

ikerbasque
Basque Foundation for Science

15
Annual
report



**“Science without conscience is
but the ruin of the soul”**

- Rabelais

¿What is Ikerbasque?

Ikerbasque, the Basque foundation for science, aims to strengthen the Basque science system through programmes to attract and consolidate researchers as well as the dynamisation of research.

142

Permanent researchers

Ikerbasque has attracted 142 researchers from 26 countries to the Basque Country, who are permanently assigned to universities and research centres.

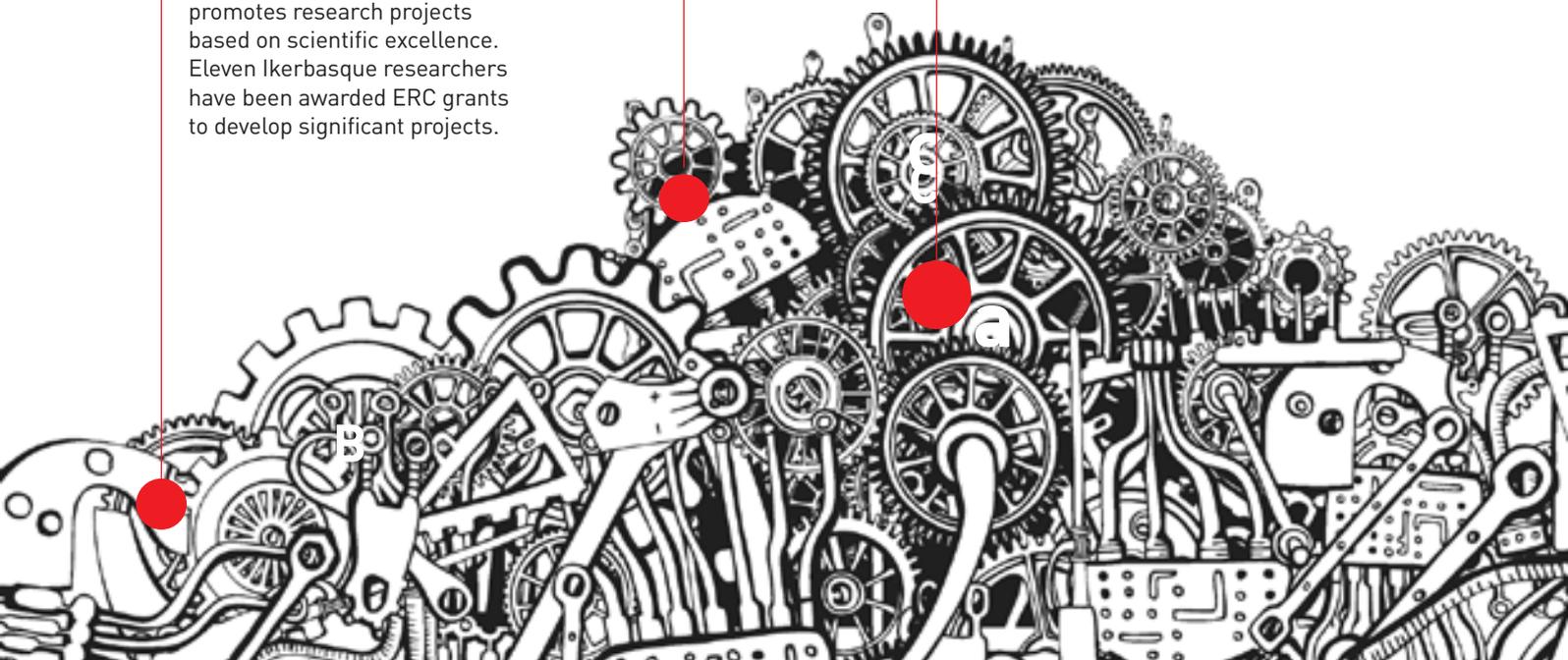
837

Articles in indexed publications

An average of 5,95 articles per Research Professor published in indexed publications (ISI or Scopus).

11 ERC

The ERC (European Research Council) is the principal European organisation that promotes research projects based on scientific excellence. Eleven Ikerbasque researchers have been awarded ERC grants to develop significant projects.



SCAN THIS CODE USING YOUR MOBILE
PHONE OR TABLET TO ACCESS THE LIST
OF PUBLICATIONS OR ACCESS IT VIA:

WWW.IKERBASQUE.NET/PUBLICATIONS



24.243.367€

Return

Total funds that Ikerbasque researchers have secured in competitive funding calls.

580

Staff led by Researchers

580 research positions led by Ikerbasque researchers.

59

Young researchers

They have a promising scientific career and international experience and the aim is to create a source of new talent, to lead the future of scientific research in the Basque Country.

342

Projects with external funding

Research projects with external financing in which Ikerbasque researchers participate.



▶ INDEX

1.1
Introduction
p. 8

1.2
Important
milestones
p. 10

1.3
Evaluation
process
p. 12

1.4
Evaluation
Committee
p. 13

1.5
Host
centres
p. 14

02

How we do it?

01

What do we do?



2.1
Research Professors
p. 18



2.2
Research Fellows
p. 26



2.3
Publications
p. 32



2.4
Horizon 2020
p. 42



2.5
Science Careers
p. 46



2.6
Euraxes Service Centre
p. 48



03

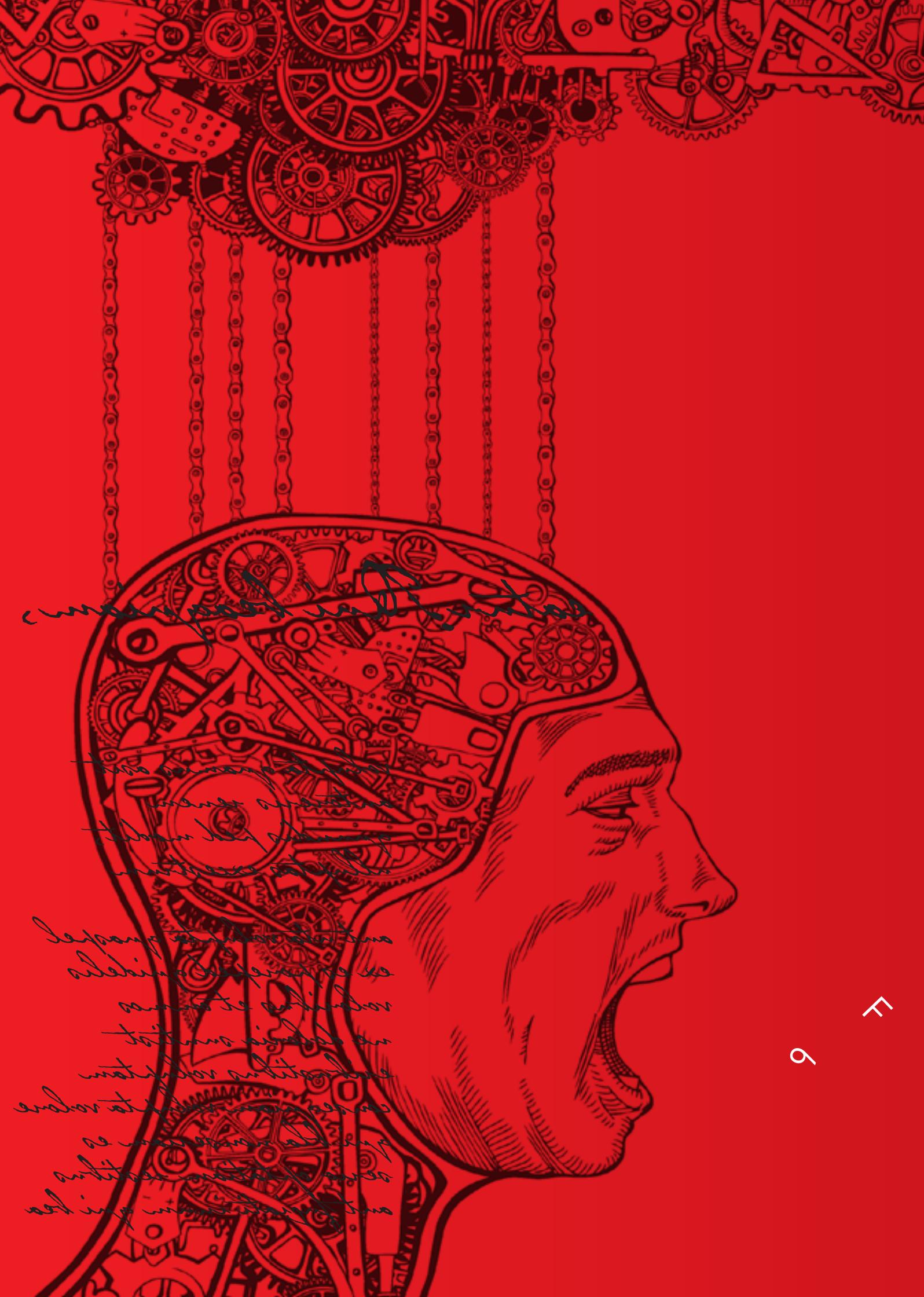
Why do we do it?

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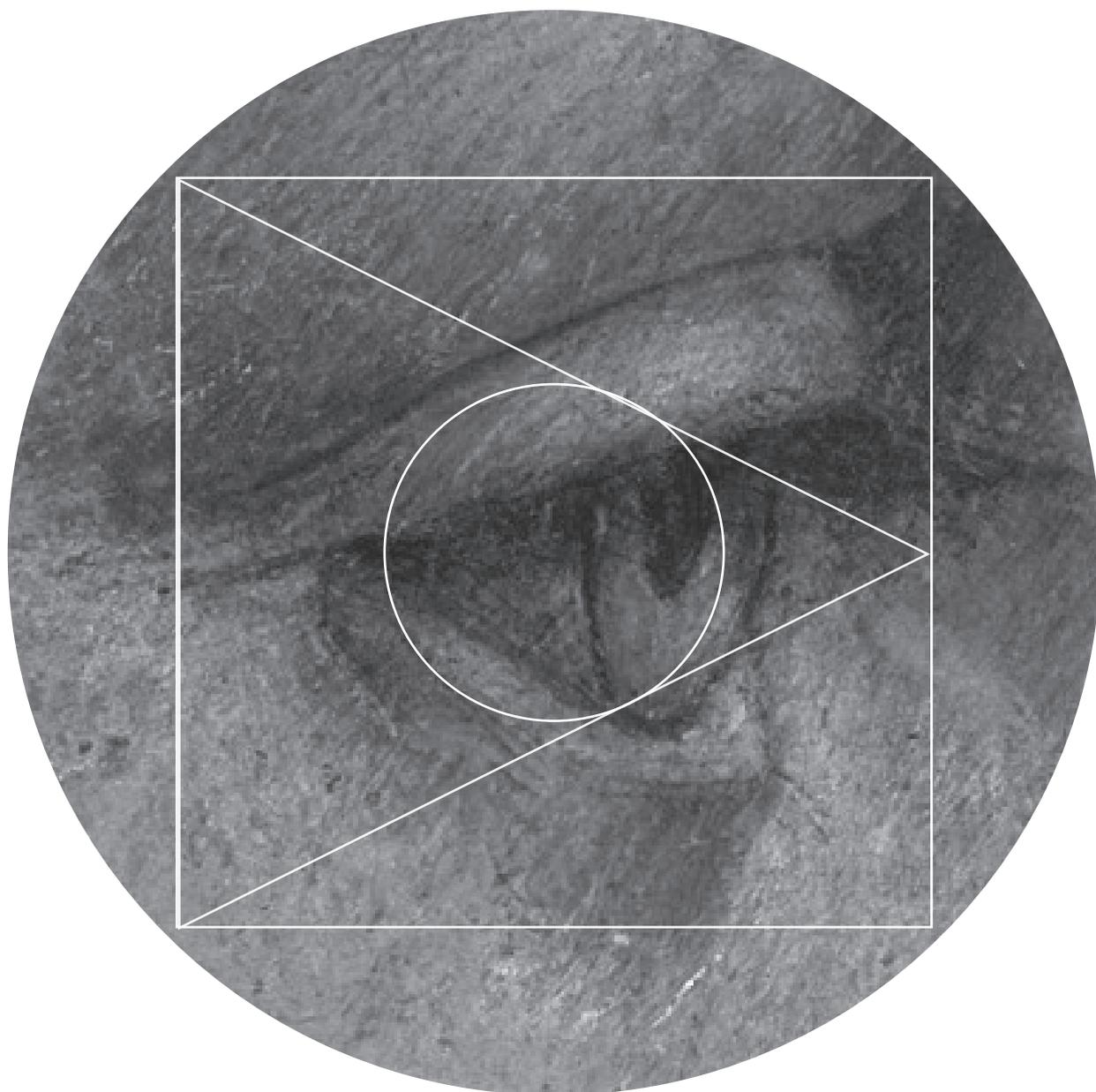
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What do we do?

► **1.1** THE BASQUE FOUNDATION FOR SCIENCE
IKERBASQUE



Euskadi has put its faith in people in science and has become a European reference point for attracting researchers. Ikerbasque, the Basque Foundation for Science, has played a vital role in this international recognition.

Some of the keys to Ikerbasque's success that have allowed us to go down this path can be found in the independence throughout the selection and evaluation processes, in the quality of the Scientific Committee, in the scientific excellence of the researchers and their alignment with the strategic objectives of our scientific policy, and, above all, the will to offer a service to the whole Basque science and technology network: universities, CIC, BERCs, technologic alliances and hospitals.

Ikerbasque currently employs 142 senior researchers from 26 countries. These are researchers from all over the world, from all fields of knowledge, with a positive trajectory and leadership capabilities. Likewise, we employ 59 young researchers with promising scientific careers.

Both programmes' aims are two-fold: one the one hand, attract people who are carrying out their research abroad, including local scientists who emigrated at a point in their careers; and, on the other hand, offer opportunities to consolidate their trajectories to those who are currently researching in Euskadi.

In 2015, our researchers published 837 articles in indexed journals and are leading 11 ERC Grants, the most prestigious grants in Europe which favour ambitious research projects that push the boundaries of knowledge. Also in 2015, Ikerbasque researchers obtained 24€ million for research projects. These resources are used to foster research in Euskadi by hiring researchers of all levels and investing in equipment and infrastructures – specifically, 580 people are working in research groups led by Ikerbasque researchers.

Euskadi has consolidated itself as a European reference point for science; we are recognised at international level as an advanced research region, with Basque research groups at international level and where conditions are ripe for carrying out research of international scale. Proof of this is that the European Commission has chosen Ikerbasque as one of the best European initiatives for the advancement of science among the more than 70 proposals from all over Europe.

IKERBASQUE CURRENTLY EMPLOYS 142 SENIOR RESEARCHERS FROM 26 COUNTRIES.

MISSION

Ikerbasque is the organization promoted by the Basque Government to boost science in the Basque Country through programmes for attracting and taking on researchers and the revitalising of research, in cooperation with research centres and universities, and committed to excellence

VALUES

- Efficiency
- Rigour
- Cooperation
- Commitment

VISION

In 2017 Ikerbasque aspires to be:

- the main revitalising entity of the science system in the Basque Country,
- thanks to its proven ability to attract and consolidate scientific talent
- and its participation in the improvement of efficiency of the Basque science system,
- recognised by society, the Administration and its Board for its contribution to the improvement of the science of the Basque Country, its management model, transparency and its sustainability;
- and where the people who compose it can fully develop.



TRANSPARENCY

At Ikerbasque we put our faith in transparency, since we understand that integrity, transparency and responsibility are the pillars for organisational excellence. Transparency refers to the accessibility available to the society of the organisation's information and, to this end, our accounts are audited annually and can be consulted on our website (www.ikerbasque.net) where both Ikerbasque's Strategic Plan and Annual Report are at your disposition.

People:

At Ikerbasque we recognise that it would not be possible to reach any of our goals without the active contribution of the 366 people that, at some stage, have been hired through the various calls. Furthermore, the organisation has a management team comprising five people, amounting to 1.5% of the total staff.

Permanent researchers' contracts and those of that management team are permanent and those of the Research Fellows or Junior Researchers have a duration of five years.

Remuneration:

The salaries at Ikerbasque are in line with those of the Basque Science System and are established, in the case of Research Professors, taking into account the experience of the individual to be hired, the position held prior to being hired, and the potential post. In terms of the salaries of the management team and the Research Fellows, the salary is unique and is published in the call.

Commitment to Quality:

Since 2007, Ikerbasque has been managed following EFQM standards for excellence in management. Ikerbasque's commitment was recognized in 2011 with the silver Q for quality in management and also in 2015 under the new model for Advanced Management.

Budget:

Ikerbasque's proposal for 2015 can be broken down as follows:

Total budget 14,2M€
 Basque Government 12,4M€
 European Union 1,5M€
 Others 0,3M€

► 1.2 IMPORTANT MILESTONES

2014

- 137 Research Professors, permanent researchers.
- 44 Research Fellows, young researchers.
- 848 Articles in indexed publications.
- 10 ERC Grants.
- Almost 20 million euros awarded to the Ikerbasque Researchers.

2013

- 130 Research Professors.
- 21 Research Fellows.
- 670 articles in indexed publications.
- 9 ERC Grants.
- Almost 17 million euros awarded to the Ikerbasque Researchers.

2012

- 116 Research Professors.
- €17,441,778.
- 450 Publications.
- Launch of the first Fellows programme aimed at young Researchers.
- 14 Researchers selected.
- 22 Visiting Researchers.
- Three new research centres in neuroscience, new materials and macromolecular design.
- 8 ERC Grants.

2011

- 5th anniversary of Ikerbasque.
- 99 Research Professors.
- 13,442,241 total funds received.
- 18 Visiting Researchers.
- “Silver Q” for management excellence.
- “Silver HR Excellence in Research” seal for its strategy in attracting research personnel.
- 6 ERC Grants.



2007

- The Basque Government creates Ikerbasque with the aim of reinforcing the Basque Science System by attracting researchers and creating research centres.
- Launch of the first international programme aimed at Research Professors: the year ends with the hiring of **21** permanent Researchers.
- Launch of the first programme to contract Visiting Researchers interested in researching in the Basque Country for a maximum of **12 months**. Ten researchers were hired.

2008

- Creation of **3** new BERG research centres of excellence in climate change, mathematics and cognitive neuroscience and language and 3 existing research centres are consolidated as BERG: DIPIC, Material Physics Center and Biophysics Foundation.
- Launch of the second Research Professor programme. The year ends with **35** Research Professors hired.
- Launch of the second programme to contract Visiting Researchers. The year ends with **23** Visiting Researchers.

