

PROFESSIONAL RESEARCH CAREERS IN CATALONIA. POLICIES AND PROJECTS OF THE CATALAN AUTONOMOUS GOVERNMENT

Blanca Ciurana*, **Joan Cadefau****, **Olga Alay***** and **Josep Maria Vilalta******

We make a detailed analysis of the set of policies and projects developed by the Catalan Autonomous Government in respect of researchers over the past five years. We specifically examine the initiatives undertaken through the former government’s Department of Universities, Research and the Information Society, now the Commission for Universities and Research. From that standpoint, we analyse various programmes for grants and funding that co-exist in Catalonia and are promoted by the Catalan, Spanish and European governments, the policy on creation of reseach centres, and the Jaume Serra-Hunter University Lecturers Plan. Lastly, we look closely in particular at the status of research careers in business and the initiatives that have been taken in that connection.

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* Blanca Ciurana is Head of Studies and Documentation of the Comission for Universities and Research of the Ministry of Innovation, Universities and Enterprise in the Generalitat de Catalunya (Catalan Autonomous Government).

** Joan Cadefau is Head of Projects of the University and Research Grants and Funding Agency (AGAUR) in the Generalitat de Catalunya (Catalan Autonomous Government).

*** Olga Alay is Head of the Programmes Service in the Directorate-General for Research of the Comission for Universities and Research of the Ministry of Innovation, Universities and Enterprise in the Generalitat de Catalunya (Catalan Autonomous Government).

**** Josep Ma. Vilalta is Deputy Director General for Research of the Comission for Universities and Research of the Ministry of Innovation, Universities and Enterprise in the Generalitat de Catalunya (Catalan Autonomous Government).

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1. Introduction

The main instrument through which the former Catalan Autonomous Government's Department of Universities, Research and the Information Society, now the Universities and Research Commission,¹ carried out initiatives in connection with professional careers in R&D was the Research Career Plan for Catalonia,² presented at the seat of the Catalan Autonomous Government on 18 March 2005. That Plan establishes the aims and major lines of strategic action for development of professional careers in R&D in Catalonia, the different stages of that development, the instruments that need to be implemented by the Catalan Autonomous Government, and financing.

The Research Career Plan for Catalonia forms a part of the set of policies relating to R&D of the Catalan Autonomous Government's Directorate-General for Research. Figure 1 shows the Direc-

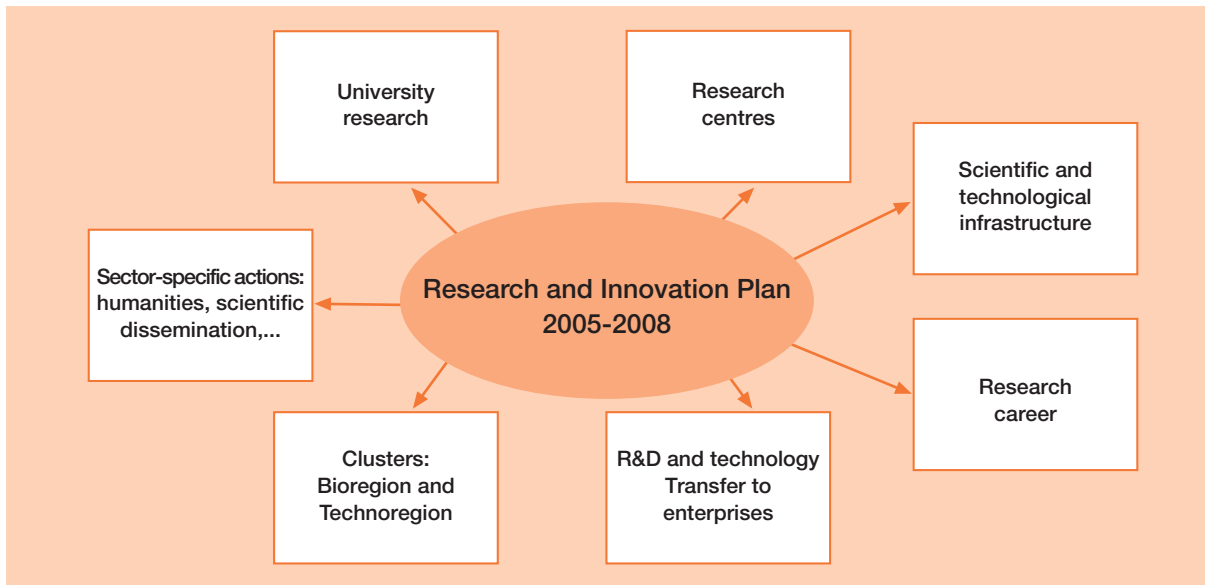
torate-General for Research's main lines of policy, within the framework of the Plan for Research and Innovation approved by the Catalan Autonomous Government in January 2005. Those lines of action, as shown in the diagram, are the following:

- Stimulation of R&D at Catalan universities.
- Promotion and consolidation of research centres of excellence.
- Stimulation of research careers in Catalonia.
- Promotion of R&D in enterprises and stimulation of technology transfer and cooperation between enterprises and universities.
- Development of scientific and technological infrastructures.
- Promotion of scientific-technological clusters.
- Development of sectorial R&D plans: stimulation of research in humanities and social sciences and stimulation of scientific communication and dissemination.

¹ Decree 571/2006 regarding the organisation of the Ministry of Innovation, Universities and Enterprise of the Generalitat de Catalunya (Catalan Autonomous Government) (Catalan Official Journal, DOGC 4785 of 21.12.2006, in Catalan)

² See the presentation by the minister Carles Solà: http://www10.gencat.net/dursi/ca/re/investigadors_carrera.htm.

Figure 1
Main policies of the Directorate-General for Research



The lack of definition of a genuine research career, i.e. the absence of a consistent career path made up of consecutive and progressive stages established for young people who wish to become involved in research, has been an obstacle to research careers in science and technology in Catalonia. As a result, this area has been historically marked by a series of structural deficiencies that have often made those who eventually decide to take this route into “heroes” who are subjected to rapidly changeable and uncertain working conditions. Furthermore, those deficiencies have given rise to the phenomenon known as brain drain, i.e. the frequently definitive departure of our professionals and our most highly qualified individuals to other countries with greater resources for R&D and innovation that, in this way, are able to enhance their potential for growth at the expense of the scientific values of other countries.

