THE CRG IN A NUTSHELL

- Founded in 2000
- 30 groups + 6 core facilities
- 425 staff
- 70% foreign researchers
- 197 publications, IF=8.8
- Budget: 27M€ (47% core – National and local government; 53% external)
- Position 9 worldwide Q1, Health - Scimago Reports (2007-2011)
- Severo Ochoa center of Excellence
Understanding the complexity of life from the genome to the cell to a whole organism and its interaction with the environment, offering an integrated view of genetic diseases.

THE MEDICINE OF THE FUTURE DEPENDS ON THE GROUNDBREAKING SCIENCE OF TODAY
STRATEGIC GOALS

INTERNATIONAL COLLABORATION

ADVANCED TRAINING

FOREFRONT TECHNOLOGY

EXCELLENCE IN SCIENCE

TECHNOLOGY TRANSFER

SCIENCE & SOCIETY
• 70% foreign researchers (PIs, Postdocs, PhDs)
• 41 nationalities (380 Europe, 15 America, 28 Asia, 2 Oceania)
• > 100 PhD students
• > 100 postdocs
THE FACES OF OUR SCIENCE

- 13 European Research Council (ERC) PIs
- 2 Howard Hughes Early Career Scientists (HHMI)
- 8 EMBO members
- 3 EMBO Young Investigators
- 2013 Eppendorf Young European Investigator
- 1 Merck Award ASBMB
Senior PIs with open-ended contracts
Junior PIs with 5 +4 contracts
Evaluation by SAB and *ad hoc* panel every 4 years according to high international standards
CRG SCIENTIFIC ORGANIZATION

CORE FACILITIES

Bioinformatics & Genomics

Gene Regulation, Stem Cells and Cancer

Development & Cell Biology

Systems Biology
To elucidate mechanisms of gene expression and epigenetic regulation, and the molecular basis of cellular decisions involved in tissue homeostasis and cancer

- Regulation of Alternative pre-mRNA Splicing during Cell Differentiation, Development and Disease (Valcárcel, coordinator)
- Chromatin and Gene Expression (Beato)
- Reprogramming and Regeneration (Cosma)
- Gene Function (De La Luna)
- Epigenetic Events in Cancer (Di Croce)
- Genome Architecture (Filion)
- Regulation of Protein Synthesis in Eukaryotes (Gebauer)
- Hematopoietic stem cell biology and differentiation (Graf)
- Mechanisms of cancer and aging (B. Keyes)
- Structural Genomics (Martí-Renom)
To understand the coding of biological information in the sequence of genomes and its relationship to human health

- Computational Biology of RNA Processing (Guigó, coordinator)
- Genomics and Disease (Estivill)
- Comparative Bioinformatics (Notredame)
- Comparative Genomics (Gabaldón)
- Evolutionary Genomics (Kondrashov)
- Gene Function and Evolution (Tartaglia)
- Genomic and Epigenomic Variation in Disease (Ossowski)
To understand the mechanisms of cell compartmentalization, division and tissue organization, and their roles in determining cell-specific properties

- Intracellular Compartmentation (Malhotra, coordinator)
- Microtubule function and cell division (Vernos)
- Coordination of Cytokinesis with Chromosome Segregation (Mendoza)
- Biomechanics of Morphogenesis (Solon)
- Organelle biogenesis and homeostasis (Carvalho)
- Cytoskeleton dependent RNA distribution mechanisms (Maurer)
To achieve a global quantitative understanding of biological systems, developing models that capture biological complexity and have predictive value

- Multicellular Systems Biology (Sharpe, coordinator)
- Design of Biological Systems (Serrano)
- Genetic Systems (Lehner)
- Sensory Systems and Behaviour (Louis)
- Comparative Analysis of Developmental Systems (Jaeger)
- Cellular & Systems Neurobiology (Dierssen)
- Transcriptomics of vertebrate development and evolution (Irimia)
**HIGH QUALITY AND IMPACT PUBLICATIONS**

**Senescence Is a Developmental Mechanism that Contributes to Embryonic Growth and Patterning**

Makayla Storey,7 Abbas Masu,1 Alessandra Poblenz-Moreno,1 Matteo Piscorano,1 M. Carmen Orrells,1 Valeria Di Giacomo,1 Reut Yosef,1 Noam Papat,1 Victor Krizhanovsky,7 James Sharpe,1 and William M. Keyes1,7

*NATURE | LETTER*

The effects of genetic variation on gene expression dynamics during development

Mirko Francesconi & Ben Lehner

**LETTER**

Epistasis as the primary factor in molecular evolution

Michael P. Frey,2 Carsten Kemen6, Peter K. Ita,2 Cedric Notredame,2 & Yudgor A. Kondrashov1,2

**TRPM5-mediated calcium uptake regulates mucin secretion from human colon goblet cells**

Sandra Mitrovic, Cristina Nogueira, Gerard Cantero-Recasens, Kerstin Kiefer, Jose M Fernandez-Fernandez, Jean-Francois Popoff, Leticia Casano, Frederic A Bard, Raul Gomez, Miguel A Valverde, Vivek Malhotra

**Molecular Cell**

Dissecting the energy metabolism in *Mycoplasma pneumoniae* through genome-scale metabolic modeling

Judith AH Wodke1,3, Jacek Puchalska1,3, Maria Lluch-Senar5,6, Josep Marca5,6, Eva Yus1,2, Miguel Godinho4,7, Ricardo Gutiérrez-Gallego5,6, Vitor AP Martins dos Santos1,8,9, Luis Serrano2,10,1, Edda Klipp4,5, and Tobias Maier1,2
**FOREFRONT TECHNOLOGIES**

