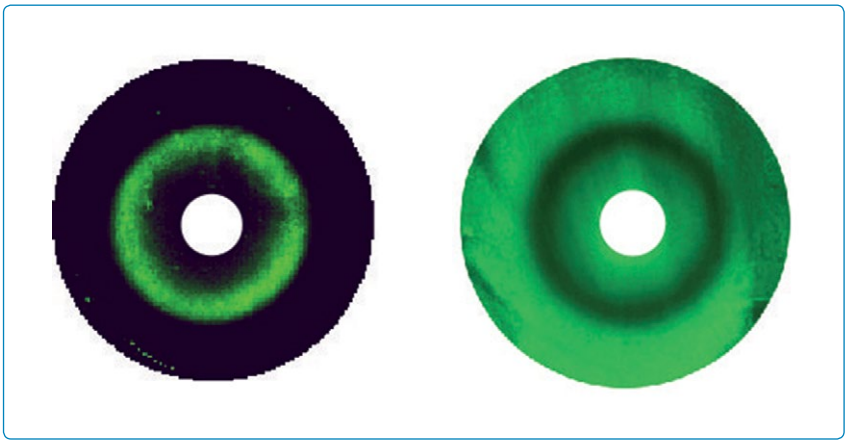
Work published in the *Journal of Cell Biology* and carried out by a team of CRG researchers led by Manuel Mendoza sheds new and revealing light on this complex mechanism. In a study using yeast, they have discovered that an enzyme known to be vital for chromosome separation, topoisomerase 2 (Topo 2), is active for much longer than was previously thought; they have also observed that chromosome length is decisive in determining the amount of time this protein works for.

According to the results of this study, long chromosomes need more time to be disentangled than short ones. And this untangling only occurs when the microtubules begin to stretch the chromosomes, in the period of mitosis known as 'anaphase'. Right up to this moment, Topo2 continues doing its job.

Understanding all the players in the precise mechanism of cell division helps us understand one of the most complex and repetitive processes in any organism. The correct functioning of cell division is the key to the survival of every cell and, by extension, of all living beings. <

SCIENCE @ CRG

A STUDY ON SYNTHETIC GENE NETWORK ENGINEERING RECREATES ANIMAL STRIPE PATTERNS



Pattern formation is essential in development. The central problem in pattern formation is how genetic information can be translated in a reliable manner to give spatial patters of cellular differentiation.

In a study published in *Nature Communications*, researchers from the EMBL/CRG Systems Biology Research Unit at the CRG, went beyond individual networks and explored both computational and synthetic mechanisms for a complete set of 3-node stripe-forming networks in E. coli. The approach combined experimental synthetic biology led by Mark Isalan, now Reader in Gene Network Engineering in the Department of Life Sciences at Imperial College London, with computational modelling led by James Sharpe, ICREA Research Professor and head of the Multicellular Systems Biology lab at the CRG.

It allowed the researchers to go one step further towards finding a deeper design principle for stripe formation. They identified a simpler, 2-node network that replicates the stripe-forming ability in its simplest form. They were successful in building this archetype of stripe forming networks and ultimately discovered that it can even display an "anti-stripe" phenotype. The system proves to be more efficient and powerful than building networks one-by-one. <

CRG & SOCIETY

SNAPPED UP!

The CRG school workshops were snapped up the morning they were announced. Only 18 minutes were needed to sell out all the 57 workshops for secondary school students. These workshops will take place this academic year, beginning in October and finishing in May.

In terms of statistics, we could say that there is a positive correlation between the number of activities we offer and the time in which they sell out. Although there are more activities year-after-year, there are more teachers that know about our programme and they are getting faster at booking. <

HIGH SCHOOL STUDENTS SPEND 3 WEEKS DOING SCIENCE

41 students, from more than 25 institutes from around Catalonia, came to the CRG to try out research into genetics and molecular biology. CRG investigators and outreach staff conducted the activities.