In order to increase the number of researchers, to offer attractive careers and professional prospects in Catalonia and to avoid or correct the existing structural deficiencies, a policy had to be defined for the research career in both the public and private spheres. The aims of the definition of a research career are to facilitate the return of emigrant researchers, attract researchers from other countries to Catalonia and make the hiring of such individuals a common practice in all areas of society, so that the figure of the R&D professional attains the social recognition that it deserves. In that connection, the Catalan Autonomous Government must take steps favouring co-ordination between all the public and private players forming part of Catalonia’s science and technology system, namely universities, research centres, enterprises, public organisations and other institutions operating in the territory.

The definition of a scientific career was one of the major shortcomings of the science and technology system in Catalonia and in all of Spain, and it was a necessary preliminary to setting Catalan society on a course for progress and wellbeing. That career which has been defined, in relation to the resources dedicated to it and the number of new positions for researchers being offered, is a limited but nonetheless realistic initiative. The scientific policy instruments created and administered by the Spanish and European governments co-exist in Catalonia with those defined by the Catalan Autonomous Government and they are not to be disdained. The definition of a research career for Catalonia by its Autonomous Government should be seen as a complementary tool, albeit strategic, necessary and legitimate, and it cannot lead us to reject the different initiatives and convocations promoted by other governments. In this connection, it is important to note that the Catalan Autonomous Government has exclusive authority in respect of technological research and development. Nevertheless, since the Spanish state has exclusive authority in respect of economic development and general co-ordination, the central government has continued to promote specific instruments and offers, in this case relating to researchers, and it has not transferred the corresponding resources.³ Thus, the resources provided by the Catalan Autonomous Government for development of the Research Career Plan for Catalonia are from its own coffers, since, as we have mentioned, the corresponding resources have not been transferred from the central government.

Another of the essential characteristics that have been established for the Research Career Plan for

Catalonia is to facilitate permeability between the public and private sectors and between the instruments defined by the Spanish government, the European Union and the Catalan Autonomous Government itself at all times. The research career is conceived as a unit that, over the course of a professional career, can be carried out in either the public and/or the private sector and mobility between one sector and the other is not only foreseen but also considered to be desirable.

2. Context

2.1. Europe

“Europe must become the most important knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion.” With this declaration in Lisbon in 2000 and later in Barcelona in 2002, the European Union stated the importance and the need for all the member states of the Europe of Fifteen and now of Twenty-seven to make efforts to increase research and technological innovation to attain a level similar to that of the US and Japan, two leading countries in R&D and innovation. One of the main targets that have been established was for average spending on investment in R&D to reach 3% of the GDP of the EU member states by 2010. In order to attain those targets, the EU recognised that the pertinent efforts would have to be made both by government and the private sector.

This increase in the funding of R&D must be accompanied by other measures. One very important

³ As specified below in this article, in 2005 and 2006 the Ministry of Science and Education transferred the Generalitat (Catalan Autonomous Government) €18,920,000 for management of the Programme of incentives for the incorporation and intensification of research activities (“I3”) at universities and centres in Catalonia, not including the centres of the Spanish High Council for Scientific Research (CSIC).

step will be to boost the number of researchers throughout Europe. In that connection, a target was set for the addition of 750,000 new researchers to the European Union's system of science and technology by 2010, as stated by the European Commission in its communication "Investing in Research: An Action Plan for Europe".⁴ In that respect, the Communication from the European Commission: "Researchers in the European Research Area: One Profession, Multiple Careers"⁵ points out that researchers are crucial for research and innovation.

In Europe, the increase in funding of R&D must be accompanied by other measures, such as a boost in the number of researchers

According to the European Union's calculations, the number of people dedicated to R&D that will have to be added to those already working in the field by 2010 will be on the order of 1.2 million (approximately 750,000 new researchers plus technicians and support staff). In that respect and in keeping with the target of attaining investment of 3% of GDP as mentioned above, the European Union aims to increase the proportion of researchers to 8 per thousand of the working population.⁶ In 2003, while Europe had 5.4 researchers (full-time equivalents⁷) per thousand of the working population, Japan had 10.1 and the US had 9.0, in 1999.⁸

If we examine the European Union figures for 2003 appearing in the same source, we note that there are countries where that number (FTE researchers per thousand inhabitants) is very high, such as the Nordic countries (Sweden with 10.1 or Finland with 16.2). However, the average decreases in countries with larger populations, e.g. Germany and France, with 6.3 and 6.9, respectively, or Italy with 2.8. As for Spain, the number was 4.9⁹ in 2003. That difference between countries means that some will have to make greater efforts, while others have already surpassed the targets set by the European Union.

Given the scarcity of scientific vocations among young people and the brain drain, particularly towards the US, the EU has set in motion a number of proposals, some of them as improvements to already existing programmes and some of them as new programmes. In fact, in the 6th Framework Programme (2002–2006) and the 7th Framework Programme planned for 2007–2013, actions aimed at dissemination of science and technology have a key role for raising society's awareness of their importance, with the goal, in short, of creating scientific vocations.¹⁰ In addition, the EU has expanded and improved conditions of mobility as well as the number of incentives for hiring researchers through the Marie Curie Programme.

Another of the EU's initiatives, and perhaps the most important, has been the publication of recommendations for the European Charter for Re-

⁴ EUROPEAN COMMISSION, 2003a

⁵ EUROPEAN COMMISSION, 2003b

⁶ EUROPEAN COMMISSION, 2004

⁷ A full-time equivalent (FTE) corresponds to the work of one person in one year. Thus, someone who normally dedicates 40% of their time to R&D and the rest to other activities (teaching, consultancy, university management) only counts as 0.4 FTE.

⁸ EUROPEAN COMMISSION. Key Figures 2005.

⁹ For 2004, the National Statistical Institute gives a figure of 5.6.

¹⁰ These may be found in the article by Xavier Goenaga and Marta Truco on the 7th FP, published in this same journal.

searchers and the Code of Conduct for Recruitment of Doctors, setting out guidelines for the rights and duties of researchers and specifying minimum conditions that must be met throughout the EU.¹¹

2.2. Catalonia and Spain

In line with the commitments undertaken by the European Council at Lisbon in March 2000 and at Barcelona in March 2002, the Catalan Autonomous Government resolved to increase spending on R&D in Catalonia to attain the rate of 2.1% of GDP by 2008. Along those same lines, the Catalonia Plan for Research and Innovation (PRI)¹² calls for an increase in the number of researchers in Catalonia over the four years of its term (2005–2008). There were 18,387 researchers in Catalonia when the PRI came into effect¹³ and the target set in that Plan for 2008 is 24,000. Consequently, the Catalan Autonomous Government had urgently to design expectations of job stability and career prospects similar to those of other professions.

