



Science





❖ The audience waiting at the entrance to the "Darwin's Evolution" exhibition.



	Amounts in euros
Personnel costs	435 552
Operating costs	98 445
Departmental activities	1 561 620
Subsidies and grants	532 682
Total	2 628 299
Receipts	1 157 359

In the first half of the 20th century, science was used above all as a privileged instrument for advanced training and education, and, in the second half of the same century, as a source for the creation of new technologies and high tech industries. However, today science is called upon to perform other types of central tasks. The quality of training and education needs to be afforded continuation at the highest level, but there is also a need to provide a reading grid that enables us to understand the role played by the communication and intensified circulation of knowledge in redefining the participative processes that bring with them solidarity and social cohesion.

The central epistemic problem facing humanity in the 21st century is not that of transforming nature, but rather the problem of living together as a community. Without the participation of the citizens, there is no democracy. For this reason, either we deepen the scientific bases of our knowledge about society, nature and the human being itself or there will be no solidarity between people, not even for the future generations. We must distance ourselves from the ignorance and superstition that continue to insinuate themselves into our lives.

In the support that it gives to research, to the circulation and use of argumentative knowledge, ranging from science to the social sciences and philosophy, the Calouste Gulbenkian Foundation has an irreplaceable role to play. The choice of a carefully thought out and rational assessment of our expectations will make a powerful contribution towards building a society in which we would all wish to live.

These were the premises that led to the Science Department's activities being guided by three main programmatic guidelines, in an attempt to facilitate the passage from the past to the future. The plan of activities is therefore centred around the following structuring goals:

- › to foster creativity and rigour in scientific research;
- › to encourage links between science and culture;
- › to strengthen the interaction between science and society.

In order to achieve these goals, the Science Department continued its distributive activity of awarding subsidies and grants to support innovative research programmes and projects. In 2009, the Department created the Programme for the Internationalisation of Social Sciences in Portugal in order to stimulate the publication of research work in prestigious international journals.

Under the scope of its own direct initiatives, and with the aim of promoting scientific culture and the interaction between science and society, the highlight of the Science Department's activities was the organisation of the “Darwin's Evolution” exhibition, in association with the American Museum of Natural History in New York, designed to mark the bicentenary of the birth of Charles Darwin – on 12 February 1809 – and the 150th anniversary of the publication of the book that lay at the foundation of evolutionary theory, *The Origin of the Species*. The exhibition was on display in the Temporary Exhibitions Gallery of the Foundation's headquarters from 12 February to 24 May 2009, being aimed at a diversified range of audiences of all ages.

In parallel to the exhibition, various educational activities were promoted, together with events designed to disseminate scientific culture, namely the play *O Professor de Darwin* (Darwin's Teacher) performed by the A Barraca theatre group and two lecture cycles, “Darwin: On the Road to Evolution” and “Darwin's Evolution”. Several books were also published that were related to the initiative and the “Darwin Festival: Science is Culture” was held in the Foundation's gardens on 23 and 24 May.



❖ The play *O Professor de Darwin* (Darwin's Teacher), written by Helder Costa and performed by the A Barraca theatre group, included in the educational activities accompanying the “Darwin's Evolution” exhibition. Calouste Gulbenkian Foundation, Auditorium 3, 14 and 28 March; 4 and 18 April; 9, 23 and 24 May 2009.



❖ The director of the Science Department João Caração and the trustee Diogo de Lucena, 17 March 2009.

Stimulating creativity and rigour in scientific research

Young Researchers Incentive Programme

The Young Researchers Incentive Programme pursued activities designed to support and stimulate young researchers, with applications being invited in the following scientific areas: equations with partial derivatives and applications, the physics of complex systems, molecular recognition, and astronomy/astrophysics/cosmology.

The programme gives two annual awards to high-quality proposals from each scientific area, and simultaneously provides support to implement them in the following year at Portuguese research centres. Forty-six applications were submitted in the four scientific areas. After due analysis, the jury recommended that eight applications be granted, two in each area. In the first quarter of 2010, each successful applicant will receive a total financial incentive of € 12,500, divided into two instalments, one of € 2,500 for the researcher, and the other of € 10,000, awarded to the institution where the work is to be carried out, which is intended to help pay for the costs of undertaking the research.

