



2014 Annual Report Summary

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SEVERO
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A middle-aged man with short, graying hair is standing on a balcony. He is wearing a light blue V-neck sweater over a light blue collared shirt. His hands are clasped in front of him, and he is wearing a silver watch on his left wrist. The background shows a modern building with large windows and a metal railing.

Letter from
the director

Since 2014, the EBI and the CRG share responsibility for the European Genome-phenome Archive (EGA), a fundamental resource for biomedical research that reinforces the leadership position of Spanish research groups and institutes in genome analysis at a European level. The implementation of this initiative was the result of the work and joint effort of not only the CRG, but numerous organizations, including: the “la Caixa” Banking Foundation; the Spanish Ministry of Economy and Competitiveness, through their ‘Severo Ochoa Centers of Excellence’ programme; the Government of Catalonia; the Barcelona Supercomputing Center (BSC-CNS); the National Institute of Bioinformatics (INB-ISCIII); the ELIXIR infrastructure; and the EMBL-European Bioinformatics Institute (EMBL-EBI). The setting up of the EGA was also helped by its being a pilot project within the European ELIXIR infrastructure. The affiliated head of the EGA Team at the CRG is Arcadi Navarro, who is also the director of the Department of Experimental Sciences and Health at Pompeu Fabra University and an ICREA Research Professor.

Another significant development in 2014 was the creation of a valorisation fund and expansion of the Technology Transfer Office through the hiring of two new people. We also maintained our collaboration with local hospitals and our translational grants continued to support early-stage projects with doctors and companies. The CRG has made a strong commitment to innovation and translational medicine, and we expect to see the first results of the new Technology and Business Development Office in 2015.

Bernhard Payer and Manuel Irimia were hired as new junior PIs in the Gene Regulation, Stem Cells and Cancer programme and the Systems Biology programme, respectively. Payer works on X-chromosome inactivation and Irimia on alternative splicing in brain development. The acting head of the Bioinformatics core facility, Jean-François Taly, moved to Toulouse at the end of the year, and we recruited a new chief for the facility, Julia Ponomarenko, who will arrive at the CRG in March 2015.

As a follow-up to our international collaboration with the Taiwan Academy of Sciences, Academia Sinica, we organised a successful mini-symposium in Barcelona. Novartis continued to support the CRG-Novartis-Africa mobility programme. As part of this programme, the CRG hosted three students from the University of Witwatersrand, in South Africa, and a second call to host three further students in 2015 was launched. Also during the year, the EU-LIFE alliance recruited a new manager, Marta Agostinho, who is doing an excellent job.

We continued to successfully attract European and international funding. Highlights included the ERC Starting Grant given to Manuel Irimia and the H2020 EU-coordinated project MycoSynVac awarded to Luis Serrano.

We believe the CRG is consolidated as a top international biomedical research institute, but we will continue to strive for scientific excellence, endeavouring to contribute towards the health and economic prosperity of our society.

Luis Serrano
Director





A look back
at the year

2014 was a year full of frantic and beneficial activity at the CRG, which served to strengthen the institute after the financial crisis. Despite this consolidation, scientists and staff members continued pursuing excellence at all levels in their respective research fields and work areas. Bearing this in mind, in April, the Systems Biology programme had their second external evaluation by an international panel, chaired by Prof. Veronica van Heyningen (UCL, London). The programme was rated as “excellent at the highest international level”.

Moreover, in July the four research-oriented departments, which include International & Scientific Affairs, Grants & Academic Management, Technology Transfer, and Communications & PR were evaluated for the first time by external and international panels, also chaired by Prof. van Heyningen. The panel members were different for each department and included experts from each area evaluated. The assessments were really positive for all the departments and included helpful and constructive recommendations for further improvement.

A broad spectrum of projects, activities and collaborations were launched or further developed, such as the European alliances EU-LIFE and CORE for LIFE, as well as other memberships and partnerships in prestigious European initiatives, in addition to all the European projects coordinated by the CRG. To facilitate translational research, the institute has established several initiatives and partnerships with hospitals and translational research groups in the Barcelona area, and together with the IRB, VHIR and IDIBAPS will launch a collaborative research training programme for medical doctors (PhD4MD) in 2015.

In 2014 the CRG experienced a significant funding boost (€20.8 million) as both the highly competitive initiatives ERC Synergy grant and AXA Research Fund Chair got the go ahead after a negotiation phase initiated in previous years.

The number and quality of papers published by CRG scientists have not stopped increasing. In 2014, 203¹ papers were published in peer-reviewed journals with an average impact factor of 9,011, and 114 seminars were held by top-level invited speakers. The media picked up many of these activities, and the CRG hit the news (newspapers, radio, and TV) on 868 occasions.

The SCImago Institution Rankings (SIR) World Report 2014 classifies the CRG in 9th position (according to the Q1 indicator, health sector) in the world. In Europe only two other research centres in the health sector have a higher Q1 indicator. These results contribute to motivating the CRG researchers and, at the same time, remind all CRG staff that they should continue to work hard to maintain and improve these standards of excellence.

¹ This includes: articles and reviews.



At the beginning of November, we celebrated our 13th Annual Symposium, entitled “Gene Regulation, Stem Cells and Cancer”. Understanding the genetic and epigenetic processes that determine the identities of the different cell types in a multicellular organism is one of the key problems in biology. The possibility of reversing these processes to generate pluripotent cells from differentiated somatic cells is opening new frontiers in the understanding of organ morphogenesis and regeneration. Furthermore, striking parallels are emerging between the molecular circuits behind changes in cellular potency and those leading to cell transformation in cancer. This symposium brought together world-leading scientists on a wide range of topics around the general themes of regulation of gene expression and the biology of stem and cancer cells. By concentrating leaders from a variety of specialisms, the symposium was particularly fruitful for showcasing the diversity of approaches and concepts at the vanguard of these fields (<http://2014symposium.crg.eu/>).

Finally, some of our young and senior scientists obtained awards and honours in recognition of the excellence of their science during the year. Bill Keyes was awarded the “City of Barcelona Prize” 2013. In April, the AXA Research Fund gave Ben Lehner the AXA Chair in Risk prediction in age-related diseases. Mara Dierssen was appointed a member of Academia Europaea, a non-governmental association comprising scientists and scholars who collectively aim to promote learning, education and research, and Dierssen also received the 2014 David and Hillie Mahoney Award for an Individual’s Contribution to Outreach, aka the Dana/EDAB Neuroscience Outreach Champion Award. Gian Gaetano Tartaglia was appointed an ICREA Research Professor, and Gloria Mas Martin, a postdoctoral researcher in Luciano Di Croce’s lab, received an award from the BBVA Foundation.