In the year 2004, the average number of researchers per thousand working inhabitants in Catalonia was 6.7. Although that number is slightly higher than the average for Europe, the percentage of researchers in the private sector is low in comparison with the average for Europe or for other countries. One factor that differentiates the system of research and innovation in Catalonia from that of other countries of the European Union is the number people with doctorates working for enterprises.

Table 1
Distribution of FTE (full-time equivalent) researchers by sectors

	Private sector	Higher education	Governments
Catalonia*	42.6%	43.5%	13.9%
Spain*	31.9	51.1	17.0
UE-25*	50.3%	36.6%	13.1%
USA**	79.9%	16.5%	3.6%
Japan*	69.5%	25.5%	5.0%

* Figures for Catalonia, Spain and EU-25 for 2004 calculated on the basis of Eurostat.

** Figures for Japan for 2003 calculated on the basis of Eurostat.

*** Figures for USA for 2002 calculated on the basis of OECD Main Science and Technology Indicators Vol 2005/2.

Note: The private sector includes private non-profit enterprises and institutions.

Table 2
Number of FTE (full-time equivalent) researchers per 1000 working inhabitants (totals and by employment sectors)

	Total	Private sector	Higher education	Governments
Catalonia*	6.7	2.9	2.9	0.9
Spain*	5.6	1.8	2.9	0.9
UE-25*	6.3	3.2	2.3	0.8
USA**	9.6	4.8	3.5	1.3
Japan**	10.4	7.2	2.7	0.5

* Figures for Catalonia, Spain and EU-25 for 2004 calculated on the basis of Eurostat.

** Figures for Japan for 2003 calculated on the basis of Eurostat.

*** Figures for USA for 2002 calculated on the basis of OECD Main Science and Technology Indicators Vol 2005/2.

Note: The private sector includes private non-profit enterprises and institutions.

In respect of investment in research and development, the ratio in Catalonia between the public and private sectors is 1:3, which is higher than for

¹¹ Recommendation of the Commission of 11 March 2005 relating to the European Charter for Researchers and the Code of Conduct for Recruitment of Researchers OJEU (2005/251/EC), 22/3/2005.

¹² Catalonia Plan for Research and Innovation 2005–2008 (<http://www.gencat.net/pricatalunya/eng/index.htm>).

¹³ Figures for 2003. National Statistical Institute 2004.

EU-25 and close to the ratio for the US, although the investment in R&D/GDP ratio remains well below the average for Europe.

Table 3
Investment in R&D by sectors

2004	Governments	Higher education superior	Private sector	R&D investment/GDP
Catalonia	9.3	24.3	66.4	1.34
Spain	16.0	29.5	54.5	1.07
UE-25	12.8	21.9	65.3	1.86
Japan*	9.3	13.7	77.0	3.15
USA	12.2	13.6	74.2	2.66

Figures for Catalonia and Spain 2004 (National Statistical Institute 2006).
Figures for EU-25 and USA for 2004. Eurostat.
* Figures for Japan for 2003. Eurostat.

Consequently, in contrast with the rest of Spain, the investment per researcher in Catalonia is higher in the private sector than in the public sector.

Brain drain has substantial implications for the loss of highly qualified human capital, debilitation of research teams, waste of resources and reduction of the country's capacity for research

2.3. Brain drain and historical and structural deficiencies

In fact, what we find in Catalonia and, by extension in Spain as a whole, is the phenomenon known as “brain drain”, i.e. the departure of pro-

fessionals or highly qualified individuals from one country or economic sector to another that offers better conditions (in terms of career opportunities, salaries, scientific and technological environment, and so on). As a rule, this departure of researchers to other countries can be explained mainly by the fact that they have better opportunities for research in those countries, since more resources are available for R&D and innovation, although the move also involves substantially better prospects for acquiring knowledge and experience.

In addition to brain drain, several other types of phenomena and circumstances can be discerned. The OECD has also identified phenomena known as “brain exchange” and “brain waste”: the former involves countries with the capacity both to provide and receive qualified individuals, whereas the latter implies that qualified individuals are occupied in professional activities that are below their levels of qualification.

In Catalonia, and throughout Spain, brain drain has substantial implications for the loss of highly qualified human capital, debilitation of research groups, waste of resources and reduction of the country's capacity for research. Brain drain is a problem affecting the EU as a whole, where the main flow is towards the US, although in Catalonia the flow, in addition to being directed towards the US, is also directed at other EU countries. Thus, the countries of destination receive trained researchers, frequently when they are at the most productive stage of their careers.

All these factors lead to the need to set up a scientific career that is attractive to young researchers and facilitates the return of scientists who have moved abroad, and that can also attract researchers from other countries.

3. Policies and plans of the Catalan Autonomous Government for research careers in Catalonia

3.1. Career stages

The path defined in the Research Career Plan for Catalonia comprises four stages, which are same stages as found in any research career defined in any country in the world. Those stages are the following:

- Pre-doctoral education (four years).
- Post-doctoral training (two years).
- Research pre-consolidation (five years).
- Research stabilisation or consolidation (ongoing).

A graduate who wishes to become a researcher begins with the pre-doctoral education stage and then progresses to the stage of stabilisation or consolidation. Before undertaking a higher stage, they need to meet all the requirements for selection and evaluation in the preceding stage. The path to be followed has been defined and each stage has been provided with the necessary instruments in the form of funding, so that the individuals reaching each stage can dedicate themselves to research on a professional basis.

The **pre-doctoral education stage** is the stage reached by someone holding a bachelor's degree or engineering degree who wishes to go into research professionally upon completion of their university studies. This is the gateway to the research career. At this stage the future researcher has one main goal, namely the completion of a doctoral thesis to obtain a doctor's degree, which is the highest university qualification. This stage is considered to last four years.

The approximate and advisable age that a person should have at this stage is 23 to 26. That age span,

as well as the others that have been determined for each stage, does not mean an older person cannot start off on a research career path, but instead indicates the intention that researchers should stabilise their employment situation at a younger age than is the case at present, in line with the situation in other similar professional groups.

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For this stage, in Catalonia there are programmes for training of researchers that are operated by the Catalan Autonomous Government (such as the programme of pre-doctoral grants for training of researchers, "FI"), by the Spanish government (such as the programme for training of researchers, "FPI"), and by the European Union (such as the different Marie Curie actions). All those programmes are examined in greater detail later in this article. In short, this stage of the career is quite well covered, particularly in comparison with others, and it has been an active concern of the Catalan Autonomous Government for over fifteen years.