The Jury recommended the attribution of two awards in each scientific area to the following applicants:

- › Equations with partial derivatives and applications
 - “Optimisation of Form for Boundary Value Problems in Partial Differential Equations”, proposed by Pedro Ricardo Simão Antunes, to be undertaken by the Physics-Mathematics Group of the University of Lisbon;
 - “Spectral Element Method Approximation of Fluid-structure Interaction in Haemodynamics”, proposed by Gonçalo Nuno Travassos Borges Alves da Pena, to be undertaken at the Mathematics Centre of the University of Coimbra.
- › The physics of complex systems
 - “Control of Light in Three-level Atomic Systems and its Applications for All-optical Devices”, proposed by Chao Hang, to be undertaken at the Centre of Theoretical and Computational Physics of the University of Lisbon;
 - “Physics of Optoelectronic Oscillator Circuits for Communication Systems Applications”, proposed by Bruno Miguel Patarata Romeira, to be undertaken at the Physics Department of the University of the Algarve.
- › Molecular recognition
 - “Atomic Force Microscopy-based Molecular Recognition of Fibrinogen Receptors in Platelets and Erythrocytes. Applications in Health and Disease”, proposed by Marco André Manso Domingues, to be undertaken at the Institute of Molecular Medicine of the University of Lisbon;
 - “Anti-Target Docking: the Other Side of the Mirror”, proposed by Sérgio Filipe Maia de Sousa, to be undertaken at ICETA – Institute of Agricultural and Agri-foodstuffs Sciences and Technologies of the University of Porto.
- › Astronomy/astrophysics/cosmology
 - “Giving Light to Dark Matter Using the Stars as a Physics Laboratory”, proposed by Jordi Casanellas Rius, to be undertaken at the Astrophysics Multidisciplinary Centre (CENTRA) of the Higher Technical Institute;
 - “Ab initio radiation from astrophysical shocks”, proposed by Joana Luís Martins, to be undertaken at the Institute of Plasmas and Nuclear Fusion of the Higher Technical Institute.

Support Programme for Cutting-Edge Research in Life Sciences

With the aim of stimulating originality and the development of new and creative ideas in the research work being undertaken in life sciences, this programme resulted from the desire to encourage young researchers working at centres of excellence to take more risks and to engage in cutting-edge research.

A competitive application process was opened and 53 proposals were submitted for possible funding. In 2009, awards were made to the following institutions, consisting of a subsidy to the amount of € 50,000:

- › Institute of Agricultural and Agri-foodstuffs Sciences and Technologies – ICETA, University of Porto, to make it possible to undertake the project “On the Nature of Species: Insights into the Lake Malawi Cichlids Explosive Radiation Based on a Genomic Analysis”, under the responsibility of Catarina Lopes Pinho;
- › Centre for Marine Sciences, University of the Algarve, to make it possible to undertake the project “Identification of Micro RNAs and its Targets Genes and Biological Roles in Vertebrate Skeletogenesis”, under the responsibility of Daniel António Martins Tiago.

Programme for the Internationalisation of Social Sciences in Portugal

Created in 2009, this programme seeks to encourage the internationalisation of the social sciences, providing incentives for the publication of research studies in leading international journals. The programme covers the following disciplines: anthropology, educational sciences, political science, demography, human geography, history, social psychology, international relations and sociology.

In accordance with the programme’s regulations, a public call was launched inviting applications for funding, with this competitive process being open to both Portuguese and foreign researchers working in Portuguese institutions. In 2009, applications for funding were accepted in relation to articles that had already been published, or accepted for publication, in leading international journals between the years of 2006 and 2008. Seventy-nine applications were submitted for consideration, and the Jury decided to give awards to the following applicants:

- › Tiago Luís de Matos Roma Fernandes, Faculty of Social and Human Sciences of the New University of Lisbon, for the article “Authoritarian Regimes and Pro-Democracy Semi-Oppositions. The End of the Portuguese Dictatorship (1968-1974) in Comparative Perspective”, published, in 2007, in the journal *Democratization*;
- › Catherine Moury, Centre for Research and Studies in Sociology (CIES – ISCTE), for the article “Explaining the European Parliament’s Right to Appoint and Invest the Commission: Interstitial Institutional Change”, published, in 2007, in the journal *West European Politics*.

“New Talents in Mathematics” Programme

Every year, the “New Talents in Mathematics” Programme selects university students of Mathematics who demonstrate high academic merit and encourages the development of their mathematical knowledge and skills, supporting their work with recognised specialists who will act as tutors. Following a public competition, during which 77 applications were received, the Calouste

Gulbenkian Foundation awarded 20 merit grants to students attending the first, second and third years of a Mathematics degree in the academic year 2009-2010.