Research

BIOINFORMATICS AND GENOMICS

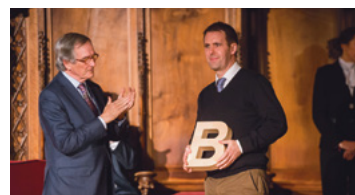
Coordinator: Roderic Guigó

The overarching goal of the research groups in the Bioinformatics and Genomics Programme is to understand the encoding of biological information in the genome sequence (that is, of the complex relationship between genomes and phenotypes), and how evolutionary forces have contributed to shaping this encoding. The groups are interested in understanding the sequence patterns that instruct the molecular pathway leading from the DNA to protein sequences, and the mechanisms by means of which the outputs of this pathway (RNA and proteins) interact to confer functionality at the molecular and cellular levels. Our research also includes developing basic alignment methodologies tailored to functional genomic domains exhibiting specific sequence conservation patterns, and investigating



13th CRG Symposium: “Gene Regulation, Stem Cells and Cancer”

Poster speed presentations session



Premis Ciutat de Barcelona

From left to right: Xavier Trias, Mayor of Barcelona, and Bill Keyes. © Pep Herrero



**AXA
Research Fund**
Through Research, Protection

Ben Lehner was awarded the AXA Chair in Risk prediction in age-related diseases by the AXA Research Fund

how the evolution of these domains correlates with the evolution of encoded phenotypic traits. We are also interested in uncovering the very basic molecular events governing evolutionary processes. Finally, the programme aims to translate the understanding of the human genome sequence into knowledge about diseases. In 2013, the programme was redesigned to include the former Genes and Disease programme.

CELL AND DEVELOPMENTAL BIOLOGY

Coordinator: Vivek Malhotra

The scientists in the Cell and Developmental Biology department aim to reveal the mechanisms of cell compartmentation, division and tissue organisation. The department comprises Vivek Malhotra (Mechanism of protein secretion), Isabelle Vernos (Microtubule and spindle dynamics), Manuel Mendoza (Cytokinesis, chromosomal segregation, and cell cycle check points), Pedro Carvalho (Organelle biogenesis and homeostasis), Jerome Solon (Tissue organisation), and Sebastian Maurer (Cytoplasmic RNA localisation). Vivek Malhotra, Manuel Mendoza and Pedro Carvalho are funded by grants from the European Research Council (ERC). Pedro Carvalho is also a recipient of the international early career scientist award from HHMI and in 2013 was elected EMBO Young Investigator. Isabelle Vernos is a member of the Scientific Council of the ERC and also on the Advisory Council for Science, Technology and Innovation of the Spanish Secretariat for Research, Development and Innovation.

GENE REGULATION, STEM CELLS AND CANCER

Coordinator: Juan Valcárcel

A highlight this year was the incorporation of Bernhard Payer as a new group leader in our programme. After very successful PhD and postdoctoral training in the laboratories of Azim Surani (Gurdon Institute) and Jeannie Lee (Harvard University), Bernie is setting up his group to study the process of X chromosome reactivation in embryos, during both induced pluripotent stem cell reprogramming and the formation of the germ cell lineage. His interest in chromatin, epigenetic regulation, X chromosome gene regulation, and cell reprogramming resonates with on-going work in our programme as well as in other programmes at the CRG.

Scientific highlights of groups in the programme during 2014 include several important publications on the mechanisms of cell differentiation and reprogramming, chromatin remodelling and RNA recognition. Collaborative work between the groups of Thomas Graf and Miguel Beato revealed that the transcription factor C/EBP poises B cells for efficient reprogramming into induced pluripotent cells,



while work by Pia Cosma's group demonstrated the importance of temporal fluctuations in signalling pathways for efficient cell reprogramming. Joint research by the groups of Luciano Di Croce and Thomas Graf unveiled a key role for the epigenetic regulator Zrf1 in the differentiation of embryonic stem cells into neural progenitors. Collaboration between the groups of Miguel Beato, Marc Martí-Renom and Guillaume Filion led to the discovery of structural transitions in chromatin topological domains relevant for hormone-induced gene regulation. Finally, work in Fátima Gebauer's lab revealed how RNA binding by the protein UNR explains functional synergy with Sex-lethal and facilitates interaction between the RNA helicase MLE and the long non-coding RNA roX2, thus regulating two aspects of X chromosome dosage compensation in *Drosophila*.

SYSTEMS BIOLOGY

Coordinator: James Sharpe

The research groups in the Systems Biology programme cover a wide range of topics: from dynamic gene regulatory networks to systems neuroscience, and employ a great variety of model systems to address these issues, including prokaryotes, cell lines, *C. elegans*, and mice. Underlying this diversity, however, are the common goals of combining systematic and quantitative data collection, using computational models, going beyond molecular descriptions, and arriving at a deeper dynamic understanding of complex biological processes. To achieve these objectives the programme is strongly interdisciplinary, comprising an increasing number of physicists, mathematicians and computer scientists, in addition to biologists.

2014 was an important year for the programme, as we had our second external evaluation by an international panel (the previous assessment was in 2011). The new head of the CRG's Scientific Advisory Board, Prof. Veronica van Heyningen (UCL London), chaired the panel, which included 9 eminent researchers from across the world. At the end of the 2-day event, the programme was rated as "excellent at the highest international level".

In June we welcomed a new group leader to the program, Manuel Irimia. He arrived from the Donnelly Centre in Toronto, and his lab will focus on the roles that alternative splicing and other mechanisms of transcriptomic diversification play in vertebrate embryonic development and evolution. His first success at the CRG was winning one of the prestigious ERC Starting Grants, and two other groups were also awarded large grants: Ben Lehner, won an ERC Consolidator Grant on robustness in development and cancer, and Luis Serrano was granted an H2020 project on engineering *Mycoplasma pneumoniae* as a broad-spectrum animal vaccine.

Scientifically, 2014 saw a number of exciting discoveries covering a wide variety of topics. At the level of individual molecules and their physical interactions, we generated novel predictions about RASopathies and cancers from structure-energy analysis. In the study of dynamical networks, we reverse-engineered the gap gene system of a non-model species of fly - the moth midge *Clogmia albipunctata*. At the multicellular level,

we demonstrated that a 62-year old theory by Alan Turing explains how fingers and toes are patterned during mouse embryo development, and also showed how the dynamics of gene expression during the development of *C.elegans* is affected by genetic variation. Finally, at the whole-organism level, we revealed that nicotine addiction may be due to a compensatory strategy in individuals with altered expression of subunits of the nicotinic acetylcholine receptors, and that *Drosophila* larval chemotaxis employs an error-correction strategy known as *weathervaning*. More details on these projects can be seen on the individual group pages.

Core facilities

Director: Mònica Morales

The core facilities programme currently comprises six Core Facility Units: Genomics, Proteomics, Advanced Light Microscopy, Biomolecular Screening & Protein Technologies, FACS, and Bioinformatics, as well as the Histology Service and the Storage and Computing Unit that are only accessible to internal users. The overall activity in core facilities continues to increase every year, a success that is achieved through the constant renewal of equipment and the implementation of the newest methods by the different facilities.

In 2014, the major technologies developed/implemented were: the sorting of single viruses in the FACS Unit; the development of a pipeline for biomarker discovery and validation in the Proteomics Unit; the setting up of CRISPR/Cas9 technology in the BMS&PT Unit; and automated library preparation in the Genomics Unit. As a result of the ALMU Unit hosting a beta-test of a Leica next-generation STED system (STED3X), we decided to apply for funds to purchase the equipment, and we were granted the money in the 2014 FEDER fund call. All these innovations have allowed our programme to continue providing the state-of-the-art services that characterise the CRG core facilities.