The **post-doctoral training stage** is entered by those who have obtained a doctor's degree and who wish to pursue the profession of researcher after submitting their thesis. At this stage, doctors are expected to join a university, research centre, government or enterprise as members of already existing research groups to obtain training as researchers by carrying out research, taking greater

initiative than when they were working on their theses and completing the activities called for in their study plan. When a doctor is hired as a researcher, they should find that their centre or organisation provides them with the support, means and equipment that they need to carry out their normal activities so that during this post-doctoral stage they can acquire further knowledge, skills and abilities to advance in their professional careers. This training is best obtained somewhere other than the place where the researcher submitted their thesis, since mobility is one of the main factors of a researcher's career, and although this stage can be completed as part of a group in the same country, it is preferably achieved as part of a foreign group.

For the definition of the career, the need was seen for a researcher pre-consolidation stage to follow the two-year post-doctoral stage and preceding the final stabilisation or senior stage

The duration of this stage should be two years and it is important to ensure that there is no break in the researcher's activities between completion of the preceding stage and the beginning of this one. Ideally, a person at the post-doctoral training stage should be 27–28 years of age. For this stage, in 2005 the Catalan Autonomous Government announced its first offer of grants/contracts,¹⁴ which was repeated this year.¹⁵ The programme is named after Beatriu de Pinós, a

15th-century noblewoman who dedicated the fortune that she inherited from her husband to the dissemination of the works of the scientist and humanist Ramon Llull. There are also other programmes in Catalonia operated by the central government (Juan de la Cierva, Torres Quevedo, scholarships for study abroad, etc.) and by the EU (as part of the Marie Curie actions). The Beatriu de Pinós programme of contracts is examined in detail in a later section of his article, along with the other programmes mentioned.

For the definition of the career, the need was seen for a **researcher pre-consolidation stage** to follow the two-year post-doctoral stage and preceding the final stabilisation or senior stage, during which the researcher would have the opportunity of forming their own research group and line of research under the auspices of a public or private institution or of joining an already existing research group. That stage is associated with a five-year employment contract that, upon completion and with positive evaluation and recruitment, can lead to a permanent employment contract at the senior level. For the pre-consolidation stage, then, the first 30 five-year ICREA Junior contracts were offered in 2005 to young researchers to allow them to prepare to assume leading positions in science and technology while carrying out cutting-edge research in Catalonia as active members of the Catalan research system in both the public and private sectors. There are also Spanish programmes operated at this stage, such as the Ramón y Cajal programme. All those programmes are discussed later in this article.

Upon completion of the pre-consolidation stage, the researcher attains **the consolidation or sta-**

¹⁴ Announcement of Beatriu de Pinós postdoctoral grants. Resolution UNI/2429/2005 (Catalan Official Journal, DOGC no. 4458, of 30/8/2005, in Catalan).
¹⁵ Announcement of postdoctoral grants and assistance under the Beatriu de Pinós programme 2006. EDU/2714/2006, (Catalan Official Journal, DOGC no. 4705, of 25/8/2006, in Catalan).

bilisation stage, where they can take up permanent or indefinite employment. At this stabilisation stage, it is assumed that all those who have been working on their research over the preceding stages in the private sector and those who wish to join the private sector will be stabilised at the enterprises where they are employed. For the public sector, the Catalan Institute of Research and Advanced Studies (ICREA) has provided Catalan universities and research centres since 2001 with researchers whom it recruits and hires on the basis of criteria of excellence. Further discussion is found below of this programme and others, including the I3 programme and the Jaume Serra Hunter university lecturer recruitment programme, which fall within this stage. Researchers at this stage of their careers are expected to be active members of the Catalan research system and to make important contributions to that system.

3.2. Programmes for predoctoral training of researchers in Catalonia

For the pre-doctoral stage, since 1989 the Autonomous Government of Catalonia has had a specific instrument in the form of pre-doctoral education grants for researchers (FI)¹⁶ and at the

same time has or has had other programmes with similar characteristics, such as grants and aid for the training of doctoral candidates and university lecturers in areas with deficiencies (AD), CIRIT pre-doctoral grants for training of researchers in fine chemistry (QF) or priority areas of the research plan (FIAP), pre-doctoral grants for completion of theses relating to important areas of industrial, social or business interest (TDOC), and FI-IQUC pre-doctoral grants for education of international students associated with consolidated doctoral programmes and doctoral programmes of international quality recognised by the Catalan Autonomous Government. A detailed summary of the training programmes for researchers operated by the Catalan Autonomous Government from 1989 to 2003 can be found in the article by Fina Villar¹⁷ in edition number 7 of this journal.

Nevertheless, anyone who wishes to take a doctorate in Catalonia also has other options for funding. By volume, the leading instrument in Catalonia is the FPI (researcher education) grant offered by the Spanish government's Ministry of Education and Science.¹⁸ In 2004, an average of 27%¹⁹ of the grants provided throughout Spain went to Catalan universities and centres.

¹⁶ The researcher education programme or "FI" has been announced yearly since 1989. The individuals who obtain a grant/contract through this programme are assured (on the condition that they fulfil the establishment requirements) a grant/salary for four years. The number of FI grants distributed has increased progressively over the years to 934 doctoral candidates who benefitted from the programme in 2005, of which 270 were new entries that year. The FI programme has undergone substantial changes in recent years and in addition to the increase in the number of pre-doctoral grants provided, in 2004 and 2005 the conditions were gradually changed from the offer of four years of grants to two years of grants plus two years of contracts (2004) and lastly to one year of grant plus three years of contracts (2005 and 2006), the possibility was added of applying for a researcher education grant/contract (FI) to prepare a thesis at an enterprise, and this form was added to the conditions for the programme. Consequently, there has been a development towards a contractual model, indicating the intention of doing away with the job insecurity faced as a rule in the past by individuals dedicated to research. The FI enterprise format of the programme is the other major change that has been made, to be discussed in another section of this article. Salaries for doctoral candidates with an FI grant or contract increase over the course of the four years and at present are between €10,000 and €12,000 yearly. In addition, these contracts also provide for the possibility of a bonus of a further €3,000 for efficiency in completion of the thesis if it is finished within four years.

¹⁷ VILLAR, 2005.

