ikerbasque

Basque Foundation for Science

14
Annual report

EUSKO JAURLARITZA
GOBIERNO VASCO

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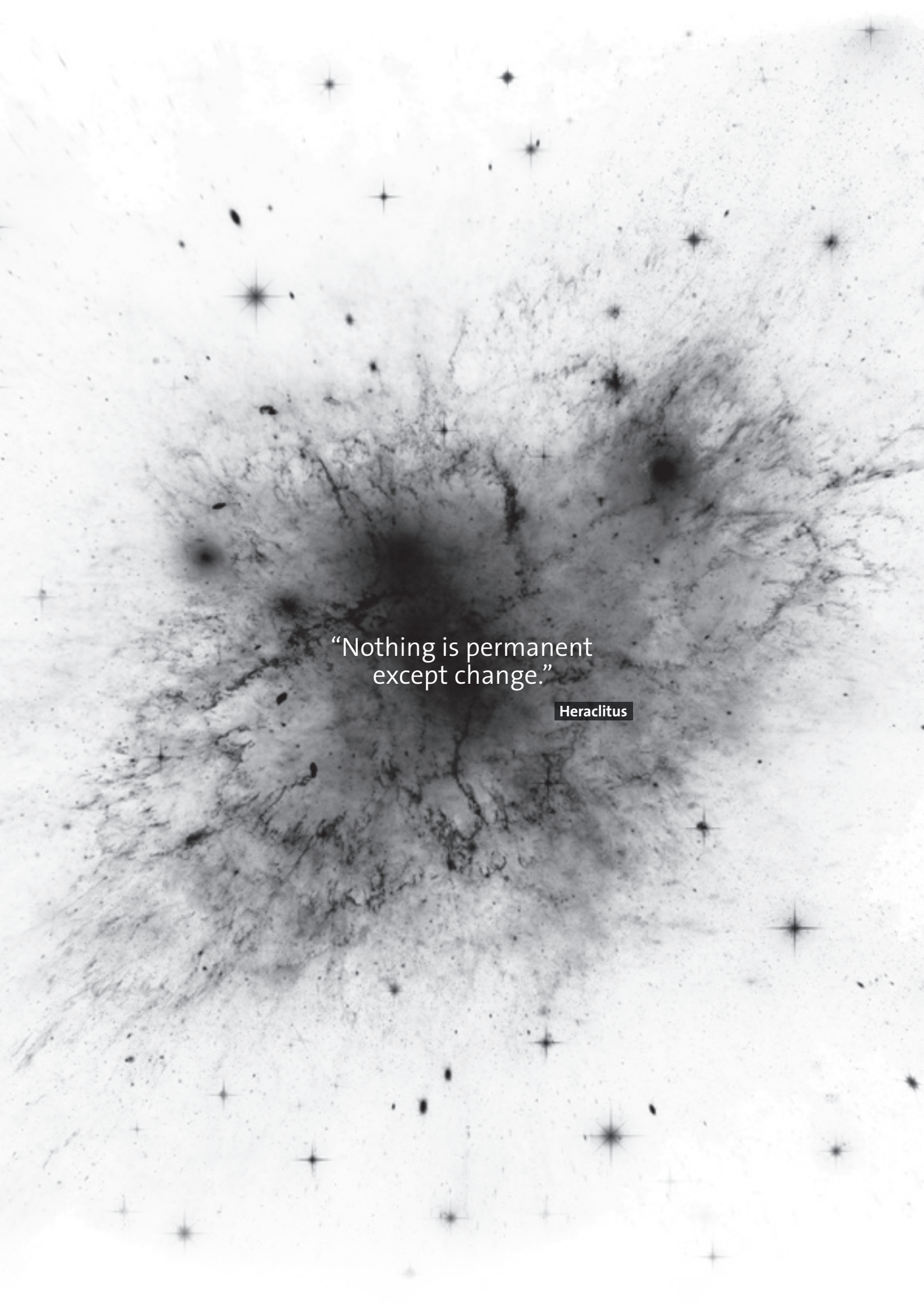
“Nothing is permanent
except change.”
Heraclitus

What is Ikerbasque?

Ikerbasque is a foundation dedicated to fostering the production, promotion and dissemination of scientific knowledge in the Basque Country.

137

Permanent researchers

Ikerbasque has attracted 137 researchers from 27 countries to the Basque Country, who are permanently assigned to universities and research centres.

305

Projects with external funding

Research projects with external financing in which Ikerbasque researchers participate.

44

Young researchers

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

10 ERC

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

415

Staff led by Researchers.

415 research positions led by Ikerbasque researchers.

848

Articles in indexed publications

An average of 5.88 articles per Research Professor published in indexed publications (ISI or Scopus).

€ 19.905.298

Return Total funs that Ikerbasque researchers have secured in competitive calls.

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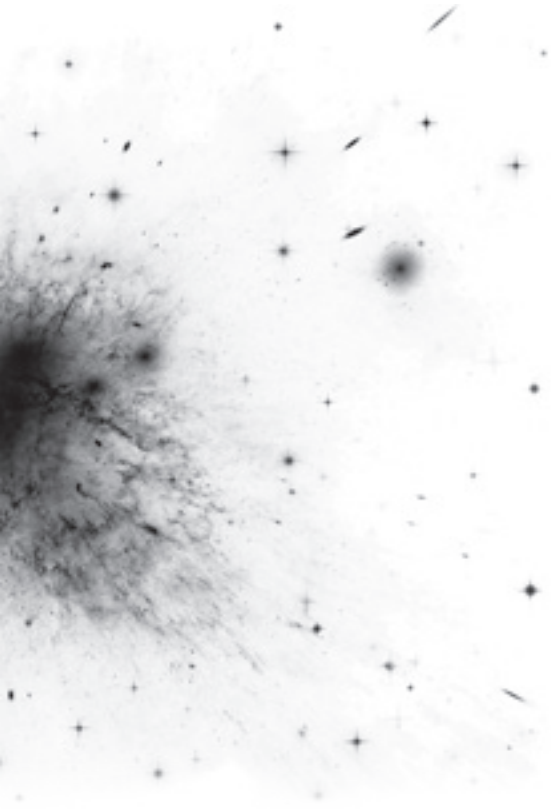
WHAT DO WE DO?

01



1.1

THE BASQUE FOUNDATION FOR SCIENCE, IKERBASQUE

The results in 2014 show that the Foundation has become a magnet for researchers.

In 2007, the Basque Government set up Ikerbasque, the Basque Foundation for Science. The aim was to help the Basque Country become an international benchmark in the field of research. For this reason, Ikerbasque has banked on scientific talent as a central element of its strategy, through programmes to attract and incorporate researchers and making the research more dynamic, all in collaboration with the research centres and universities of the Basque Country.

The results achieved in 2014 show a consolidated project: currently, Ikerbasque has contracts with 137 senior researchers. These researchers come from 27 countries with extensive research experience and have been permanently assigned to the universities and research centres. Similarly we are consolidating our commitment to the Research Fellows, young researchers who have a promising scientific career and international experience and with whom the aim is to create a source of new talent to lead the future of scientific research in the Basque Country. Ikerbasque currently has 44 Research Fellows.

In 2014, Ikerbasque's researchers published 848 papers in indexed journals and are currently directing 10 projects funded by ERC Grants, the most sought-after grants in Europe that promote ambitious frontier research projects. In 2014, the Ikerbasque researchers were awarded around €20m for research projects, which doubles the investment made. These resources are used to foster research in the Basque Country by hiring researchers of all levels and investing in equipment and infrastructures; 415 people are working in research groups led by Ikerbasque researchers.

Ikerbasque has therefore proven that investment in research is profitable in both the long and the short term. In the long term, research will result in new products and services that give Basque companies an extra competitive edge. In the short term, investment in research gives immediate return in the form of funding for the Basque Country.

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 is 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

Ikerbasque makes a strong pledge to transparency, in the belief that integrity, transparency and responsibility are the pillars of organisational excellence. Transparency refers to the access people have to information about the organisation. Our accounts are audited annually and can be viewed on our website: **www.ikerbasque.net**

Since Ikerbasque was set up in 2007, 338 people have been hired through different initiatives. The organisation's management team comprises 5 people, which represents 1.5% of the total workforce.

Ikerbasque continues to be a model of management excellence, being awarded the EFQM's Silver Q Award in 2011 and has also received the European Commission's "HR Excellence in Research" seal, which gives recognition to leading institutions in Europe in terms of selecting, hiring and consolidating research talent.

Ikerbasque's budget for 2014 is broken down as follows:

Total budget
€ 13.9M

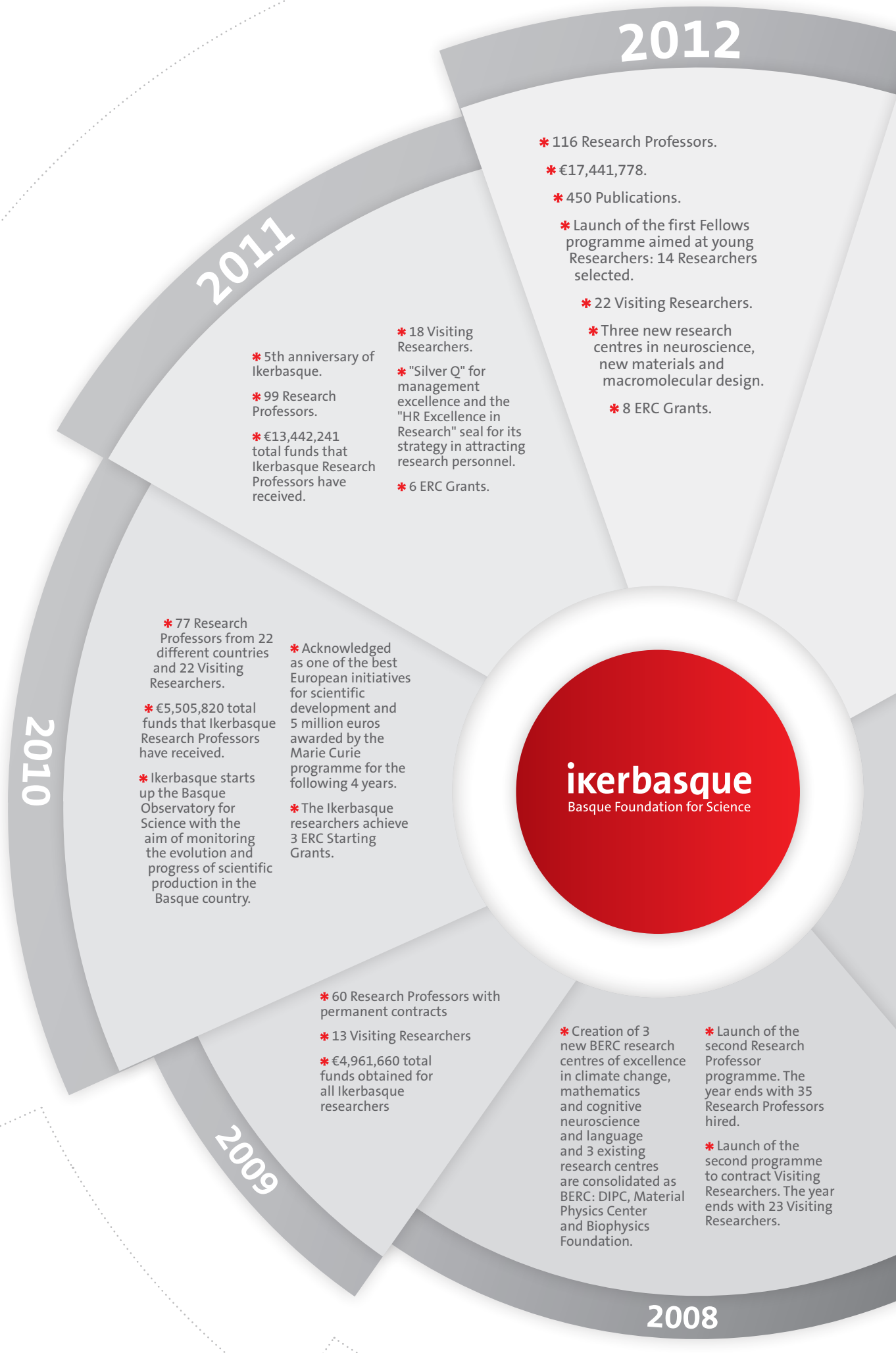
Basque Government
€ 11..2M

European Union
€ 1.9M

Others
€ 0.8M

HR EXCELLENCE IN RESEARCH

to the Management Quality 2011


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 that Ikerbasque Research Professors have received.
18 Visiting Researchers.
"Silver Q" for management excellence and the "HR Excellence in Research" seal for its strategy in attracting research personnel.
6 ERC Grants.
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.
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2009
60 Research Professors with permanent contracts
13 Visiting Researchers
€4,961,660 total funds obtained for all Ikerbasque researchers
Creation of 3 new BERC research centres of excellence in climate change, mathematics and cognitive neuroscience and language and 3 existing research centres are consolidated as BERC: DIPC, 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.
2008

1.2 IMPORTANT MILESTONES

2007

* The Basque Government creates Ikerbasque with the aim of reinforcing the Basque Science System by attracting research 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 research in the Basque Country for a maximum of 12 months. Ten researchers are hired.

2013

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

1.3 PROGRAMMES

Ikerbasque has two international programmes: The first is aimed at contracting Research Professors, consolidated researchers, which have an excellent reception in the international scientific community: In 2014, 569 researchers applied for for 15 positions to work in research centres and universities of the Basque Country.

They were researchers with extensive research experience. The average age of the candidates was 44. Of the applications received, 25% were from women and 75% from men. Regarding areas of knowledge, the majority of the candidates specialise in experimental sciences, but there were candidates from all fields of knowledge: technical and engineering sciences, medicine and life sciences, social sciences and humanities.

Regarding the institutions of origin, the candidates came from top international scientific organisations in the United States and Europe, such as the University of Harvard and Berkeley, the CNRS and Karolinska University.

The second programme is for Research Fellows, in which, for the third consecutive year, 25 promising young scientists were selected to continue their work in the Basque country for the next five years.

The Research Fellow programme works in two ways: on one hand, attracting people who are developing their research overseas, including local scientists who left the Basque Country at some point in their career, and on the other hand offering those who are already researching in the Basque country opportunities to consolidate their careers.

This fact is reflected in the institutions of origin of the 25 people selected, which include top international scientific organisations in the United States and Europe, such as the University of California, the University of Cambridge and the CNRS, and leading research centres in the Basque country, such as the Donostia International Physics Center, CIC bioGUNE and the Biophysics Unit.