During 2014 we set up new partnerships with hospitals, and we established further bilateral agreements with other local research institutes for provision of services (VHIR, CCiTUB and CMRB). The BMS&PT, together with the Genomics and Bioinformatics units, were active participants in setting up and implementing the mouth microbiome project '**Saca La Lengua**', a social project coordinated by the CRG in collaboration with the CREAL and the "la Caixa" Banking Foundation. During 2015, the core facilities at the CRG will perform the DNA extraction, sequencing and data analysis of the microbiome present in the saliva of 2,000 students from schools around Spain (see the Communication & Outreach section to learn more).

The CRG core facilities are not only well established locally, with users coming from different institutions all over Barcelona and Spain (as well as from abroad), but we are also recognised **partners in European initiatives**. The Advanced Light Microscopy Unit participates in the ESFRI initiative EuroBioimaging, the Genomics Unit is a transnational access site in the European infrastructure network ESGI, and the Proteomics Unit



is a transnational access and research site within the European Infrastructure network PRIME-XS, as well as being the only Spanish Proteomics Facility listed on the European MERIL platform.

The Core Facilities are member of the Core Facilities Excellence Alliance "**Core For Life**" (www.core4life.eu), which also includes the EMBL, VIB (Belgium), MPI-CBG (Dresden, Germany), IMP and CSF (Vienna, Austria), and the Functional Genomics Centre Zurich. Core For Life is aimed at sharing and consolidating procedures, joining forces in personnel training and technology validation, sharing access to facilities across institutes, and lobbying at EU level for infrastructure funding.

International and Scientific Affairs

The CRG is continually fostering and implementing strategic alliances and projects to strengthen the international and interdisciplinary perspectives of the institute, with the support of the International and Scientific Affairs (ISA) office.

INSTITUTIONAL COLLABORATIONS

Facilitating translational research

To facilitate the translation of CRG discoveries in fundamental biology to applied research in health and medicine, the institute has established several partnerships with hospitals and translational research groups in the Barcelona area.

A few years ago, the CRG began actively collaborating with the **Vall d'Hebron Institute of Research (VHIR)**. This year, the two institutes co-organised the second edition of the course on exome sequencing for medical doctors and researchers. Additionally, in collaboration with the IRB and the IDIBAPS, they are also planning a new pilot collaborative research training programme for medical doctors, called **PhD4MD**, to be launched in 2015.

The CRG and the **Sant Joan de Deu research foundation** organised a joint meeting in December to explore synergies and possible new joint projects. Some potential collaborations were identified that will be followed-up in 2015.

An important initiative for fostering translational research at the CRG has been the launch of seed funding for **emergent translational research projects** of CRG group leaders for their collaboration with clinical researchers and/or health-related industries. So far, four proposals have been funded; these are coordinated by Isabelle Vernos in collaboration with EUGIN, Stephan Ossowski in collaboration with VHIR, Mara Dierssen in collaboration with Starlab, and Toni Gabaldon in collaboration with Hospital Universitari Parc

Members of the ISA team (from left to right): Joaquim Calbó, Michela Bertero, Olaf Kostbahn and Sonja Reiland



Taulí de Sabadell. There is a broad range of topics, including the application of next generation sequencing technologies, clinical practice, and new experimental tools to improve in vitro fertilisation.

The CRG has also started preparing a joint transversal project on the lung microbiome with clinical groups from the **Barcelona Respiratory Network (BRN)**. With the support of ISA, Toni Gabaldon and the CRG core facilities on bioinformatics and genomics are participating in the project.

Additionally, ISA chairs the **EU-LIFE working group (WG) on translational research**. This WG organised the first EU-LIFE scientific meeting on the "Biology of Cancer: bridging basic and translational research" (CRG, 12-13 May, 2014), which was attended by basic science researchers and clinicians from both the public and private sectors.

Exchanging knowledge and good practice, and integrating activities with European institutions

EU-LIFE, the European Life Sciences Institutes for Excellence, is a key initiative chaired by the CRG to promote excellence in research, to strengthen integration among European research institutes in life sciences, and to develop and share best practice in research, research management, and training.

During 2014, the EU-LIFE working groups prepared several publications on science policy, best practice in research management (e.g., mentoring programmes for junior researchers, and computing storage strategies), and funding opportunities. In addition, the EU-LIFE website was updated to include information about all the research groups as well as all the technological platforms available at the 13 institutes. The EU-LIFE directors met twice during the year, once in Barcelona and once in Oeiras, to discuss the future challenges and long-term objectives of the alliance. On these occasions, key representatives from the European Commission, as well as international funding agencies (e.g., from Argentina and Brazil), were invited to discuss potential synergies and joint initiatives with EU-LIFE. Finally, EU-LIFE hired a new project manager, Marta Agostinho, who has been coordinating its activities since October 2014.



Fostering collaboration and mobility

As part of the collaboration agreement with the **Ministerio de Ciencia, Tecnología e Innovación Productiva of Argentina**, two main initiatives were organised:

- A joint call for mobility between CRG and Argentinian groups. Four joint collaborative projects to exchange personnel were selected and will start running in 2015;
- Joint course and workshop on “personalised medicine” in Buenos Aires. More than 40 students participated in the course, and more than 100 people attended the symposium.
<http://workshoponpersonalizedmedicine.wordpress.com/>

As part of the collaboration with Wits University and Novartis, during the first six months of the year, CRG laboratories hosted three PhD students from Wits, working on themes of common interest. During the summer, we launched a second call to host three further students in 2015, and to reach other universities in South Africa. The programme is now called the **CRG-Novartis-Africa mobility programme**. Three new junior researchers were selected (from Wits, the University of Cape Town (UCT), and the University of Western Cape (UWC)), who will join the CRG labs in January 2015.

ISA and the CRG outreach programme also promoted a collaboration agreement with the **MIT-Spain programme**. In January 2013, the MIT Global Teaching Lab was organised for the first time in Spain. Six students taught different subjects at selected Catalan schools and also gave short talks at the CRG. Next year, the collaboration will be led and supported by Fundació Catalunya la Pedrera.

To follow-up the collaboration with **Academia Sinica** (Taiwan) that was launched in 2012, in October we organised a successful joint mini-symposium in Barcelona, together with the UPF, the BSC, and a delegation of seven scientists from Academia Sinica.

COORDINATED AND STRATEGIC PROJECTS

With the launch of the new European Commission H2020 programme for research and innovation, the ISA team actively collaborated with CRG group leaders to prepare and submit several new collaborative proposals based on public-private partnerships across Europe. The CRG also participated as a member of the Spanish co-location centre in the InnoLIFE initiative, a new knowledge and innovation community (KIC) on healthy living and active ageing that was awarded by the European Institute of Technology at the end of the year.

The CRG is leading several Spanish and large European collaborative projects and is also a key partner in some large European infrastructure projects. These projects, as well as being useful for networking, contribute to advancing knowledge in diverse fields of biology and biomedical research, ranging from systems biology, cancer, epigenetics, cellular trafficking, and rare diseases to medical genomics. The 2014 portfolio of projects managed by ISA includes:

- Coordination of 6 European projects: **SystemTb** (Serrano), **Cure-FXS** (Dierssen), **BioPreDyn** (Jaeger), **4DCellFate** (Di Croce), **Swarm-Organ** (Sharpe), **FLiACT** (Louis).
- Coordination of 2 Spanish projects: **RNAREG** (Valcarcel), **COAT** (Malhotra).
- Participation in 3 European infrastructure projects: **EuroBioImaging** (Zimmermann, Sharpe); **ISBE** on Systems Biology (Sharpe); **ELIXIR** on bioinformatics (Guigó, Navarro).