¹⁸ At present, people receiving grants through this programme are treated as salaried employees under the general Social Security regime. Since with the 2006 edition of this programme (Resolution of 27 March 2006; Spanish Official Bulletin, BOE number 85 of 10/4/2006, in Spanish) and with the approval of the Researcher Trainee Charter (Royal Decree 63/2006; Spanish Official Bulletin, BOE number 29 of 3/2/2006, in Spanish), they follow the 2+2 model, i.e. they are structured into two periods: 24 months of grant (until attainment of the advanced studies diploma or DEA) and 24 months of trainee contracts. This grant programme is linked to the national R&D&I Plan, in the sense that each grantholder must be signed up with one of the projects funded through its programmes.

¹⁹ Figures for 2004 according to the PRI: success of researchers in state-wide programmes. Source: Ministry of Education and Science of the Spanish Government. Data processed by the Department of Universities, Research and the Information Society of the Catalan Government.

Table 4
Yearly additions to the number of beneficiaries of pre-doctoral grants/contracts

Year	Programmes*					
	FI	AD	QF	FIAP	TDOC	FI-IQUC
1989	80	-	-	-	-	-
1990	155	-	-	-	-	-
1991	281	156	-	-	-	-
1992	402	151	25	-	-	-
1993	455	135	47	-	-	-
1994	522	122	46	-	-	-
1995	529	89	45	40	-	-
1996	518	-	19	151	-	-
1997	495	-	20	201	-	-
1998	424	-	-	314	25	-
1999	362	-	-	240	39	-
2000	449	-	-	277	60	-
2001	415	-	-	317	70	-
2002	749	-	-	-	28	-
2003	794	-	-	-	-	-
2004	798	-	-	-	-	122
2005	866	-	-	-	-	128
2006	934	-	-	-	-	107

* Figures include renewals and new grants.

FI: pre-doctoral grants for training of researchers.

AD: grants and aid for training of doctoral candidates and university lecturers in areas with deficiencies.

QF: CIRIT pre-doctoral grants for training of researchers in fine chemistry.

FIAP: CIRIT pre-doctoral grants for training of researchers in priority areas of the research plan.

TDOC: pre-doctoral grants for completion of theses relating to important areas of industrial, social or business interest.

FI-IQUC: pre-doctoral grants for education of international students associated with consolidated doctoral programmes and doctoral programmes of international quality recognised by the Catalan Autonomous Government.

There are also other less extensive alternatives, such as the pre-doctoral grants offered by different universities and research centres, including those offered by the CSIC²⁰ and the programme of pre-doctoral FPU grants for training of university lecturers offered by the State Secretariat for Universities and Research itself.²¹

With its 6th Framework Programme (2003–2006), the European Union also offered pre-doctoral grants as part of the Marie Curie

actions. Among those grants were the so-called “host-driven actions”, which included a type of grant (Marie Curie Host Fellowships for Early Stage Research Training) covering this stage. Those grants are used to provide funding to research centres, organisations and enterprises to offer training opportunities to researchers of any age or nationality at the beginning of their careers. The 7th Framework Programme (2007–2013) provides for similar actions within the People programme.

²⁰ IP3 pre-doctoral grants. Resolution of 27 July 2005 (Spanish Official Bulletin, BOE number 202 of 24/8/2005, in Spanish).

²¹ Grants for training of university lecturers. Resolution of 31 August 2006 (Spanish Official Bulletin, BOE number 222 of 16/9/2006, in Spanish).

Table 5
Figures for the FI programme 2005

2005	Applications	Grants*
New grants (first year)	1,481	270
Extensions (2 nd , 3 rd i 4 th any)	643	641
Enterprise grants (1 st year)	27	23
TOTAL	2, 151	934

* Resolution UNI/2464/2005, (Official Journal, DOGC of 2/9/2005).

Table 6
FI programme. Withdrawal from programmes in 2003, 2004 and 2005

Initial year of programme	New grants	Extended for 2006	Withdrawn	Withdrawal rate
2003	234	178	56	24 %
2004	234	197	37	15.8 %
2005	284	266	18	6.4 %
TOTAL	752	641	11	17.31 %

3.3. Programmes for post-doctoral training of researchers in Catalonia

This is a stage of the research career that had never been given priority by the Catalan Autonomous Government, although it was already reasonably well covered. That coverage existed, on the one hand, in the form of small grant programmes forming part of the Directorate-General for Research's international co-operation programme, some of which remain in operation, such as the Autonomous Government of Catalonia-Fullbright (BFUL) post-doctoral grants offered yearly since 1998 by the Autonomous Government of Catalonia with the Fullbright Foundation for post-doctoral training in the United States, the Balsells post-doctoral grants (BBI), the Gaspar de Portolà programme with California (BGP) and the programme with Que-

bec, created on the basis of agreements between the Catalan Autonomous Government and that province. Likewise, there are a number of Spanish state programmes that allow researchers to apply for grants for post-doctoral training.

In keeping with the objectives of the Research Career Plan for Catalonia promoted by DURSI, specific offers have been made since 2005 to cover the post-doctoral researcher training stage in both the public and private sectors, and the Beatriu de Pinós programme was launched, which provided 105 grants for post-doctoral training in 2005, with a hundred more foreseen for 2006.

In line with the foregoing, the Beatriu de Pinós post-doctoral programme provides for the following three formats:

- Format A, accounting for one half of the grants offered (50), is aimed at allowing Catalans who have recently obtained a doctorate to augment their training abroad by working for two years at internationally prestigious universities, research centres or enterprises.
- Format B1, accounting for one quarter of the grants offered (25), is aimed at bringing doctors into the public sector in Catalonia.
- Format B2, accounting for one quarter of the grants offered (25), is aimed at bringing doctors into the private sector in Catalonia.

With the B formats, aid is provided to organisations or enterprises for R&D projects or activities so that they can employ researchers who have recently obtained doctorates to work on such projects for two years. As mentioned, one half of the grants for employment of post-doctoral researchers in Catalonia (25 of 50) are meant for the public sector (universities, research centres, non-profit organisations, government organisations, preferably at the

Table 7
Yearly additions to the number of beneficiaries of post-doctoral grants/contracts.