2009

- **60** Research Professors with permanent contracts.
- **13** Visiting Researchers.
- **€4,961,660** total funds obtained for all Ikerbasque researchers.

2010

- **77** Research Professors from **22** different countries and **22** Visiting Researchers.
- **€5,505,820** total funds that Ikerbasque Research Professors have received.
- Ikerbasque starts up the Basque Observatory for Science with the aim of monitoring the evolution and progress of scientific production in the Basque Country.
- Acknowledged as one of the best European initiatives for scientific development and 5 million euros awarded by the Marie Curie programme for the following **4 years**.
- The Ikerbasque researchers achieve **3** ERC Starting Grants.

▶ 1.3 EVALUATION PROCESS

CANDIDATE SELECTION IS KEY TO THE SUCCESS OF IKERBASQUE. THE CRITERIA FOR EVALUATION ARE:

Scientific merit and research trajectory

Relevance of field of research and published papers

Concordance with the capabilities of the Basque Science System

One of our main goals is to ensure an independent, excellent and professional evaluation and, to this end, we look for the best researchers and professional scientists from all over the world in order for them to form part of our evaluation panel. It is a question of having evaluators from all fields of knowledge and from outside the **Basque Science System** with the aim of guaranteeing the independence of the evaluations.

▶ 1.4 EVALUATION COMMITTEE

CURRENTLY, OUR EVALUATION PANEL COMPRISES MORE THAN 200 INDEPENDENT EVALUATORS FROM 29 COUNTRIES THAT PARTICIPATE IN THE EVALUATION PROCESS UNDER THE COORDINATION OF THE IKERBASQUE SCIENTIFIC ASSESSMENT COMMITTEE, COMPRISING:



1- Prof. Luis Oro
Professor of Inorganic Chemistry
at the University of Zaragoza

2- Prof. Ginés Morata
CSIC Researcher (Spanish
National Research Council)

3- Prof. Margarita Díaz-Andreu,
Professor of Archaeology at
the University of Barcelona

4- Prof. Laura Morales,
Professor of Politics and
International Relations at
Leicester University

5- Prof. Francisco Guinea,
Professor in the theory of
condensed matter department
at the Material Science Institute
(ICMAT)-Theory of Condensed
Matter department” in Madrid

6- Prof. Domingo Docampo
Telecommunications Professor and
former-Rector at Vigo University

7- Manel Esteller
Director of the Epigenetics and
Cancer Biology Programme
at the Bellvitge Institute for
Biomedical Research (IDIBELL)
and Professor of Genetics at
the University of Barcelona

▶ 1.5 HOST CENTRES

THE IKERBASQUE RESEARCHERS
HAVE JOINED THE FOLLOWING
CENTRES IN THE BASQUE COUNTRY.

● * Number of researchers



bcbl
BASQUE CENTER
ON COGNITION, BRAIN
AND LANGUAGE

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ik4 research alliance



tecnalia
Corporación Tecnológica

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ehugroup
BASQUE CENTER FOR NEUROSCIENCE



Universidad de
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BioCruces 4
HEALTH RESEARCH
INSTITUTE



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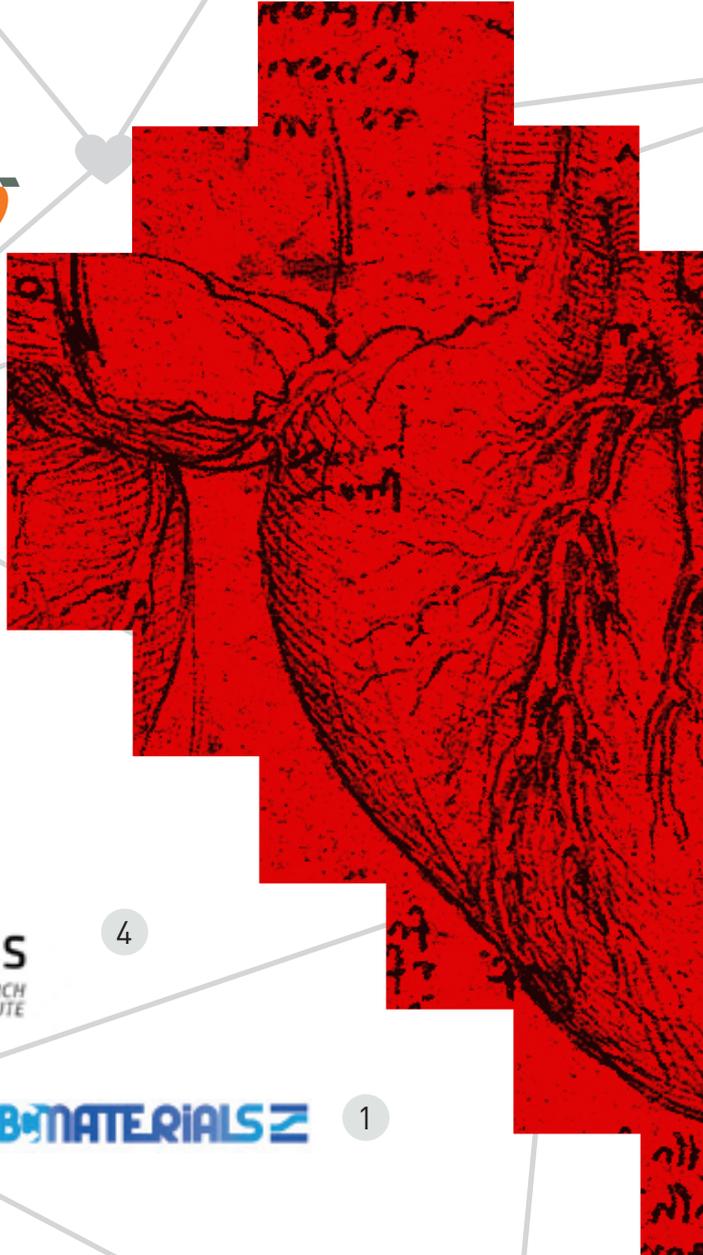
dipc
Donostia International Physics Center

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bc³
BASQUE CENTRE
FOR CLIMATE CHANGE

6





GLOBERNANCE
GOBERNANTZA DEMOKRATIKOAREN INSTITUTUA
INSTITUTO DE GOBERNANZA DEMOCRÁTICA

1

POLYMAT
Basque Center for
Macromolecular Design and Engineering

4



CSIC-UPV/EHU

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UNIDAD DE BIOFÍSICA
BIOFÍSICA UNITATEA
CENTRO MIXTO
CONSEJO SUPERIOR DE
INVESTIGACIONES CIENTÍFICAS
UNIVERSIDAD DEL PAÍS VASCO
EUSKAL HERRIKO UNIBERTSITATEA

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eusko fundazioa
Fundación Vasca de Innovación
e Investigación Sanitarias

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Universidad
del País Vasco Euskal Herriko
Unibertsitatea

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bioGUNE
Biomaterials Basque Cooperative Center
Centro de Investigación Cooperativa en Biomateriales

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energigUNE
energy cooperative
research center

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MONDRAGON
UNIBERTSITATEA

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biodonostia
INSTITUTE OF INVESTIGATION

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CFM
Centro de Física de Materiales
Materials Physics Center
Materialen Fisika Zentroa

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(bcam)
basque center for applied mathematics

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CIC
biomaGUNE
Biomaterials Ikerkuntza Kooperatiboko Zentroa
Centro de Investigación Cooperativa en Biomateriales

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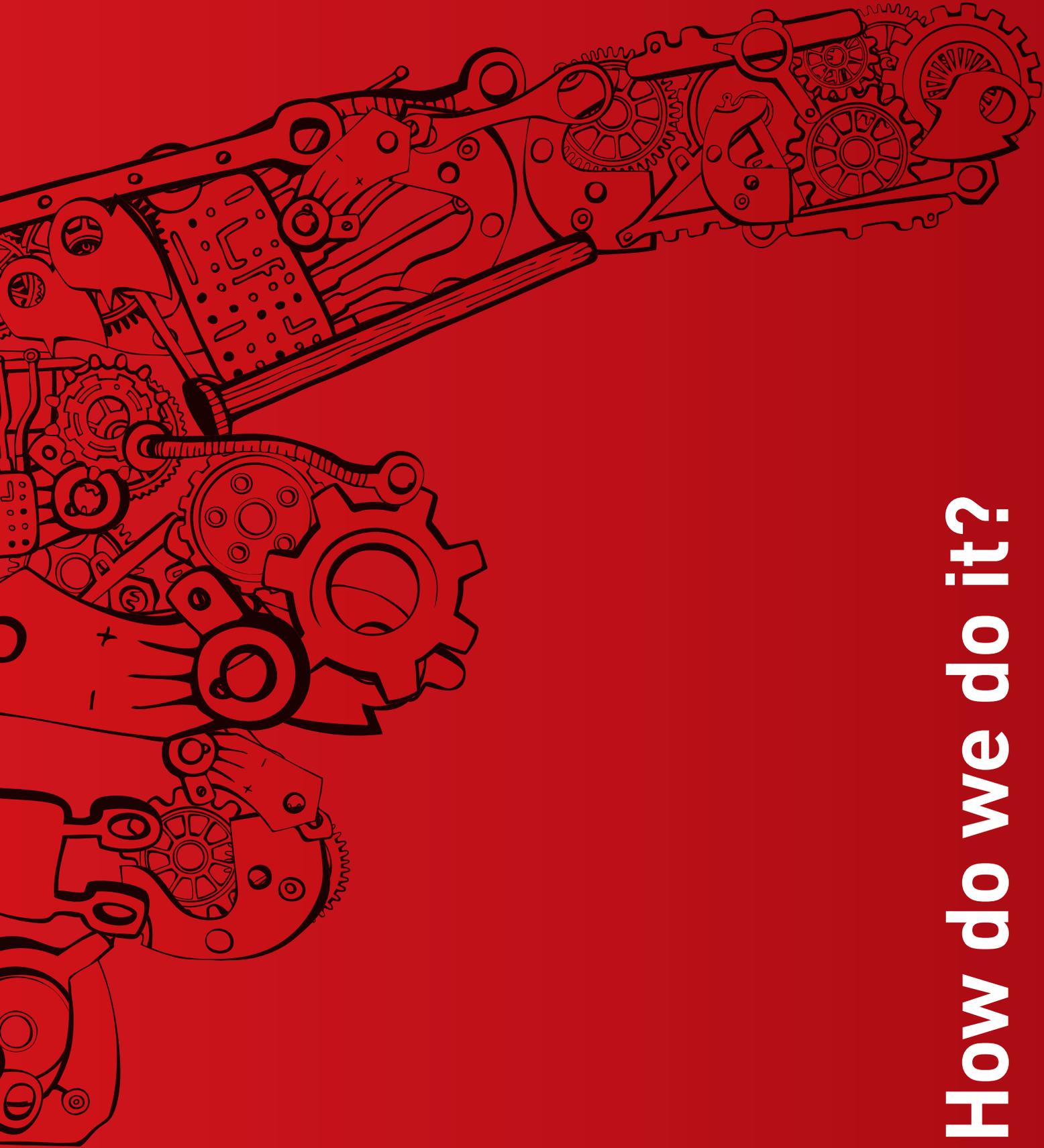
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nanoscience cooperative research center

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02



How do we do it?

► 2.1 RESEARCH PROFESSORS

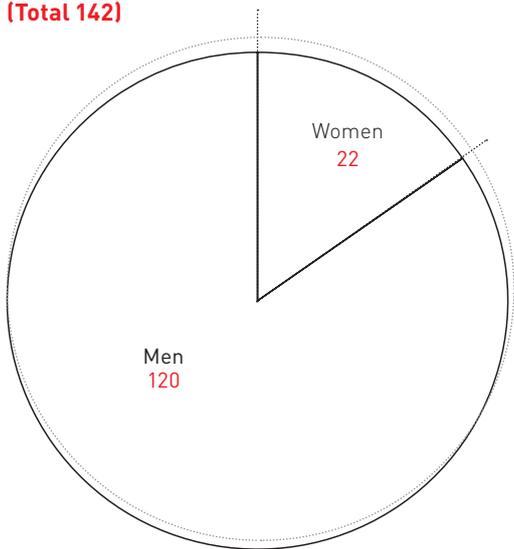
SENIOR RESEARCHERS WITH EXTENSIVE RESEARCH EXPERIENCE AND LEADERSHIP SKILLS. THEY ARE ASSIGNED PERMANENTLY TO BASQUE UNIVERSITIES AND RESEARCH CENTRES.



PROFILE RESEARCH PROFESSORS

Distribution by sex

(Total 142)



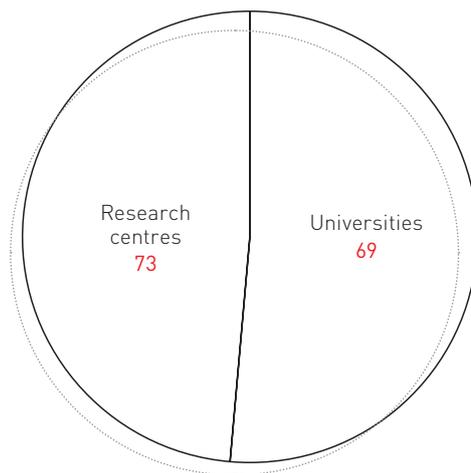
Main Information

- Articles in indexed journals per researcher: 5,95
- Papers, books and chapters in books per researcher: 7,13
- Presentation at international congresses per researcher: 3,23
- Projects with external funding: 298
- Doctoral theses supervised: 29
- Master's students supervised: 28

Due to some researchers having started to work in Ikerbasque over the course of 2015, they have not worked for a full year. Taking this variable into account the ratios are calculated for 132 Research Professors.

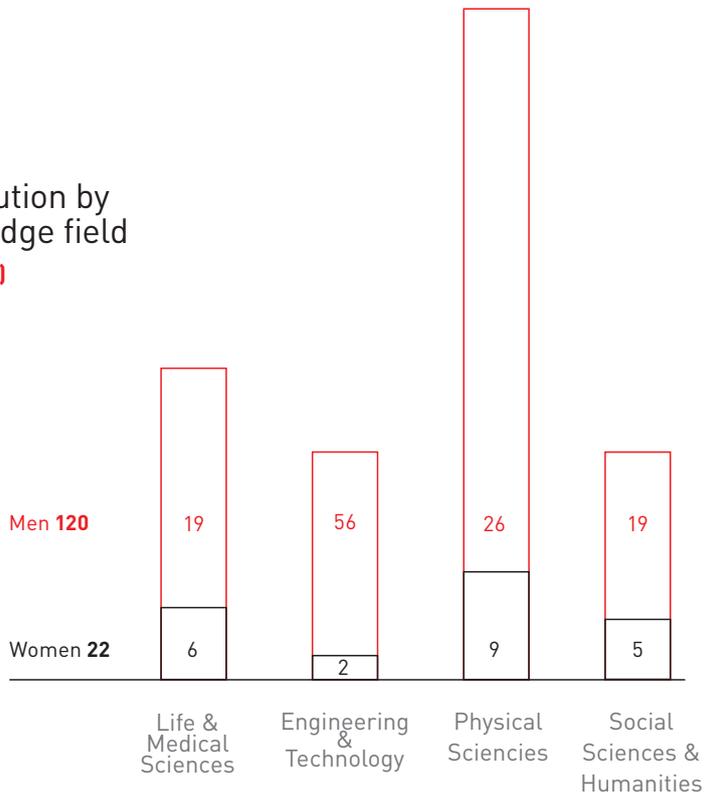
Distribution by host centre

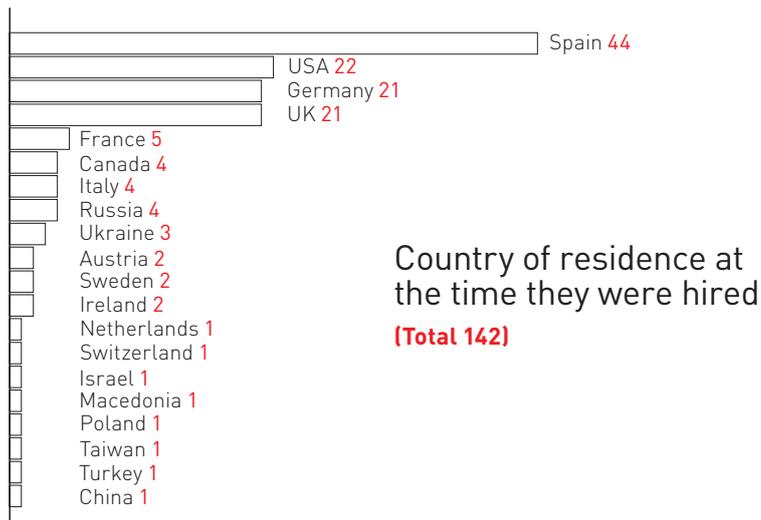
(Total 142)



Distribution by knowledge field

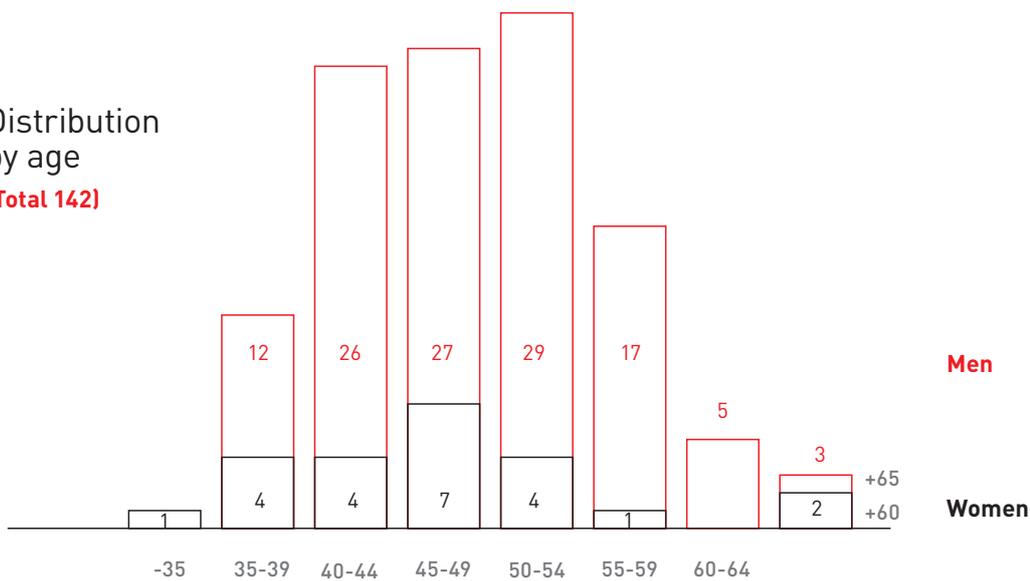
(Total 142)