HIGHLIGHTS

- The **SystemTb** project focuses on the systems biology of *M. tuberculosis*. The project finished in 2014 but combined efforts on a common experiment are continuing with the aim of preparing a joint publication.
- **BioPreDyn** organised and taught a highly successful week-long EMBL-EBI workshop entitled "BioPreDyn: The systems biology modelling cycle - building mechanistic dynamical models". Numerous software tools for modelling have been developed within the project, as can be seen on the BioPreDyn.eu website.
- The **4DCellFate** project has already published 43 articles in 3 years, with an average impact factor of 14.6. B. Lehner and V. Raker co-organised a 4DCellFate-IMPCC workshop on "Integrative and Computational Biology" (26-27 March), which had an audience of 250 and featured 15 top-level speakers from Europe and the USA. Importantly, they reached their goal of a gender-balanced symposium with 7 women and 8 men speakers. 4DCellFate also organised a very interesting exhibition on "The art of stem cells" featuring the work of Ana Cid, a Barcelona-based Spanish artist, who has recently been greatly inspired by images produced by biological research (<http://www.acid-factory.com/>).
- The **Swarm-Organ** project focuses on systems containing autonomous but simple agents (robots, cells), that collectively organise themselves into complex spatial arrangements (organs). In collaboration with the communication unit, Swarm-Organ helped prepare the "*Activa't amb la Cèl·lula!*" outreach activity for schoolchildren.
- The mission of the **ISBE** preparatory phase is to assemble a Europe-wide, distributed infrastructure providing the systems biology research community with access to state-of-the-art facilities. The CRG leads the work package on community building, and in August 2013 launched the *European Systems Biology Community Website* (<http://community.isbe.eu/>). Continuing with the community-building activities, and in the context of preparing the ISBE business plan, the CRG launched a systems biology audit service in Europe, which will help us understand the research landscape and also increase ISBE visibility in European countries.



- In 2014, together with the PRBB Intervals programme, **FliACT** organised a course on scientific integrity: “*Good science, honest science*”. The instructors Michele Garfinkel, science policy manager for EMBO, and Alison North, director of the bioimaging centre at Rockefeller University, presented the topics “Responsible Conduct of Research: From Policy to Practice”, and “Acquiring and presenting reliable scientific imaging data – the Good, the Bad, the Ugly and the Downright Dishonest”, including discussions with the participants.

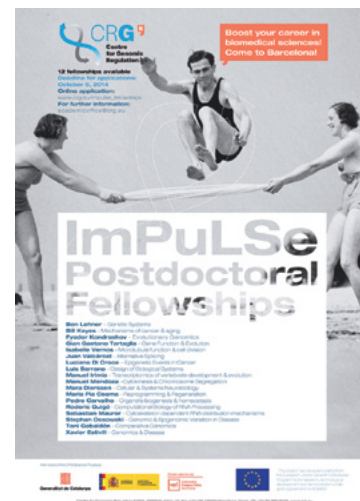
Advanced Training

Throughout 2014, the International PhD Programme has continued to attract many young talents from all over the world, supported both by internal and external competitive funds and the “la Caixa”/ Severo Ochoa International PhD Fellowship Programme. This year, after a highly competitive selection process (235 candidates from over 60 different countries), 15 students were selected through the “la Caixa”/Severo Ochoa call (funded by “la Caixa”, Severo Ochoa and the CRG). The specific training offered to PhD students in 2014 includes the Advanced Seminars in Biomedical Research Course, in partnership with the Universitat Pompeu Fabra. The CRG PhD community has actively promoted a number of initiatives, such as the 8th annual PhD symposium (4-5 December) and the 4th joint retreat, this year with CeMM, in Vienna (15-18 June). During the PhD Symposium, the Eppendorf prize for the best CRG thesis 2013-2014 was awarded to Luciano Marcon.

The International Postdoctoral Programme at the CRG currently hosts around 99 postdocs supported by internal and competitive funding from highly prestigious institutions. The CRG has launched a new Postdoctoral Programme, co-funded by the European Commission under the COFUND scheme (ImPuLSe) to recruit 12 new postdocs in 2014. Finally, the second edition of the CRG Summer Internship Programme for undergraduate students was launched with great success (112 applications).

A highlight of the CRG Advanced Training Programme is the series of high-level international courses, Courses@CRG. These courses are open to the scientific community and deliver high quality training (including lectures and hands-on sessions) on the latest scientific breakthroughs and technologies, bringing together the expertise of the CRG faculty, along with well-known experts and skilled instructors.

In 2014, the CRG Training Unit co-organised and delivered seven high quality Courses@CRG (see below), which were attended by more than one hundred internal and external participants from diverse research institutes in Europe and worldwide. Highlights of Courses@CRG include, the first “go abroad” edition on Personalised Medicine that took place in Buenos Aires in collaboration with the University of Buenos Aires, Argentina, and attracted 40 students from various universities in the country.





The Training Unit also started implementing a new internal training programme where four different scientific courses were offered to 103 participants from the various scientific communities at the CRG.

In collaboration with the Technology Transfer department, the Training Unit helped foster a culture of entrepreneurship and knowledge transfer by co-organising the first CRG Bio-Business School (a one-week intensive course in September). 11 external speakers gave high quality lectures to the twenty participants, who also had the opportunity to develop business plans for their own ideas.

Courses@CRG in 2014:

- Analysis of Exome Sequencing Data for Clinical Application (17-20/02)
- Summer Course Modelling for Systems Biology (29/06-04/07)
- Advanced Proteomics Course (07-11/07)
- Personalised Medicine (01-05/09)
- Genome-wide Approaches for Protein/RNA Interactions (15-20/09)
- Library Preparation for NGS (13-17/10)
- Somatic Cell Reprogramming (07-12/11)

Internal training programme in 2014:

- Microscopy (June)
- Statistics (June)
- Galaxy Tutorial (July)
- Brain Atlas (September)
- Research Integrity (July)
- Adobe Illustrator (July)

A new teaching space, created specifically for computational training, was added to the other two “wet labs” used for various CRG training activities aimed at scientists at all stages of their careers, courses and workshops within the Courses@CRG and PhD Programme, and activities for school children.

ADVANCED TRAINING FIGURES

PhD students: 102 (71% foreign)

External fellowships obtained by PhD students: 15+15 selected in the “la Caixa” call

Advanced Seminars offered to Masters and PhD students: 6

PhD theses defended: 17

Postdoc researchers: 99 (73% foreign)






External fellowships obtained by postdoctoral researchers: 14

Courses@CRG: 7



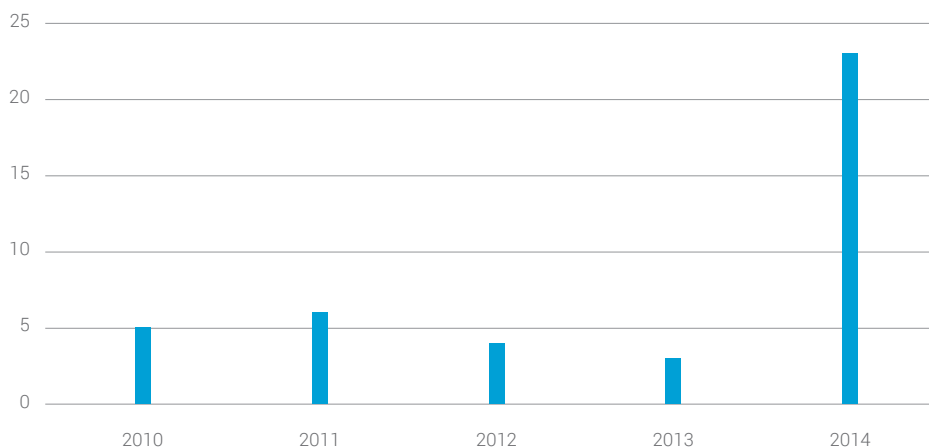
Technology Transfer

In 2014, the CRG's Technology Transfer Department consolidated its new model and defined its future efforts, which are represented in the following figure.