Programme in Catalonia	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
BPOST/RED	14	23	-	-	20	40	40	10	11	20	31	29	17	-
PIEC	20	29	-	-	-	-	-	-	-	-	-	-	-	-
BCC	-	-	-	-	-	-	-	-	1	1	-	1	1	1
SINCROTRÓ	4	4	-	-	-	-	-	-	-	-	-	-	-	-
RI	3	4	1	8	1	1	5	-	-	-	-	-	-	-
ADQUA	-	-	-	-	-	-	-	-	-	-	5	24	12	-
IGSOC	-	-	-	-	-	-	-	-	-	-	2	-	-	-
NANOTEC	-	-	-	-	-	-	-	-	-	6	7	7	6	-
Abroad														
BE-AIRE	153	170	154	148	73	73	70	51	67	52	58	100	98	57*
BBR	6	5	5	1	7	5	6	7	5	6	9	-	-	-
CTP-AIRE	-	-	-	4	2	4	2	5	3	2	5	-	2	(p.r.)
PR-INSERM	-	-	-	-	-	-	-	-	-	-	1	-	-	-
QUEBEC	1	2	2	2	2	2	2	1	0	1	2	-	-	-
MIT	-	6	6	6	6	-	-	-	-	-	-	-	-	-
BBI	-	-	-	-	-	-	-	-	-	1	1	-	-	-
BGP	10	4	5	8	-	-	9	5	9	7	7	-	-	-
BFUL	-	-	-	-	-	-	5	5	6	6	9	6	6	-
BP	-	-	-	-	-	-	-	-	-	-	-	-	105	(p.r.)
TOTAL	211	247	173	177	111	125	139	84	102	102	137			

Figures include renewals and new grants.

* Figures for 1st term; 2nd term pending resolution (p.r.).

BPOST/RED: aid for hiring and rehiring of doctors (later CRED).

PIEC: Postdoctoral stages for foreign researchers in Catalonia.

BCC: grants for young members of Catalan communities overseas.

SINCROTRÓ: Grants for the specialisation and training in fields related to the light laboratory of Sincrotron.

RI: Grants for projects of interest of enterprises.

ADQUA: grants for doctoral programmes at Catalan universities in areas of social sciences and humanities.

IGSOC: pre-doctoral grants from the International Graduate School of Catalonia.

NANOTEC: research grants for training in the field of nanotechnologies (later NANOS).

BE-AIRE: grants for research visits outside Catalonia. International or interregional aid for research abroad.

BBR: Batista i Roca grants for funding of research projects in the field of social sciences and humanities.

CTP-AIRE: Mobility aid for researchers within the Framework of the Pyrenees Work Community.

PR-INSERM: research projects with Institut National de la Santé et la Recherche Medical.

QUEBEC: Catalonia-Quebec co-operation programme.

MIT: grants for work at the Massachusetts Institute of Technology.

BBI: Balsells – Autonomous Government of Catalonia grants in the fields of engineering.

BGP: Gaspar de Portolà grants.

BFUL: Autonomous Government of Catalonia - Fulbright grants.

BP: Beatriu de Pinós programme of post-doctoral grants and aid.

local level; the programme reserves 5 of the 25), while the other half (25 of 50) goes to the private sector (enterprises or businesses operating in Catalonia). Given the extraordinary success that this programme has achieved with Catalan enterprises,

it was possible to increase slightly the number of grants provided to the private sector in 2005 and in fact 29 grants were made. Those grants have the final approval of the European Union, which, since the funds are made available to private enterprise,

must be obtained.²² As is evident, the proportions of the Beatriu de Pinós grants/contracts offered are meant to favour primarily the mobility of researchers and secondarily the entry of researchers into government enterprises and entities and not just universities or research centres.

The aim is to allow people who have recently obtained a doctorate and wish to pursue a professional career in research to “practice” for two years as doctors or researchers. The footnote here sets out a detailed summary of the main characteristics of this programme (salaries received by beneficiaries of these grants, conditions in respect of nationality, teaching obligations, etc.).²³

The amounts finally granted for the different formats in 2005 were as follows:

Format A: €2,726,872.20
 Format B1: €1,535,000.00
 Format B2: €1,135,900.00

The Spanish government also has a number of different grant and aid instruments and programmes for

this stage. First of all, there is the Ministry of Education and Science-Fulbright programme of post-doctoral grants²⁴ for working abroad, many of which have been obtained by Catalans holding doctorates, who are, of course, eligible even though the Catalan Autonomous Government operates its own programme.

In addition, since 2004 the Ministry of Education and Science has operated the Juan de la Cierva programme,²⁵ which is aimed at the public sector and allows hiring of individuals who have recently obtained a doctorate for three years,²⁶ and, since 2001 it has operated the Torres Quevedo programme, in this case aimed at the private sector and also meant to finance the hiring of individuals with doctorates by enterprises. These programmes must also be taken into account as resources available to researchers in Catalonia to cover the post-doctoral stage. In fact, Catalonia is one of the autonomous communities with the largest number of individuals hired through these programmes, accounting for 30% of the total for the the Juan de la Cierva programme in 2004 and 23% of the total overall (2001–2004) for the Torres Quevedo programme.²⁷

²² State aid 4/2006, Beatriu de Pinós programme. Brussels 24/5/2006 C (2006) 2173.

²³ With the A format, given that the subsidised activity is carried out abroad, where the Catalan Autonomous Government has no opportunity or authority to have researchers hired by the centres where they are to work, the salary received by those researchers is provided as a grant. The grant is accompanied by aid to cover travel expenses and researchers can apply for travel insurance coverage if they do not carry their own. Eligible candidates include anyone with a doctorate who has obtained their bachelor's degree or engineering degree from a Catalan university, regardless of their nationality and even if they have obtained their doctorate abroad. In contrast with the A format, for the B formats the researchers who are hired in Catalonia do not need to have obtained their undergraduate degree or doctorate in Catalonia and they may be of any nationality.

Researchers eligible for hiring in Catalonia by means of a Beatriu de Pinós grant cannot be hired by the same institution or enterprise where they obtained their doctorate, except in the case that when they join the organisation they have already completed a post-doctoral stay of at least two years abroad.

In respect of the salary received by these post-doctoral researchers under the A format, the full gross amount of the grant in 2006 was between 19,440 and 28,000 yearly, depending on the country of destination. With the B formats, the aid granted to public or private entities may only be used to finance the employment contracts of researchers, and the minimum salary to be paid to researchers must, as provided in the conditions for the offer of aid under both formats, be 23,900 gross yearly. In the case of universities, research centres or other public sector enterprises (B1), the granted provided (31,900 gross yearly) covers 100% of the total cost of the contracts. Where the hiring entity is an enterprise, the aid will partially finance the total cost of contracts, depending on the activities for which application is made and the characteristics in terms of dimension and location of the enterprise, in accordance with current European Union regulations. Where the activities of the hiring entity include teaching, the conditions for the offer establish a teaching collaboration programme that can be given by post-docts.