The CRG Science & Society programme organises and develops a wide array of outreach activities for the general public, and it also collaborates with other programmes to identify and support talented young students with a special interest in science. In order to attract the students' interest, we undertake prior work with school teachers. They attend a 20 hour course on advanced genomic techniques, organised by the CRG, within the framework of "Professors i Ciència", a programme from Fundació Catalunya-La Pedrera. The idea is to provide teachers with an overview of current biomedical science as well as resources and skills to use in the classroom. After this, teachers select the students and support them in their application.

We offer them a life experience from inside a real scientific laboratory. It is not merely a technical and theoretical approach to scientific research but a live experience with real planning, development and results. <

PEOPLE @ CRG

WELCOMES

We warmly welcome:

Bernhard Payer joined the CRG as junior group leader of the Epigenetic Reprogramming in Embryogenesis and the Germline laboratory at the Gene Regulation, Stem Cells and Cancer Programme. He did his PhD on germ cell specification in mice in Azim Surani's laboratory at the University of Cambridge, UK. After his PhD he joined the laboratory of Jeannie Lee at Harvard Medical School (Boston, USA) where he studied mechanisms of X-chromosome re-activation during mouse embryogenesis and iPS-cell reprogramming. His current research is focused on using X-chromosome re-activation as a model system for epigenetic reprogramming events during early embryogenesis and in the germ cell lineage.

Sabela de la Torre (EGA); Nicole Voges (Sensory Systems and Behaviour); Álvaro Moreno and Clauda Vivori (Regulation of Alternative pre-mRNA Splicing); Kathrin Meindl (Genomics Unit); Jordi Fernández and Javier Tapial (Transcriptomics of Vertebrate Development and Evolution); Carolina Segura and Alessandro Dasti (Hematopoietic Stem Cells Transdifferentiation and Reprogramming); Nivedita Natarajan (Organelle Biogenesis and Homeostasis); Roberto Ferrari and Alexandra Leopoldi (Chromatin and Gene Expression); Guillaume Diss (Genetic Systems); Anupama Ashok (Intracellular Compartmentation); Paola Andrea Cortés (Reprogramming and Regeneration); Antonio Tarruell and Serena Generoso (Epigenetic Reprogramming in Embryogenesis and the Germline); and Bongumilla Jagiello (Cytoskeleton Dependent RNA Distribution Mechanisms).

FAREWELLS

Our best wishes to:

Gabrielle Bertier (EU Life), Hilde Janssens and Astrid Hoermann (Comparative Analysis of Developmental Systems); Álvaro Moreno (Regulation of Alternative pre-mRNA Splicing); Yolanda Schaerli (Multicellular Systems Biology); Maria Sanz and Judith Escarré (Computational Biology of RNA Processing); Rubayte Rahman (Genomic and Epigenomic Variation in Disease); Ana Catarinha Vidinhas de Oliveira (Genome Architecture); Kiana Toufighi (Design of Biological Systems and Genetic Systems); and Maria Isabel Muñoz (Reprogramming and Regeneration).

DIARY

06-07/11/14 - 13th CRG Annual Symposium
Gene Regulation Stem Cells and Cancer
PRBB Auditorium, Dr. Aiguader 88, Barcelona
2014symposium.crg.eu

07-12/11/14 – Satellite Course@CRG
Somatic Cell Reprogramming
CRG, Dr. Aiguader 88, Barcelona
2014symposium.crg.es/satellite

08-13/11/14 – ESF-EMBO Conference
Flies, Worms and Robots: combining perspectives on minibrains and behaviour
Hotel Eden Roc, Sant Feliu de Guixols
minibrains.esf.org

21/11/14 – CRG Core Facility Technology Symposium
Applying Proteomics to Life Sciences: From Ions to Biology
PRBB Auditorium, Dr. Aiguader 88, Barcelona
www.crg.eu/en/technology_symposium_141121

CRG Centre for Genomic Regulation

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