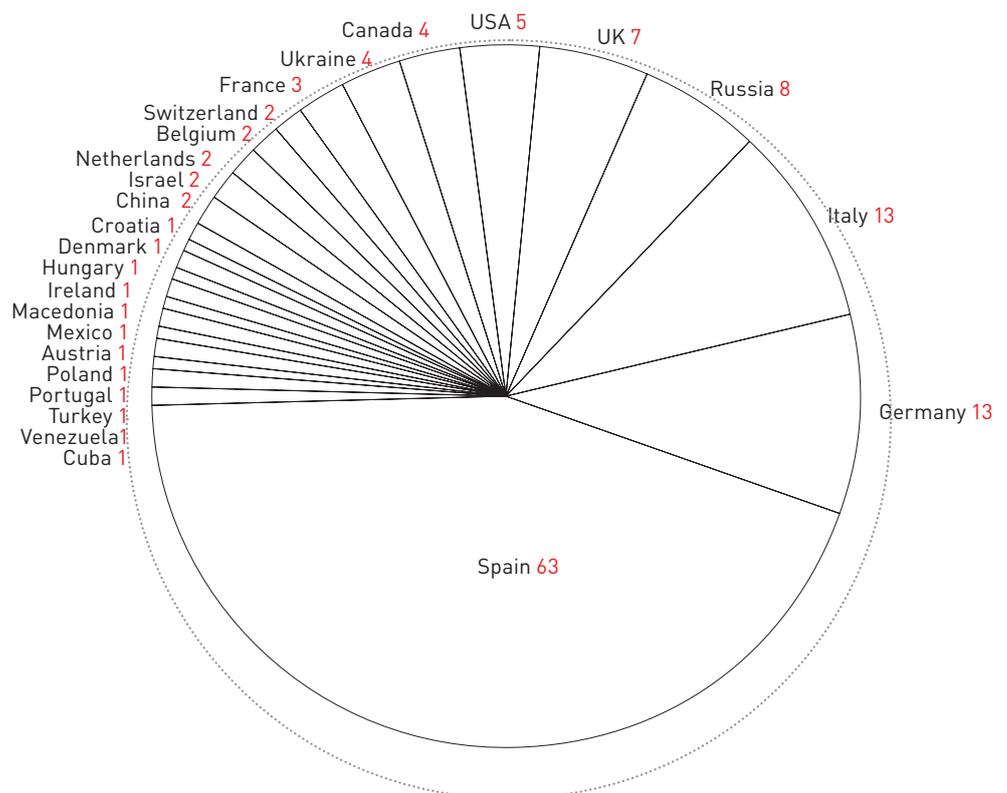
Distribution by age

(Total 142)



Nationality of the Research Professors

(Total 142)





1. **Dr. Nicola G. A. Abrescia** Structural studies of large molecular complexes and virus particles using X-ray crystallography and electron microscopy. 2. **Dr. Elena Akhmatkaya** Mathematical models and computational simulation in life sciences and materials. Numeric methods. 3. **Dr. Aitor Anduaga** History of physics and geophysics, science in non-democratic regimes; the interaction between science, technology and industry. 4. **Dr. Juan Anguita** Proinflammatory signals in response to infectious agents. Macrophage function. Antimicrobials and Immunomodulators. 5. **Dr. Juan Carlos Arango** Traumatic brain injury, spinal cord injury, physiotherapy and family affairs. 6. **Dr. Marcos Jesús Arauzo Bravo** Computational biology and biocomputing in regenerative medicine and human disease. 7. **Dr. Emilio Artacho** Condensed matter physics; theory and simulation of solids, liquids and nanostructures. 8. **Dr. Igor Bando** Theoretical physics of high energies, string theory/M theory, supergravity, supersymmetry. 9. **Dr. Lourdes Basabe** Point-of-care diagnostic platforms: integration of biosensors in microfluidic platforms for disposable point-of-care diagnostic tests. 10. **Dr. Urtzi Ayesta** Programming theory, queuing theory, stochastic processes, gaming theory and their applications to the performance of the evaluation, design and scoping of the telecommunications and distributed systems networks. 11. **Dr. Alexander Bittner** Electrochemistry, solids/liquids interfaces, plant viruses, electrospinning. 12. **Dr. José Juan Blanco** Cosmology of the primitive universe. 13. **Dr. Francisco Borrego** Immunology. 14. **Dr. Luz Boyero** Biodiversity, functional ecosystems, global change, freshwater ecology. 15. **Dr. Christian Blum** Swarm intelligence techniques for optimisation and management tasks in static and decentralised environments, hybridisation of metaheuristics with complete combinatorial optimisation techniques. 16. **Dr. Thomas Broadhurst** Observational cosmology, dark matter, the formation of galaxies. Experience with telescopes and satellites. 17. **Dr. Jean-Bernard Bru** Mathematical studies (analysis, probability, algebra) of the quantum problem of multiple bodies relating to condensed matter physics. 18. **Dr. Félix Casanova** Spin currents in complex systems (metals, superconductors, organic semiconductors) by nanomanufacturing and features of "spintronic" devices". 19. **Dr. Francisco Blanco** Biosciences, the structure of proteins. 20. **Dr. Arkaitz Carracedo** Study of the contribution of the reprogramming of the metabolism to the biology of cancer cells, and the implication of the signalling pathways in the regulation of the cancer's metabolism, with special emphasis on prostate cancer. 21. **Dr. Manuel Carreiras** Psycholinguistics, language neurocognition. 22. **Dr. Joaquín Castilla** Molecular mechanisms involved in the transmission of prions between different species. 23. **Dr. Hubert Chen** Theoretical computer science and related mathematics. 24. **Dr. Volodymyr Chernenko** Ferromagnetic materials with shape memory. 25. **Dr. Andrey Chuvilin** Low voltage high resolution TEM of nanocarbon materials, electron diffraction in convergent beams, image simulation and processing. 26. **Dr. Daniel Conversi** Historia política y social. 27. **Dr. Martin Cooke** Political and social history. 28. **Dr. Eros Corazza** Philosophy of language and the mind. Linguistics. Cognitive sciences. 29. **Dr. Susana Cristobal** Proteomics: tools to calculate environmental and health matters. 30. **Dr. Roberto D'Agosta** The transport of electrons in nanoscale systems, multiple bodies system theory and the open quantum system. Cold atoms physics. 31. **Mauro D'Amato** Molecular genetics of gastrointestinal diseases. 32. **Dr. Ezequiel DiPaolo** Personal and social cognition, philosophy of the mind, evolutionist robotics, computational neuroscience. 33. **Dr. Davide Donadio** Theoretical nanoscience. 34. **Dr. Fadi Dornaika** Computer vision, image processing, models recognition, learning by machines. 35. **Dr. Darrell Conklin** Bio information technology, musical information technology. 36. **Dr. Jesus Cortés** Application of statistical methods and information theory to neuroimaging data. 37. **Dr. Javier Echeverría** The information and knowledge society. 38. **Dr. Juan M.**



† 1969-2015
In Memoriam

Encinas Study of the intrinsic properties of neural stem cells and neurogenesis in the adult hippocampus under normal conditions, of ageing and of neurological disorders such as epilepsy. **39. Dr. Inma Estevez** Improvement of poultry production. **40. Dr. Juan Falcón-Pérez** Functional and molecular study of microvesicles and thorough metabolic analysis of body fluids. **41. Dr. Sergio Faria** Environmental physics, glaciology, geomorphology, thermodynamics, soft matter, continuous diversity, biodiversity, emerging and multiscale modelling. **42. Javier José Fernández de Bobadilla** Algebraic Geometry, Topology and Singularity Theory **43. Dr. Thomas Frederiksen** Quantum transport theory and electronic structure methods. Theory and simulation of nanostructures and interfaces. **44. Dr. Paola Fucini** Structural biology of the ribosome. **45. Dr. Zoraida Freixa** Homogeneous catalysis, supramolecular chemistry and photochromic materials. **46. Dr. Vadim Frolov** Biophysics of cellular membranes and model; membrane dynamics, fusion and fission, mechanics and thermodynamics of small membrane systems. **47. Dimas García de Oteiza Fieldman** Investigation of physico-chemical phenomena in organic materials, including thin-film growth, self-assembly, interface electronics and surface-supported chemical reactions. **48. Dr. Geza Giedke** Theory of quantum information. Dynamics of open quantum systems. **49. Dr. Frank Giro** Optimisation and simulation of manufacturing processes; application of nanotechnologies to manufacturing processes. **50. Dr. Humberto González Díaz** Chemical and bio information technology and complex networks in molecular & bio-systems. **51. Dr. Javier Gorosabel** Explosive phenomena in the universe. The astrophysics of high energies. Optical polarisation in astronomical sources. Astronomical instrumentation. The automation of telescopes. **52. Dr. Durk Gorter** Studies in minority languages; multilingual education. **53. Dr. Slawomir J. Grabowski** Theoretical chemistry, physics-chemistry, intermolecular interactions. **54. Dr. Marcelo E. Guerin** Structural glycobiology. **55. Dr. Aitor Hierro**

Structural biology, membranes traffic. Protein complexes. **56. Dr. Konstantin Gusliyenko** Theory of magnetism and magnetic materials: quantum magnetism, nano magnetism and micromagnetism, spin dynamics. **57. Dr. Andreas Heidenreich** Simulations of Coulomb explosions in clusters induced by ultra-intense and ultra-short pulses. **58. Dr. Rainer Hillenbrand** Nano-optics and materials characterisation. **59. Dr. Luis Hueso** Electronic devices with organic semiconductors and nanofibres. Memory devices. **60. Dr. Daniel Innerarity** Political philosophy (governance in the global knowledge society). **61. Dr. Maria José Iriarte Chiapuso** Archaeology, paleobotany and paleopalynology. **62. Dr. Nagore Iriberrri** Behavioural and experimental economics, initial responses to games, role of beliefs and expectations in individual decision-making and games. **63. Dr. Jesús Jiménez Barbero** Magnetic nuclear resonance and molecular recognition. **64. Dr. Vladimir Kaberdin** Post-transcriptional control, processing and decay of RNA, bacterial stress responses. **65. Dr. Andrey Kazansky** Computer simulation of the ultra-fast phenomenon in gases and metal interfaces. **66. Dr. Ilya Kazachkov** Combinatorial and geometric group theory and model theory of groups. **67. Dr. Shira Knafo** Neurosciences, ageing, Alzheimer's disease, anxiety disorder, synaptic plasticity. **68. Dr. Mato Knez** Nanomaterials (synthesis and properties), material science, thin film coatings, atomic layer deposition (ALD) and organic-inorganic and bio-organic hybrid materials. **69. Dr. Sergey Korotov** Numerical analysis, finite element method, mesh generation. **70. Dr. Eugene Krasovskii** The science of the surface, the theory of the deflation/diffraction of electrons and photoemissions, computational methods of solid state theory. **71. Dr. Stefan Kurth** Particle quantum physics, especially functional density theory, the temporal description of the transport of electrons through molecules and nanostructures. **72. Dr. Banafshe Larijani** Biophysics applied to cancer. **73. Dr. Annick Laruelle** Game theory and social choice. **74. Dr. Charles Lawrie** Use of primary



genome techniques to identify the genes/micro-RNA involved in the pathology of cancer and their potential as a biomarker. **75. Dr. Luis Liz-Marzán** Synthesis and assembly of nanoparticles, development of sensors and diagnosis tools based on nanoparticles. **76. Dr. Hartmut Luecke** Structure-function studies of membrane proteins. The discovery of drugs based on structural studies. **77. Dr. Michael Marder** Phenomenology, ethical and political philosophy, environmental philosophy. **78. Dr. Juan Mareque** Bioinorganic and supramolecular chemistry, molecular recognition, biomedical and nanomedical imaging. **79. Dr. Anil Markandya** The economics of the environment and of the resources, climate change. **80. Dr. Aurelio Mateo** Molecular and supramolecular materials. **81. Dr. Iciar Martínez** Identification and characterisation of bioactive compound in aquatic organisms, development of quick and non-invasive methods for detecting contaminants, pathogens and parasites and the development of methods for the authentication of foodstuffs. **82. Dr. Ugo Mayor** Biochemical and genetic characterisation of the locational pathways in functions and neuronal disorders. **83. Dr. David Mecerreyes** Polymer chemistry, organic catalysis, polymers that are non-harmful for the environment, sustained polymerisation reactions. **84. Dr. Joseph McIntyre** Computational models related to human motor sensorial behaviour. **85. Dr. Michele Modugno** Bose-Einstein condensation. Quantum "ultracold" gases in optical networks and potential disorders. **86. Dr. Rafael Morales** Interchange magnetism of paired multilayers and nanostructure magnetism. **87. Dr. Alejandro Müller** Nucleation, crystallisation, morphology and physical properties of polymers, biopolymers, nanocomposites. Soft matter and structured fluids rheology. **88. Dr. Jaume Navarro** The history of science, especially the history of physics science. **89. Dr. Marc Neumann** Aquatic impact of climate change, adaptation of water infrastructures, planning and design in conditions of uncertainty. **90. Dr. Ignacio Palacios** Theoretical and applied microeconomy, game theory,

behavioural and experimental economy. **91. Dr. David Pardo** Computational simulations, multiphysics, investment and petroleum. **92. Dr. Peter Pearman** Distribution of species with regard to environmental gradients, phylogeography, paleoecology. **93. Dr. Raul Pérez Jimenez** Microscopy of the atomic force of singular molecules. Research on protein mechanics and mechano-enzymology. **94. Dr. Carlos Pérez Moreno** Real and harmonic analysis. **95. Dr. Mario Piris** Chemistry physics, quantum chemistry, reduced density matrix mechanics, natural orbit functional theory. **96. Dr. Jose Pomposo** Synthesis of nano-soft uniform objects and the research of nano-complex objects with self-assembly behaviour. **97. Dr. Ignacio Pascual** Single atom/molecule spectroscopy and manipulation with a scanning-tunnelling-microscope. **98. Maurizio Prato** Carbon nanotubes **99. Dr. Rafael Pulido** The role of protein phosphatase and kinases in human cancer. **100. Dr. Yury Racovich** Nanophotonics, spectroscopy and photonics application of particles and structures at a nano scale, microcavities optics, nano-biophotonics. **101. Pedro Ramos** Molecular imaging. Nonomedicine **102. Dr. José Julio Rodríguez Arellano** Arellano Neuroanatomy and functional connectivity of neural circuits in the context of plasticity relating to memory under normal and pathological conditions. **103. Dr. Susana Rodríguez** Production of ligninolytic enzymes, development of different techniques for the immobilisation of microorganisms and the immobilisation of enzymes, bioreactor design, development of bioprocesses, biological treatment of waste water containing dyes and the purification of enzymes. **104. Dr. M^a Cruz Rodríguez Oroz** Parkinson's disease, mainly based on surgical treatment and the associated behavioural and cognitive problems, as well as the pathophysiology of basal ganglia of this disease. **105. Dr. Arthur Samuel** Psycholinguistics, particularly, the cognitive processes involved in the recognition of spoken language. **106. Dr. Unai Pascual** Economy of the environment and development, ecological economy, modelling of natural



resources, the economy of biodiversity and ecosystems, global environmental change, links between poverty and the environment, preservation of the agrobiodiversity. **107. Dr. Marie-Louise Saboungi** Materials for sensors **108. Juan José Saenz Gutierrez** Theory and Modeling on NanoOptics, Wave Transport through Random Media and Scanning Probe Microscopy. **109. Dr. Marta Sánchez Carbayo** Translational oncology, molecular pathology, biomarkers, bladder cancer. **110. Dr. Thomas Schäfer** Sustainable separation processes through the use of benign materials, interfaces of stimuli sequences for separation systems and artificial smell systems, membranes separation in microreactor technology. **111. Dr. Gunar Schnell** Experimental and phenomenological research of quantum chromodynamics and particularly the structure of the nucleon and hadronisation. **112. Dr. Eugeny Sherman** Nanostructures, spintronics and quantum magnetism. **113. Andreas Seifert** Nanoengineering, Biomedical Microsystems **114. Dr. Amanda Sierra** Microglial cells in the interaction between phagocytosis and inflammation in the diseased brain. **115. Dr. Jens Siewert** Quantum dynamics and transport in mesoscopic systems, quantum information theory. **116. Dr. Vyacheslav Silkin** Ultra-fast particle dynamics. **117. Dr. Dmitri Sokolovski** Quantum theory. **118. Dr. Enrique Solano** Multidisciplinary research in quantum optics; quantum information; quantum mechanics; condensed matter. **119. Dr. Vadim Soloshonok** Organic chemistry, fluoridated chemistry, chiral nanotechnology, astrochemistry. **120. Dr. Ivo Souza** Condensed matter theory. Computational electronic structure. **121. Dr. Francesca Tinti** Church organisation of the High Middle Ages, papal correspondence, preservation and transmission of documents of the High Middle Ages. **122. Dr. Ilya Tokatly** Quantum physics and nanostructures. **123. Dr. Radmila Tomovska** Photochemistry, photocatalysis, preparation and characterisation of materials, polymer surface modification. **124. Dr.**

Esther Torrego Linguistic theory, syntax interface between syntax and phonology and syntax and semantics, comparative syntax and Spanish and Romance linguistics. **125. Dr. Geza Tóth** Quantum information. **126. Dr. Mustafa Tutar** Interactions of the structure of fluids for aerodynamic and/or hydrodynamic applications, turbulences modelling for different movement scenarios, renewable energy. **127. Dr. Koen Vandenberg** Pharmacogenomics and the genetics of autoimmune diseases. **128. Dr. Paolo Vavassori** Changing magnetisation, related characterised dynamics and methods. Manufacturing and characterisation of magnetic nanostructures. **129. Dr. Alexei Verkhatsky** Neuroscience, cellular signalling, neurodegeneration. **130. Dr. Agustín Vicente** Philosophy of the mind; specifically in mental causation and emergentism, relationships between language and thought. **131. Dr. José Vilar** Computational biology. **132. Dr. Ferdinando Villa** Theoretical ecology. **133. Dr. Joel Villatoro** Applied Photonics. Development of photonic devices and prototypes. **134. Dr. Lucia Vitali** Surface science, spectroscopic and local scale structural research based on tunnel effect techniques. **135. Dr. Lian-Ao Wu** Quantum information theory. **136. Dr. Ronen Zangi** Chemical physics. **137. Dr. Kornelius Zeth** Biology mechanisms: biogenesis of proteins in bacteria and mitochondria, human antimicrobial peptides, iron storage in bacteria. **138. Wei Zhang** Visualizing and Application of Interaction in Oxide/Metal Materials for Electrochemical Energy Conversion; Structure and Surface Elucidation of Complex Oxide for Catalysis **139. Dr. Peicheng Zhu** Phase transition models. Differential partial equations analysis. **140. Dr. Arkady Zhukov** Magnetic materials, magnetic cables, amorphous nano-crystalline and granular magnetic materials, magnetoelectric effects, transport properties, magnetic properties. **141. Dr. Enrique Zuazua** Partial differential equations, numerical methods, control and optimal design theory. **142. Dr. Jose Luis Zugaza** Cell signalling in cancer and neurodegeneration.