The 6th Mathematics Summer School – the Escola Diagonal – took place between 7 and 12 September, 2009, at the Department of Pure Mathematics of the Faculty of Science of the University of Porto. This involved around 50 students, including pre-university and university students, who attended two courses. These courses were taught by guest professors from Portugal and abroad (Vitaly Bergelson, Ohio State University, and Peter E. Trapa, Utah University, USA), and complemented by working sessions supervised by monitors.

This Summer School preceded the 9th National Meeting of the “New Talents in Mathematics” Programme, which was held in Porto on 11 and 12 September 2009. The main objectives were: to allow students from across the country to meet and exchange experiences about their respective academic environments; to draw up an overview of the work done under the programme; to hold scientific debates involving all participants (award-winners and tutors). The meeting also included a series of lectures given by some of the award-winners and by the guest professors from Portugal and abroad, as well as by the participants in the exchange programme with IMPA (National Institute of Pure and Applied Mathematics, Rio de Janeiro) – the IMPA Scientific Initiation Summer Course – Roberto Imbuzeiro, Rafael Montezuma and Álvaro Krüger (Federal University of Rio Grande do Sul).

Programmes to Strengthen Research Potential

Basic research was supported through the award of subsidies to various institutions, most notably:

- Portuguese Astronomy Society, for the programme of activities developed under the auspices of the International Year of Astronomy (IYA 2009), whose main aims were to promote scientific dissemination and to stimulate the creation and consolidation of astronomy networks involving amateurs, trainers, scientists and promoters of science at local, regional, national and international levels. The subsidy was awarded in partnership with the Education and Scholarships Department.
- Lisbon Geographical Society, to support the commemorations of the 90th anniversary of Sir Arthur Eddington’s scientific mission to the island of Príncipe in 1919.
- Directorate-General of Archives – Ministry of Culture, to contribute towards the costs of the exhibition “Records of the Sky: Astronomy in Manuscripts at the Torre do Tombo”, promoted in the International Year of Astronomy with the aim of highlighting the importance of scientific documents and spreading knowledge, in an interactive and pedagogical fashion, about some of the fundamental historical documents relating to Portuguese thought and scientific activity.
- Institute of Complexity Sciences, for the organisation of the Arrábida Paths of Complexity Conference entitled “The Notion of Emergence in the Physical and Social Sciences”.
- Catholic University of Portugal, to contribute towards the costs of organising the international conference “Darwin’s Impact on Science, Society and Culture”, which formed part of the commemorations of the 200th anniversary of the birth of Charles Darwin and, at the same time, the 150th anniversary of the publication of his seminal work *The Origin of Species*.

- › Bento da Rocha Cabral Scientific Research Institute, to contribute towards the costs of organising the international conference “Arts and Science: Humanities as Science Matters”.
- › Institute of Strategic and International Studies, for the organisation of the scientific meeting on the theme “Europe, Globalisation and Crisis: New Developments for the Lisbon Agenda”, which is set to result in the publication of a book entitled *Europe, Globalisation and the Lisbon Agenda*.

Promoting links between science and culture

Conferences and seminars

In order to prepare the appropriate climate for the exchange of ideas and learning that was to be provided by the “Darwin’s Evolution” exhibition, on display in the Temporary Exhibitions Gallery at the Foundation’s headquarters from 12 February to 24 May 2009, a lecture was given on 21 January on the subject “How did we Become Human?” by Eugénia Cunha, of the University of Coimbra, which marked the end of the lecture cycle “Darwin: On the Road to Evolution”.

The same exhibition also gave rise to the lecture cycle entitled “Darwin’s Evolution”, consisting of two monthly lectures given between 13 February and 24 May. The first lecture, “Darwin. Discovering the Tree of Life”, was given by Niles Eldredge, from the American Museum of Natural History, New York; John Parker, from the University of Cambridge, talked about “The Cambridge Years: Henslow’s Legacy, Darwin’s Inheritance”; in March, Olivia Judson, from Imperial College, and Pietro Corsi, from Oxford University, United Kingdom, respectively gave the lectures “Glad to be Evolved” and “Just Before Darwin: The Question of Species during the 1850s”. Lynn Margulis, from the University of Massachusetts, USA, and Mark Stoneking, from the Max-Planck Institute for Evolutionary Anthropology, respectively talked about the themes of “Evolution on a Gaia Planet: Darwin’s Legacy” and “Human Evolution: The Molecular Perspective”. David Sloan-Wilson, from Binghamton University, USA, gave the lecture entitled “Evolution and Human Affairs”. Rosemary and Peter Grant, from Princeton University, USA, brought this lecture cycle to a close with their talk on the “Evolution of Darwin’s Finches”.