²⁴ Programme of post-doctoral grants, including the Ministry of Education and Science-Fulbright programme. Resolution of 13 september 2005 (Spanish Official Bulletin, BOE of 29/9/2005, in Spanish).

²⁵ Juan de la Cierva programme. Available from: www.mec.es/ciencia/delacierva.

²⁶ Torres Quevedo programme. Available from: www.mec.es/ciencia/torresq.

²⁷ Figures from the Spanish Ministries of Science and Technology and Education and Science, processed by the Catalan Department of University, Research and Information Society (DURSI).

Table 8
Figures for the Beatriu de Pinós programme 2005

	Applications	Grants*	Proportion
Format A (two-year grants abroad)	139	51	36.36 %
Format B1 (two-year contracts at universities and research centres in Catalonia)	279	25	8.96 %
Format B2 (two-year contracts in the private sector in Catalonia)	39	29	74.36 %
TOTAL	457	105	22.97 %

*Resolution UNI/2429/2005, (Official Journal DOGC 30/9/2005).

The European Union’s 6th Framework Programme offers individual Marie Curie actions. This type of action is aimed at researchers of any age with a minimum of four years’ experience or holding a doctorate.²⁸ The People Programme of the 7th Framework Programme (2007-2010) also provides for those actions, in the form of individual grants and also through joint funding of regional, national and institutional programmes.

3.4. Programmes for professional consolidation and development

One of the problems that have come to light so far in Catalonia has been the lack of continuity in the professional development of researchers. Without taking into account the employment of individuals holding doctorates in private enterprise, effectively

the only possibility for employment stability²⁹ in the recent past was to be hired as a university lecturer or as a researcher with the CSIC.

One of the consequences of that circumstance can be noted in job insecurity and in the make-up of many research groups. As a rule, they are led by a lecturer and all the other researchers in the group are at the training stage (with pre-doctoral grants) or at the post-doctoral stage with short-term contracts (associate lecturers, assistant lecturers, re-entry contracts, and so on) with little likelihood in most cases of any possibility of working on research projects as the lead researcher.

In recent years, the existence of the Spanish Ministry of Education and Science’s Ramón y

²⁸ The individual Marie Curie actions provide a good opportunity for researchers who wish to work with research groups in other countries. Funding can be obtained for visits to other European Union member states or outside countries. This format includes three types of actions that can be of interest to Catalan researchers or for Catalan enterprises that wish to bring in post-doctoral researchers from other countries in Europe or third-party countries. There are Intra-European Fellowships, available to European researchers of any age with at least four years’ professional experience or a doctorate. Applicants must find a European research group that wishes to admit them before applying. The aim here is to provide funding for ongoing advanced training in research or acquisition of supplementary skills at a European organisation over one or two years. The Marie Curie Outgoing International Fellowships allow European Researchers at this stage in their careers to work at centres outside Europe for up to two years, with a reintegration phase of up to one year upon return to their original institution. Applicants must find a centre willing to admit them. Lastly, there are the Marie Curie Incoming International Fellowships aimed at researchers from outside the European Union who wish to do research in Europe. They must have at least four years’ experience or a doctorate and establish a working programme with a European organisation (in this case, Catalan) before applying.

²⁹ Employment stability does not necessarily equate with holding a civil service position, but rather with a long-term contract allowing completion of R&D and innovation projects with future prospects.

Cajal, Torres Quevedo and I3 contract programmes, the Catalan Autonomous Government's Beatriu de Pinós, ICREA and Serra Hunter university lecturer recruitment programmes, and alternative education at universities (the Spanish Universities Organic Act and the Catalan Universities Act), the prospects for recruiting and stabilising researchers have greatly improved. In addition, it is important to bear in mind that the number of research centres promoted by the Catalan Autonomous Government has mushroomed over the past six years, with the resulting increase in the potential for hiring researchers. Let us now look at the current possibilities for stabilisation of researchers in Catalonia.

Serra Hunter plan

Within the academic sector in Catalonia, and more specifically, at universities, the Catalan Universities Act allows for the possibility of stabilising the employment of lecturers and researchers by means of contracts, in addition to the recruitment of teaching staff through the conventional means of competitions for civil service jobs in the different categories, as provided in the Spanish Universities Organic Act, and in the context of the teaching-research nature of those jobs. It is also worth noting that although the Catalan Universities Act provides for the possibility of hiring researchers, at present most universities do not make use that possibility, but it is nevertheless an option that could be considered in future.

In that connection, in 2003 DURSI implemented the Serra Hunter Plan for recruitment of university lecturers in collaboration with the Catalan public universities and the Catalan University System Quality Agency, calling for the permanent hiring of 1,200 lecturers over the period 2003–2015 at

a rate of 100 lecturers per year, to ensure the same levels of stability and remuneration as in the civil service.

First of all, the Catalan Universities Act allows for the possibility of contracts of up to four years as lecturers with full teaching and research capacity for individuals holding doctorates who wish to undertake an academic career, with a rank similar to that of tenure track in English-speaking countries. The Catalan Universities Act then establishes two categories of professors, both with permanent employment contracts and also with full teaching and research capacity, namely associate professor and full professor. Through the Serra Hunter Plan, the Catalan Autonomous Government and the universities jointly fund the recruitment of associate professors and full professors, on a fifty-fifty basis, at the rate mentioned above.

The Serra Hunter Plan calls for the permanent hiring of 1,200 lecturers over the period 2003-2015

During the first two years of implementation of the Serra Hunter Plan (2004–2005), 198 new professional positions were agreed in accordance with the types and scopes detailed in the specific agreements in effect between DURSI and the public universities, of which 148 were filled in the course of those two academic years. In 2006, agreements were made with the public universities for a further 119 teaching and research staff positions to be filled under contract.

Table 9
Serra Hunter Plan. Positions assigned under agreements, Teaching and Research Staff (TRS) recruited in 2004-2005 and positions forecast for 2006.