► 2.2 RESEARCH FELLOWS

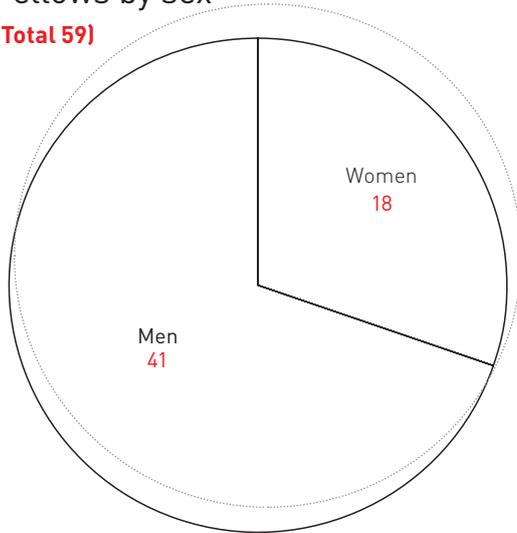
YOUNG RESEARCHERS WITH 2 TO 7 YEARS OF POSTDOCTORAL EXPERIENCE, WITH OUTSTANDING CVS, INTERNATIONAL BACKGROUND AND PROMISING SCIENTIFIC CAREER. THEY ARE ASSIGNED TO BASQUE UNIVERSITIES AND RESEARCH CENTRES FOR A FIVE-YEAR PERIOD.



PROFILE RESEARCH FELLOWS

Distribution of Research Fellows by sex

(Total 59)



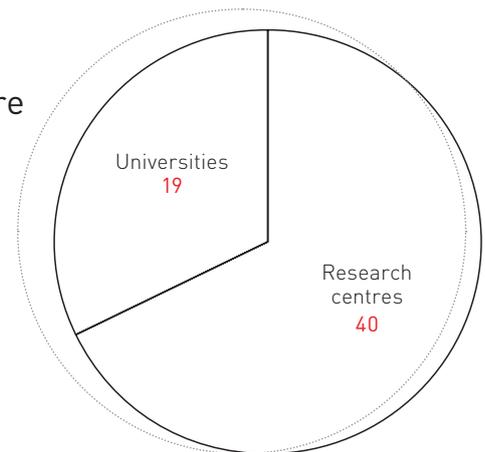
Main Information

- Articles in indexed journals per researcher: 2,71
- Papers, books and chapters in books per researcher: 2,99
- Presentation at international congresses per researcher: 1,14
- Projects with external funding: 44
- Master's students supervised: 6

Due to some researchers having started to work in Ikerbasque over the course of 2015, they have not worked for a full year. Taking this variable into account the ratios are calculated for 50 Research Fellows.

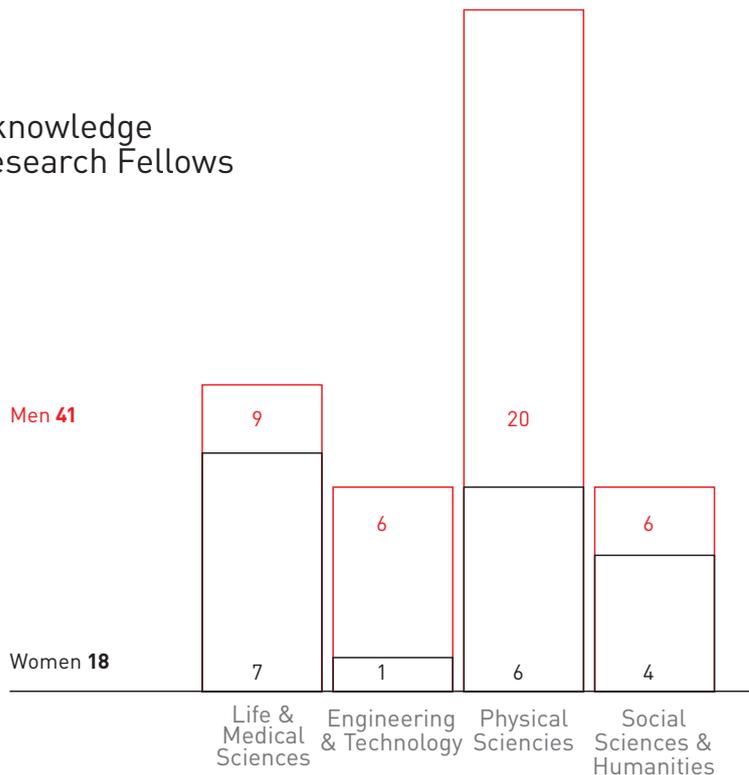
Distribution by type of host centre

(Total 59)



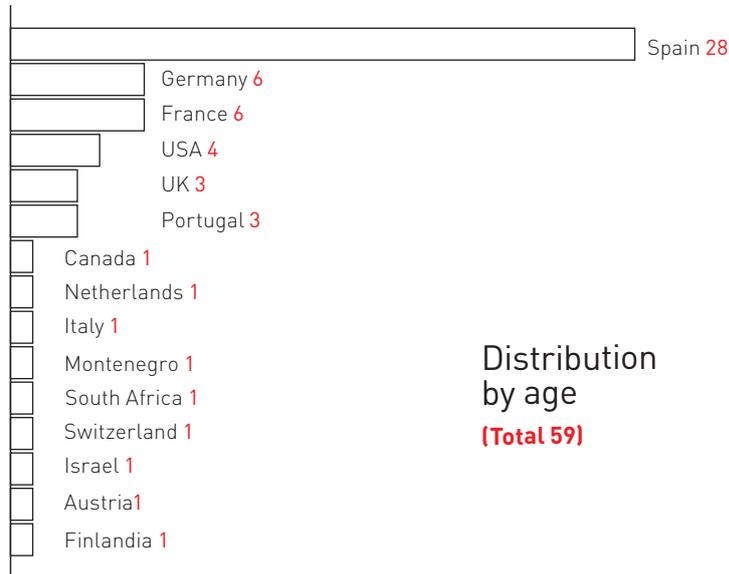
Area of knowledge of the Research Fellows

(Total 57)



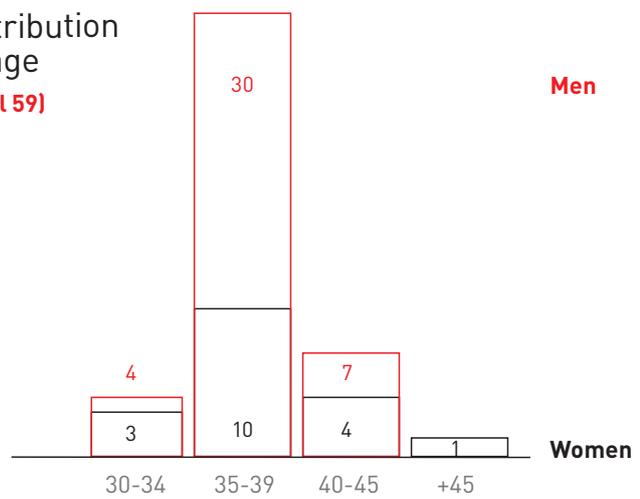
Country of residence at the time they were hired

(Total 59)



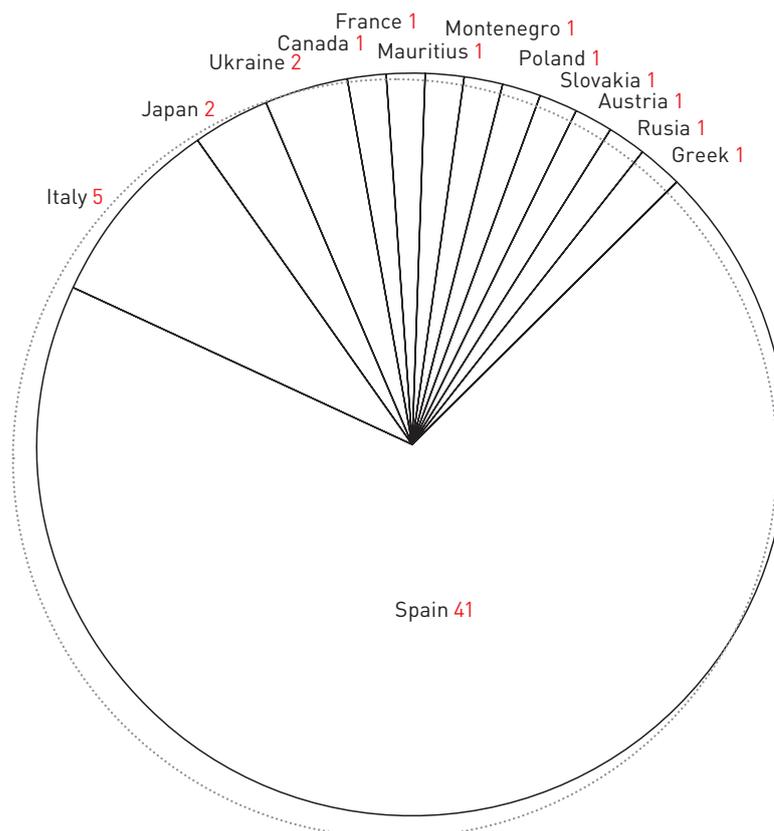
Distribution by age

(Total 59)



Nationality of the Research Fellows

(Total 59)



RESEARCH FELLOWS

- 1. David Albesa** The study of structure-function relationship of essential proteins in pathogenic bacteria. **2. Iraide Alloza** Identification and analysis of prognostic biomarkers associated with cerebrovascular diseases. **3. Ignacio Arganda** Biomedical image processing and computer vision. **4. Richard Balog** Graphene and its properties. **5. Jesús Bañales** Study of the pathophysiology of the liver, functions of bile acid, microRNA and metabolites in normal liver function, and study of liver diseases. **6. Dario Bercioux** Quantum transport in low dimensional systems. Theoretical physics of condensed matter. **7. Santiago Blanco** Spectrometry on highly correlated materials (superconductivity, magnetism, etc.). **8. Paolo Bonifazi** Structure-function of brain circuitries. **9. Pepa Cabrera** Interaction of small molecules with surfaces. Specifically, water ice modelling on ion substrates and graphite surfaces, and the behaviour of water on transition metal surfaces. **10. María Reyes** Local properties of nanostructures and mesoscopic devices. **11. Estibaliz Capetillo** Experimental research in Alzheimer's and other neurodegenerative diseases. **12. Daniel Carriazo** Materials with application in energy storage systems. **13. Mónica Carril** Synthesis and biofunctionalisation of nanoparticles as contrast agents for molecular imaging. **14. David Casanova** (I) Computation of solar cells sensitised by dye; (II) theory of the processes of singlet fission for the production of solar energy; (III) development and implementation of methods for the study of the electronic structure of excited states and (iv) symmetry of the electronic structure and its properties. **15. Montserrat Casals** Group Theory. **16. Elena Castroviejo** Theoretical linguistics (with a focus on Romance languages), formal semantics (and its interfaces with syntax and pragmatics), experimental pragmatics and, more specifically, gradability and interaction of meaning types. **17. Sean Connell** Structural characterisation of complexes of ribosomes involved in the regulation of protein synthesis and the way in which alterations in these complexes may contribute to pathogenesis during a bacterial and/or viral infection. **18. Xabier Contreras** Mechanisms and dynamics of lipid-protein interaction, and the role of those interactions in protein activity and cell signalling, with special emphasis on membrane proteins. Development of functionalised small molecules to investigate membranes. **19. Martina Corso** Electronic structure and scanning tunnelling and atomic force microscopy characterisation of the morphology of low-dimensional systems, and angle-resolved photoemission. **20. Abel de Cozar** Reaction mechanisms, metallophilic interactions, computer-aided design of chemical compounds. **21. David de Sancho** Computational Biophysics, protein folding and molecular modelling. **22. Fernando Delgado** Condensed matter physics, quantum magnetism. **23. Juan Luis Delgado** Hybrid photovoltaic materials. **24. Daniel Erro** cVoice conversations, speech synthesis, speech signal analysis, modelling, transformation, vocoding. **25. Javier García** Archaeometry of archaeological artefacts during the Early Middle Ages and the Early Modern World. Technological change and archaeological and cultural processes in societies during colonial contact. Historical archaeology. **26. Arantazu García** Modelling electron transport in nanoscale; theoretical investigation of electron processes on nanostructured surfaces. **27. Idoia García** Study of the molecular mechanisms involved in brain tumorigenesis and characterization of neural and cancer stem cells. **28. Asier Gómez** Study of the evolution of the human postcranial skeleton. **29. Vitaly Golovach** Majorana fermion in hybrid semiconductor and superconductor systems; quantum computation, spintronics and nanoelectronics. **30. Marek Grzelczak** Synthesis of nanoparticles; biometric self-organisation of molecular and colloidal systems, artificial photosynthesis and biosensors. **31. Miguel Angel Huertos** Organometallic chemistry. **32. Sugumi Kanno** Gravity, string cosmology. **33. Vanja Kljajević** Language deterioration in Alzheimer's disease; Language in post-stroke aphasia; Language and ageing processes. **34. Fernando López** Assembly of multi-enzyme systems in advanced materials. **35. Anna Llordés Gil** Chemical solutions for assembly and integration of functional blocks in battery electrodes and electrolytic materials. **36. Antonio David Masegosa** Smart systems based on soft computing techniques. **37. Daniel Marino** Plant nutrition and metabolism, plant molecular biology, plant-microbe interactions. **38. Clara Martín** Bilingual language comprehension and production and interaction between the face and voice processing in social interactions. **39. Ander Matheu** Characterisation of brain cancers and population study of cancer mother cells. **40. Eduard Matito** Theoretical and Computational Chemistry. **41. Nicola Molinaro** Language disorders. Neurophysiological basis of the reading ability. **42. David Moreno** Recovery of damaged ecosystems, ecology of wetlands, restorative ecology. **43. Miguel Moreno** Characterization of novel 2D materials and Low dimensionality effects in nano materials. **44. Patrick Müller** European Foreign Policy, Global and Multi-level Governance, Euro-Mediterranean Relations. **45. María Muñoz** New therapeutic targets in Triple Negative Breast cancer. **46. Noemi Navarro** Research field: Economics, Game theory, Social networks. **47. Alexey Nikitin** Qualitative and quantitative methods in photonics/plasmonics. **48. Mitsuhiro Okuda** Self-organisation of biological, organic and inorganic molecule. Development of applications using bio-nano fusion technology. **49. Mikhail Ordín** Rhythmic patterns in language acquisition, change and evolution. Cross-linguistic differences in the segmentation of a novel language. **50. Gianni Pagnini** Mathematical and numerical modelling of environmental flows. **51. Ioannis Parissis** Harmonic Analysis. **52. M^a Jesús Perugorria** Molecular mechanisms involved in chronic liver disease, from inflammation to hepatic fibrosis and hepatocellular carcinoma. **53. Pedro Jesús Pérez Caro** Mathematics; mathematical analysis; partial differential equations; inverse problems. **54. Javier Reguera** Self-assembly of nanoparticles for biomedical applications. **55. Enrique Rico Ortega** Strongly correlated quantum many-body physics and quantum information. **56. Miquel Torrent** Computational Chemistry. **57. Jorge Valero** Regulation of neurogenesis by microglia and its involvement on learning and memory function. **58. Ashwin Woodhoo** Molecular mechanisms that regulate the development of Schwann cells and disease. **59. Iratxe Zarraindia** Metagenomics: Plant-Microbe Interactions, Soil communities, biodiversity monitoring, host pathogen resistance.



▶ 2.3 PUBLICATIONS

Publication 1

THOMAS BROADHURST:

Research on collisions between galaxy clusters leads to new theories regarding dark matter.

Publication 2

AMANDA SIERRA

JUAN MANUEL ENCINAS:

Epilepsy reduces the formation of new neurons.

Publication 3

ASIER GÓMEZ:

Oldest quarternary mammal deposit in the Basque Country discovered.

Publication 4

DANIEL INNERARITY:

Politics after the indignation

Publication 5

J. JIMÉNEZ-BARBERO:

A key moment for science.

Publication 6

ENRIQUE SOLANO:

The group QUTIS has managed to develop the most advanced algorithm in a quantum simulator.