In the last quarter of the year, as a complement to the celebrations of the International Year of Astronomy, the Science Department also promoted the first three lectures of the cycle “On the Frontiers of the Universe”, which began on 14 October with the scientist Alfredo Barbosa Henriques from the Multidisciplinary Centre for Astrophysics of the Higher Technical Institute, who spoke about “The Universe of Einstein”. Paulo Crawford, from the Centre for Astronomy and Astrophysics of the Faculty of Science of the University of Lisbon spoke on the theme “From the Island of Príncipe to the Confines of the Universe”, and Robert Kennicutt, from the Institute of Astronomy – University of Cambridge, delighted the audience with his lecture entitled “The New Age of Discovery in Astronomy”.

Scientific exhibitions

The “Darwin’s Evolution” exhibition was opened on 12 February in the Temporary Exhibitions Gallery. Running until 24 May, it was designed to celebrate the 200th anniversary of the birth of Charles Darwin, and simultaneously the 150th anniversary of the publication of his seminal masterpiece *The Origin of Species*.

The exhibition's curator was José Feijó, a full professor from the Faculty of Science of the University of Lisbon, with Thiago Carvalho, a PhD holder in Biology, acting as the assistant curator. Designed for a non-specialist audience, the initiative had a strong didactic component and included the organisation of an itinerant exhibition, the development of an educational project that also involved the publication of some relevant works related to its subject-matter, as well as the creation of the blog <http://a-evolucao-de-darwin.weblog.com.pt/> to allow for the



✚ The curator of the “Darwin’s Evolution” exhibition, José Feijó, guides the President of the Portuguese Republic, members of the Government and the president of the Calouste Gulbenkian Foundation on the first visit to the exhibition. Temporary Exhibitions Gallery, 12 February 2009.



✚ Award of the prize for the “Darwin Returns to the Galapagos Islands” competition, 25 March 2009.

daily discussion of themes related to evolution, and the holding of two conference cycles. The exhibition was on display to the public for 85 days and was visited by 161,118 people.

The educational programme, open to schools from both basic and secondary education, included guided tours of the exhibition, and the delivery of the “School Pack” containing a guide for teachers and information packs for the different levels of education, and the Portuguese versions of the book *Darwin’s Origin of Species – A Biography*, by Janet Browne, and the brochure *Evolution*, by Daniel Loxton. 933 guided visits were held, aimed at students from all educational levels, as well as other organised groups and the general public.

As a further part of these educational activities, a competition entitled “Darwin Returns to the Galapagos Islands” was organised, aimed at students from the 3rd cycle of basic education and secondary education, in which the 1st prize consisted of a trip to the Galapagos archipelago. The A Barraca theatre group was associated with the various activities programmed under the scope of the exhibition and presented the play entitled *O Professor de Darwin* (Darwin’s Teacher), directed by Hélder Costa, on six occasions in the Foundation’s Auditorium 3.

The closing of the exhibition was marked by the holding of the “Darwin Festival: Science is Culture”, on 23 and 24 May. This included a range of different activities running non-stop from 9.30 to 18.00 at the Calouste Gulbenkian Foundation: plays, *Eu (a Natureza É a Natureza)*, performed by the theatre group of the Faculty of Science of the University of Lisbon (FC-Acto) and directed by A. Branco; *Conferência de Um Macaco*, performed by the theatre collective Causa.ac and written and directed by Amândio Pinheiro; as well as the already-mentioned play *O Professor de Darwin*; a recital of

“Music that Evolution Inspired”; practical workshops: “5 Centuries of Scientific Illustration”, “Fossils for All”, “Diagnosing Darwin: Dr. House Visits Down House”, “How to Make a Mountain”, “DNA Detectives”, “The Tricks our Brains Play on Us”, “With Darwin, from Garden to Garden”, “Looking for Birds in the Garden”, “Evolution in the Garden”, “Rocks and Minerals” and “Sparrows in the Nest”; lectures: “Hormones and What we Are”, Rui Oliveira; “What our Bones can Tell us”, Eugénia da Cunha; “The Evolution of Form: from Darwin to DNA”, Élio Sucena; “Darwin’s Revolutions”, Ana Leonor Pereira; “Our Brain and Behaviour”, Rui Costa; “What if Darwin Came Back Again ... to the Azores”, António Frias Martins; “What Darwin didn’t Know about Dinosaurs”, Octávio Mateus; “Darwin the Geologist and the Paradox of Biodiversity”, Carlos Marques da Silva; “Everything You Always Wanted to Know about Sex (in Plants) but Were Afraid to Ask”, José A. Feijó.