- **Advanced Light Microscopy**
  - Super-resolution (STED)
  - Two-photon
  - Confocal

- **Genomics**
  - Microarray
  - NGS (Illumina and 454 platforms)

- **Histology**

- **Proteomics**
  - Orbitrap mass spec

- **Bioinformatics**
  - NGS data analysis
  - Data integration

- **FACS**
  - Becton Dickinson site
  - 5 analyzers and 2 sorters

- **Screening / protein tech.**
  - High content screening
  - LabChip, AKTA
TOWARDS TRANSLATIONAL RESEARCH

COLLABORATION
- HOSPITALS
- HEALTH INDUSTRY
- TRAINING FOR MD
- INSTITUTIONAL SEED FUNDS

CRG Fundamental Knowledge
- MODELS
- TISSUES, ORGANS
- GENOMES

TRANSLATION TOWARDS PERSONALIZED MEDICINE

RESOURCES
- EUROPEAN GENOME PHENOME ARCHIVE (EGA)
- MERGING WITH SPANISH NATIONAL SEQUENCING CENTER (CNAG)
THE EGA

• A service for **permanent archiving** and **secure sharing** of personally identifiable genetic and phenotypic data from biomedical research projects.
• A key resource for personalized systems medicine.
• **EBI-BSC-CRG** partnership to host, manage and improve the EGA.

![Bar chart showing number of studies by disease category](chart.png)

Studies in the EGA by disease
Click on a column to view category subgroups

- Cancer: 373
- Cardiovascular: 212
- Infectious: 27
- Neurological: 118
- Other: 102

*If applicable, a study may be included in more than one category*
## EU-LIFE

European Life Sciences Institutes for Excellence, [www.eu-life.eu](http://www.eu-life.eu)

**13 partners across Europe**

- Promoting excellence
- Integration
- Attract talent, support mobility
- Sharing best practise in research and management

**PARTNERS:** CRG, VIB, Curie, MDC, Babraham, IGC, FMI, NKI, CEITEC, CeMM, IEO, BRIC, FIMM

## CORE FOR LIFE

Excellence Alliance of Life Sciences Core Facilities in Europe, [www.coreforlife.eu](http://www.coreforlife.eu)

**7 partners across Europe**

- Sharing best practice
- Training
- Scouting new technologies
- Capacity sharing
- Funding

**PARTNERS:** CRG, VIB, EMBL, MPI-CBG, CSF - Vienna Biocente, FGCZ
INTERNATIONAL COOPERATION

MIT-Spain: Hosting MIT students in CRG research labs

Bi-national centre on bioinformatics and systems biology

Mobility programme on collaborative projects (supported by Novartis)

Collaboration agreement; exchange programme

Joint postdoctoral program
2013-2014 programme
3 PhD students for 6 months on collaborative projects
2014-2015 programme

- 3 fellowships for PhD students or postdocs for 6 months on collaborative projects (January – July 2015)
- Open up to other SA Universities and research centres
EUROPEAN COORDINATED PROJECTS

**4DCellFate**
Global understanding of the PRC and NuRD complexes in stem cells and disease.

**SysteMTb**
Systems Biology of *M. tuberculosis* and its interaction with the host.

**FLiACT**
Systems neuroscience in *Drosophila* (training network).

**SWARMORGAN**
Theoretical framework for swarms of GRN-controlled agents in morphogenesis and robotics.

**BioPreDyn**
New systems biology and bioinformatics tools for biotechnology applications.
INTERNATIONAL PROJECTS

ICGC
Genome sequencing of chronic lymphocytic leukemia (CLL)

IHEC
A BLUEPRINT of Haematopoietic Epigenomes (FP7)

GTEx
Genotype-tissue Expression Portal (NIH funded)

ENCODE
The Encyclopedia Of DNA Elements (NIH-funded)
ADVANCED TRAINING

Training the next generation of scientists

- International PhD Programme
- International Postdoctoral Programme
- Programme for visiting scientists
- Courses@CRG
- Teaching and Training LAB
- Training Unit
- Seminars, data clubs, retreats, courses
INTERNATIONAL PhD PROGRAMME

- Personalized mentoring
- Advanced training and courses
- Weekly journal clubs, data seminars, Courses @ CRG
- Career development and transferable skills
- PhD symposia and retreats
- Social activities
INTERNATIONAL POSTDOC PROGRAMME

- Training through research
- Advanced courses
- Teaching and mentoring activities
- Weekly journal clubs, data seminars, Courses @ CRG
- Career development and transferable skills
- Postdoc symposia and retreats
- Collaboration and mobility opportunities
- Social activities
- **New calls open now (ImPULSE)**
07/07/2014 - 11/07/2014 **Advanced proteomics course for molecular biologists and clinicians**

15/09/2014 - 20/09/2014 **Genome wide approaches to study functional protein/RNA interactions**

28/09/2014 - 03/10/2014 **EMBO Practical course on targeted proteomics: experimental design and data analysis**

06/10/2014 – 10/10/2014 **Next Generation Sequencing: lab methods and computational challenges**

27/10/2014 – 05/11/2014 **Stem Cells and induced Pluripotent Stem Cells**
Translating new scientific knowledge into benefits for health and value for society

- Licensing and patent portfolio in cancer, CNS, dermatology, HIV/AIDS, methods
- Contract research agreements with pharmaceutical and biotech companies
- Strategic research agreement with Sanofi
- Q-Genomics
Encouraging critical thinking and offering new educational resources

- Science & Art: scientific artistic contest
- Workshops for primary & high schools
- Scientific cafes
- “Easy Science” conferences
- Molecular biology summer campus
- Summer internships
THANKS!

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