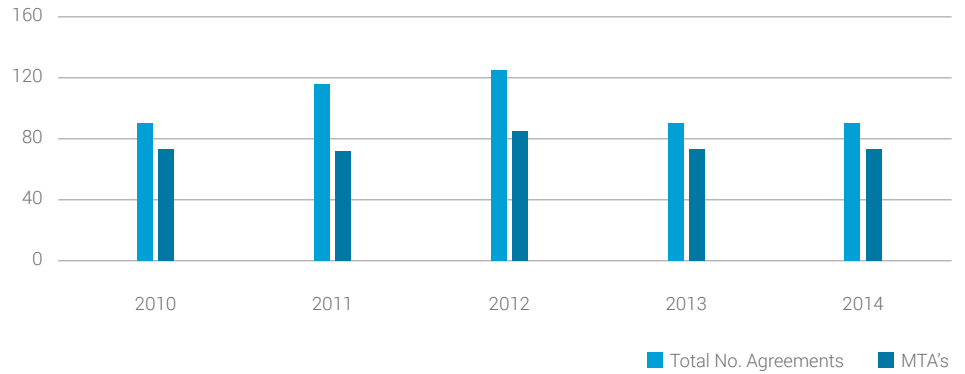
-  Build trust and fluent communication
INCREASE THE IP PORTFOLIO
-  Technology and market assessment
HIGH QUALITY DEAL FLOW
-  Valorization projects
BRING CRG TECHNOLOGIES TO MARKET
-  Business Development
REVENUES GENERATION
-  Generate awareness on Technology Transfer, Business development and entrepreneurship at CRG
OPEN NEW CHANNELS FOR COMMERCIALIZATION

One of the central tasks in the technology transfer process consists of technology scouting, identifying and evaluating discoveries and inventions generated at the CRG. Consequently, during 2014 the Technology Transfer team started an intense scouting campaign reflected by an increase in reported inventions of over 600% compared to 2013. In addition the Technology Transfer department reviewed more than one hundred agreements, representing an increase of 20% in the number of technology transactions during 2013.

Report of inventions

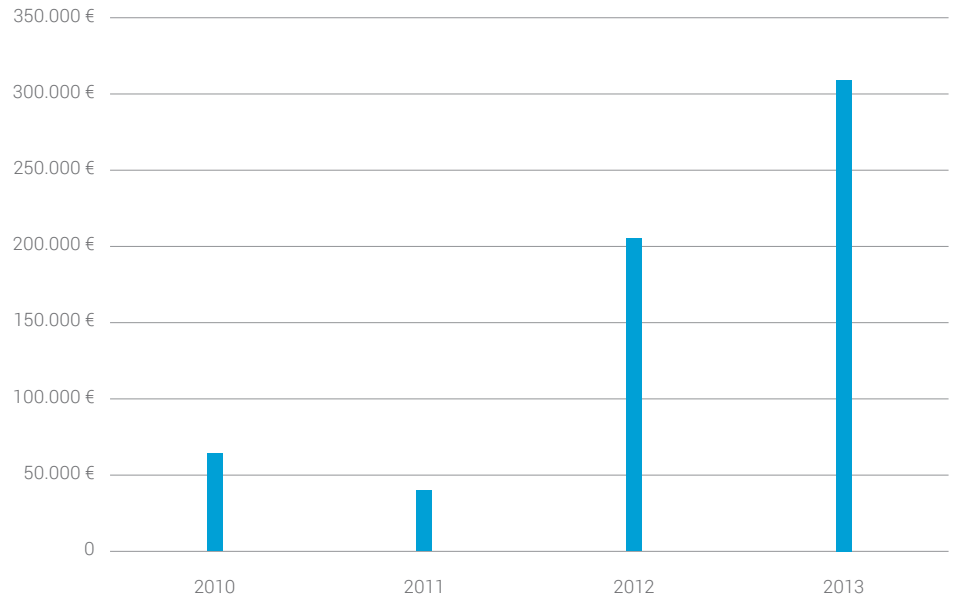


Technology transactions



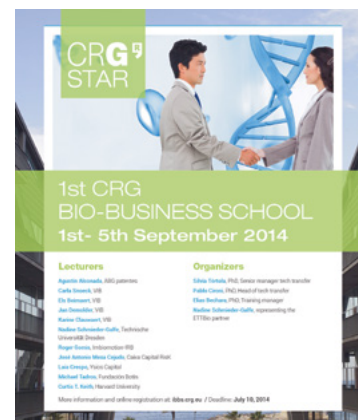
Together, the transactions represented a total income of €309,203 during 2014 from out-licencing, services offered to companies, and from sponsored research agreements with the private sector.

Income 2014



We are convinced of the importance of generating business and technology transfer awareness in life sciences, 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.

Consequently, during 2014 we organised the 1st CRG Bio-Business School. This first edition of the Bio-Business School, sponsored by Interreg IVC, was a complete success and we will definitely repeat it in the coming years. Two particular aspects of the workshop were highlighted by both participants and speakers: the fact that the workshop format included sessions discussing real projects, and a round table at the end of the workshop with investors, which provided feedback for participants' projects, and which has motivated a series of follow up conversations.



Communication & Outreach

One of the strategic objectives of CRG activity is “to communicate and establish a dialogue with society, educating the public and taking into account their demands and needs”. To this end, during 2014 the number of activities organised continued to increase. 203 events were held, including workshops for primary and secondary schools, training courses for teachers, school visits, summer internships, the open day, science cafés, electrophoresis kit loans, and participation in fairs and events for the dissemination of science. The CRG, together with other leading research institutes across Europe, continued its participation in two EU-funded science communication projects: EuroStemCell (2010-present) and CommHERE / HorizonHealth (2011-2014), which aim to communicate the results of EU-funded research projects to society at large.

In September 2014, we started a new ambitious and pioneering citizen science project, mainly funded by the “la Caixa” Banking Foundation, called “Saca la Lengua” (“Stick out your Tongue”, in English). This is the first study into the mouth’s microbiome and involves the collection of 2,000 saliva samples from students in 40 schools around Spain. The aim of the study is to determine the variety of bacteria and fungi present in



“Stick out your tongue” project.

Dr. Toni Gabaldón and Annick Labeeuw (centre) with the teachers involved in the collection of saliva samples.



Different screen-shots of the "CRG Memo Game" App

the mouth's microbiome and find out if this bears any relation to environmental characteristics or lifestyle. The samples will be sequenced to look for fragments of DNA common in bacteria and fungi. University students and the general public will be also able to get involved in the second phase of the study, taking part in the bioinformatics and statistical data analysis. The project is expected to finish in February 2016.