EVALUATION CRITERIA

The selection of the candidates is the key to success for Ikerbasque. The evaluation criteria are:

1. Scientific merit and research career.

2. Relevance of the research field and of the publications made.

3. Concordance with the capabilities of the Basque Science System.

The candidates are selected by an Evaluation Committee that is independent from the Basque Science System and comprises more than 150 researchers from 26 countries, coordinated by six professors and prestigious researchers: Félix Yndurain (Physics), Luis Antonio Oro (Chemistry), Domingo Docampo (Mathematics), Ginés Morata (Biology), Nuria Sebastián (Social Sciences and Humanities) and Manel Esteller (Medicine).

1.4 EVALUATION COMMITTEE

The Ikerbasque Evaluation Committee is independent from the Basque Science System and comprises more than 150 researchers from 26 countries, coordinated by the following researchers:

Prof. Luis Oro
Professor of Inorganic Chemistry of Saragossa University, awarded the National Chemistry Research Prize 2007 and the King James I Research Prize 1999.

Prof. Ginés Morata
Researcher of the CSIC, awarded the Prince of Asturias Research Prize 2007 and the King James I Research Prize 1996.

Prof. Domingo Docampo
Professor of Telecommunications and ex-Vice-chancellor of Vigo University.

Prof. Felix Yndurain
Professor of Condensed Matter Physics at the Autonomous University of Madrid and ex-Secretary General of Scientific Policy of the Ministry of Science and Technology.

Nuria Sebastián
Professor in Psychology of the Pompeu Fabra University (Barcelona). Member of the Scientific Council and Vice-President of the European Research Council (ERC).

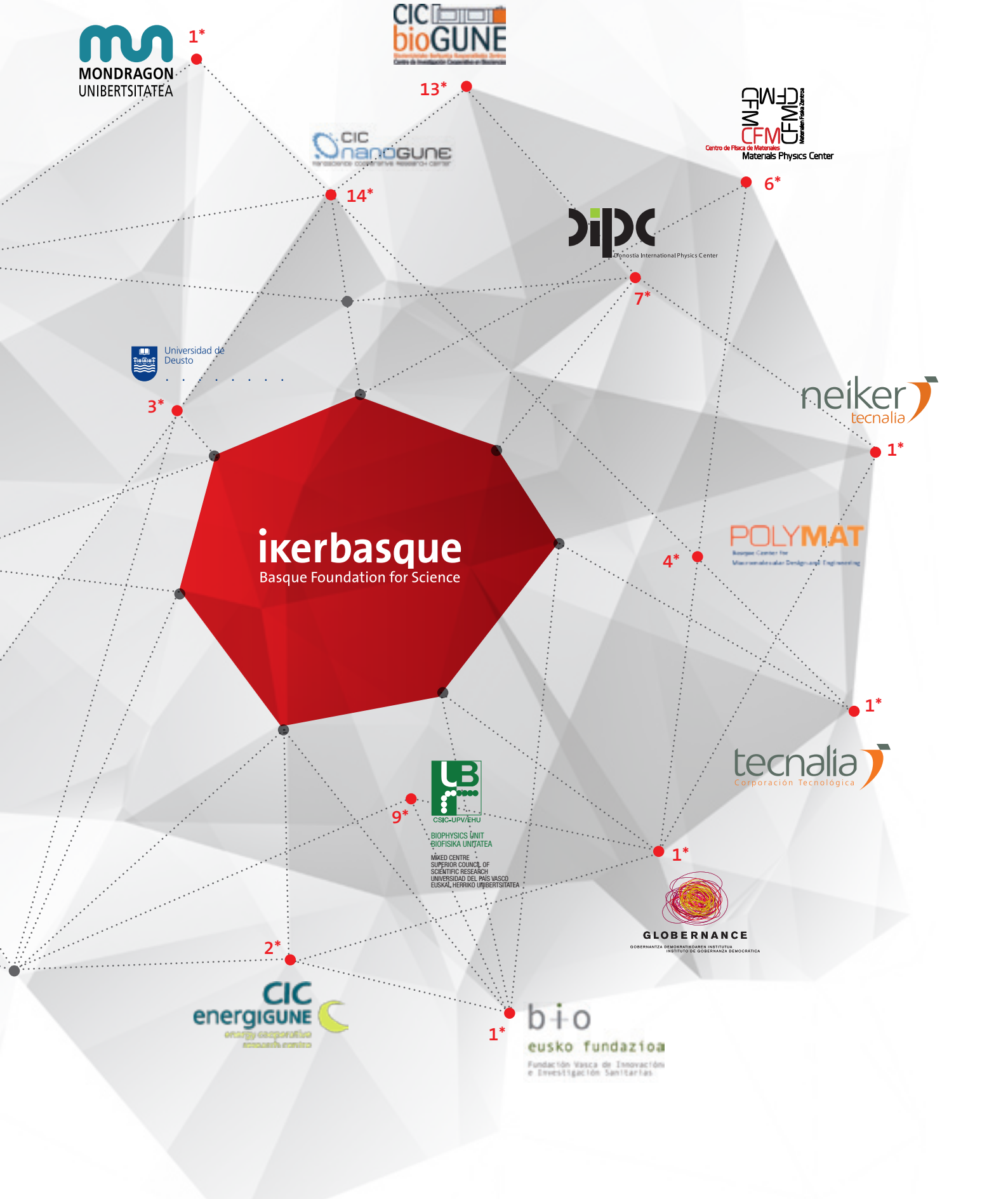
Manel Esteller
Director of the Epigenetics and Cancer Biology Programme at the Bellvitge Biomedical Research Institute (IDIBELL), teacher of Genetics at the University of Barcelona (UB) and awarded the James I Prize for Basic Research in 2013.

1.5

HOST CENTRES

The Ikerbasque researchers have joined the following centres in the Basque Country.

* = Number of researchers


MONDRAGON UNIBERTSITATEA
1*
CIC bioGUNE
13*
CIC nanoGUNE
14*
CFM Centro de Física de Materiales Materials Physics Center
6*
DIPC Donostia International Physics Center
7*
Universidad de Deusto
3*
neiker tecnalia
1*
ikerbasque
Basque Foundation for Science
POLYMAT
4*
1*
tecnalia Corporación Tecnológica
9*
CSIC-UPV/EHU
BIOPHYSICS UNIT
BIOFISIKA UNITATEA
MIXED CENTRE
SUPERIOR COUNCIL OF SCIENTIFIC RESEARCH
UNIVERSIDAD DEL PAIS VASCO
EUSKAL HERRIKO UNIBERTSITATEA
1*
GLOBERNANCE
GOBERNANTZA DEMOKRATIKOAREN INSTITUTUA
INSTITUTO DE GOBERNANZA DEMOCRÁTICA
2*
CIC energiGUNE
1*
bio
eusko fundazioa
Fundación Vasca de Innovación e Investigación Sanitarias

1.6

RESEA

PROFE

Senior researchers with extensive research experience and leadership skills.
They are assigned permanently to Basque universities and research centres.

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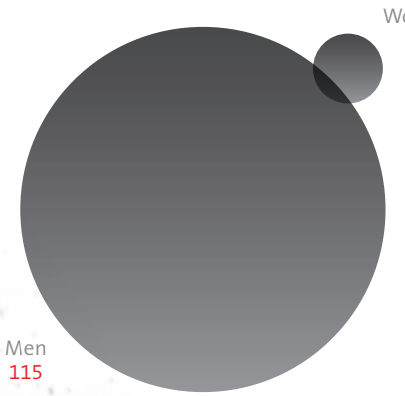
SSORS

PROFILE OF RESEARCH PROFESSORS

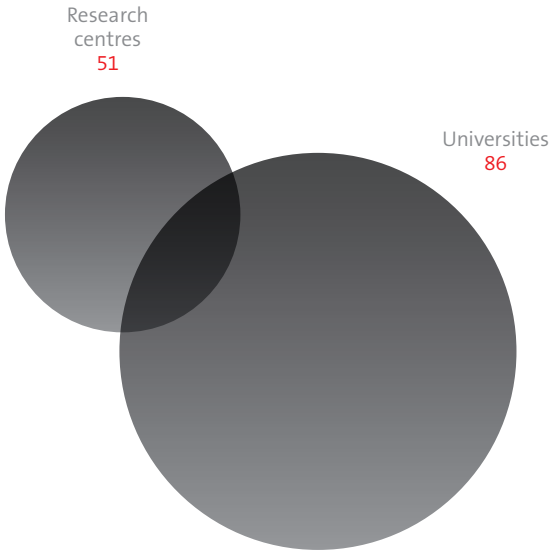
Breakdown by sex

(Total 137)



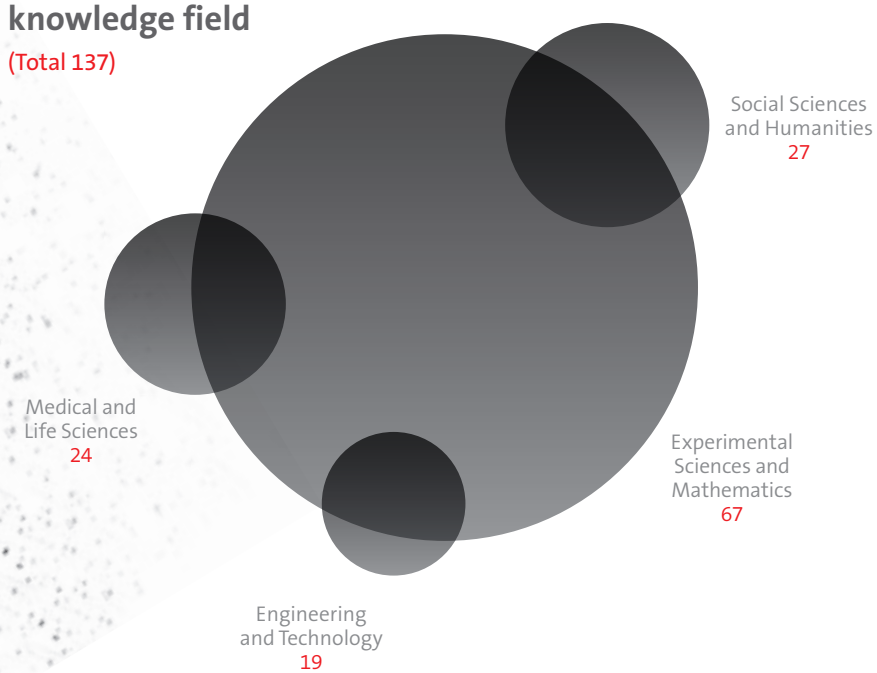
Distribution by host centre

(Total 137)



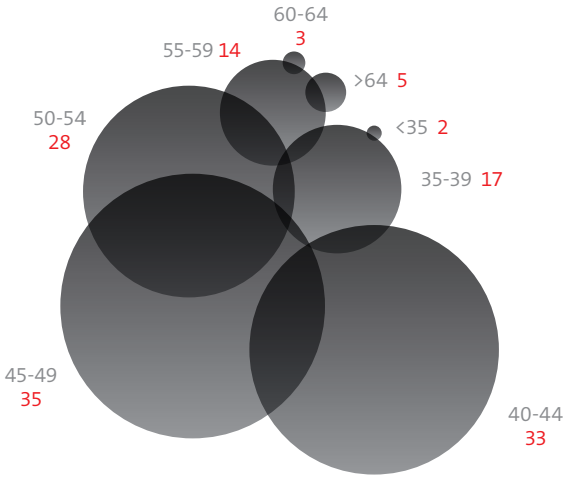
Distribution by knowledge field

(Total 137)



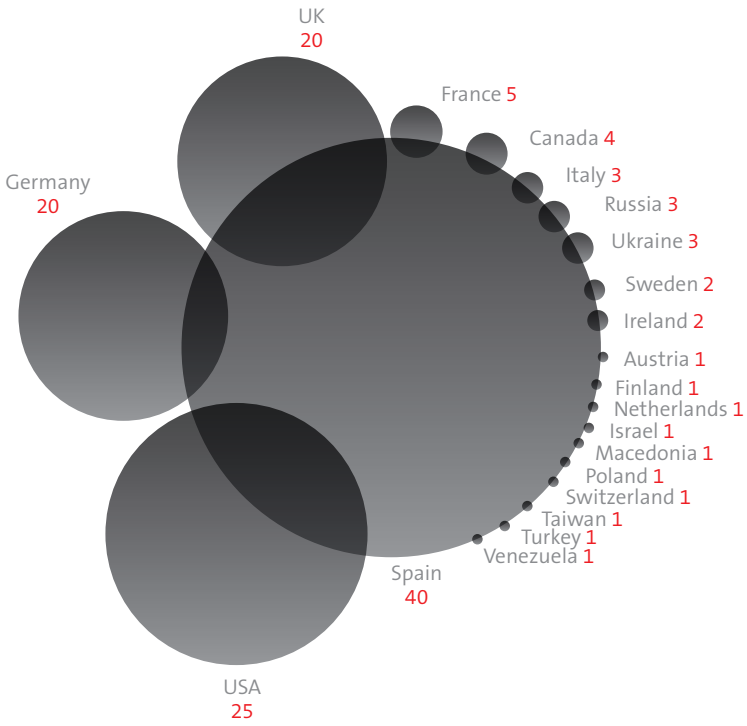
Breakdown by age

(Total 137)



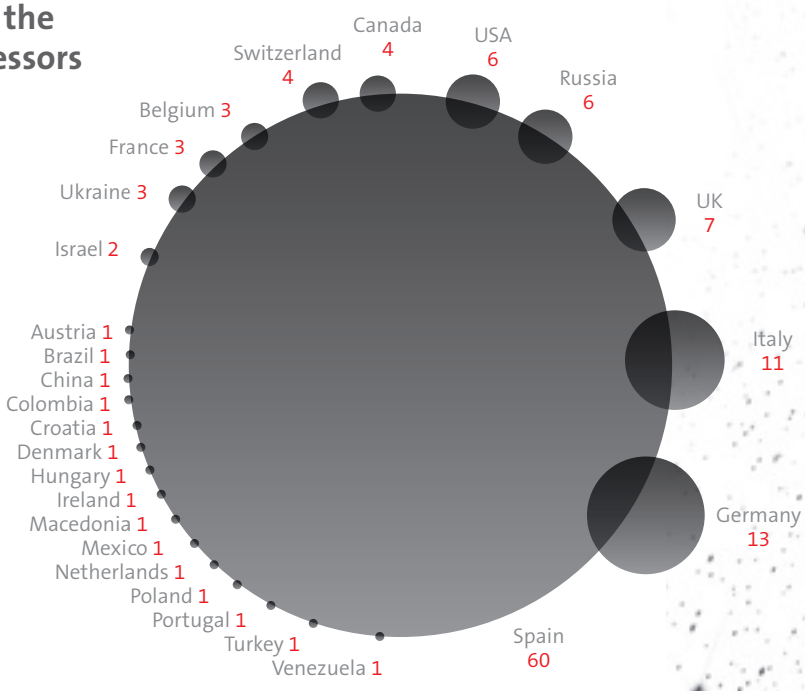
Country of residence at the time they were hired