Publication 7

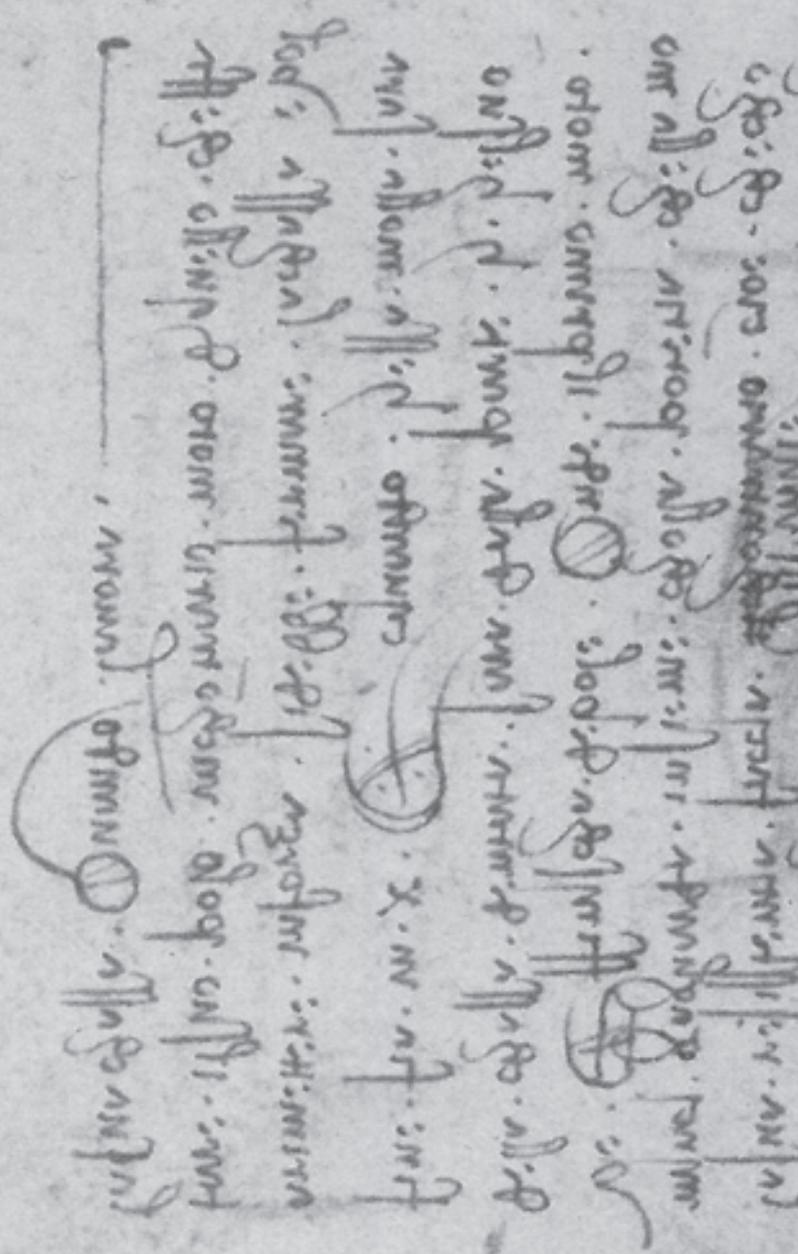
CHRISTIAN BLUM:

Frogs resolve computational issues.

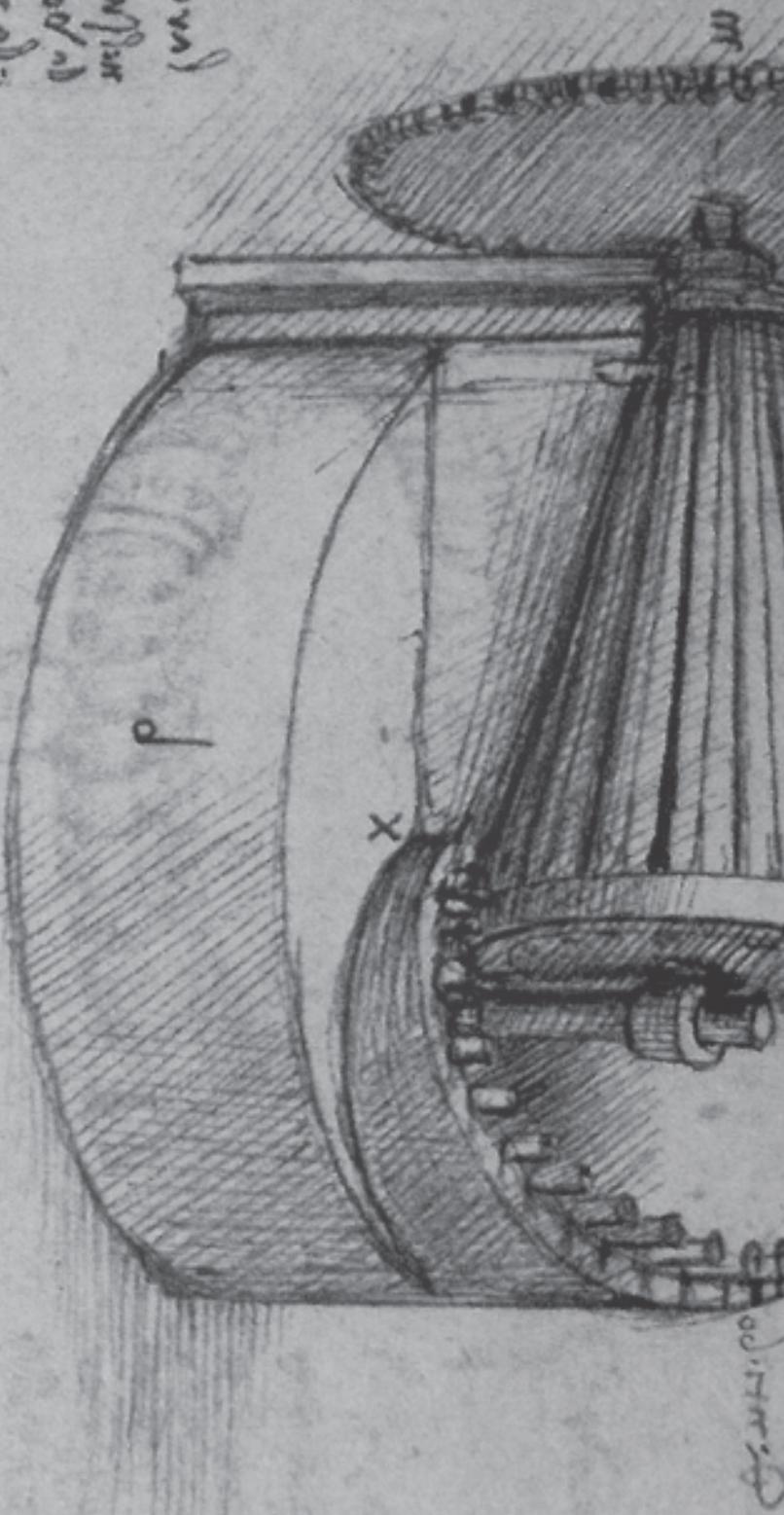
Publication 8

MAURO D'AMATO:

Study finds genetic markers that fight against a little-known gastrointestinal illness



Handwritten text at the top of the page, partially cut off. It appears to be a list or a set of instructions, possibly related to the mechanical drawing below.



Main body of handwritten text in a cursive script, likely a technical description or a set of instructions corresponding to the drawing. The text is dense and covers most of the lower half of the page.



Thomas Broadhurst

Publication 1

Research on collisions between galaxy clusters leads to new theories regarding dark matter.

Tom Broadhurst, an **Ikerbasque** researcher at the University of the Basque Country (Theoretical Physics department), together with Sandor Molnar from the National University of Taiwan and **Ikerbasque** visiting researcher at the University of the Basque Country in 2013,...), have carried out a simulation that explains galaxy cluster collisions. The clusters or bunches of galaxies are the largest objects in the universe – hundreds of thousands of galaxies held together by gravity.

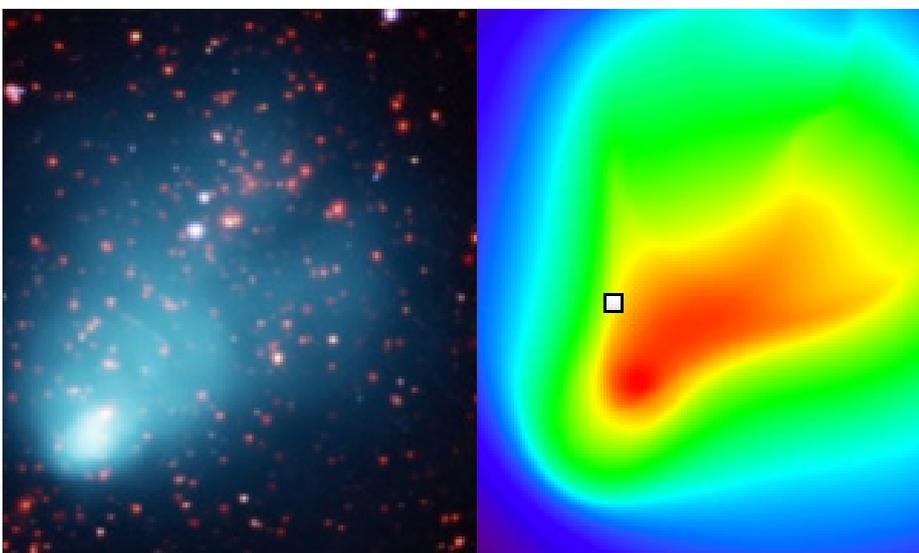
In general, galaxy clusters grow in size by fusing themselves together in order to become larger and larger. Gravitational forces make them join together slowly over time despite the expansion of the universe. The system known as “El Gordo”, the largest known galaxy cluster, is actually the result of the fusion of two large bunches. It was detected due to the dense, hot gas that is emitted in the process of the collision, a gas which becomes compacted and shines in the

X-ray region of the visible spectrum. In the X-ray spectrum, the said gas cloud is comet-like in shape, with two long tails that stretch through the dense nuclei of the two groups of galaxies. This distinctive configuration has allowed the relative speed of collision to be established, and it is extreme (~2,200 kilometres/second), given that it finds itself at the limit of what current dark matter theory permits.

These rare and extreme examples of clusters caught in the act of colliding seem to be challenging the accepted view that dark matter comprises heavy particles, since in reality such particles are yet to have been detected, despite the efforts being made to find them using the particle accelerator LHC (Large Hadron Particle Collider) in Geneva, and such as at LUX (Large Underground Xenon Experiment - subterranean detector of dark matter in the United States). In Tom Broadhurst’s opinion, “it is more important than ever to find a new model which permits better understanding of the mysterious dark

matter”. Broadhurst is one of the authors of a dark matter wave model, published in the magazine *Nature Physics* last year.

This new research has consisted of interpreting El Gordo’s observed gas and dark matter in a “hydrodynamic” way through the development of a unique computational model that includes dark matter, which comprises the majority of the mass, and that can be observed in the X-ray region of the visible spectrum due to its extremely high temperature (100 million Kelvin). Doctors Broadhurst and Molnar have managed to obtain a unique computational solution for this collision due to the comet-like shape of the hot gas, and also due to the locations of the masses of the two dark matter nuclei, which have crossed through each other at an oblique angle at a relative speed of some 2,200 km/s. This means that the total energy released is superior to any other known phenomenon, with the exception of the Big Bang.



Bibliographical reference

Molnar, SM and Broadhurst, T. Hydrodynamical Solution for the “Twin-Tailed” Colliding Galaxy Cluster “El Gordo” *Astrophysical Journal*, ApJ 800 37. doi:10.1088/0004-637X/800/1/37

Caption

Comparative image of the data (image of the galaxy clusters and the X-ray gas emitted, left) with the model for the hot gas (right). The “comet” shape of the X-ray data is well-reproduced by the model.



Publication 2

Amanda Sierra / Juan Manuel Encinas

Epilepsy reduces the formation of new neurons.

Amanda Sierra and Juan Manuel Encinas, **Ikerbasque** researchers at the **Achucarro Basque Centre for Neuroscience**, have discovered a **new property of hippocampal neural stem cells** using an epilepsy model in genetically modified mice. The work was published by the prestigious journal *Cell Stem Cell*, the main international reference point for stem cell research.

Neural stem cells located in the hippocampus, one of the main structures of the brain, are programmed to generate new neurons throughout adult mammals' lives, including humans, naturally, and their function is to participate in certain types of learning as well as anxiety and stress responses. Using an epilepsy model with genetically modified mice, the researchers found that hippocampal neural stem cells stop generating new neurons and become reactive astrocytes, a type of cell that causes inflammation and alters the communication between neurons.

This research work, furthermore, has made it possible to confirm the hypothesis

from these researchers' previous work, which established that even though neural hyperexcitation does not go so far as to cause convulsions, it does induce mass activation of neural stem cells and, consequently, their premature exhaustion; which leads to chronically reduced hippocampal neurogenesis (the generation of new neurons).

According to Juan Manuel Encinas, who led the study, "thanks to this discovery, we better understand the function of neural stem cells. We have shown that aside from generating neurons and astrocytes, adults' hippocampal neural stem cells can generate reactive astrocytes following an epileptic seizure".

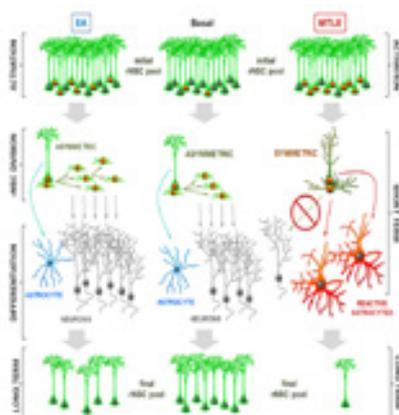
Despite the fact that the research has been carried out on experimental animals, this discovery has obvious implications for clinical practice, as well as in the search for new treatments for epilepsy, given that the generation of new neurons (neurogenesis) is a process that is negatively affected by seizures centred on the hippocampus.

During this ambitious and multidisciplinary project the researchers collaborated with research groups from institutions such as the Baylor College of Medicine in Houston (USA), Leuven Catholic University (Belgium), the Achucarro Centre itself, and the University of the Basque Country's (EHU/UPV) Genetic Expression Service

Bibliographical reference

"Neuronal Hyperactivity Accelerates Depletion of Neural Stem Cells and Impairs Hippocampal Neurogenesis". Amanda Sierra, Soraya Martín-Suárez, Roberto Valcárcel-Martín, Jesús Pascual-Brazo, Sarah-Ann Aelvoet, Oihane Abiega, Juan José Deudero, Amy L. Brewster, Irantzu Bernales, Anne E. Anderson, Veerle Baekelandt, Mirjana Maletić-Savatić and Juan M. Encinas.

Cell Stem Cell 16, 1–16, May 7, 2015.





Asier Gómez

Publication 3

Oldest quarternary mammal deposit in the Basque Country discovered.

The Cantera de Punta Lucero site (Zierbana, Biscay) was unearthed in 1987 by Iñaki Libano. This deposit was excavated toward the end of the 80s and the early 90s, before being destroyed by the adjacent super-port's quarry. Part of the collection had not been released, yet studying it has made it possible to determine the presence of species that, until now, had not been known to inhabit the Basque Country: the sabre-toothed feline, *Homotherium latidens*; the European jaguar, *Panthera gombaszoegensis*; and the ancestor of the wolf, *Canis mosbachensis*. Together with these species were remains of a rhinoceros, three deer, a giant deer, several large bovids, (probably aurochs as well as bison), and a fox. The deposit served as a natural trap where numerous animals fell and died; likely a small chasm on the slopes of the Punta Lucero mountain. The closest deposits in which such fauna have been discovered are located in the Sierra de Atapuerca, some 120km (75 miles) away.

This discovery takes us back to a time in which Biscay still harboured giant deer and rhinoceroses, and where herds of bison, aurochs and deer could be seen. These herbivores would have been stalked by solitary predators such as the jaguar and the sabre-tooth, or small packs of wolves. During this era, or shortly afterwards, the first humans appeared.

The deposit is at least 400,000 years old and probably no more than 600,000 years old, judging by biochronological data, and would be placed, consequently, in the Middle Pleistocene. It would be of a similar age, or slightly older than the sites that reveal the earliest human activity in the Basque Country.

The identification of a lower canine among the remains of Punta Lucero as belonging to a sabre-toothed feline, of the species *Homotherium latidens*, was what made researchers realise that this site may have been older than they had previously thought, and led to the revision of all the fossil material.

There are not many archaeological sites from the Middle Pleistocene along the Cantabrian coast, and the ones that do exist are, generally, under 300,000 years old. The Punta Lucero site allows us to understand which animals the first inhabitants of the Basque Country may have encountered.

Biscay has a wealth of archaeological-paleontological heritage from the Pleistocene era, but, many have sadly disappeared during the operations of quarries, as has been the case with Punta Lucero.

Bibliographical reference:

The Punta Lucero Quarry site (Zierbena, Bizkaia): a window into the Middle Pleistocene in the Northern Iberian Peninsula". Asier Gómez-Olivencia, Nohemi Salad, Diego Arceredillo, Nuria García, Virginia Martínez-Pillado, Joseba Rios-Garaizar, Diego Garate, Gonzalo Solar, Iñaki Libano. *Quaternary Science Reviews*. 08/2015; 121. DOI: 10.1016/j.quascirev.2015.05.001



DIFFERENCES IN SIZE BETWEEN THE TWO CERVIDS FOUND AT THE PUNTA LUCERO SITE: THE GIANT DEER (*MEGACERINI INDET.*), ABOVE; AND THE COMMON DEER (*CERVUS ELAPHUS SPP.*), BELOW. IN BOTH CASES THE SAME BOWN IS SHOWN: A SECOND PHALANGE. FRAGMENTS OF DEER JAW (*CERVUS ELAPHUS*) EXACTLY AS THERE WERE FOUND AT THE SITE IN 1988. PHOTOGRAPH: IÑAKI LIBANO.



FRAGMENTS OF DEER JAW (*CERVUS ELAPHUS*) EXACTLY AS THERE WERE FOUND AT THE SITE IN 1988. PHOTOGRAPH: IÑAKI LIBANO.



PHOTOGRAPH (ASIER GÓMEZ): LOWER CANINE OF THE SABRE-TOOTHED TIGER *HOMOTHERIUM LATIDENS* FOUND IN THE DEPOSIT IN THE PUNTA LUCERO MINE. NOTICE THE SERRATED EDGE - CHARACTERISTIC TO THIS FELINE YET NOT PRESENT IN LIONS. COMPARED WITH THAT OF A LION, WHICH WOULD BE OF APPROXIMATELY THE SAME SIZE, THE LOWER CANINE OF *HOMOTHERIUM* WERE SMALLER, AND THE UPPER ONES WERE LARGER. FURTHERMORE, THESE TEETH HAVE DISTINCT MORPHOLOGIES, WITH THOSE OF LIONS BEING MORE CONICAL WHILE THOSE OF *HOMOTHERIUM* ARE FLATTER.





Daniel Innerarity

Publication 4

Politics after the indignation.