Also during 2014, the itinerant scientific picture exhibition "TREE OF LIFE. The complexity of life: from the cell to a living organism" was shown in Alicante and Barcelona. In Barcelona, Palau Robert, in the heart of the city, hosted the exhibition, which attracted nearly 20,000 visitors. The production of the exhibition was kindly supported by the Banc Sabadell Foundation. Leica and Hewlett-Packard also contributed by providing some microscopes and tablets used during the parallel activities organised as part of the exhibition in Barcelona. The exhibition was also the scenario for the presentation of the "CRG Memory Game", an app based on the classic matching pairs game but using scientific images taken by CRG researchers.

Furthermore, the various findings published in top scientific journals, the different activities organised, and the recognition of the CRG as a research institute of reference in the biomedical arena led, throughout the year, to articles in the press and online media, as well as participation by scientists in radio and television programmes. In May 2014, the press office, together with the EMBL, organised a study trip to the CRG and other institutes in Barcelona, supported by the CommHERE project. 15 European journalists, members of the European Union of Science Journalists' Associations (EUSJA), spent 4 days at various institutes in Barcelona. Moreover, during 2014 the presence of the CRG in social networks, which are proving to be a very effective additional dissemination tool for all activities, increased remarkably.

2014 was a particularly busy year in terms of seminars, sessions and scientific meetings, all held at the institute's facilities. It is worth highlighting the scientific meetings "Next Generation Sequencing (NGS) 2014" hosted by the International Society for Computation Biology and the CRG, the "1st LightSheet Fluorescence Microscopy International Conference & 6th LSFM International Workshop" co-organised by the ICFO, IRB and CRG, the 13th CRG Symposium: "Gene Regulation, Stem Cells and Cancer", the ESF-EMBO Symposium "Flies, Worms and Robots: combining perspectives on minibrains and behaviour", and 2 editions of the Core Facilities Technology Symposia series.

CRG COMMUNICATION & OUTREACH FIGURES

Outreach activities: 203

Radio/TV appearances: 27

Audience reached: just over 31,000 people

Blogs: 62

Press releases & short pieces of news: 41

International meetings: 12

Written/online media appearances: 779

High-profile seminars: 114



Grants & External Funding

In 2014, the CRG experienced a significant funding boost (€20.8 million) as the two highly competitive initiatives ERC Synergy grant and AXA Research Fund Chair got the go ahead after a negotiation phase initiated in previous years. The CRG was also successful in its renewed efforts to maintain its excellent funding track-record at a national level despite current budgetary restrictions. Financing from the European Commission still represents the largest source of competitive funds with €13.3 million. The CRG ranks 7th in Spain for attracting European funds and holds 2nd position in the rankings of excellent projects funded by the prestigious European Research Council (7 Starting, 3 Advanced, 1 Consolidator, 1 Synergy and 1 Proof of Concept grants). The launch of 'Horizon 2020', the new European framework programme for research and innovation, was instrumental in bringing in additional resources, including a new ERC Starting grant (Manuel Irimia) and a unique collaborative project led by the CRG (Luis Serrano) and targeted at developing innovative synthetic biology processes as a platform for vaccination (both projects were still under negotiation in 2014, as shown in Table 2).

Table 1. Total external funding 2014

	2014		2013	
EXTERNAL FUNDING	€000	%	€000	%
Competitive grants	20,394	98.2%	11,485	89.6%
European Commission (FP7)	13,278	63.9%	5,179	40.4%
National	5,738	27.6%	5,845	45.6%
International	1,377	6.6%	461	3.6%
Other external funding	379	1.8%	1,332	10.4%
National	350	1.7%	1,308	10.2%
International	29	0.1%	23	0.2%
TOTAL	20,773	100%	12,817	100%

Table 2: Competitive grants under negotiation 2014

COMPETITIVE GRANTS IN NEGOTIATIONS	€000
EUROPEAN COMMISSION (H2020)	3,626
FUNDACIÓ MARATÓ DE TV3	116
MINISTRY OF ECONOMY AND COMPETITIVENESS	62
OTHER	105
TOTAL	3,909

The launch of the philanthropic AXA Research Fund Chair initiative with Ben Lehner as first holder of the AXA Chair in Risk prediction and age-related diseases stands out as an innovative source of financial aid and international recognition for the CRG in their efforts to predict risk in age-related diseases and to better understand the health of individuals. In parallel, other outstanding awards were received by CRG young researchers to acknowledge their careers and to support them in their endeavours for developing cutting-edge projects: Pedro Vizán won a grant from the Spanish Association for Cancer Research (AECC), for his studies on cancer stem cells, and Gloria Mas Martín received an award from the BBVA Foundation for her commitment to studying the causes defining the transformation of normal cells into tumour cells. Additionally, CRG Group Leader Gian Tartaglia became an 'ICREA Senior researcher' as recognition for his outstanding research record. La Marató de TV3 fundraising telethon also financed Tartaglia's research proposal focusing on neurodegenerative diseases, one of the 44 awards made in their 2014 edition.

The CRG continues to promote collaboration with the private sector in order to develop common research activities, encourage the next generation of young researchers, and foster constant dialogue with society in general. Private funding includes financial support from "la Caixa" Banking Foundation for the remarkable field study 'Saca la Lengua' focused on the biome of the mouth and its possible connections to lifestyle, where active participation is expected from students in a number of schools as well as the general public across Spain (see the Communication & Outreach section to learn more). Two other successful cases of engagement in private-public collaborations are the mobility training programme launched in collaboration with Novartis and Wits University in South Africa, and the translational research study jointly developed by the CRG research group led by Isabelle Vernos and EUGIN Clinic, aimed at improving the understanding of infertility.