(Total 137)



Nationality of the Research Professors

(Total 137)

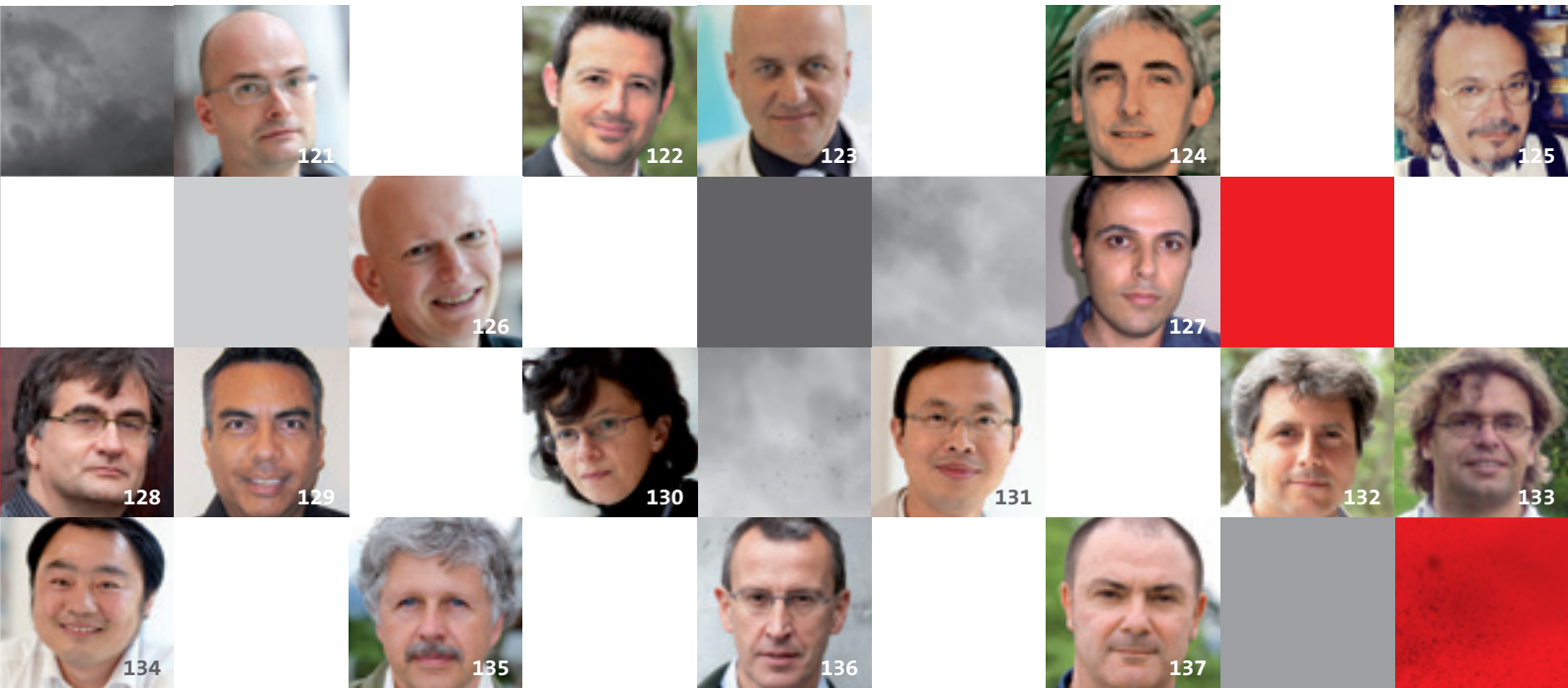


1. Dr. Nicola G. A. Abrescia Structural studies of large molecular complexes and virus particles using X-ray crystallography and electron microscopy. **2. Dr. Elena Akhmatskaya** Mathematical models and computational simulation in life sciences and materials. Numeric methods. **3. Dr. Aitor Anduaga** 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. Frames 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. Gonzalo Bacigalupe** Family health, immigrant and transnational families, psychosocial impact of social technologies (ISTs), gender violence, family psychotherapy. **9. Dr. Igor Bandos** Theoretical physics of high energies, string theory/M theory, supergravity, supersymmetry. **10. Dr. Lourdes Basabe** Point-of-care diagnostic platforms: integration of biosensors in microfluidic platforms for disposable point-of-care diagnostic tests. **11. 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. **12. Dr. Alexander Bittner** Electrochemistry, solids/liquids interfaces, plant viruses, electrospinning. **13. Dr. José Juan Blanco** Cosmology of the primitive universe. **14. Dr. Francisco Borrego** Immunology. **15. Dr. Luz Boyero** Biodiversity, functional ecosystems, global change, freshwater ecology. **16. Dr. Christian Blum** swarm intelligence techniques for optimisation and management tasks in static and decentralised environments, hybridisation of metaheuristics with complete combinatorial optimisation techniques. **17. Dr. Thomas Broadhurst** Observational cosmology, dark matter, the formation of galaxies. Experience with telescopes and satellites. **18. Dr. Jean-Bernard Bru** Mathematical studies (analysis, probability, algebra) of the quantum problem of multiple bodies relating to condensed matter physics. **19. Dr. Félix Casanova** Spin currents in complex systems (metals, superconductors, organic semiconductors) by nanomanufacturing and features of “spintronic” devices”. **20. Dr. Francisco Blanco** Biosciences, the structure of proteins. **21. 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. **22. Dr. Manuel Carreiras** Psycholinguistics, language neurocognition. **23. Dr. Joaquín Castilla** Molecular mechanisms involved in the transmission of prions between different species. **24. Dr. Hubert Chen** Theoretical computer science and related mathematics. **25. Dr. Volodymyr Chernenko** Ferromagnetic materials with shape memory. **26. Dr. Andrey Chuvilin** Low voltage high resolution TEM of nanocarbon materials, electron diffraction in convergent beams, image simulation and processing. **27. Dr. Daniel Conversi** Political and social history. **28. Dr. Martin Cooke** Computer hearing, robust automatic speech recognition. **29. Dr. Eros Corazza** Philosophy of language and the mind. Linguistics. Cognitive sciences **30. Dr. Susana Cristobal** Proteomics: tools to calculate environmental and health matters. **31. Dr. Roberto D'Agosta** The transport of electrons in nanoscale systems, multiple bodies system theory and the open quantum system. Cold atoms physics **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, mod-

els 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. 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. Dr. Thomas Frederiksen** Quantum transport theory and electronic structure methods. Theory and simulation of nanostructures and interfaces. **43. Dr. Paola Fucini** Structural biology of the ribosome. **44. Dr. Zoraida Freixa** Homogeneous catalysis, supramolecular chemistry and photochromic materials. **45. Dr. Vadim Frolov** Biophysics of cellular membranes and model; membrane dynamics, fusion and fission, mechanics and thermodynamics of small membrane systems. **46. Dr. Geza Giedke** Theory of quantum information. Dynamics of open quantum systems. **47. Dr. Frank Girot** Optimisation and simulation of manufacturing processes; application of nanotechnologies to manufacturing processes. **48. Dr. Humberto González Díaz** Chemical and bio information technology and complex networks in molecular & bio-systems. **49. Dr. Javier Gorosabel** Explosive phenomena in the universe. The astrophysics of high energies. Optical polarisation in astronomical sources. Astronomical instrumentation. The automation of telescopes. **50. Dr. Durk Gorter** Studies in minority languages; multilingual education. **51. Dr. Slawomir J. Grabowski** Theoretical chemistry, physics-chemistry, intermolecular interactions. **52. Dr. Marcelo E. Guerin** Structural glycobiology. **53. Dr. Aitor Hierro** Structural biology, membranes traffic. Protein complexes. **54. Dr. Konstantin Gusliyenko** Theory of magnetism and magnetic materials: quantum magnetism, nano magnetism and micromagnetism, spin dynamics. **55. Dr. Andreas Heidenreich** simulations of Coulomb explosions in clusters induced by ultra-intense and ultra-short pulses. **56. Dr. Rainer Hillenbrand** Nano-optics and materials characterisation. **57. Dr. Luis Hueso** Electronic devices with organic semiconductors and nanofibres. Memory devices. **58. Dr. Daniel Innerarity** Political philosophy (governance in the global knowledge society). **59. Dr. Maria José Iriarte Chiapuso** Archaeology, paleobotany and paleopalynology. **60. Dr. Nagore Iriberri** Behavioural and experimental economics, initial responses to games, role of beliefs and expectations in individual decision-making and games. **61. Dr. Jesús Jiménez Barbero** Magnetic nuclear resonance and molecular recognition. **62. Dr. Vladimir Kaberdin** Post-transcriptional control, processing and decay of RNA, bacterial stress responses. **63. Dr. Andrey Kazansky** Computer simulation of the ultra-fast phenomenon in gases and metal interfaces. **64. Dr. Ilya Kazachkov** Combinatorial and geometric group theory and model theory of groups. **65. Dr. Shira Knafo** Neurosciences, ageing, Alzheimer's disease, anxiety disorder, synaptic plasticity. **66. Dr. Mato Knez** nanomaterials (synthesis and properties), material science, thin film coatings, atomic layer deposition (ALD) and organic-inorganic and bio-organic hybrid materials. **67. Dr. Sergey Korotov** Numerical analysis, finite element method, mesh generation. **68. Dr. Eugene Krasovskii** The science of the surface, the theory of the deflation/diffraction of electrons and photoemissions, computational methods of solid state theory. **69. Dr. Stefan Kurth** Particle quantum physics, especially functional density theory, the temporal description of the transport of electrons through molecules and nanostructures.

70. Dr. Banafshe Larijani Biophysics applied to cancer. **71. Dr. Annick Laruelle** Game theory and social choice. **72. 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. **73. Dr. Amaury Lendasse** Machine learning, environmental models, variable selection, industrial applications and chemometrics. **74. Dr. Luis Liz-Marzán** Synthesis and assembly of nanoparticles, development of sensors and diagnosis tools based on nanoparticles. **75. Dr. Hartmut Luecke** Structure-function studies of membrane proteins. The discovery of drugs based on structural studies.**76. Dr. Michael Marder** phenomenology, ethical and political philosophy, environmental philosophy. **77. Dr. Juan Mareque** Bioinorganic and supramolecular chemistry, molecular recognition, biomedical and nanomedical imaging. **78. Dr. Anil Markandya** The economics of the environment and of the resources, climate change. **79. Dr. Aurelio Mateo** Molecular and supramolecular materials. **80. 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. **81. Dr. Ugo Mayor** Biochemical and genetic characterisation of the locational pathways in functions and neuronal disorders. **82. Dr. David Mecerreyes** Polymer chemistry, organic catalysis, polymers that are non-harmful for the environment, sustained polymerisation reactions. **83. Dr. Joseph McIntyre** Computational models related to human motor sensorial behaviour. **84. Dr. Michele Modugno** Bose-Einstein condensation. Quantum "ultracold" gases in optical networks and potential disorders. **85. Dr. Rafael Morales** Interchange magnetism of paired multilayers and nanostructure magnetism. **86. Dr. Alejandro Müller** Nucleation, crystallisation, morphology and physical properties of polymers, biopolymers, nanocomposites. Soft matter and structured fluids rheology. **87. Dr. Jaume Navarro** The history of science, especially the history of physics science. **88. Dr. Marc Neumann** Aquatic impact of climate change, adaptation of water infrastructures, planning and design in conditions of uncertainty. **89. Dr. Ignacio Palacios** Theoretical and applied microeconomy, game theory, behavioural and experimental economy. **90. Dr. David Pardo** Computational simulations, multiphysics, investment and petroleum. **91. Dr. Peter Pearman** Distribution of species with regard to environmental gradients, phylogeography, paleoecology. **92. Dr. Raul Pérez Jimenez** Microscopy of the atomic force of singular molecules. Research on protein mechanics and mechano-enzymology. **93. Dr. Carlos Pérez Moreno** Real and harmonic analysis. **94. Dr. Mario Piris** Chemistry physics, quantum chemistry, reduced density matrix mechanics, natural orbit functional theory. **95. Dr. Jose Pomposo** Synthesis of nano-soft uniform objects and the research of nano-complex objects with self-assembly behaviour. **96. Dr. Ignacio Pascual** Single atom/molecule spectroscopy and manipulation with a scanning-tunnelling-microscope. **97. Dr. Rafael Pulido** The role of protein phosphatase and kinases in human cancer. **98. Dr. Yury Racovich** Nanophotonics, spectroscopy and photonics application of particles and structures at a nano scale, microcavities optics, nano-biophotonics. **99. Dr. José Julio Rodríguez Arellano** Neuroanatomy and functional connectivity of neural circuits in the context of plasticity relating to memory under normal and pathological conditions. **100. 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. **101. Dr. Mª 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