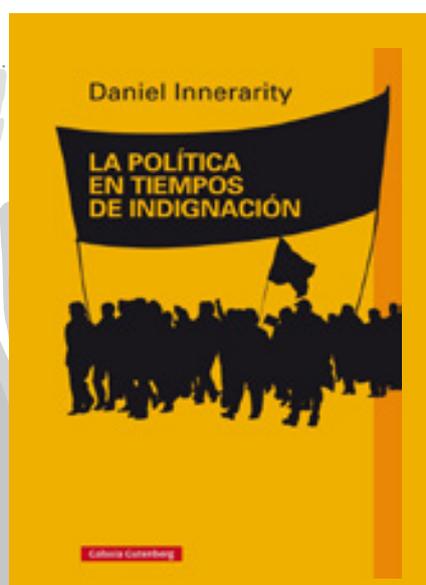
Years of recession have filled the streets with indignant protesters (such as the 15th May (15M) movement in Spain), and have given rise to new social movements and even new political parties. This powerful wave of indignation has shaken up many institutions, has sparked great political passions, but has also generated a special kind of disorder. Something serious is happening in politics and the term "indignation", with it has recently been becoming associated, reflects this dramatically. Never in history have there been so many ways to access, keep an eye on and challenge authority, but never has society felt more frustrated regarding their ability to change politics. The recession we are going through is probably a complex process and is flying by at such speed that

the we still have not had enough time to understand its magnitude. Maybe this is why the times of indignation are, and mainly, times of confusion. This book is an attempt to define what is valuable in all of this and what its limitations are.

Only those who have understood properly what politics is currently able to offer us and its logic can avoid false hope and, at the same time, formulate their criticisms with real radicalism. This book aims to contribute to understanding politics better because this is the only way in which we can judge it with the severity it deserves. In an era of indignation, which questions and criticises many things that we considered peacefully shared, this book looks to provide a revision of our

idea of politics, asking if our definition of its nature was right, who should make it, what its possibilities and limitations are, if some of our shared sites are still valid and what we can expect from it. It tries to contribute to ensuring that this indignation does not become an unproductive blowing off of steam, but rather it becomes a force which strengthens politics and improves our democracies.

The book, published in September, is in its third edition in Spanish and the English, German, Italian, Slovakian, Portuguese and French versions are currently being prepared.





Publication 5

J. Jiménez-Barbero

A key moment for science

There are moments that are so brief that it is impossible to capture them, but their brevity does not mean that they lack relevance. Something similar happens during the chemical reactions that form and cleave sugars, a process during which there occur many short-lived episodes, called intermediates, whose existence had been theorised but which nobody had been able to empirically observe, until now.

Sugars or carbohydrates are essential substances for life. They constitute a source of energy that is quickly absorbed, they cover the surface of the cell and act as receivers and transmitters of information in processes that are beneficial to the body; but they also act in harmful processes, such as the interaction between cells and pathogens that lead to infectious or inflammatory diseases or cancer. For this reason, an in-depth understanding of the structure of sugars contributes to the advancement of health sciences and the development of new treatments against ailments.

CIC bioGUNE, has coordinated a research project in which they have managed to observe, for the first time, one of the intermediary species generated during the chemical reactions in the formation and cleavage of sugars.

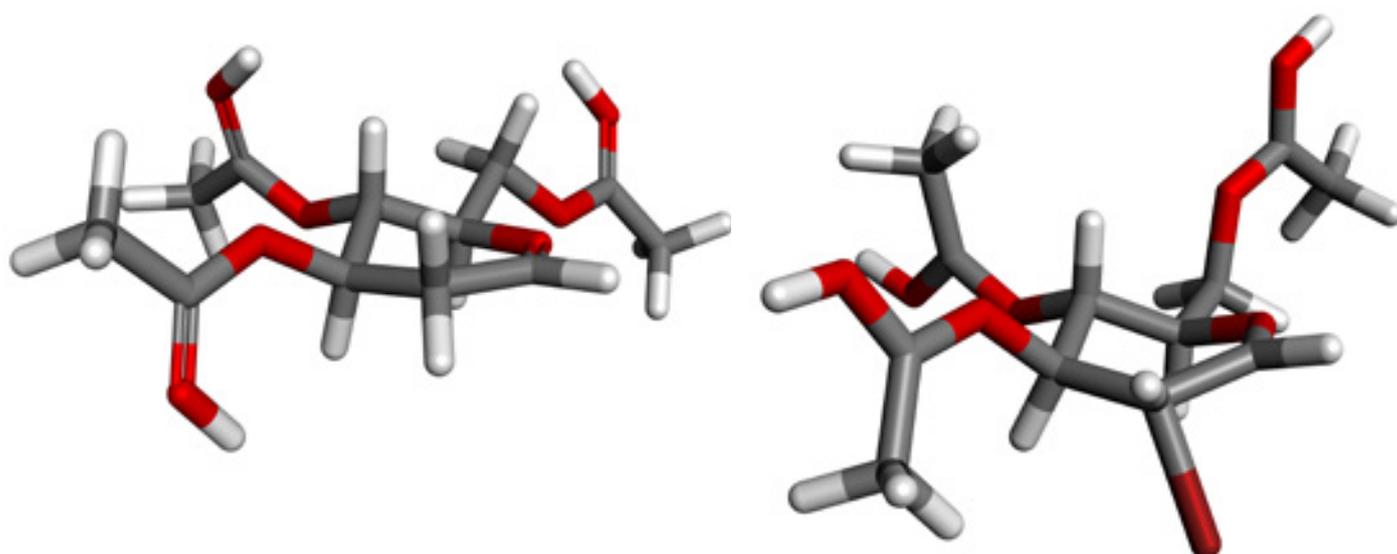
In the words of **Ikerbasque** researcher Jesús Jiménez Barbero: "In every chemical reaction, a series of steps take place in which short-lived chemical species, called intermediates, are generated. These are hard to detect, but despite this difficulty, there is enough theoretical knowledge to infer their existence. However, experimental demonstration is what enables the progress of science".

The study, which was published in the **prestigious publication Nature Chemistry**, and which was carried out by a team of scientists led by Yves Bleriot and Sébastien Thibaudeau from the University of Poitiers (France), seeks to determine the relationship between the chemical

structure of sugars and their biological function.

This project forms part of the search for the intermediate common to every chemical reaction related to the formation and cleavage of carbohydrates in nature. This intermediate, called glycosyl oxocarbenium ion, had been theorised, but had never been detected experimentally. This research has allowed us to observe it empirically and to determine its geometric shape.

Bibliographical reference:
Catching elusive glycosyl cations in a condensed phase with HF/SbF₅ superacid. A. Martin, A. Arda, J. Désiré, A. Martin-Mingot, N. Probst, P. Sinaÿ, J. Jiménez-Barbero, S. Thibaudeau & Y. Blériot. *Nature Chemistry* 8, 186–191 (2016) doi:10.1038/nchem.2399





Publication 6

Enrique Solano

The group QUTIS has managed to develop the most advanced algorithm in a quantum simulator

The research group Quantum Technologies for Information Science (QUTIS), from the University of the Basque Country, has published an article in the journal *Nature Communications* entitled "Digital quantum simulation of fermionic models with a superconducting circuit" in collaboration with researchers from Google Inc. and the University of California Santa Barbara (UCSB), in which they describe the most advanced quantum algorithm to date and in which they have managed to produce a quantum simulation of electronic material models in superconductor circuits. This algorithm has been developed in the superconductor circuit laboratories at Google UCSB based on original ideas put forward by the QUTIS group from the UPV/EHU.

The research team for the QUTIS group from the University of the Basque Country that took part in this project was led by **Ikerbasque** Professor Enrique Solano, in conjunction with Dr Lucas Lamata and doctorate student Laura García Álvarez.

According to Enrique Solano, "this experiment represents the first digital simulator in a solid state quantum platform, superior to the most advanced quantum algorithm developed in a quantum computer, so it may revolutionise Information Technologies in the 21st century". The collaboration between the UPV/EHU and Google/UCSB has made it possible to achieve a ground-breaking fermion digital simulator with over 300 quantum logic gates in a 9 quantum bit circuit. Fermions are quantum particles, like electrons, and form the fundamental base for superconductors, chemical reactions or high-energy processes. Studying them is therefore very relevant, since this is the first study in which these particles are universally simulated with such advanced architecture and in a scalable way, as is the case of superconductor circuits at cryogenic temperatures.

As the article published in the journal *Nature Communications* details, one of the

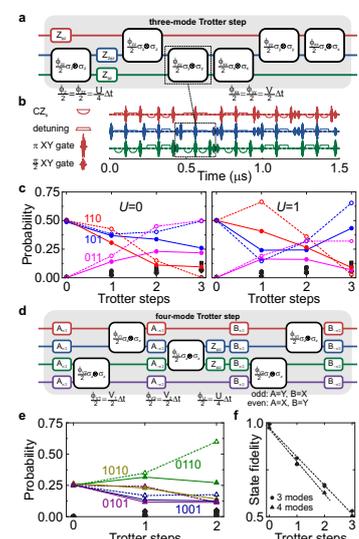
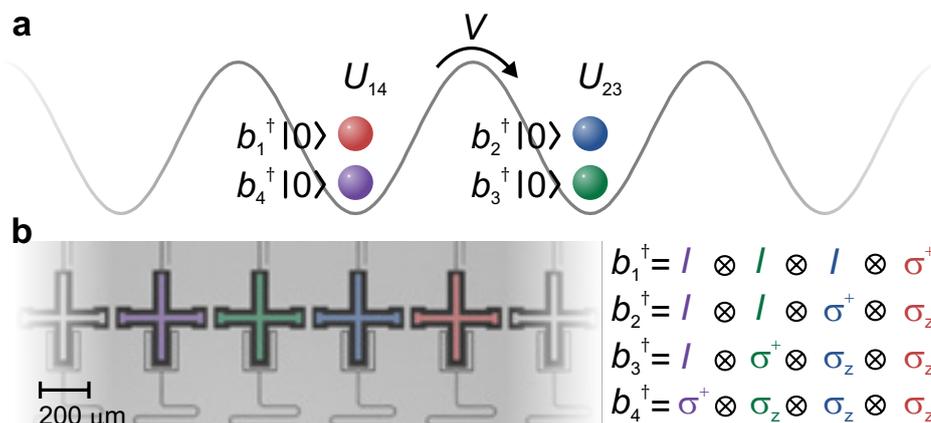
main applications of quantum information is the simulation of nature. Fermions are ubiquitous in nature; they appear in condensed matter systems, chemistry and high-energy physics. However, universally simulating their interactions is without doubt one of the biggest challenges in physical chemistry and material science.

Bibliographical reference:

R. Barends, L. Lamata, J. Kelly, L. García-Álvarez, A. G. Fowler, A Megrant, E Jeffrey, T. C. White, D. Sank, J. Y. Mutus, B. Campbell, Yu Chen, Z. Chen, B. Chiaro, A. Dunsworth, I.-C. Hoi, C. Neill, P. J. J. O'Malley, C. Quintana, P. Roushan, A. Vainsencher, J. Wenner, E. Solano & John M. Martinis. Digital quantum simulation of fermionic models with a superconducting circuit. *Nature Communications* 6:7654.

<http://dx.doi.org/10.1038/ncomms8654>

www.qutisgroup.com





Christian Blum

Publication 7

Frogs resolve computational issues

Christian Blum, **Ikerbasque** researcher at the University of the Basque Country (UPV/EHU), alongside researchers from the Universitat Politècnica de Catalunya (UPC), have copied the **strategy** used by **Japanese tree frogs** when desynchronising their mating calls in order to develop an **algorithm** which can optimise and resolve **problems** over any network; from Facebook or Twitter to the underground train system or any wireless communication system.

Male Japanese tree frogs perform their mating calls to attract females, who, in this way, determine the origin of the call and locate the suitor. A problem arises when two or more males are too close together and call at the same time. In this case, the confused females cannot determine where the call is coming from. Therefore, the males have had to learn to desynchronise their calls – i.e. not to call at the same time – so as for the females to be able to differentiate and thereby choose the more gifted individual.

“This process is a good example of self-organisation in nature, which has helped to develop the bio-inspired algorithms,” explains Christian Blum, **Ikerbasque** professor at the UPV/EHU.

The team has used this mathematical tool to resolve computational problems related to graphs – sets of nodes joined together by links which represent in graph form their relationships. For example, underground train network or friendships between people can be represented in graph form.

Some years ago, researchers used these algorithms to colour graphs, a technique with applications in the field of wireless networks. Now, according to the study published in the journal *Swarm Intelligence*, they have been used to detect so-called “independent node sets”, those which are not directly connected in the graph.

Applications in social and Wireless networks

“This has very important applications in communication networks; in the formation wireless backbone networks, for instance,” Blum points out, “but also in the field of social networks, like Facebook and Twitter, since it allows for structural analysis and the detection of independent communities therein”.

In this way, it could be possible to locate inactive or inconspicuous users; closed, tight-knit communities that don't interact with others; discover popular and well-connected personalities or find users who it would be convenient to connect to increase the relationships between certain communities. “All these kinds of issues can be converted into mathematical problems which can then be resolved on the graph representing the network,” according to Blum.

According to the authors, the results of the new algorithms “are excellent and are the best to date, substantially improving on what other algorithms have achieved, such as those inspired by the nervous system of the fly, *Drosophila*”.

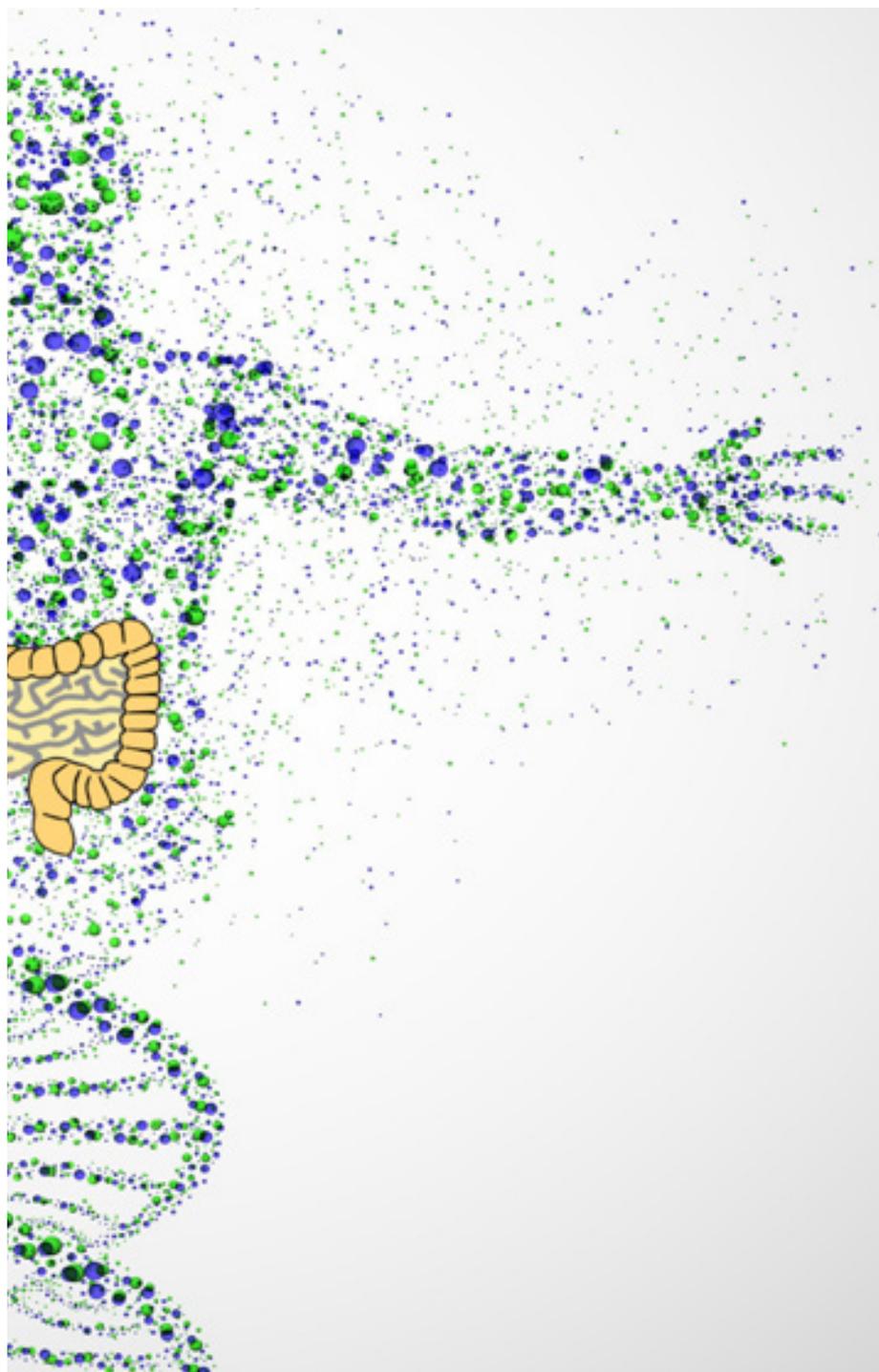
Bibliographical reference:

Dense genotyping of immune-related loci identifies HLA variants associated with increased risk of collagenous colitis. Westerlind H, Mellander MR, Bresso F, Munch A, Bonfiglio F, Assadi G, Rafter J, Hübenthal M, Lieb W, Källberg H, Brynedal B, Padyukov L, Halfvarson J, Törkvist L, Björk J, Andreasson A, Agreus L, Almer, Miehle S, Madisch A, Ohlsson B, Löfberg R, Hultcrantz R, Franke A, D'Amato M. *Gut* 11/2015; DOI: 10.1136/gutjnl-2015-309934.





Study finds genetic markers that fight against a little-known gastrointestinal illness



Collagenous colitis is an inflammatory gastrointestinal illness with little-known etiology and pathophysiology. It is suspected that there exists a genetic predisposition, and this is thought to be a significant risk factor, but, to date, attempts to find genetic results had been fruitless.

A project coordinated by Mauro D'Amato, currently an **Ikerbasque** researcher at the BioCruces Institute, has discovered significant results regarding the genetic factor behind collagenous colitis, studying immune-related genes in different groups of patients in hospitals in Germany and Sweden. The findings show that DQ2.5 and other HLA variants of the 8.1 ancestral haplotype are unequivocally associated with a higher risk of collagenous colitis.