Management

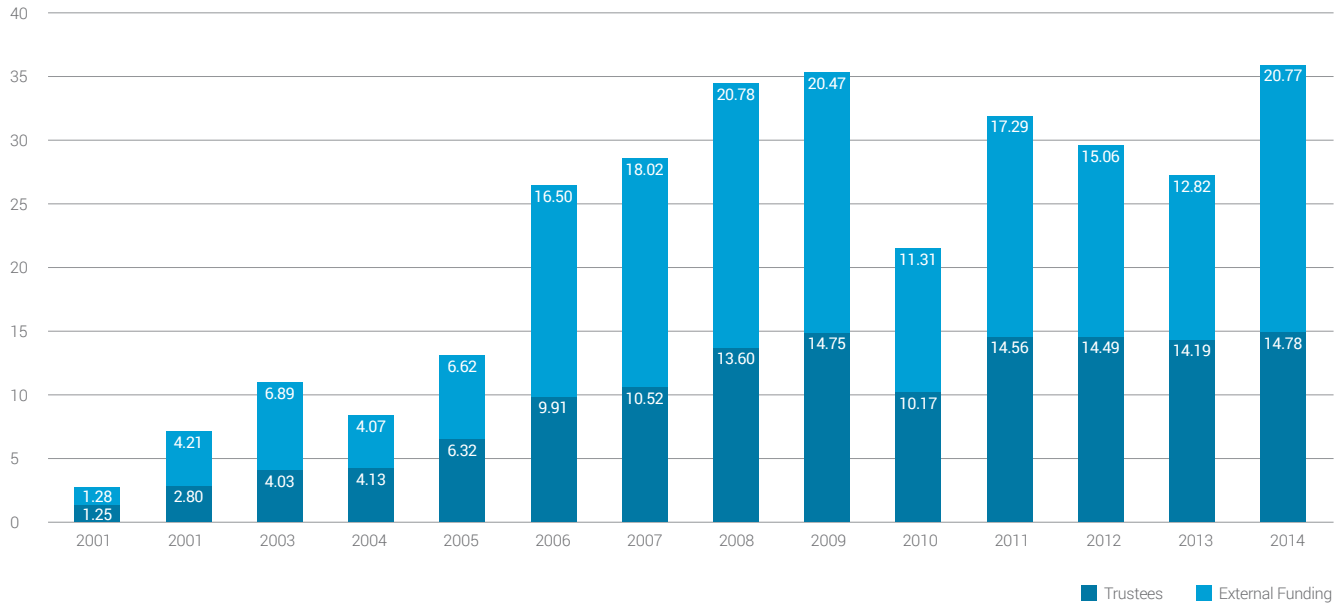
The year 2014, for the first time since the beginning of the financial crisis, has been a year when the “books have balanced”. This is due to all the measures implemented during the previous years and the growth experienced thanks to attaining greater income. The equilibrium reached has allowed the management team to concentrate its efforts on the continued improvement of the support that it offers to the entire scientific community, including core services, and the information that it provides to society through the various projects led by institute.

Amongst the most outstanding achievements in 2014, and to finalise the plan initiated in 2011, it is necessary to highlight:

- The reorganisation of the HR department that, broadly speaking, consisted of the following phases:
 1. The incorporation of a new HR chief who has reorganised the department in order to increase the quantity and quality of services offered to the scientific community.
 2. Change in the organisation of the HR unit, which has moved from Administration to Management.
 3. Development and launch of a schedule for implementing and achieving the targets set out in the Action Plan 2013-2015, approved and agreed when receiving the “HR Excellence in Research” logo in 2013.
- The department of Management & Information Control has continued to work with the all centre’s departments to achieve increased automation and the complete integration of all management information. To do this, various tools have been implemented, such as “Business Intelligence”, “Scientific productivity SFW”, “Tech transfer management SFW”, “Purchasing SFW” and “Days Sales Outstanding”. These have all been integrated using our information management tool.
- The ICT department has finished implementing the “Disaster Recovery Plan”, and has internalised the systems administration services, which were previously outsourced. This action has meant improved service, both in quality and quantity, and the professionalisation of the staff in the department, while at the same time costs have been reduced.
- Internationalisation of the management team. The management team has continued to actively participate in the working groups of the European alliances EU-LIFE and Core for Life.
- Additionally, with the Director’s agreement and approval of the Board of Trustees, a plan was initiated to find a replacement for the CEO, Marian Marrodán, after 14 years at the helm of the CRG. This plan was put into action during the fourth quarter through an external selection process, and the incorporation of the new CEO was planned for early 2015, with a transitional period to lessen the impact of the changeover.

Finally, and by way of conclusion, 2014 was a good year for the management team, which, thanks to the efforts made over the years and the spirit of continuous improvement, keeps on growing professionally for the benefit of everyone at the CRG.

FUNDING EVOLUTION (M€)



HUMAN RESOURCES

During 2014, the services provided by the HR Department improved from the point of view of professional skills. Additionally, HR not only extended beyond the Administration Department but finally managed to become an independent department.

As a result, in 2014 the HR Department was divided into 2 subareas: Centre and Talent, each team specialising accordingly:

- HR Centre is dedicated to providing administrative services to the CRG personnel
- HR Talent has been specially created to deal with recruitment policies, talent management, training, immigration support for foreign employees, and to work on several HR Projects.

A new Head of HR and an HR Specialist were appointed in 2014 to support these changes and drive the deployment of the HR Strategy for Researchers Action Plan.



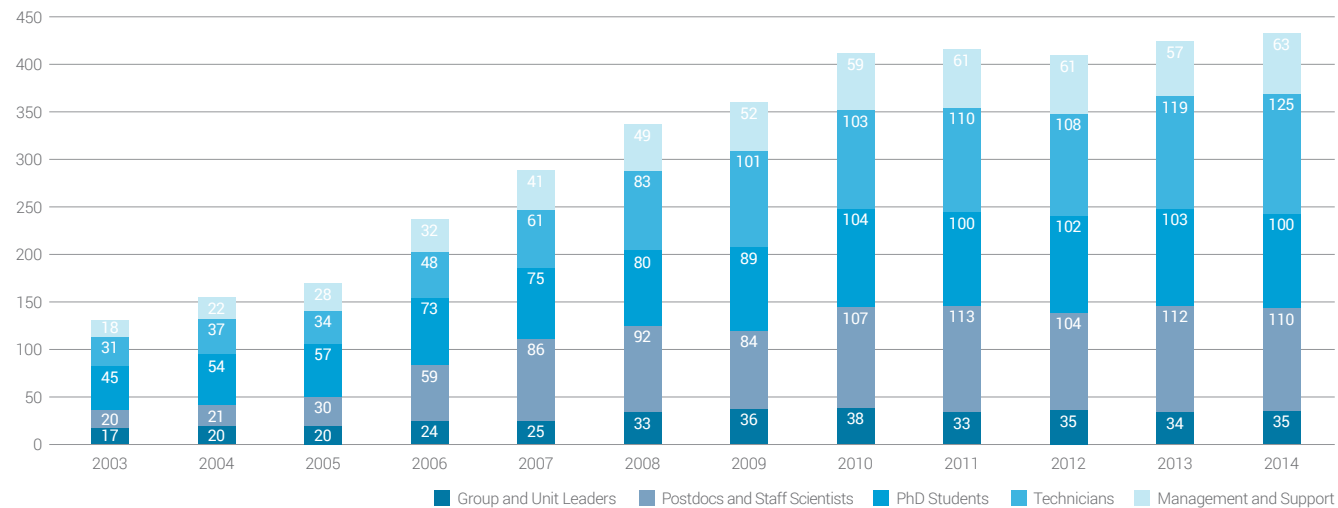
HR EXCELLENCE IN RESEARCH



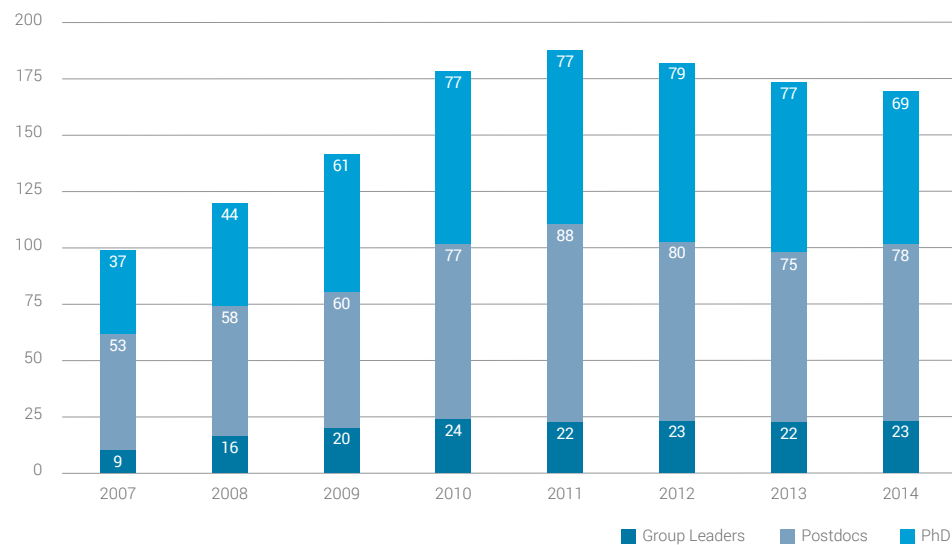
Personnel evolution

On 31st December 2014, the CRG employed a total of 437 people from 42 different countries.