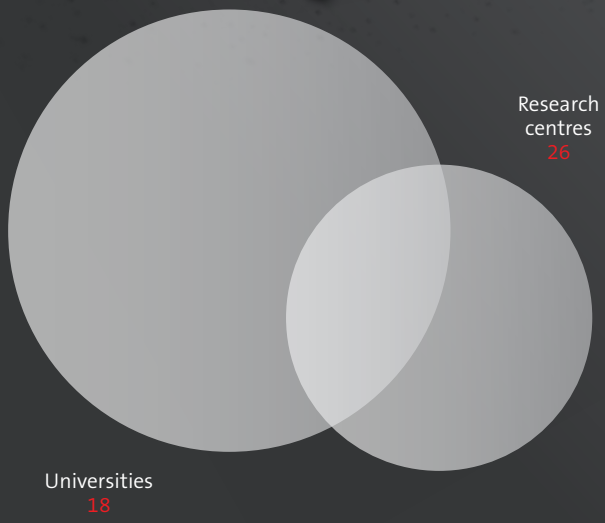
ganglia of this disease. **102. Dr. Dirk Rübbelke** Environmental and public economics; specifically the international aspects of climate change and the benefits of climate change policy. **103. Dr. Arthur Samuel** Psycholinguistics, particularly, the cognitive processes involved in the recognition of spoken language. **104. 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. **105. Dr. Marie-Louise Saboungi** Materials for sensors **106. Dr. Marta Sánchez Carbayo** Translational oncology, molecular pathology, biomarkers, bladder cancer. **107. 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. **108. Dr. Gunar Schnell** Experimental and phenomenological research of quantum chromodynamics and particularly the structure of the nucleon and hadronisation. **109. Dr. Eugeny Sherman** Nanostructures, spintronics and quantum magnetism. **110. Dr. Amanda Sierra** Microglial cells in the interaction between phagocytosis and inflammation in the diseased brain. **111. Dr. Jens Siewert** Quantum dynamics and transport in mesoscopic systems, quantum information theory. **112. Dr. Vyacheslav Silkin** Ultra-fast particle dynamics. **113. Dr. Dmitri Sokolovski** Quantum theory. **114. Dr. Enrique Solano**Multidisciplinary research in quantum optics; quantum information; quantum mechanics; condensed matter. **115. Dr. Vadim Soloshonok** Organic chemistry, fluoridated chemistry, chiral nanotechnology, astrochemistry. **116. Dr. Ivo Souza** Condensed matter theory. Computational electronic structure. **117. Dr. Francesca Tinti** Church organisation of the High Middle Ages, papal correspondence, preservation and transmission of documents of the High Middle Ages. **118. Dr. Ilya Tokatly** Quantum physics and nanostructures. **119. Dr. Radmila Tomovska** Photochemistry, photocatalysis, preparation and characterisation of materials, polymer surface modification. **120. Dr. Esther Torrego** Linguistic theory, syntax interface between syntax and phonology and syntax and semantics, comparative syntax and Spanish and Romance linguistics. **121. Dr. Geza Tóth** Quantum information. **122. Dr. Mustafa Tutar** Interactions of the structure of fluids for aerodynamic and/or hydrodynamic applications, turbulences modelling for different movement scenarios, renewable energy. **123. Dr. Koen Vandenbroeck** Pharmacogenomics and the genetics of autoimmune diseases. **124. Dr. Paolo Vavassori** Changing magnetisation, related characterised dynamics and methods. Manufacturing and characterisation of magnetic nanostructures. **125. Dr. Alexei Verkhratsky** Neuroscience, cellular signalling, neurodegeneration. **126. Dr. Agustín Vicente** Philosophy of the mind; specifically in mental causation and emergentism, relationships between language and thought. **127. Dr. José Vilar** Computational biology. **128. Dr. Ferdinardo Villa** Theoretical ecology. **129. Dr. Joel Villatoro** Applied Photonics. Development of photonic devices and prototypes. **130. Dr. Lucia Vitali** Surface science, spectroscopic and local scale structural research based on tunnel effect techniques. **131. Dr. Lian-Ao Wu** Quantum information theory. **132. Dr. Ronen Zangi** Chemical physics. **133. Dr. Kornelius Zeth** Biology mechanisms: biogenesis of proteins in bacteria and mitochondria, human antimicrobial peptides, iron storage in bacteria. **134. Dr. Peicheng Zhu** Phase transition models. Differential partial equations analysis. **135. Dr. Arkady Zhukov** Magnetic materials, magnetic cables, amorphous nano-crystalline and granular magnetic materials, magnetoelectric effects, transport properties, magnetic properties. **136. Dr. Enrique Zuazua** Partial differential equations, numerical methods, control and optimal design theory. **137. Dr. Jose Luis Zugaza** Cell signalling in cancer and neurodegeneration.



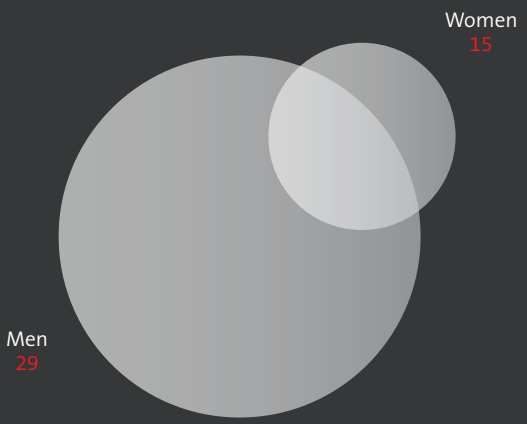
1.7 RESEARCH FELLOWS

PROFILE

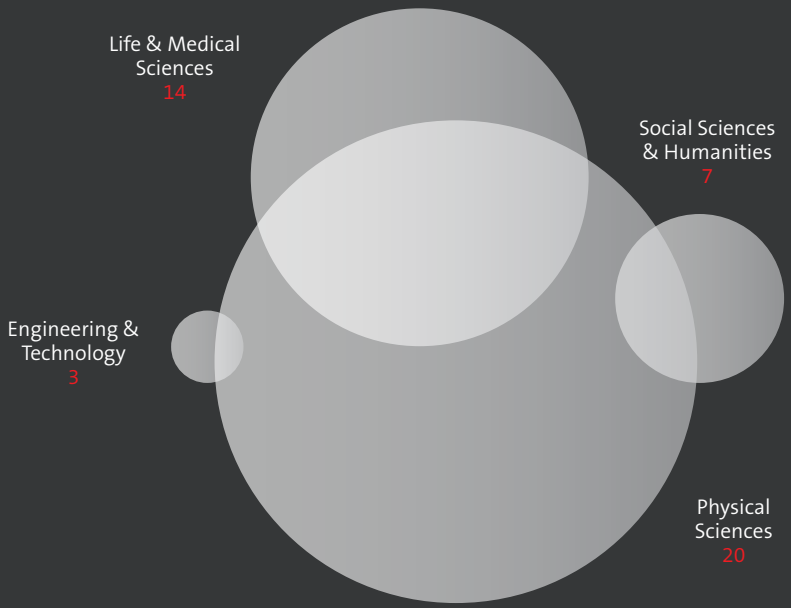
Distribution by type of host centre
(Total 44)



Distribution of Research Fellows by sex
(Total 44)

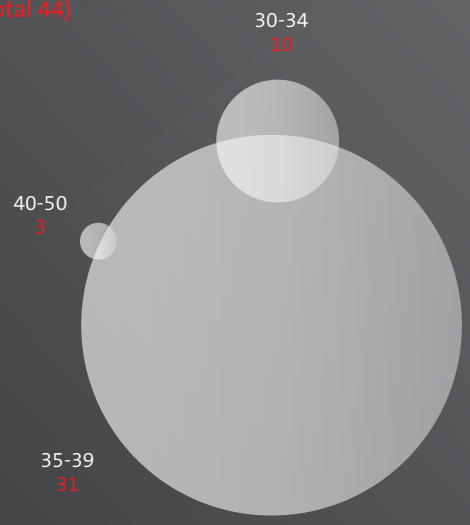


Area of knowledge of the Research Fellows
(Total 44)



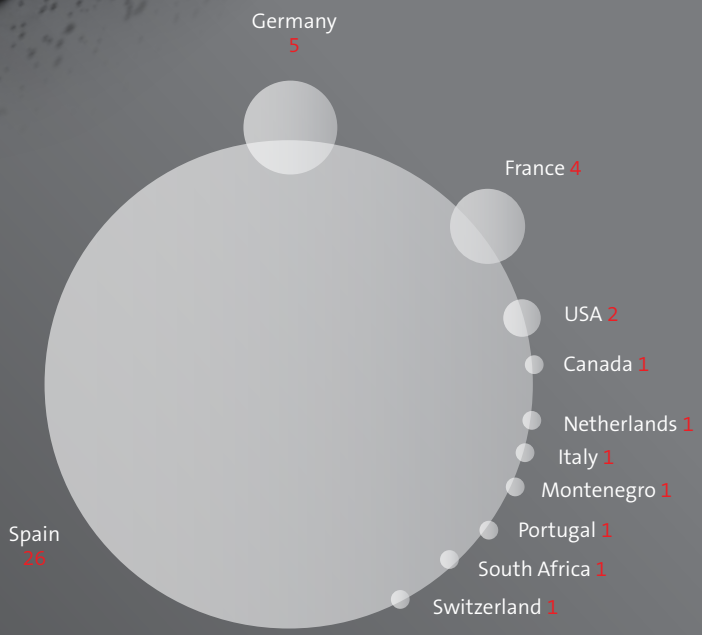
Distribution by age

(Total 44)



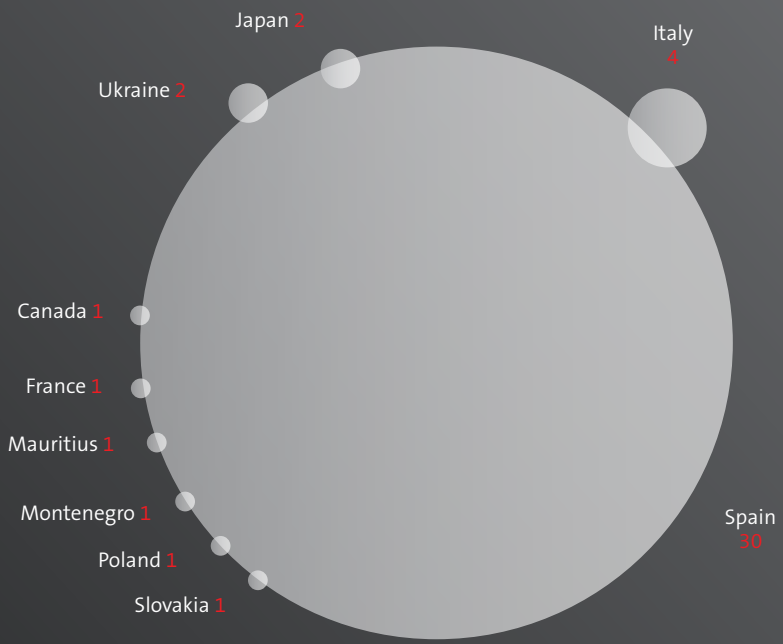
Country of residence at the time they were hired

(Total 44)



Nationality of the Research Fellows

(Total 44)



RESEARCH FELLOWS

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

1. David Albesa Jove 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. Richard Balog** Graphene and its properties. **4. 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. **5. Naiara Beraza Aguilar** Role of epigenetics in the immune system. Acute hepatic injury. **6. Dario Bercioux** Quantum transport in low dimensional systems. Theoretical physics of condensed matter. **7. Santiago Blanco Canosa** Spectrometry on highly correlated materials (superconductivity, magnetism, etc.). **8. Mariam Bouhmadi** Late acceleration of the universe, quantum cosmology and modified gravity theories. **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. Estibaliz González de Capetillo Zarate** Experimental research in Alzheimer's and other neurodegenerative diseases. **11. Daniel Carriazo** Materials with application in energy storage systems. **12. Mónica Carril** Synthesis and biofunctionalisation of nanoparticles as contrast agents for molecular imaging. **13. 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. **14. 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. **15. 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. **16. Martina Corso** Electronic structure and scanning tunnelling and atomic force microscopy characterisation of the morphology of low-dimensional systems, and angle-resolved photoemission. **17. Abel de Cozar** Reaction mechanisms, metallophilic interactions, computer-aided design of chemical compounds. **18. Fernando Delgado Acosta** Condensed matter physics, quantum magnetism. **19. Juan Luis Delgado Cruz** Hybrid photovoltaic materials. **20. Daniel Erro** Voice conversations, speech synthesis, speech signal analysis, modelling, transformation, vocoding. **21. 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. **22. Arantzazu García** Modelling electron transport in nanoscale; theoretical investigation of electron processes on nanostructured surfaces. **23. Idoia García Camino** Study of the molecular mechanisms involved in brain tumorigenesis and characterization of neural and cancer stem cells. **24. Asier Gómez Olivencia** Study of the evolution of the human postcranial skeleton. **25. Vitaly Golovach** Majorana fermion in hybrid semiconductor and superconductor systems; quantum computation, spintronics and nanoelectronics. **26. Marek Grzelczak** Synthesis of nanoparticles; biometric self-organisation of molecular and colloidal systems, artificial photosynthesis and biosensors. **27. Miguel Angel Huertos Mansilla** Organometallic chemistry. **28. Sugumi Kanno** Gravity, string cosmology. **29. Vanja Kljajevic** Language deterioration in Alzheimer's disease; Language in post-stroke aphasia; Language and ageing processes. **30. Fernando López Gallego** Assembly of multi-enzyme systems in advanced materials. **31. Anna Llordés Gil** Chemical solutions for assembly and integration of functional blocks in battery electrodes and electrolytic materials. **32. Antonio Masegosa** Smart systems based on soft computing techniques. **33. Daniel Marino** Plant nutrition and metabolism, plant molecular biology, plant-microbe interactions. **34. Clara Martin** Bilingual language comprehension and production and interaction between the face and voice processing in social interactions. **35. Ander Matheu** Characterisation of brain cancers and population study of cancer mother cells. **36. Nicola Molinaro** Language disorders. Neurophysiological basis of the reading ability. **37. David Moreno Mateos** Recovery of damaged ecosystems, ecology of wetlands, restorative ecology. **38. Noemi Navarro** Research field: Economics, Game theory, Social networks. **39. Alexey Nikitin** Qualitative and quantitative methods in photonics/plasmonics. **40. Mitsuhiro Okuda** Self-organisation of biological, organic and inorganic molecule. Development of applications using bio-nano fusion technology. **41. Gianni Pagnini** Mathematical and numerical modelling of environmental flows. **42. Mª Jesús Perugorria** Molecular mechanisms involved in chronic liver disease, from inflammation to hepatic fibrosis and hepatocellular carcinoma. **43. Javier Reguera Gómez** Self-assembly of nanoparticles for biomedical applications. **44. Ashwin Woodhoo** Molecular mechanisms that regulate the development of Schwann cells and disease.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HOW DO WE DO IT?

02

2.1 MAIN INFORMATION

Total funs that Ikerbasque researchers have secured in competitive calls in 2014.

€ 19,905,298

Number of articles in indexed publications.

848

No. of young researchers:

44

No. of researchers with a permanent contract in 2014.

137

People working in research groups led by Ikerbasque Researchers.

415

Projects with external funding in which Ikerbasque researchers participate.

305

	RESEARCH PROFESSORS	RESEARCH FELLOWS
Articles in indexed journals per researcher	5.88	2.91
Presentations at international congresses per researcher	4.75	1.63
Projects with external funding	281	24
Doctoral theses supervised	31	0
Master's students supervised	30	6
Papers, reports, books and chapters in books	1,017	102
Papers + books / researcher	7.7	3.26

Due to some researchers having started to work in Ikerbasque over the course of 2014, they have not worked for a full year. Taking this variable into account the ratios are calculated for 132 research professors and for 31 research fellows

2.2

PUBLICA

01. Dr. Banafshe Larijani: A new image platform for the customised fight against cancer.

02. Dr. Thomas Broadhurst: Reinterpreting dark matter.

03. Dr. Maria José Iriarte Chiapuso: The chronology of the disappearance of the Neanderthals.

04. Dr. Vadim Frolov: Nanotubes could be used as "universal scaffolds" of the channels of cell membranes.

05. Dr. Geza Toth: Quantifying the interweaving in an experiment with cold gas.

06. Dr. Javier Gorosabel: A stellar explosion in the confines of the Universe provides clues to the formation of black holes.

07. Dr. Inma Estevez: Development of the first mobile application to measure well-being in poultry farms: i-watch turkey app.

08. Dr. Rainer Hillenbrand: Graphene plasmons, a light for new-generation devices.

ATIONS

PUBLICATION 01

Dr. Banafshe Larijani

A new image platform for the customised fight against cancer.