These results have been published in the journal *Gut* – one of the most prestigious at international level in gastroenterological research. The new data, obtained thanks to the international collaboration of some of the most prestigious medical institutions in Sweden and Germany, allow better understanding of the illness, shining a light on its immunological origin.

Furthermore, other markers common to several autoimmune diseases show genetic consequences similar to those of collagenous colitis. This will allow for the identification of priority candidates for future studies, on a larger scale, that will serve to confirm these findings.

▶ 2.4 HORIZON 2020:

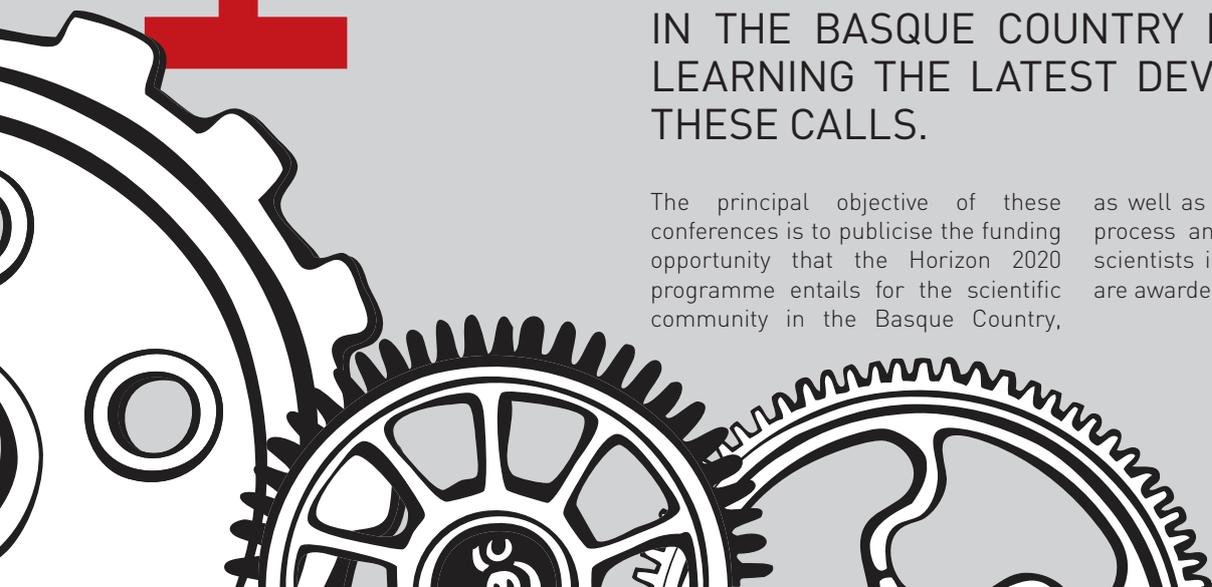
HORIZON 2020



TAKING ADVANTAGE OF OUR CENTRAL POSITION IN THE BASQUE SCIENCE SYSTEM, IN 2015 WE ORGANIZED SEVERAL WORKING SESSIONS ON MAJOR FUNDING PROGRAMS ABOUT EXCELLENT SCIENCE OF HORIZON 2020 SUCH AS THE ERC, IFA AND ITN NETWORKS WITH THE PARTICIPATION OF RESEARCHERS FROM ALL OF THE RESEARCH CENTRES IN THE BASQUE COUNTRY INTERESTED IN LEARNING THE LATEST DEVELOPMENTS IN THESE CALLS.

The principal objective of these conferences is to publicise the funding opportunity that the Horizon 2020 programme entails for the scientific community in the Basque Country,

as well as to facilitate the application process and increase the number of scientists in the Basque Country who are awarded this programme.



IF (Individual Fellowship)

Opportunities to work on personal research projects by moving between countries and possibly sectors to acquire new skills

- Enhance the **creative and innovative potential** of experienced researchers by providing them with opportunities to acquire new knowledge, work on research projects in a European context or outside Europe
- Special eligibility conditions for those **resuming a career** or **returning to Europe**

ITN

Innovative Training Networks – Marie Skłodowska-Curie Actions, whose objectives are:

The formation of a new generation of creative, entrepreneurial and innovative researchers

To foster excellence and provide a European framework for the formation of doctors

Ikerbasque researchers have had an active participation in ITN programmes 2015:

Project acronym	IP name	Institution
INSPIRE	Martin Cooke	UPV/ EHU
OLIMPIA	David Mecerreyes	UPV/ EHU
OrgBIO	David Mecerreyes	UPV/ EHU
REINASSANCE	David Mecerreyes	UPV/ EHU
TESIS	Ezequiel di Paolo	UPV/ EHU
SUSPOL	David Mecerreyes	UPV/ EHU
TOLLerant	Juan Mareque	CICbioma-GUNE
GLYCOVAX	Jesús Jiménez Barbero	CICbioGUNE

ERC:

The ERC Grants are grants of up to 2.5 million awarded by the European Commission for the development of ambitious scientific projects for five years. They are individual grants, awarded to top scientists from all fields of knowledge with the objective of “Reinforcing the excellence, the drive and the creativity of the European Research”. In the period 2014-2020, the ERC will award 13 billion in competitive funding, which is a marvellous opportunity to boost scientific research.

The Basque Country currently has 15 ERC Grants, which equates to more than 21 million of investment with which to hire new research staff, acquire scientific infrastructure and consolidate prestigious research groups. Eleven of these grants belong to Ikerbasque researchers in various research centres across the Basque Country

ERC Advanced Grants

Dr. Manuel Carreiras

Is leading an ERC Advanced Grants project called Bi-literacy: Learning to read in L1 and in L2.

The aim of this research project is to identify the neural substrates of the reading process and the cognitive components these comprise, with special attention to individual differences and reading disabilities, as well as researching the relationship between the specific cognitive functions and the changes that take place in the neural activity during the reading learning process in L1 and in L2.

The results of this project will provide a greater understanding of how the general factors and the specific neurocognitive factors of language underlie the individual differences - and reading disabilities - in the acquisition of reading of L1 and L2.

The project started in 2012 and it will end in 2017.

Dr. Enrique Zuazua

Directs the ERC Advanced Grants project NUMERIWAVES. The research that he is carrying out with this project has the aim of obtaining new analytical tools and numerical schemes.

Moreover, this will contribute towards significant progress in some applied fields, where the matters that are the object of the study play a decisive role.

Together with the analytical and numerical analysis of these problems, a mathematical simulation platform will be installed to perform computer simulations and explore and visualise some of the most significant and complex phenomena.

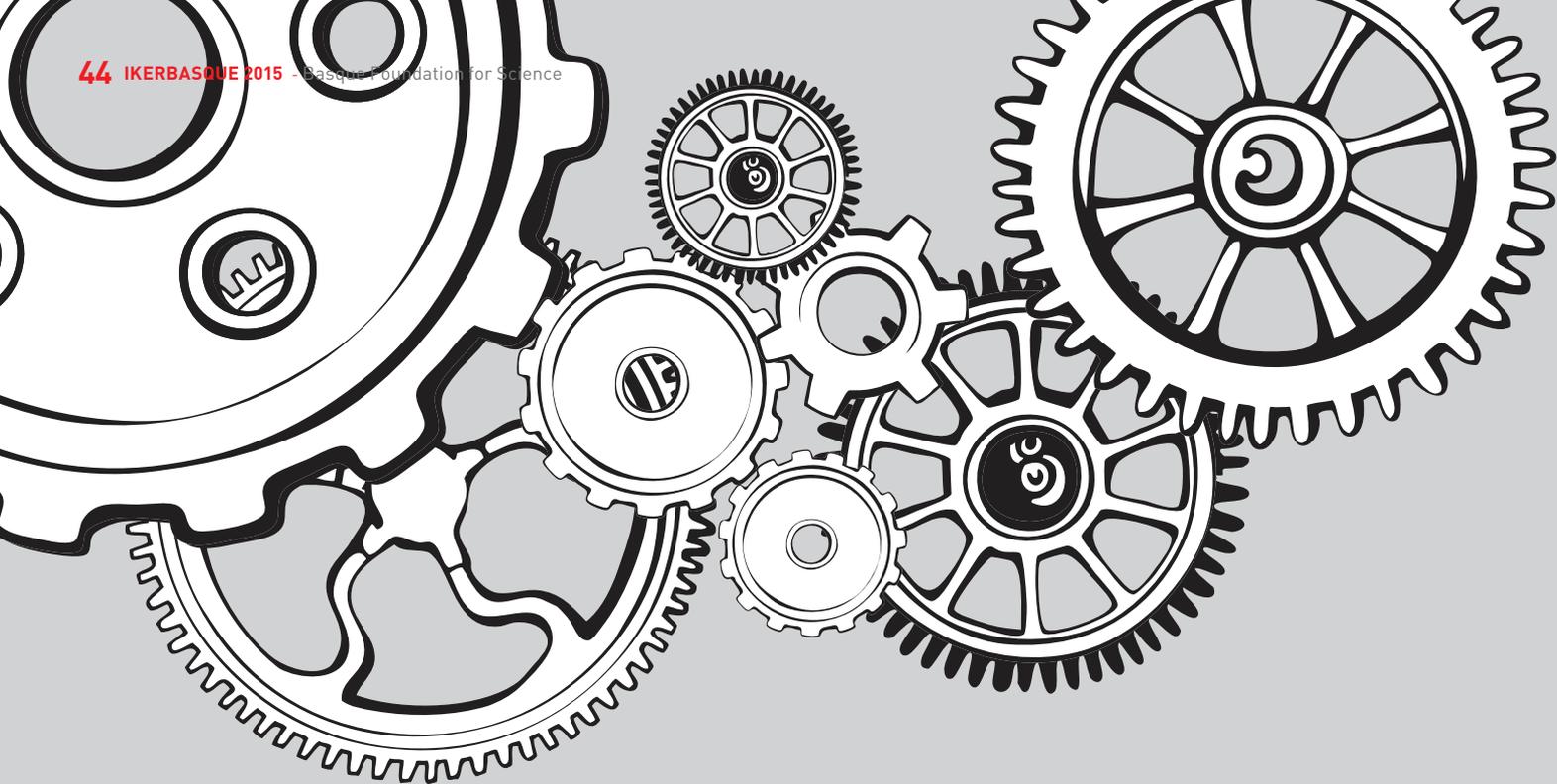
The project started in 2010 and it will end in 2015.

Dr. Luis Liz-Marzán

Manages the project entitled ERC Advanced Grant PLASMAQUO; Development of plasmonic quorum sensors for understanding bacterial-eukaryotic cell relations. The aim is to create new nanostructured materials based on crystalline assemblies of anisotropic plasmonic nanoparticles (gold/silver).

The project will use nanoparticle-based diagnosis techniques and will design a biosensor to study how bacteria communicate with each other and with other cell colonies. This is very important information to combat diseases.

The project started in 2011 and it will end in 2016.



ERC Consolidator Grants

Dr. Javier Fernández de Bobadilla

The NMST project is centred in Singularity Theory and its interactions and applications to Complex and Algebraic Geometry, Differential/symplectic/Contact Topology, Hodge Theory and Algebraic Topology. This subject has deep applications to other fields in mathematics, and it is still at the centre of various developments (Mori's Minimal Model Program, symplectic and Contact Geometry, algebro-geometric Donaldson-Thomas theory and Enumerative Geometry, Hodge Theory and D-modules,...) Besides these interactions classical and challenging old conjectures motivate research in the area.

The project started in 2013 and it will end in 2018

ERC Starting Grants

Dr. Arkaitz Carracedo

The project directed by Arkaitz Carracedo on the "Necessary metabolic requirements for the health of prostate cancer", is based on understanding how nutrition, which affects both a single cell as well as people, can determine the behaviour of prostate cancer. Carracedo and his team considered that understanding the nutritional and metabolic foundations of the tumour could help improving its prevention, detection and treatment.

The project started in 2013 and it will end in 2018.

Dr. David Mecerreyes

The Innovative Polymers for Energy Storage project aims to fully develop the field of polymers for energy storage by using an innovative macromolecular engineering approach to get an insight into their unique electronic properties.

The main goal is to develop polymers at the next level to store and use energy, technologies that are currently dominated by inorganic electrode materials.

Mecerreyes works on the chemistry of polymers using innovative methods such as organic catalysis, new ionic polymers and macromolecular architectures.

The project started in 2012 and it will end in 2017.

Dr. Rainer Hillenbrand

The project undertaken is called "Spectroscopic Field Nanotomography Close in Infrared and Terahertz Frequencies", and its main aim is the development of a new microscopic technique to obtain 3D images of extremely small structures, measured in nanometres (millionths of a metre).

The project started in 2010 and it ended in 2015.

Dr. Luis Hueso

"Spin Transport in Organic Semiconductors" is the title of the project which has obtained the European Grant, the aim of which is the research of new materials to manufacture electronic devices at a nanometric scale, replacing the silicon with organic molecules. It is therefore a search for a possible alternative to current electronics, in which physics, materials science and electronic engineering converge.

The project started in 2011 and it will continue until 2016.

Dr. Geza Tóth

The work has been presented under the caption of "Generation and detection of multi-particle entanglement in quantum optical systems".

It is largely theoretical research, although applicable to experimentation, on the so-called quantum entanglement, a phenomenon discovered in 1935 by three physicists, including Albert Einstein. This phenomenon has application in metrology, as it allows for a great degree of precision to be achieved when measuring certain quantities on an atomic scale.

The project started in 2010 and it will end in 2016.

Dr. Ilya Kazachov

Ilya Kazachkov leads the ERC Starting Grant project: Elementary theory of partially commutative groups.

The solution of Tarski problems on the first-order theory of the free groups has established profound relationships between model theory, geometry and group theory and has been a nexus and motivation for many classic results. The objective of this project is to indicate a new direction in group theory and develop suitable generalisations that connect tree geometry and similar of greater dimensions with partially commutative groups and their elementary theory.

The project started in 2014 and it will continue until 2019.

Dr. Dimas García de Oteyza

The project "Functional materials from on-surface linkage of molecular precursors" aims at the development of new surface-supported chemistry. In contrast to conventional wet-chemistry, this alternative synthetic route occurs on surfaces held under ultra-high-vacuum. The surface confinement opens new pathways for chemical reactions and in addition it may ultimately allow the synthesis of functional materials directly on the supports required for applications.

The project started in 2015 and it will continue until 2020

2.5 SCIENCE CAREERS.EU

342

**job offers broadcast
since 2010**

THE PORTAL RUN BY IKERBASQUE BRINGS TOGETHER JOB OFFERS FROM SCIENTIFIC INSTITUTIONS AND RESEARCH GROUPS IN EUSKADI.

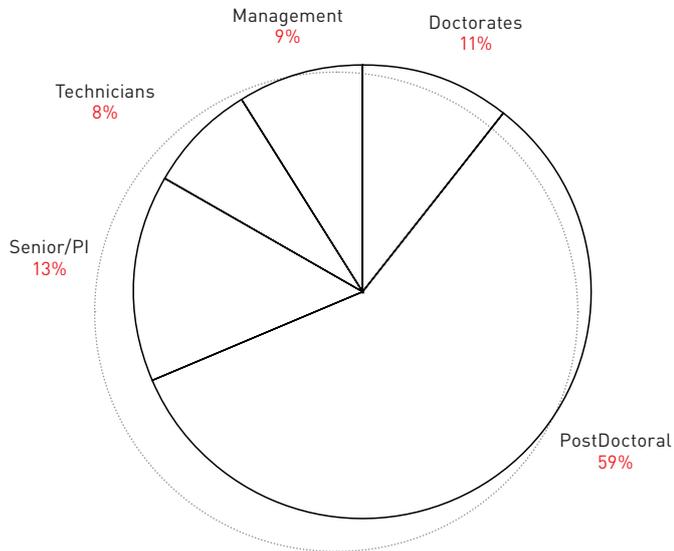
In 2010, Ikerbasque launched the portal sciencecareers.eu, an initiative that sought to bring together in one place all the employment opportunities from the different institutions of the Basque Science System. Since the creation of this tool, 342 job offers at 69 institutions or research groups in the Basque Science, Technology and Innovation System have been broadcast, 68 of which were published in 2015.

ScienceCareers is a useful tool for researchers as well as for research institutions. To the former, it provides a unique place with access to all the professional opportunities offered by the Basque Science and Technology System, including an alerts system that informs researchers about vacancies that come up. For universities, technological centres and research centres in the Basque Country, it provides a space with which to publish job offers with greater visibility. This aspect is fundamental in such an internationalised field that is as competitive as is that of scientific research.

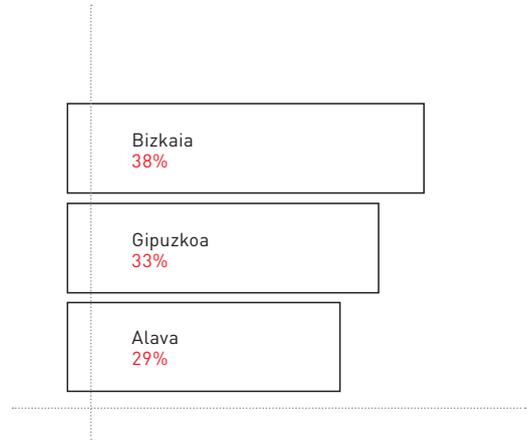
There are other online services that possess similar characteristics as ScienceCareers.eu, but the cornerstone of this portal is based on the centralisation of information, which allows those who publish employment opportunities to give these a greater exposure, thanks to the automatic exportation of the information to Euraxess (the European portal, managed by the European Commission) which means that Basque centres that publish their offers in ScienceCareers need not double the efforts publishing the same information on other portals.

The service is free and any group belonging to the Basque Science, Technology and Innovation System can register instantly to be able to start publishing their offers.