The “Darwin’s Evolution” exhibition was on display from 11 July 2009 to January 2010, at the National Museum of Natural Sciences, in Madrid, and will be presented at the Science Park, in Granada, from 19 March to 3 October 2010, after which it will move to Porto, where it will open in November 2010 and will be on display to the public for six months.



✚ Practical workshop which took place in the gardens of the Calouste Gulbenkian Foundation under the auspices of the “Darwin Festival: Science is Culture”.

The exhibition and its parallel activities were partly financed by the following institutions: the National Agency for Scientific and Technological Culture, the British Council, Oeiras Municipal Council and the Foundation for Science and Technology.

Strengthening the interaction between science and society

“Science and Society” Programme

Under the scope of this programme, grants were awarded to the following institutions:

- ✦ Centre for Research and Studies in Sociology (CIES – ISCTE), for the organisation of the first “AfterMath” seminar, which brought together a group of internationally renowned scientists with the aim of engaging in critical and philosophical reflection on the theme “After the Crisis. Towards a New Economic Culture”.
- ✦ Yale University, to finance the third year of the research project “Linear vs. Polarizing Trends in World Social Processes”, which consists of reflecting upon and questioning whether the pattern of development processes is leading to a homogenisation or to an ever increasing polarisation in the way in which the world is structured. The research methodology is based on a network of different teams, each of them centred on one of the eleven pre-established research themes.
- ✦ Centre for the Study of Democracy of the University of Westminster, a subsidy awarded, in partnership with the International Department, to contribute towards the costs of implementing

the research project “The Future of Representative Democracy”, which is designed to answer the fundamental question regarding the current state and the likely future of representative democracy.

- › Research Unit on Complexity and Economics – UECE, ISEG/Technical University of Lisbon, to allow for the holding of the Programme of Advanced Training for Innovation and Economic Development (PhD School of the Globelics Academy). The Globelics Academy was established under the framework of the international Globelics network (Global Network for Economics of Learning, Innovation, and Competence Building Systems).
- › International Mathematics Centre, to support the organisation of the international conference on “The Mathematics of Darwin’s Legacy”, which had as its aim to celebrate the 150th anniversary of the publication of the book *The Origin of Species*, by Charles Darwin. The initiative also enjoyed the backing of the European Society for Mathematical and Theoretical Biology, as well as the Centre for Mathematics and Fundamental Applications of the University of Lisbon and the Centre for Mathematics and Applications of the New University of Lisbon.

Publications

- › Book: *Trajectórias de Jovens Cientistas – O Prémio Estímulo à Investigação 1994-2006*, a joint edition, co-published with Gradiva, with the aim of understanding the relevance and impact of the Research Stimulation Programme on the scientific community.
- › Production of a DVD of the lecture cycle entitled “Darwin: On the Road to Evolution”, to be made available to secondary school libraries.
- › Catalogue of the *Darwin’s Evolution* exhibition, published in Portuguese and English.
- › Book: *A Origem das Espécies de Charles Darwin – Uma Biografia*, a Portuguese translation of Janet Browne’s work *Darwin’s Origin of Species – A Biography* published in partnership with Gradiva.
- › Brochure: *Evolução*, a Portuguese translation of Daniel Loxton’s *Evolution*, published by the Calouste Gulbenkian Foundation.
- › Book: *A Evolução para Todos*, a Portuguese translation of David Sloan Wilson’s *Evolution for Everyone*, published in partnership with Gradiva.
- › Book: *O Professor de Darwin*, by Hélder Costa, published in partnership with Gradiva.
- › Book: *Darwin em Cabo Verde*, written by Filipa Vala, published by the Calouste Gulbenkian Foundation and offered to the University of Cape Verde for local distribution to the schools and higher education institutions. This book formed part of an integrated project to provide support to the University of Cape Verde, in partnership with the Gulbenkian Development Aid Programme (PGAD – Education and Health). Its fundamental aim was to afford more widespread training and dissemination of knowledge about Darwin and the Theory of Evolution.