01

Banafshé Larijani, Ikerbasque researcher in the Biophysics Unit (CSIC – UPV/EHU), together with researchers from the United Kingdom and France, has developed a new quantitative imaging platform and a new analytical method for determining the condition of an activated biomarker in cancer patients, which will enable better identification of high-risk patients that could benefit from a more personalised drug therapy.

The deregulation of an oncoprotein, akt/PKB, is linked to a poor prognosis in various human carcinomas. In cancer, akt/PKB plays a central role in cell proliferation and survival, glucose metabolism, genomic stability and revascularisation.

In breast cancer –the most frequent diagnosis in women in the whole world– the activation of Akt/PKB correlates to an advanced state of the disease, poor prognosis, reduced survival and resistance to radiotherapy.

The current approximations for evaluating the activation of proteins based on intensive methods, which are limited by manual scoring and a poor specification. Doctor Larijani and her colleagues have designed a new procedure, highly specific and sensitive, which will also serve to analyse any molecular signalling pathway.

In parallel, they have developed a high-performance FRET/LINEF image platform based on Multiple Frequency Fluorescence Lifetime Imaging Microscopy (mfFLIM), in conjunction with the necessary software, capable of automatically mapping tissue microarrays (TMA), acquiring LINEF images and processing FRET data, distinguishing regions of interest in cells and tumours.

This platform has a great potential for both predictive and diagnostic patient evaluations. The scientific team that has undertaken the research has already used this technology to demonstrate that the activation of oncoproteins in breast cancer patients is linked to a low rate of survival and cure of the disease. In addition, the method functions equally well in other types of tissues, such as colon carcinomas.

The possibility of precisely quantifying oncoprotein activation has significant implications for translational medicine, especially the discovery and validation of prognostic and predictive biomarkers and the stratification of patients based on oncoprotein activation.

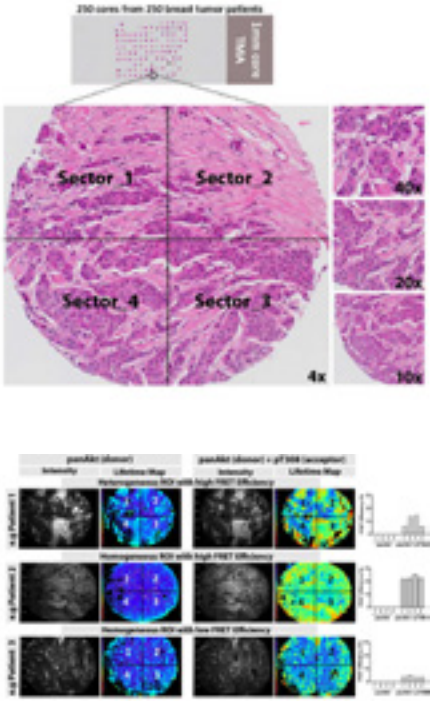
These biomarkers are a turning point in the treatment of cancer patients, as they enable us to advance toward customised therapy. A prognostic biomarker anticipates the likely development of the disease, indicating whether it is necessary to advance the therapy. The predictive biomarkers, on the other hand, assess the probability that a tumour will respond to a certain medicine, helping to establish more personalised and effective therapies.

Professor Banafshé Larijani is the head of the Cell Biophysics Laboratory in the Biophysics Unit (UPV/EHU – CSIC), which she joined in 2014 after achieving a place as an Ikerbasque Research Professor. Previously, she researched at Cancer Research UK, where in 2013 she was designated a senior researcher. She holds positions as an associate professor at the Stony Brook University (New York) and the University of Massachusetts, Amherst (Massachusetts).

Prof. Larijani's laboratory is a cutting-edge multidisciplinary platform, that is based on physical sciences for the development of new channels for research into biological processes. Her laboratory has opened a unique route via research into the function of phosphoinositides and their metabolites, as second messengers and as membrane morphology modulators. The fundamental research results, which involve the application of quantitative techniques (FRET-LINEF) for research into the molecular mechanisms of enzyme that modify phosphoinositides and are dependent on phosphoinositides, have been applied to various clinical objectives.

From 2002 Professor Larijani has published 70 research papers in the area of nuclear membrane biogenesis, lipid signalling and the biology of cancer, which have been cited more than 1,000 times.

The results were published in the journal Brain, one of the most relevant in the field of neuroscience.



High performance in the quantification and detention by means of FRET (resonance energy transfer) amplified in two site, of the oncoprotein activation of its molecular heterogeneity in breast cancer.

PUBLICATION 02

Dr. Thomas Broadhurst

Reinterpreting dark matter.

02

Tom Broadhurst, Ikerbasque researcher in the department of Theoretical Physics at the UPV/EHU, has worked with scientists from the National University of Taiwan on in-depth research into cold dark matter and proposes new answers about the formation of galaxies and the structure in the Universe. These predictions, published in the prestigious journal Nature Physics, are being contrasted with new data provided by the Hubble space telescope.

In cosmology, cold dark matter is a form of matter whose particles move slowly in comparison with light and interact weakly with electromagnetic radiation. It is estimated that only a small fraction of the matter in the Universe is baryonic matter, which forms stars, planets and living organisms. The rest, more than 80%, is dark matter and energy.

The theory of cold dark matter helps to explain how the universe evolved from its initial state to the current distribution of galaxies and clusters, the structure of the Universe on a large scale. In any event, the theory was unable to satisfactorily explain certain observations, and the new research by Dr. Broadhurst and his colleagues sheds new light in this respect.

As the Ikerbasque researcher explained, they have reinterpreted cold dark matter as a Bose-Einstein condensate guided by the initial simulations of the formation of galaxies in this context. Thus, "the ultra-light bosons forming the condensate share the same quantum wave function, so disturbance patterns are formed on astronomic scales in the form of large-scale waves."

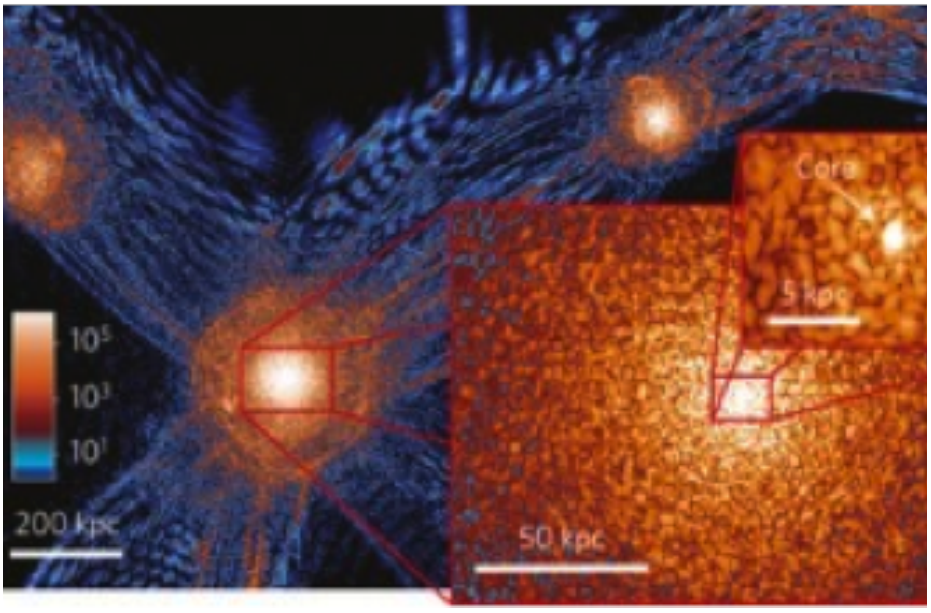
This theory can be used to suggest that all the galaxies in this context should have at their centre large stationary waves of dark matter called solitons, which would explain the puzzling cores observed in common dwarf galaxies.

The research also makes it possible to predict that galaxies are formed relatively late in this context in comparison with the interpretation of standard particles of cold dark matter. The team is comparing these new predictions with observations by the Hubble space telescope.

The results are very promising as they open up the possibility that dark matter could be regarded as a very cold quantum fluid that governs the formation of the structure across the whole Universe.

This is not the first time Thomas Broadhurst has been published in the prestigious journal Nature. In 2012 he participated in research into a galaxy from the reionisation period, an early stage of the Universe that had not previously been researched and that may be the oldest known galaxy yet discovered. This research opened up fresh possibilities to conduct research into the first galaxies to emerge after the Big Bang.

Tom Broadhurst has a PhD in Physics from the University of Durham (United Kingdom); until joining Ikerbasque he did his research at top research centres in the United Kingdom, United States, Germany, Israel, Japan and Taiwan. He has had 184 papers published in leading scientific journals, and has received 11,800 citations to date. In 2010, he was recruited by Ikerbasque and works in the UPV/EHU's department of Theoretical Physics. His line of research focuses on observational cosmology, dark matter and the formation of galaxies.



A comparison of the radial density profiles of the galaxies which the researchers have created by displaying the soliton in the centre of each galaxy with a halo surrounding it. The solitons are broader but have less mass in the smaller galaxies.

PUBLICATION 03

Dr. María José Iriarte Chiapuso

The chronology of the disappearance of the Neanderthals.

03

The high-precision dating of materials from 40 archaeological sites, from Russia to Spain, reveals that the disappearance of Neanderthals from Europe took place around 40,000 years ago. But rather than a rapid replacement by anatomically modern humans, the research, published by the prestigious Nature journal this week, reveals a much more complex picture, a more biological and cultural mosaic that lasted some thousands of years.

The Ikerbasque researcher, María José Iriarte, from the Prehistory Team at the Universidad del País Vasco/Euskal Herriko Unibertsitatea (UPV/EHU), is a member of the international team, authors of the article entitled 'The timing and spatiotemporal patterning of Neanderthal disappearance'. Determining the spatial and temporal relations between Neanderthals and the first modern humans is fundamental to understanding the underlying processes of and the reasons for the disappearance of the Neanderthals. However, technical problems have hampered reliable dating of the period, given that, in samples of over 50,000 years, too little carbon 14 is preserved for the traditional radiocarbon dating to be able to provide precise results.

In order to analyse bone remains and those of the lithic industry of the Mousterian culture - and of other Palaeolithic cultures which have been linked to the Neanderthals, such as the Châtelperronian and the Uluzzian - the research team, led by University of Oxford Professor Tom Higham, used a cleaning system for processing samples and for dating involving accelerator mass spectrometry (AMS) radiocarbon dating. The results suggest that the disappearance of the Neanderthals and the end of the Mousterian culture happened between 41,000 and 39,000 years ago throughout the sites stretching from the Black Sea to the Atlantic coast. The findings also reveal an overlap between Neanderthals and modern humans of between 2,600 and 5,400 years in this region, which may have enabled cultural and genetic interchanges between both groups.

PUBLICATION 04

Dr. Vadim Frolov

Nanotubes could be used as "universal scaffolds" of the channels of cell membranes.

04

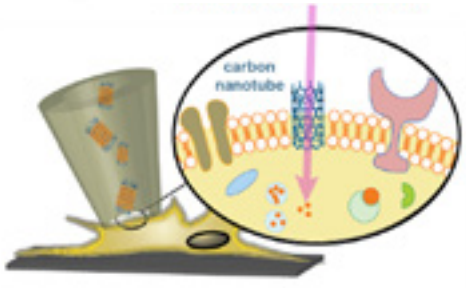
A study, in which the Membrane Nanomechanics group led by the Ikerbasque lecturer Dr. Vadim Frolov at the Biophysics Unit of the UPV/EHU has participated, suggests that single-wall carbon nanotubes could be used as universal scaffolding to help to replicate the properties of cell membrane channels. The results of the study have been published in the journal Nature.

Biological membranes define the functional architecture of living systems: they are selectively permeable, maintain the chemical identity of the cells and intracellular organelles, and regulate the exchange of material between them. To control the transporting of ions and small molecules through cell membranes, highly specialised proteins that transport these molecules through the membrane are used. Recent advances in nanotechnology and nanofabrication have made it possible to synthesise and manufacture artificial compounds destined to fulfil the functions of transmembrane channels and transporters. The behaviour of these artificial compounds is increasingly similar to that of their cell prototypes, in other words, they have increasingly similar characteristics: molecular selectivity, membrane targeting and transport efficiency. However, creating a universal, versatile prototype to manufacture channels with specific transport properties remains a challenge.

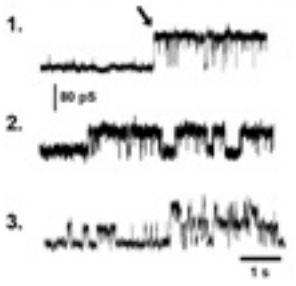
The study, which included participation from the group led by Dr Vadim Frolov, Ikerbasque lecturer-researcher at the UPV/EHU's Biophysics Unit, and led by Dr. Alex Noy of the Lawrence Livermore National Laboratories (United States), suggests that single-wall carbon nanotubes (CNTs) can be used as a framework with similar affinity and transport properties as protein channels. Nanotubes are very efficient transporters because their narrow diameter (of about 1 nm) and hydrophobic interior are very similar to the general structural design of these proteins.

The researchers involved in the study have discovered that ultrashort CNTs covered with lipid molecules form channels in artificial membranes as well as in living cell membranes. These structures remain stable in solution and spontaneously insert into the membranes. Likewise, the researchers have seen that the CNTs inserted in a membrane contain transport properties comparable with those of small ion channels. What is more, they have found that these CNTs are capable of transporting DNA.

Transport of ions and DNA



Ion transport measurements



1. Stable insertion of a single carbon nanotube (shaft)

2. Reversible insertion of a single nanotube

3. Reversible insertion of two carbon nanotubes

PUBLICATION 05

Dr. Geza Toth

Quantifying the interweaving in an experiment with cold gas.