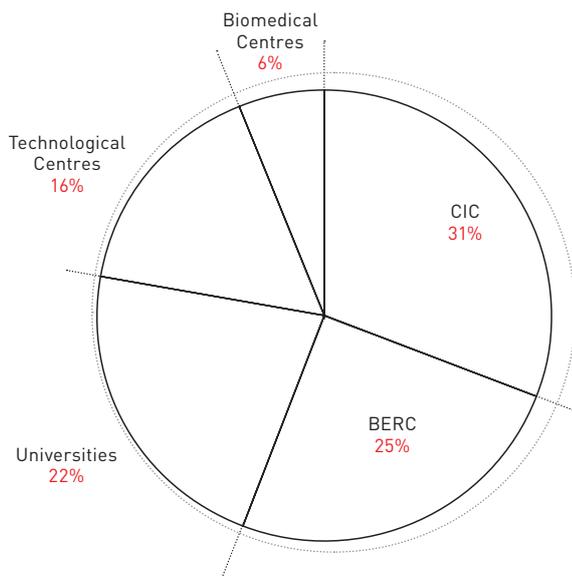
Classification of positions by their category or functional area



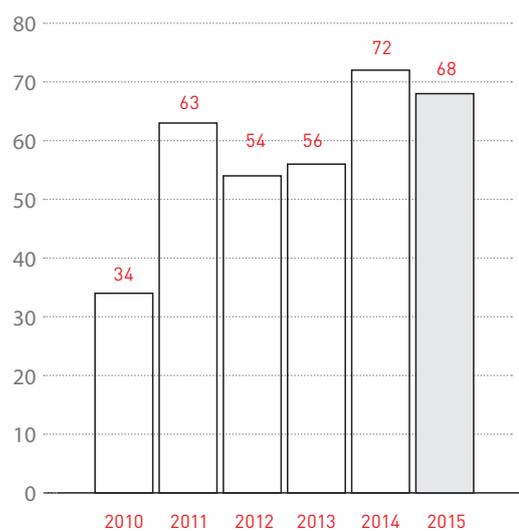
Classification of positions by Historical Territory



Classification of positions by Institution



Evolution of positions announced by year



▶ 2.6 EURAXESS SERVICE CENTRE



IKERBASQUE IS THE EURAXESS SERVICE CENTRE IN THE BASQUE COUNTRY.

The EURAXESS European Network of service centres tries to provide information and advice those researchers moving to/ from/within Europe, regardless of their nationality or the type of programme they are joining, in order to help them overcome the mobility barriers.

Highly qualified professionals (researcher, technologist, etc.) coming to work in the Basque Country and/or an organization thinking of recruiting such a person, can get useful information about accommodation, visas, administrative and social-cultural aspects, grants and vacancies.



03

Why we do it?

WHY WE DO IT

IKERBASQUE'S MAIN MISSION IS TO STRENGTHEN SCIENTIFIC RESEARCH IN THE AUTONOMOUS BASQUE COMMUNITY (EUSKADI). THE CREATION OF NEW KNOWLEDGE AND ANSWERING QUESTIONS TO WHICH WE CURRENTLY LACK ANSWERS ARE THE FRUITS SCIENCE BEARS.

This knowledge is transmitted via publications that are reviewed by experts in the same field, which offers the chance for the conclusions they draw to be shared with the international scientific community. These conclusions in turn represent the starting point for new research, turning science into a virtuous cycle which allows humanity to advance.

In 2010, Ikerbasque developed and launched the Basque Science Observatory (Ikerboost), a tool with a base of over 60 synthetic indicators of the main aspects related by research activity,

such as the research community, research results, research incentives, technological transfer, researcher projects and formation.

Thanks to this observatory, it is possible to monitor the progress of science in Euskadi, carrying out diagnostics and making decisions regarding scientific politics that more correct and in line with the requirements of the science system and the community. These are the main figures collected in 2015 by Ikerboost – Basque Science Observatory.

Figure 1

Scientific production in Euskadi passed 5,000 indexed publications in 2014, which indicates that the quantity of publications has tripled from 2004 to the present.

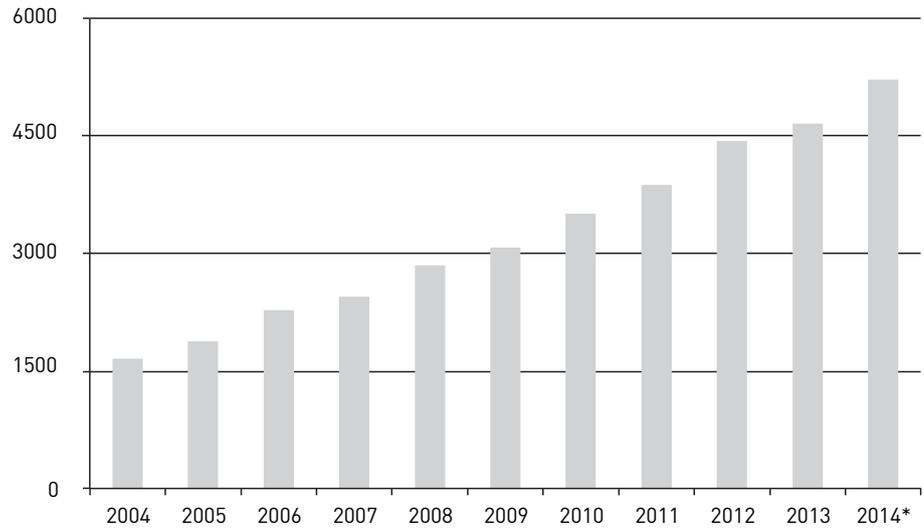


Figure 2

The University of the Basque Country (UPV/EHU) is the leading scientific centre with 2,813 indexed publications in 2014.

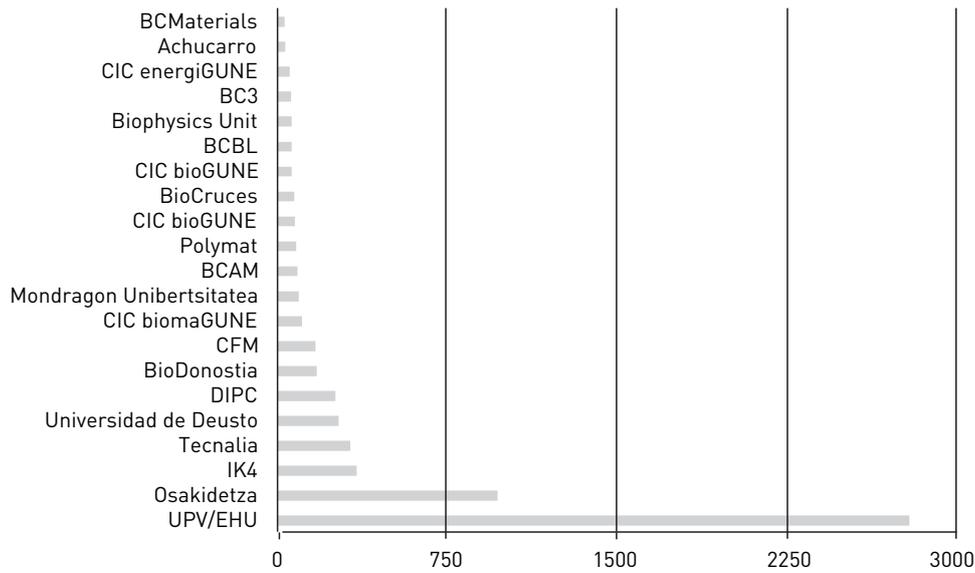


Figure 3

The Basque science system has diversified with the creation and strengthening of new centres. The BERCs and CICs represent more than 15% of articles published in Euskadi.

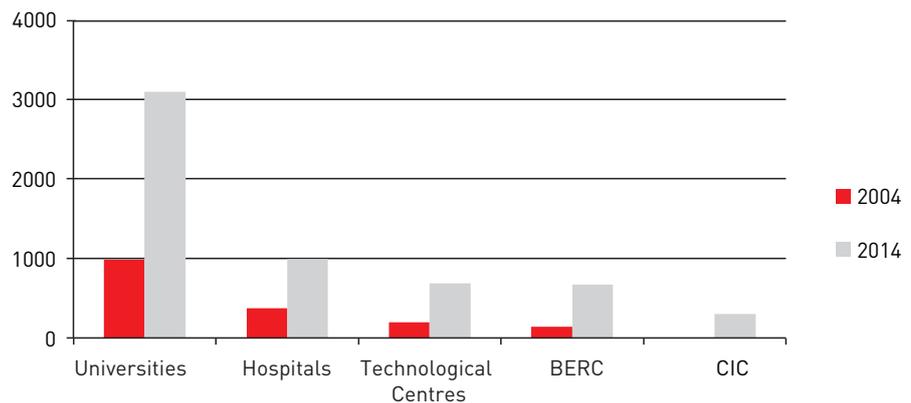


Figure 4

This growth in scientific production has occurred alongside increased international collaboration.

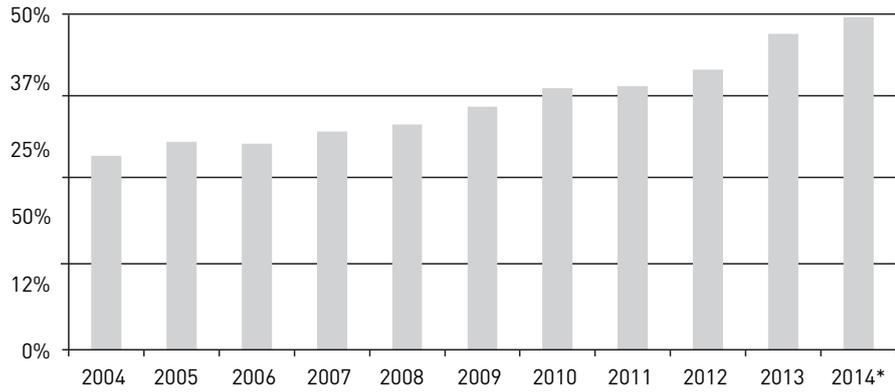


Figure 5

Euskadi finds itself in fifth position in the overall production in Spain having overtaken Galicia, and in publications per capita it is quickly becoming one of the leading regions.

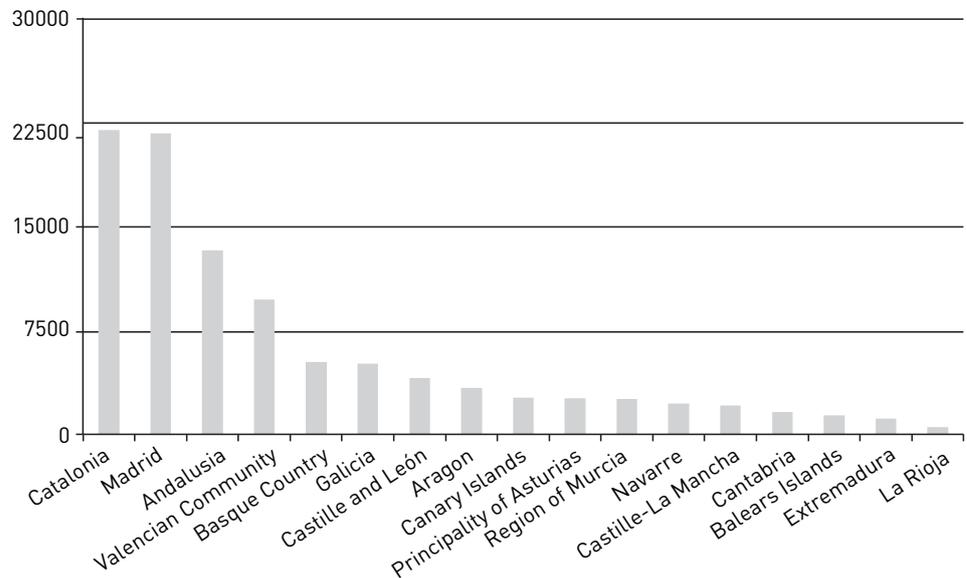
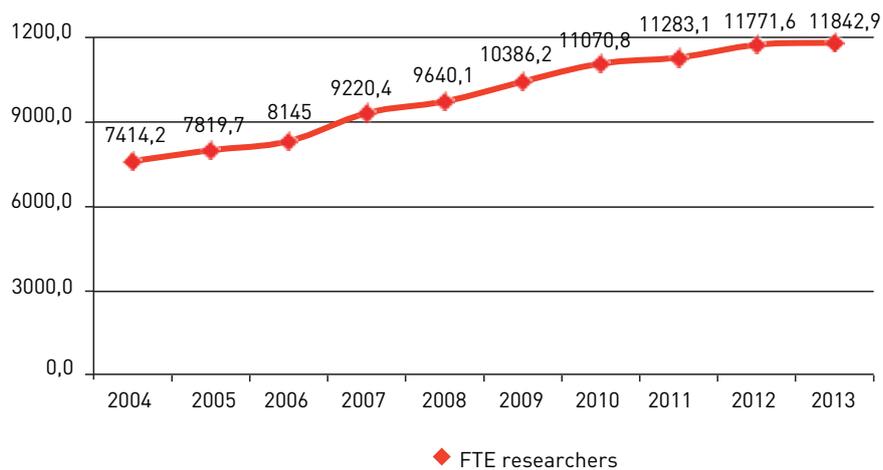


Figure 6

In 2013 the number of Full Time Equivalent researchers in Euskadi reached 11,843.

**Figure 7**

Euskadi currently benefits from 15 ERC Grants (5 Advanced Grants, 2 Consolidator Grants and 8 Starting Grants) obtained by researchers from seven different centres.

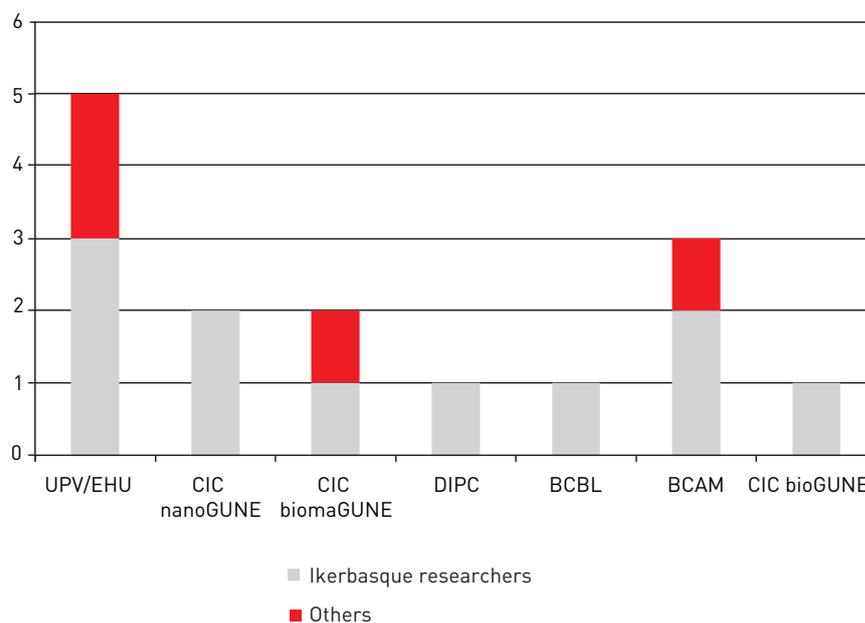


Figure 8

While the ration of men and women presenting doctoral theses is balanced, the number of women who consolidate their research career is lower.

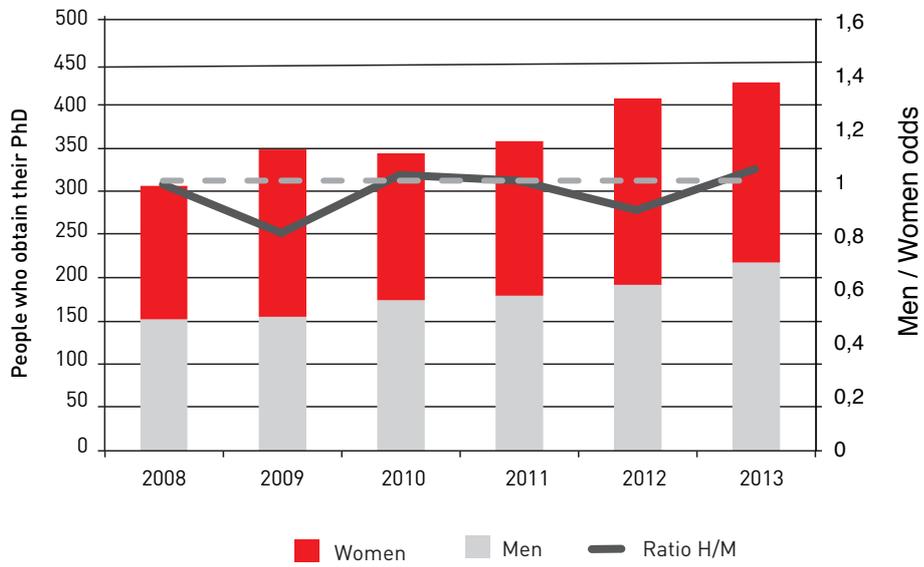
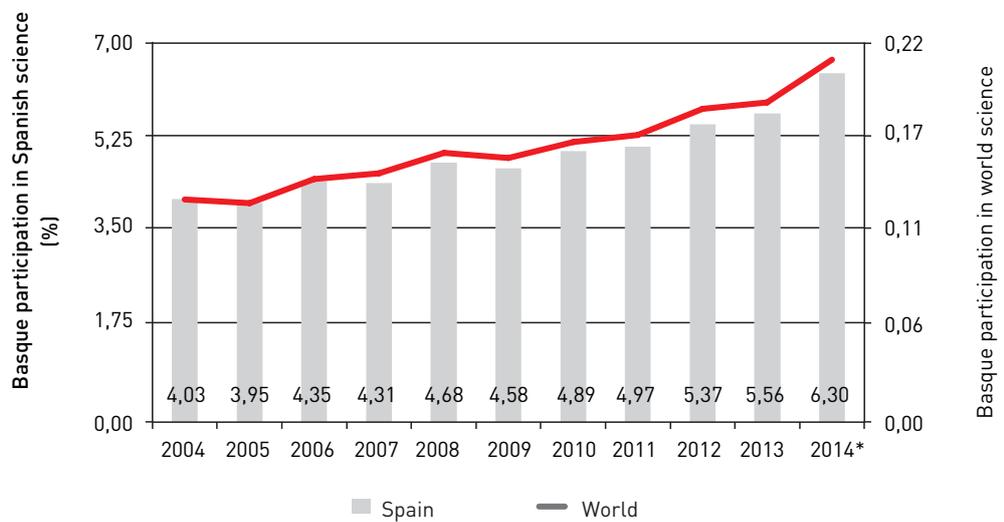


Figure 9

Euskadi's weight on the international stage has grown consistently over the last decade; thanks to growth rates above the global average. In 2014, scientific publications in Euskadi represented more than 6% (6.3%) of the national total for the first time.





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15
Annual
report