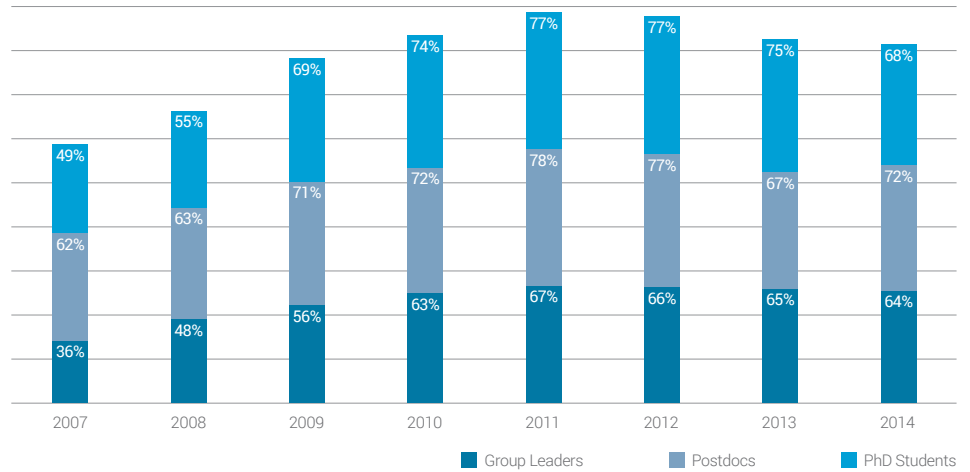
Personnel on 31st December 2014



Foreign Researchers



Foreign Scientists Vs. Total



Nationalities



America 17



Europe 392



**Asia 26
Oceania 2**

ADMINISTRATION

In 2014 the restructuring of the Administration department was finalised, with Human Resources once again becoming a separate department, as planned. Transverse procedures were employed to improve efficiency not only in the Administration department, but also in others with whom we actively collaborate.



Suppliers Area

Corrective measures have been implemented to minimise the impact on cash flow caused by advanced payment of invoices that should be included in the reports of competitive projects.

Likewise, together with the legal area, a thorough analysis has been made of the possibility of carrying out public tendering and resolution of framework agreements for laboratory consumables.

Core Facilities Management Area

In 2013 and part of 2014, various different software were evaluated for managing the commercial area of the Core Facilities (access to and booking of facilities, quotes issuing, communication between users and the facilities, monitoring sample follow up, and so on). Currently all these aspects are managed separately and with different tools, and the aim is to unify them to provide a better and more comprehensive view for both the users and Core Facilities staff. Finally, the ideaElan software was selected. This software provides remote access (like SAS), and must be integrated with the current Oracle ERP to transfer the invoicing information. At present it is in the implementation phase and is expected to come into operation during 2015, once the planned testing phases with real users are complete.

Finance Area

The area organised its first round table on finances, which was attended by the main centres associated with CERCA (the institution that groups all research centres in Catalonia). The aim was to create a framework for dialogue, discussion and sharing of issues related to accounting, tax, and the management of core facilities. The meeting was a great success, with over 20 centres in attendance, represented by 40 participants. The initiative will continue with a new edition in March 2015, hosted by another of the associated centres.

Secretariat & Reception Area

Meetings of project consortia and projects were managed, including: 4DCellFate, FLIACT, Ingenium and EU-Life, with a volume of more than 800 visitors, representing an 85% increase with respect to the previous year.

In 2014, the use of the new scientific activity management tool, Fund@net, was maximised, facilitating the reporting and filing of the activities.

INFORMATION & COMMUNICATION TECHNOLOGIES (ICT)

During 2014, the ICT department continued working to achieve its strategic plan, after adapting to the new organisation and the drastic reduction of operational costs in 2013.

The strategic projects included implementation of the infrastructure for a new backup-on-disk platform that has taken over the legacy backup-to-tape system; upgrade of Exchange Server 2010 to Unified Communications Server (Exchange Server 2013 plus Lync for IMS plus SharePoint). Also, the VMWare virtualisation platform has been enhanced to be fully redundant. At this moment all the critical IT services are redundant as data and servers are replicated between the primary and secondary data centres.

The RedIRIS antispam service, aka "Lavadora", has been integrated with the Unified Communications Server, thus reducing the operational cost of the whole email service.

A corporate agreement with Dropbox has been signed so that every CRG user will be provided an account with unlimited storage.

Another highlight of 2014 was the publication of the Identity Management public tender that will be rolled out during the first half 2015 and that will improve the unification of credentials between the different user repositories, the password recovery self-management, and the setup of automatic user provision workflows.

It is also worth mentioning that the collaboration with the EU-LIFE consortium increased during 2014.

GENERAL SERVICES

In 2014, the 6th floor was remodelled so that the CRG will have two more seminar rooms available as well as an additional study room. As well as this, the space plan designed and approved by the institute's directors in 2013 is now finished.

The CRG has continued to maintain its sustainability according to energy consumption indicators and the associated costs. It is worth highlighting that in only two years, the generation of cytostatic waste has been reduced by 60% due to the banning of ethidium bromide at the institute.

Also in 2014, the department carried out the most repairs in the history of the institute. This is due to the fact that the equipment is getting older every year. However, complete preventive maintenance is also carried out on a regular basis.

The Sterilisation and Preparation of Culture Media unit has continued to offer its usual services. They have internalised the LPS analyses of pure water as well as the management and coordination of the lab deep cleanings.



Health & Safety Office

The office participated in different meetings and courses: a) XII International Congress of Health & Safety (ORP 2014), held in Zaragoza (Spain), with a poster entitled: "Integration of Health & Safety: Investigation of the accidents occurring in the lab of an international biomedical research institute"; the 2nd National Congress on Biosafety and Biocontainment, with the talk "Implementation of biosafety standards in P2 culture rooms"; and an Advanced Training Course in Biosafety, according to UNE-CWA 16335:2014 "Professional skills in biosafety".

During 2014, the training offered increased and included the following new courses: Fire Prevention, Laser Work Safety, Ocular Protection, Cardio Pulmonary Resuscitation (CPR), and Management of Business Activities Coordination.

Also since 2014, the area has been offering a welcome session for newcomers and an introduction to basic aspects of biosafety for the Masters course students.

CRG HEALTH & SAFETY FIGURES

Safety visits: 35, producing 159 work orders

Training courses offered: 54, with 279 participants

Accidents: 6 work accidents, 2 in transit accidents, and 1 accident of a member of an external company

Medical check-ups: 264



Read the full version here:
annualreport2014.crg.eu



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