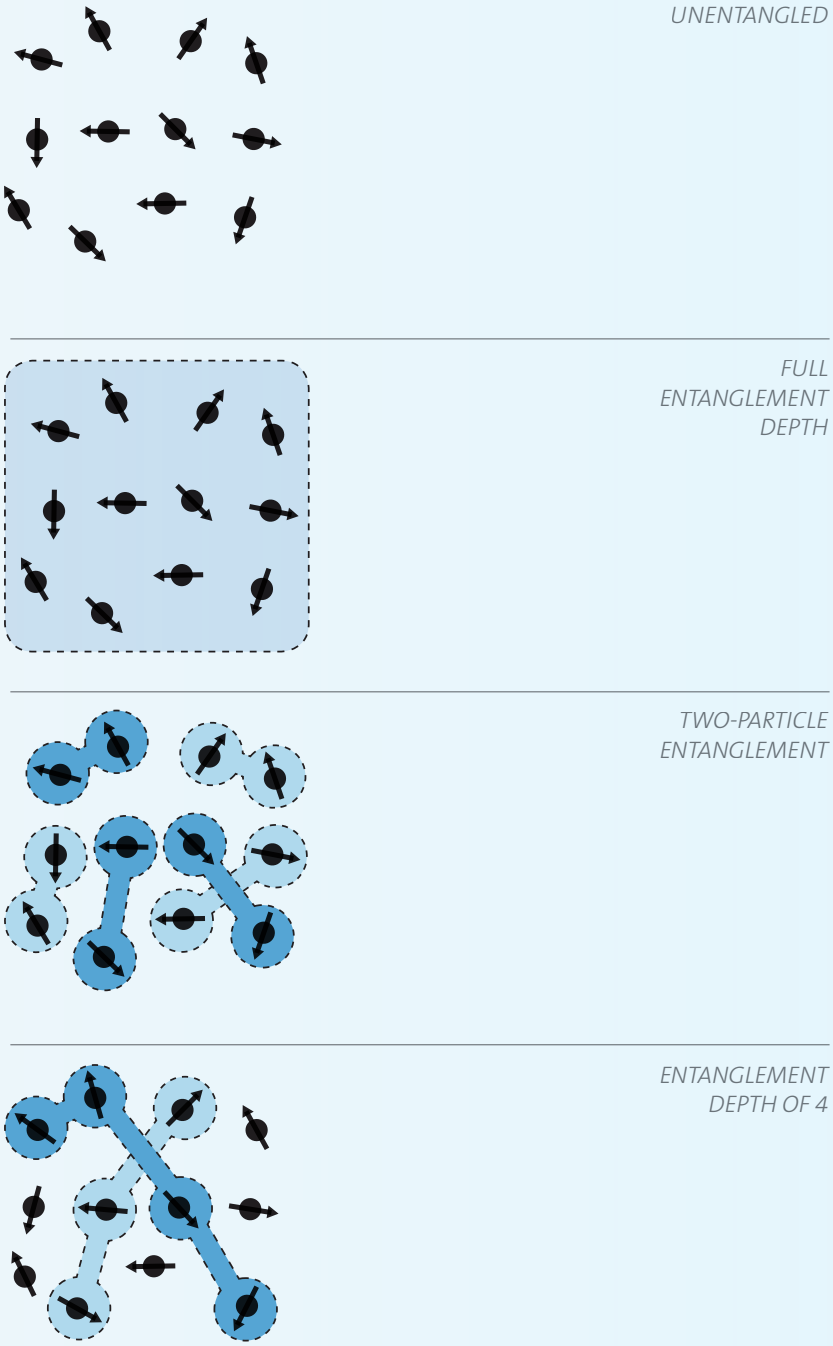
05

The results of a collaboration of European scientists –including Ikerbasque researcher Géza Tóth- for creating large entangled quantum states in cold gases have recently been published in Physical Review Letters as an Editor's Suggestion and were also described in physics.aps.org, a web site featuring the synopses of selected articles.

Entanglement is a surprising quantum phenomenon that is useful for metrology, quantum communication, and quantum computation. Recently a significant effort has been made to create entangled states with cold atoms, cold trapped ions and photons.

The publication describes an experiment in which a Bose-Einstein condensate of around 8,000 cold atoms was created in the experimental group of Carsten Klempt in Hannover. The quantum state was a Dicke state well known in quantum optics theory, but it had not yet been verified experimentally.

On the theory side, the collaboration involved Giuseppe Vitagliano and Geza Toth from the Department of Theoretical Physics at UPV/EHU, who worked on a new method to quantify entanglement in this system. Thus, they were able to show that at least 28 particles were entangled with each other. Looking for stronger and stronger entanglement is crucial for quantum computation and many other applications of quantum states.



Entanglement of particle K

PUBLICATION 06

Dr. Javier Gorosabel

A stellar explosion in the confines of the Universe provides clues to the formation of black holes.

06

On the 24th of October 2012 observatories across the world were alerted to a huge stellar explosion, the GRB121024A, which had been located just hours before in the Eridanus constellation by NASA's Swift satellite. However, only the European Southern Observatory using its Very Large Telescope (VLT), located in the Atacama desert in Chile, managed to take accurate polarimetric measurements of the phenomenon. The data obtained from that explosion, which took place about 11 billion years ago, has made it possible to reconstruct how a black hole is formed. The work, which was undertaken with the participation of Ikerbasque researcher Javier Gorosabal, co-director of the Associated Unit with the Institute of Astrophysics of Andalusia/CSIC-UPV/EHU, has been published in the prestigious journal Nature.

There is no other event in the cosmos that can compete in terms of energy and intensity with stellar explosions in the confines of the universe. Known as LGRBs (Long Gamma-Ray Bursts): in just one second a single GRB can emit as many as hundreds of stars like the Sun during its 10,000-million-year lifetime.

For the last decade astrophysicists have been in possession of strong evidence that LGRBs occur when the so-called massive stars burst; these are huge stars with masses of up to hundreds of times bigger than that of the Sun and which, moreover, spin rapidly on a rotation axis.

As these stars are massive and spin, they do not explode like a normal star, which does so radially, as a ball does when it deflates, for example. The implosion of these huge stars would produce, according to theoretical models, a huge spinning top, which would turn in the way that water rotates down the plughole of a basin, until a black hole is finally formed. The energy given off by this gigantic explosion would be emitted in two jets displaying a high level of energy and which would be aligned with the rotation axis of the dying star.

What is more, all these stars have magnetic fields. And these are intensified further if they rotate rapidly, as in the case of the LGRBs. So during the internal collapse of the star towards the central black hole, the magnetic fields of the star would also swirl around the star's rotation axis. And during the collapse of the star, a powerful "magnetic geyser" would be produced and be ejected from the environment of the black hole that is being formed; the effects of this could be felt at distances of billions of kilometres.

This complex scenario led to the prediction that the light emitted during the explosion of the star must have been circularly polarised as if it were a screw. And that is what, for the first time, the authors have detected in Chile: a circular polarised light that is the direct consequence of a black hole "recently" created in the confines of Universe and that confirms the theoretical model. What is more, an optical circular polarisation to such a high degree had never been detected, and nor had one been detected in such a distant source. All this indicates that the GRB121024A is an extraordinary event.

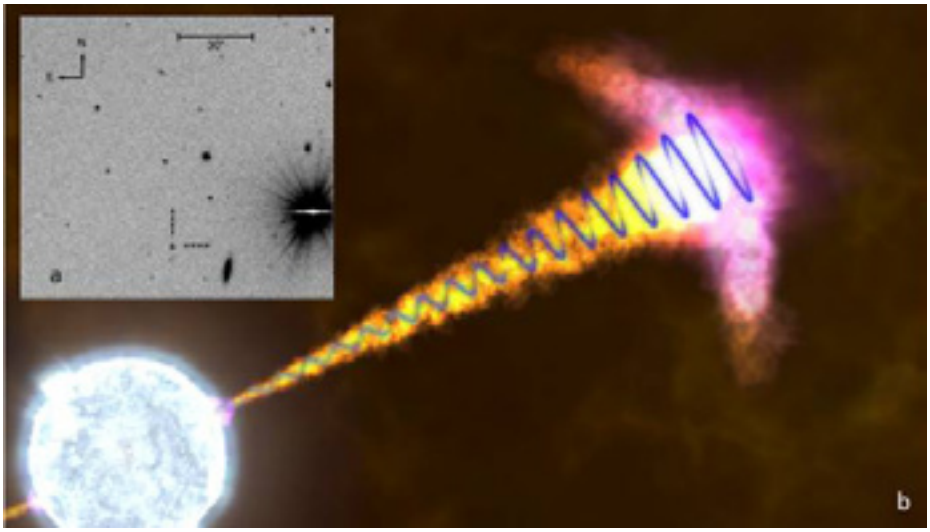


Figure 01: Upper left insert (a): Field image of GRB121024A, taken with the Very Large Telescope (VLT), Chile. GRB121024A is the point indicated by the dotted lines. The brightness of GRB121024A in the image does not correspond with its distance from Earth. In fact, as can be seen in the image, GRB121024A is one of the brightest images in the field, despite being one of, if not the furthest away, in the image. Thus, the indicated point corresponds to the explosion of a star approximately ~11 billion years ago, when the Universe was only a third its current age. Image (b) An artist's rendering of GRB121024A. The bursts can be seen emerging from the dying star, in the centre of which a black hole would form. The blue wave the extends around the burst represents the circular polarisation that was detected. Credit: NASA, Goddard Space Flight Center/S. Weiessinger.

PUBLICATION 07

Dr. Inma Estevez

Development of the first mobile application to measure well-being in poultry farms: i-WatchTurkey app.

07

The new app developed by Ikerbasque researcher Inma Estevez at Neiker-Tecnalia is the first mobile application for the evaluation of animal welfare. The i-Watchturkey is aimed at measuring the health and welfare of turkeys on commercial poultry farms, using the scientific method. At the same time as the evaluation is being undertaken, the statistical tool incorporated into the application enables farmers and veterinarians to make comparisons with previous measurements in a simple and rapid manner. The tool requires the user to input information about the conditions of the accommodation and the management practices carried out, these features may be linked to the behaviour of the birds, their health and their welfare.

Doctor Estévez's knowledge of ecology led her to think that a methodology of a transverse nature might be useful for the measurement of the welfare of turkeys on poultry farms, "It was a kind of Eureka moment" according to her. The idea was accepted and tested in commercial poultry farms by the AWIN project research teams at Neiker-Tecnalia and the University of Milan and with the collaboration of researchers from the University of Purdue in the USA. Apart from testing the methodology, the next logical step was to create a platform for the gathering, analysis and visualisation of data. Developing an app seemed the simplest and most rapid tool to reach out to users worldwide.

The results have been presented at various international conferences. The research has been published in Poultry Science journal. "Many scientists have expressed their surprise with the results obtained using such a simple method: the indicators that we have implemented can enable obtaining great economic impact in the poultry industry, and our objective is to both enhance the welfare of the turkeys as well as to increase the profitability of the farmers, helping them to have healthier farms" stated Dr. Estévez. She is currently working on the development of a sister app aimed at chicken farms, the expectation being that this will be on the market within a month.

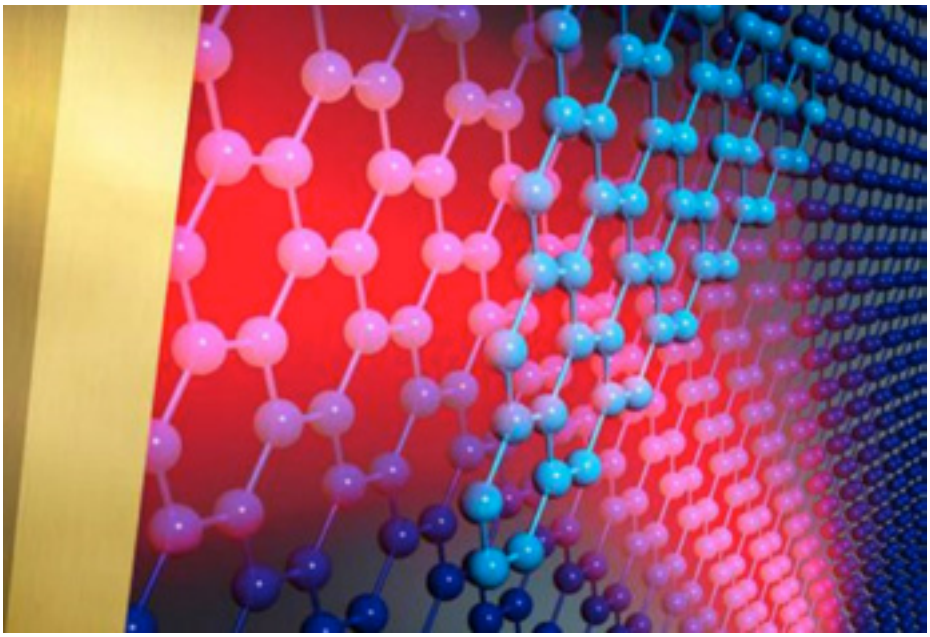
PUBLICATION 08

Dr. Rainer Hillenbrand

Graphene plasmons, a light for new-generation devices.

08

Researchers from nanoGUNE, in collaboration with ICFO and Graphenea, introduce a platform technology based on metal antennas for trapping and controlling light with the one-atom-thick material graphene. The experiments show that the dramatically compressed graphene-guided light can be focused and bent, following the fundamental principles of conventional optics. The work, published in the prestigious scientific journal Science, opens new opportunities for smaller and faster photonic devices and circuits.



Optical circuits and devices could make signal processing and computing much faster. "However, although light is very fast it needs too much space", explains Rainer Hillenbrand, Ikerbasque Professor at nanoGUNE. In fact, propagating light needs at least the space of half its wavelength, which is much larger than state-of-the-art electronic building blocks in our computers. For that reason, a quest for compressing light to propagate it through nanoscale materials arises.

The wonder material graphene, a single layer of carbon atoms with extraordinary properties, has been proposed as one solution. The wavelength of light captured by a graphene layer can be strongly shortened by a factor of 10 to 100 compared to light propagating in free space. As a consequence, this light propagating along the graphene layer —called graphene plasmon— requires much less space. Nevertheless, the efficient transformation of the light in grapheme plasmons and their handling with a compact device is very much a technological challenge. A team of researchers from nanoGUNE, ICFO and Graphenea –members of the EU Graphene Flagship– now demonstrates that the antenna concept of radio wave technology could be a promising solution. The team shows that a nanoscale metal rod on graphene (acting as an antenna for light) can capture infrared light and transform it into graphene plasmons, analogous to a radio antenna converting radio waves into electromagnetic waves in a metal cable.

"We introduce a versatile platform technology based on resonant optical antennas for launching and controlling of propagating graphene plasmons, which represents an essential step for the development of graphene plasmonic circuits", says team leader Rainer Hillenbrand.

The research team *also performed theoretical studies. Alexey Nikitin, Ikerbasque Research Fellow at nanoGUNE, performed the calculations and explains that "according to theory, the operation of our device is very efficient, and all the future technological applications will essentially depend upon fabrication limitations and quality of graphene".*

Based on Nikitin's calculations, nanoGUNE's Nanodevices group, led by the Ikerbasque researchers Luis Hueso and Félix Casanova, fabricated gold nanoantennas on graphene provided by Graphenea. The Nanooptics group then used the NEASPEC near-field microscope to view how infrared graphene plasmons are launched and propagated along the graphene layer. In the images, the researchers saw that, indeed, waves on graphene propagate away from the antenna, like waves on a water surface when a stone is thrown in.

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2.3 ERC

THE ERC (EUROPEAN RESEARCH COUNCIL) WAS CREATED BY THE EUROPEAN UNION. IT IS THE FIRST EUROPEAN ORGANISATION THAT PROMOTES RESEARCH PROJECTS BASED ON SCIENTIFIC EXCELLENCE.

ERC Advanced Grants

The ERC Advanced Grants programme is aimed at researchers with an exceptional background and leadership skills, who have undertaken pioneering and highly ambitious projects in life sciences, experimental sciences and engineering or social sciences and humanities.

ERC Starting Grants

The aim of the ERC Starting Grants is to provide support to young researchers so that they develop their research career in Europe; these are intended for researchers who have demonstrated their capacity to become independent leaders.

These projects are granted for the research fields of life sciences, experimental sciences and engineering research or social sciences and humanities.

ERC GRANT CONFERENCES

In 2014 IKERBASQUE organised several conferences on the ERC Grants (the most prestigious and best funded individual grants for research projects in Europe), with the participation of researchers from all of the Research Centres in the Basque country, interested in learning about the latest developments in the ERC programme.

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 areas 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 has funding of €13 billion, which is a big opportunity to boost scientific research.

The principal objective of these conferences is to publicise the funding opportunity that the ERC Grants entail among the scientific community in the Basque Country, as well as facilitate the application process, and to increase the number of scientists in the Basque Country who are awarded these grants.

The Basque Country currently has 13 ERC Grants, which equates to more that €21 million of investment with which to hire new research staff, acquire scientific infrastructure and consolidate prestigious research groups. Ten of these grants belong to IKERBASQUE researchers in various research centres in the Basque Country.

ERC Advanced Grants

Dr. Manuel Carreiras

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.

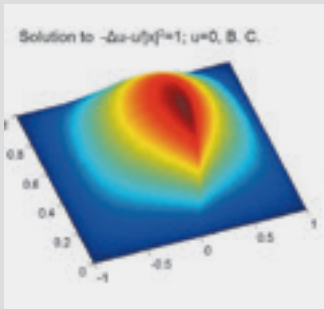
Dr. Enrique Zuazua

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.

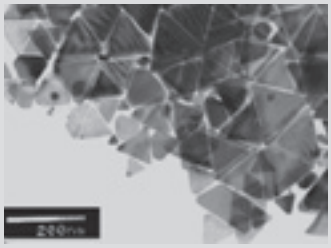


Dr. Luis Liz-Marzán

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.



Dr. Arkaitz Carracedo

The project that will be undertaken 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

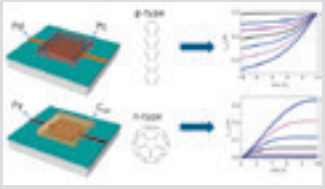
The project undertaken is called "Spectroscopic Field Nanotomography Close in Infrared and Terahertz Frequencies", and its main aim is the development of a new microscopic technique to obtain 3D images of extremely small structures, measured in nanometres (millionths of a metre).

The project started in 2010 and it will continue until 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.



ERC Starting Grants

New

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. Thomas Schäfer

"MATRIX" ("Mixed-Matrix Interfaces for Enhanced Fine Chemicals Downstream Processing and Monitoring") is the name of the project obtained by Thomas Schäfer.

It involves a multidisciplinary project. Joining the recent progress made in biology/ biochemistry, chemistry and materials science and combining these fields with the principles of chemical engineering, the project's aim is to create a more selective and versatile synthetic membrane for use in subsequent transformation processes of the chemicals industry.

The project started in 2008 and ended in 2014.

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 2008 and it will end in 2016.

2.4 SPIN-OFF

Spin-off companies help to transfer knowledge and scientific research to the business world, seeking its direct application in production processes, even its marketing. In 2014, four new spin-offs led by Ikerbasque Researchers were created.

01. SIMUNE

SIMUNE Atomistics (www.simune.eu) was created in June 2014 as a joint initiative with four expert researchers, including the Ikerbasque Researcher Emilio Artacho, and CIC nanoGUNE.

SIMUNE aims to provide support to all types of entities and companies in their R&D processes. This service performs simulations to determine the behaviour of the matter at atomic scale, helping to solve specific technological problems at the same time as minimising the investment.

SIMUNE offers useful simulations for many sectors, although it is true that, at least at first, the focus was on companies working in the energy and electronics sector.

02. Ctech-nano

Ctech-nano (www.ctechnano.com) Driven by the Ikerbasque researcher Mato Knez, it was created in July 2014 in a joint project with nanoGUNE and two local companies, AVS and Cadinox, to provide solutions in the area of thin-film coatings. Ctech-nano specialises in Atomic Layer Deposition technology and has a highly qualified human team, ready and able to respond to the client's needs.

The objective of Ctech-nano is to provide services to companies and product development services, and also to offer the equipment or technical means so they can do so at their own facilities.

The profile of the Ctech-nano customer is someone who seeks innovative solutions, either to overcome challenges in the area of thin-film coatings or to improve their processes and products.

03. ThreeRLabs

ThreeRLabs or 3RLabs was created in September 2014. The developers are the Ikerbasque researcher José Luis Zugaza Gurruchaga in conjunction with Alessandra Di Penta, Doctor in Neurosciences, and Francisco Llavero Bernal, Doctor in Biology. It came about as a spin-off of the Achucarro Neuroscience BERC (Basque Excellence Research Centre), with the aim of becoming a technology-based company centred on the development of innovative products in all sectors related to health improvement.

The competitive strategy of the company is focused on the design and manufacture of interfering recombinant peptides, and the provision of complementary services in the area of organotypic cultures using tissues from the central nervous system and genetics and genomics as tools, the latter for the anticipation and correction of the prevention of chronic diseases.

3RLABS
Laboratorio Biotecnológico

04. Evolgene

Evolgene, (www.evolgene.com) promoted by the Ikerbasque Researcher Raul Perez-Jimenez, was created in September 2014 by nanoGUNE within the framework of an idea supported by the Entrepreneurs Fund of the company Repsol. The objective of Evolgene is the reconstruction of ultra-efficient ancestral enzymes with a wide range of industrial applications, such as in cosmetics and biofuel.

Evolgene.

2.5 SCIENCE CAREERS.EU

The website promoted by Ikerbasque brings together job offers from more than 65 scientific organisations and research groups in the Basque Country.

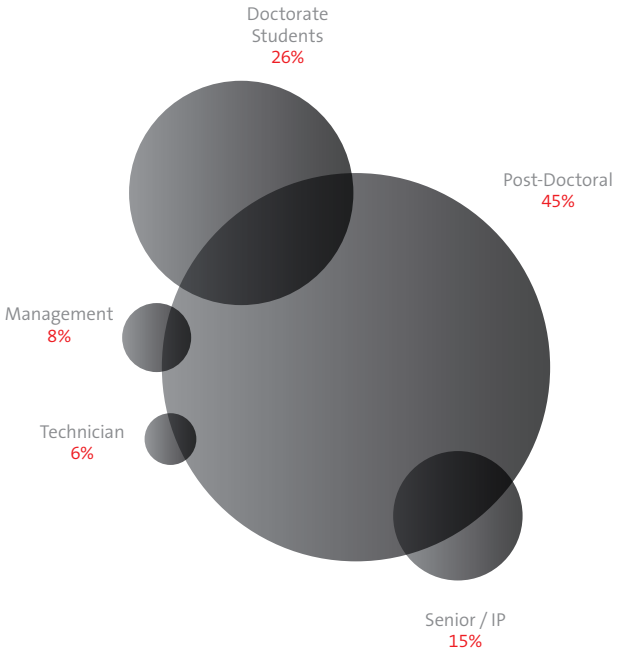
In 2010, Ikerbasque launched the sciencecareers.eu portal which has already become a reference for research staff all over the world who choose the Basque Country to develop their professional career. In 2014, 72 calls were published, a new maximum since the initiative was started.

ScienceCareers is a useful tool both for researchers and for research institutions. For the former it provides a unique platform from where they can access all professional opportunities offered by the Basque System of Science and Technology, including a notification service which occasionally gives information on any vacancies which arise. With regards to universities, technology and research centres in the Basque Country, they are given a space where their employment vacancies are given greater publicity. This aspect is fundamental in such an internationalised and competitive era such as the one characterising scientific research.

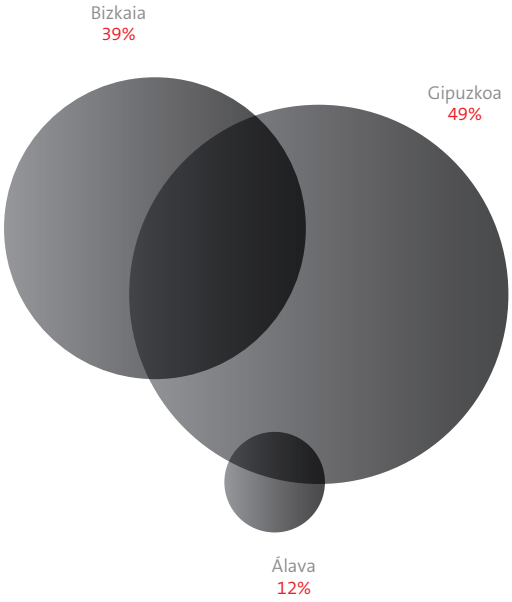
There are other web services which offer the same features as ScienceCareers.eu, however the advantage of this portal is that it is based on the centralisation of data, thus enabling those who publish employment vacancies to have these more widely disseminated by virtue of automatically exporting information to other international portals such as Euraxess (the European portal managed by the European Commission) and NatureJobs (from the prestigious Nature journal), in such a way that the Basque centres that publish their vacancies in ScienceCareers do not have to double their efforts by publishing the same information in various portals.

The website currently holds job offers from 65 institutions or research groups belonging to the Basque Science, Technology and Innovation Network. Since the initiative was started, at total of 279 job offers have been published.

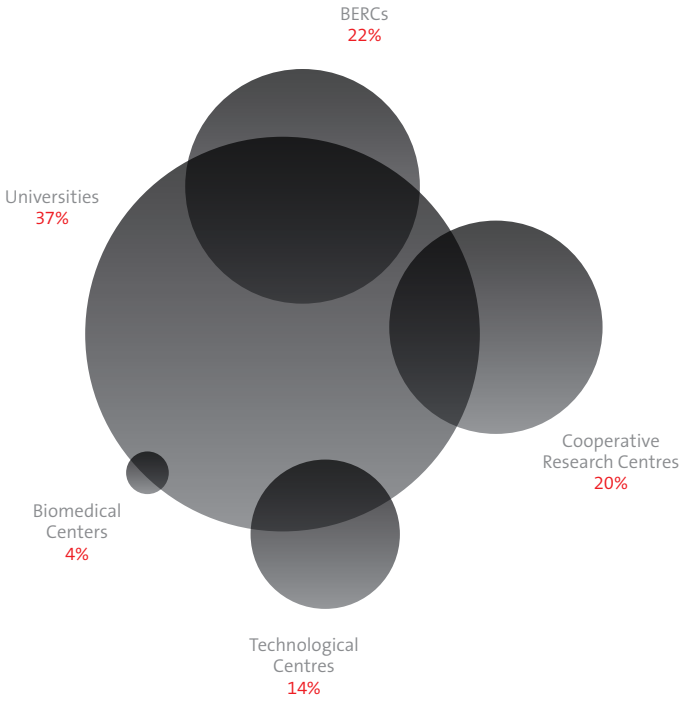
Classification of positions by their category or functional area



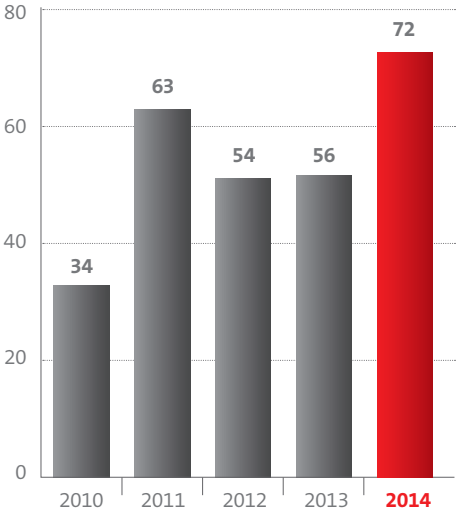
Classification of positions by Historical Territory



Classification of positions by Institution



Evolution of positions announced by year



WHY DO WE DO IT?

03

The Situation of Science in the Basque Country

The essential mission of Ikerbasque is to strengthen scientific research in the Basque Country. The generation of new knowledge, responding to the unanswered questions, is the principal fruit of science.

Ikerbasque developed and launched the Basque Observatory of Science in 2010, with a base of more than 60 synthetic indicators regarding the main aspects related to research activity such as the research population, research results, research incentives, technological transfer, projects and training of researchers.

Thanks to the Observatory it is possible to monitor the progress of science in the Basque Country. The data gathered in the Report on Science in the Basque Country 2014 shows a positive tendency, reflected in the following indicators.

The Scientific Production in the Basque Country has doubled in less than a decade, increasing by 144% between 2004 and 2013.

The weight of the Basque Country in this global scale has grown sustainably throughout the last decade, thanks to a growth rate higher than the average global rate. In 2013, the Scientific Production of the Basque Country represented 0.19 percent of the total scientific production in the world.

The Basque Country is the sixth Autonomous Community in terms of absolute volume of production (Figure 3), after having surpassed Castile-Leon in 2009, and is poised to take fifth place, as the scientific production in the Basque Country has been growing faster than that of Galicia for years. If there are no drastic changes in the trends of the last five years, next year the Basque Country will become the fifth Autonomous Community in absolute scientific production.

An indicator of the quality of the science published is the impact of the journals in which it has been published. The journals are ranked in order of their impact using various indices, such as the impact factor or the SJR published annually by the research group Scimago.

The journals that are in the high quarter of these indices are the journals with the greatest impact on the scientific community.

The Basque Country has maintained a stable percentage during the last decade: approximately half of the scientific articles are publication in the 25% of journals with the greatest impact in every area.

With regard to the percentage of publications for which the first author is a person belonging to an organisation in the Basque Country, in recent years the downward trend has been inverted, and currently almost 65% of the publications in which Basque institutions have participated have a person that researches in our Region as the first author.

The subject matters that have a greater weight in the Basque Country are undoubtedly Medicine, Engineering, Physics, Material Sciences, Chemistry and Biochemistry, Genetics and Molecular Biology. This distribution has been stable for the last decade.

The areas that have experienced greater growth in their relative weights throughout the last ten years are Social Sciences, Arts and Humanities, Mathematics, Energy and in particular Computational Sciences. In the case of Social Sciences and Humanities, part of the increase may be due to the changes in the publication habits of our researchers, with a growing presence in the journals with visibility in databases such as Scopus. These dynamics are similar to those of rest of the world.

The percentage of scientific publications from the Basque Country in conjunction with institutions from other countries has increased continually throughout the last decade, indicated by a jump of more than ten percent since 2008. In 2013, 47.10% of the publications from the Basque Country were in collaboration with institutions from other countries.

Figure 1

Evolution of the scientific output in The Basque Country (Scopus).

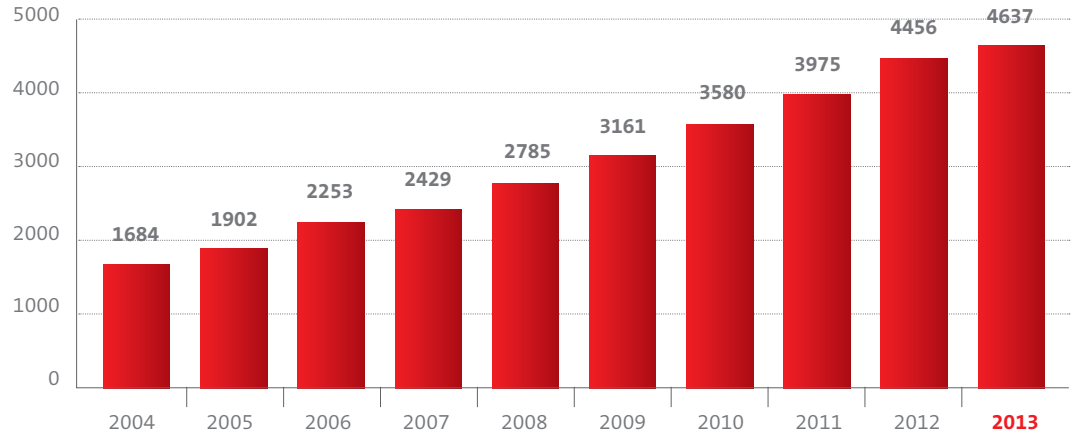


Figure 2

Regional representativeness of The Basque Country compared to Spain and the world (Scopus).

Spain

Worldwide

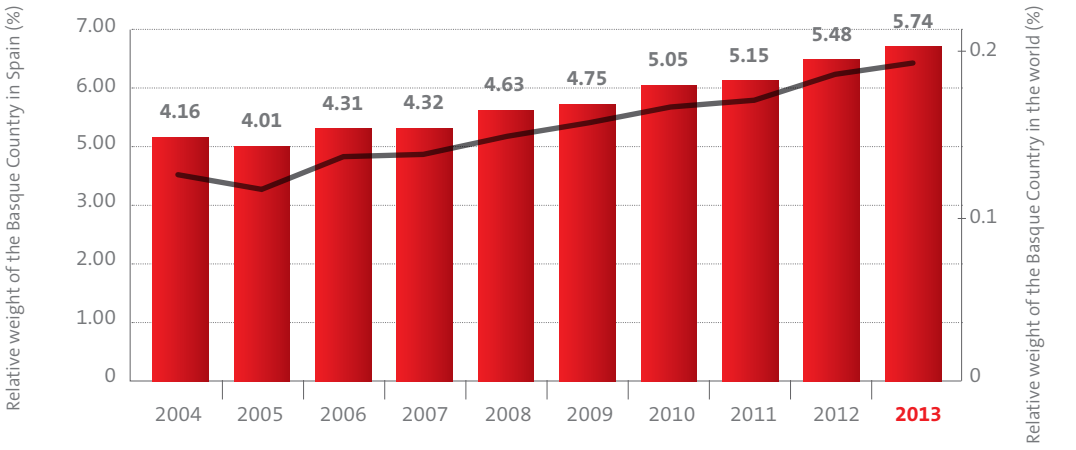


Figure 3

Scientific Production of the Autonomous Communities in 2013 (Scopus).

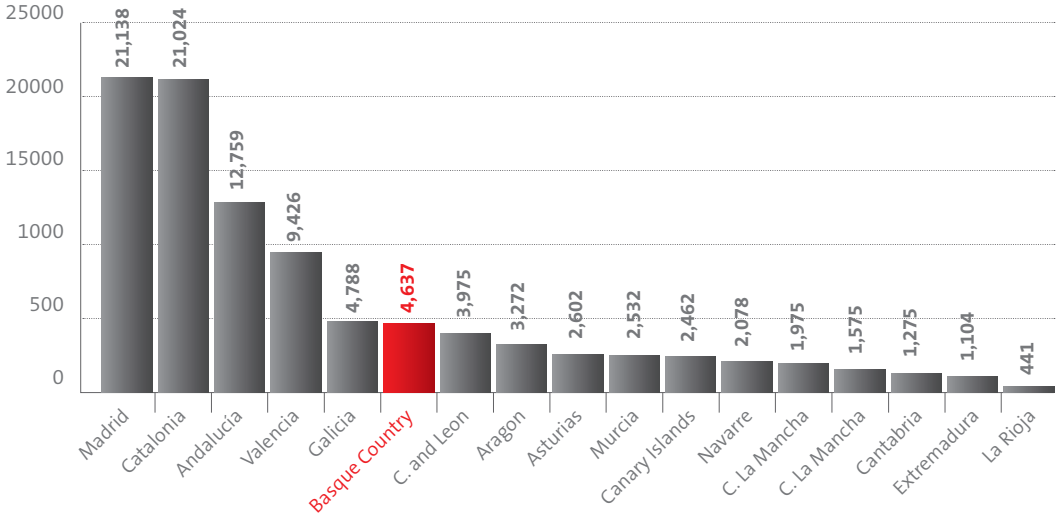


Figure 4

Percentage of publications in the first quarter of SJR (Scopus, with SJR values of Scimago).

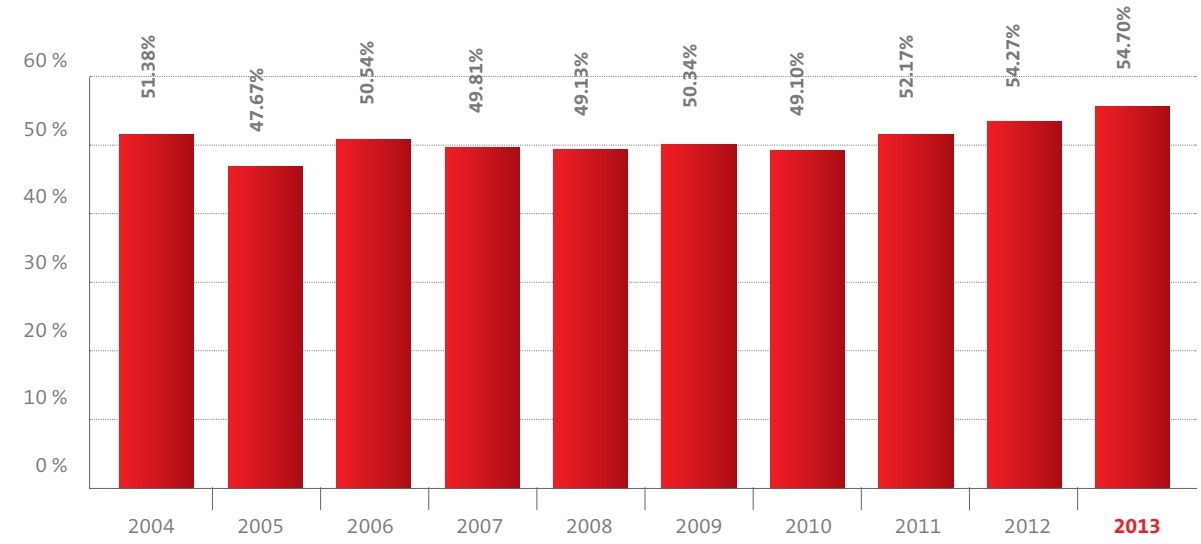


Figure 5

Percentage of leadership in the publications (Scopus).

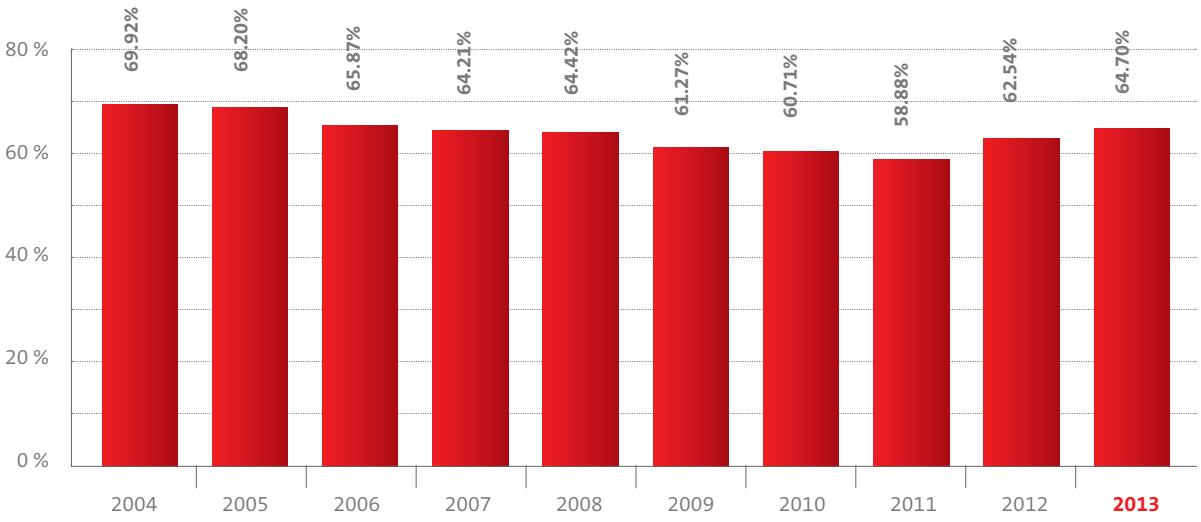


Figure 6

Distribution of the production by subject matter Scopus (Scopus).

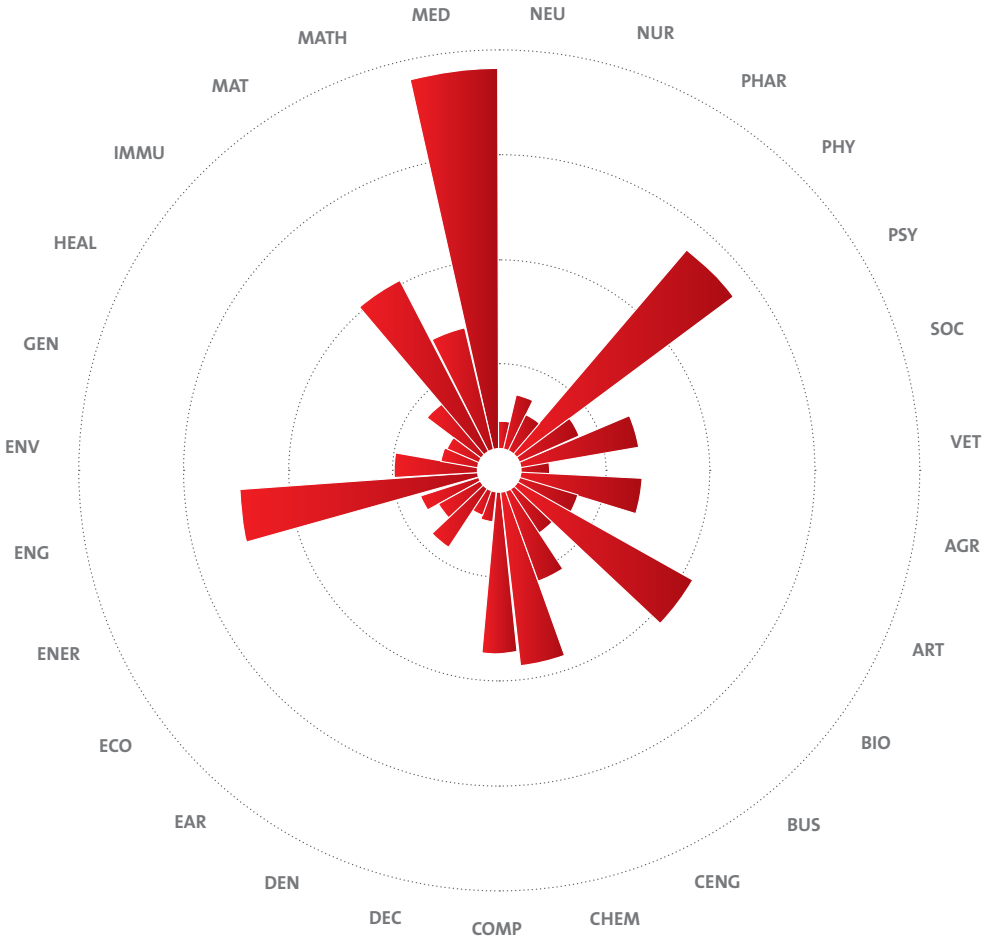
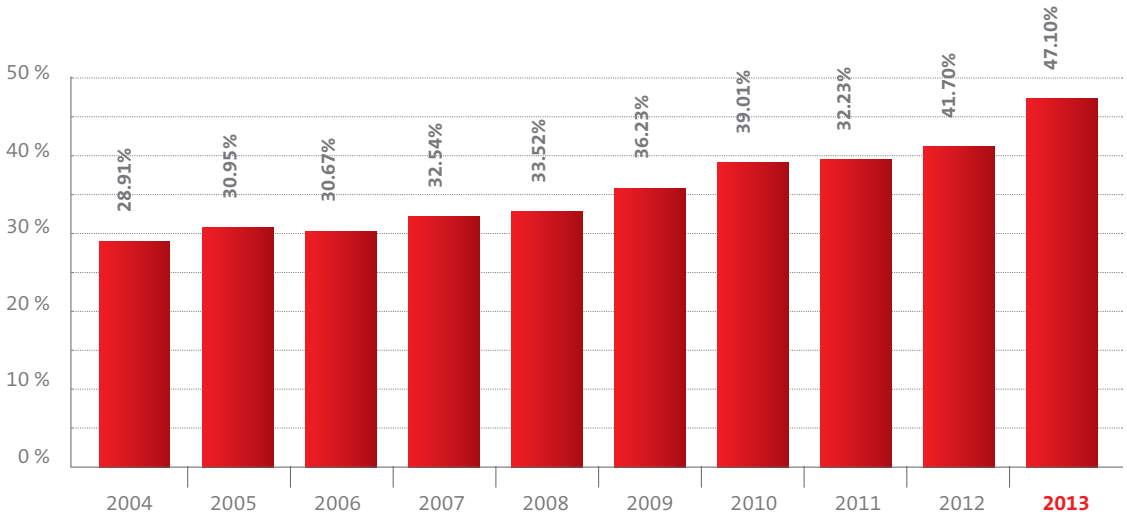


Figure 7

Percentage of publications in international collaboration (Scopus).

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María Díaz de Haro, 3
48013 Bilbao
Tel. + 34 944 05 26 60
info@ikerbasque.net

www.ikerbasque.net