	2004		2005		Forecast 2006 (as of october)
	Positions assigned for agreement	TRS hired for university	Positions assigned for agreement	TRS hired for university	Positions assigned for agreement
UB	15	14	39	36	31
UAB	21	14	28	27	22
UPC	14	9	18	13	24
UPF	6	6	8	6	8
UdG	3	1	9	4	9
UdL	6	3	10	7	10
URV	8		8	7	15
TOTAL	73	48	120	100	119

Catalan Institute of Research and Advanced Studies (ICREA)

ICREA is a pioneering institution that has been promoted since 2001 jointly by DURSI and the Catalan Research Foundation. ICREA aspires to be an effective instrument for fostering and developing research in Catalonia that will facilitate the draw of talent and consolidate the career of researcher in Catalonia. The only requirement for

means to carry out their research. Consequently, the principle aim of ICREA has been, and remains, to make it possible for a greater number of researchers who are not yet permanent members of the Catalan research system to work on a stable basis in Catalonia. To do so, ICREA enters into long-term agreements with universities and other research centres for the researchers that it recruits and hires to enter the different research groups and projects maintained by those entities. In its five years of existence, ICREA³⁰ has added 137 research lecturers and junior researchers with a range of specialities to the Catalan R&D system. The recruitment of those researchers has contributed to the fact that Catalonia’s universities and research centres that have taken them on have intensified their research activities, enhanced their research capacities and increased the number of publications that they generate along with other quality indicators. The contracts offered by ICREA are the object of a substantial number of applications, even though one of the prerequisites for application is ample international experience. Over

In its five years of existence, ICREA has added 137 research lecturers and junior researchers with a range of specialities to the Catalan R&D system

recruitment of a researcher by ICREA is selection by an independent and qualified jury and a commitment by any research institution in Catalonia to accept the researcher and provide them with the

³⁰ For further information, visit the ICREA website at www.icrea.es.

300 applications are submitted each year for the 20 to 30 contracts that are signed. Researchers have been hired by ICREA from around the world and this initiative has facilitated the return of Catalan and Spanish researchers who had accomplished a part of their research careers abroad. In its five-year existence to date, ICREA, in the words of Salvador Barberà, its first director, published in this journal,³¹ has succeeded in “providing certainties that allow plans to be made” for the return to Catalonia or the stabilisation here of researchers who were working abroad, and that circumstance “has given rise to expectations among important groups of expatriate scientists, who know that in Catalonia there is a competitive mechanism for return”.

Although the average age of the individuals hired by ICREA in 2005 was 43, the ages of the researchers applying successfully to ICREA varies widely. Anyone holding a doctorate who fulfils the requirements established for the offers of positions can apply. Since 2005, the stages of consolidation and stabilisation in the research career have given rise to more offers by ICREA.

For the preconsolidation stage, DURSI commissioned ICREA to launch a new offer known as ICREA Junior. That offer is aimed at top-quality young post-doctoral researchers, with the objective of lowering the age at which researchers enter stable employment in Catalonia. It has been designed to provide ongoing employment to researchers who have completed the post-doctoral

stage, whether they are Catalan or not, and have taken part in the Beatriu de Pinós programme or other similar programmes. Among the 30 positions offered by ICREA last year, researchers also had the opportunity of carrying out their research activities at enterprises. This format is called ICREA Enterprise. In 2006, ICREA Junior researcher positions were once again offered, and differentiation was made between the offers for Junior Academic positions – of which there were fifteen – and the ICREA Enterprise offers, with the same number of positions. Beginning in 2008, when the first beneficiaries of the Beatriu de Pinós post-doctoral programme complete their contracts, the offer of ICREA Junior contracts³² will be increased.

Upon completion of the pre-consolidation stage, researchers arrive at the stabilisation stage, where they can obtain permanent positions. Researchers with ICREA Junior contracts undergo evaluation after the fourth year of the contract and if they pass that evaluation they can enter a permanent position with an ICREA Senior contract at the end of their five-year contract. In the public sector, ICREA provides and will continue to provide Catalan universities and research centres, as they have done since 2001, with researchers who are recruited and hired on the basis of criteria of excellence. In 2006, 25 positions were offered once again for the hiring of senior researchers on the same basis of entry of talent as in the preceding years. Offers are aimed at individuals holding doctorates with at least four

³¹ BARBERÀ, 2004.

³² For the ICREA Junior positions offered, the candidate must contact the institution or enterprise in Catalonia where they wish to work and be accepted. That institution or enterprise must then inform ICREA of its interest in the candidate and complete a form to that effect for submission along with the application. The salaries paid to successful ICREA Junior applicants are in line with those paid to university lecturers, i.e. some €30,000.00 gross yearly. The ICREA Foundation assumes the cost of that hiring for five years if the contracting entity is in the public sector. In contrast, an enterprise that submits an interest form to hire a junior researcher and receive this funding must assume a part of the cost of the contract. The contribution by each enterprise to the cost of the researcher's employment contract is negotiated on a case-by-case basis once selection has been completed, in accordance with the guidelines established by the European Union.

Table 10
ICREA Junior offers 2005

Position offered	Positions granted to public sector	Positions granted to private sector	Contracts executed as of 31 December 2005	Additions planned to university staffs	Additions planned to research centre	Additions planned to private sector
30	18	1	12	9	9	1

Table 11
Summary of scientists applying successfully for ICREA Senior contracts

Year	Grants	Contracts signed as of 31 Desember 2005	Contracts pending
2001	32	32	-
2002	30	30	-
2003	27	25	2
2004	29	26	3
2005	30	19	11
TOTALS	148	132	16

years' international experience, who have leadership skills and a very strong background in research. Those individuals enter Catalan universities and research centres as researchers and they are expected to be active members of the Catalan research system and to make important contributions to that system.³³ ICREA Senior contracts are of a permanent nature with the ICREA Foundation, although research lecturers, as those with ICREA Senior contracts are known, undergo evaluation of their research achievements after their first three years in that position and subsequently every five years. There are different categories of research lecturers with the corresponding pay scales, in all cases according to the results of evaluations.

Beginning in 2010, when the first ICREA Junior contracts are set to expire, it is foreseen that 80% of the researchers with ICREA Junior contracts in the public sector will be able to advance to an ICREA Senior contract, after having undergone evaluation and selection as mentioned above. In that connection, from 2010 onwards, plans call for 40 ICREA Senior contracts to be offered, twenty of them to provide continuity for ICREA Junior researchers, and the other twenty to incorporate new talent, under conditions analogous to those in place at present.

Ramón y Cajal Programme

In addition, there are at present some 500 researchers at a stage of their career equivalent to

³³ As mentioned in connection with the Junior offers, candidates for the Senior offers must contact the institution in Catalonia where they wish to work and be accepted. That institution or entity must then inform ICREA of its interest in the candidate and complete a form to that effect for submission along with the application. The salaries paid to successful ICREA Senior are defrayed in full by ICREA, which is funded almost exclusively by the Catalan Autonomous Government's Directorate-General for Research, and are in line with those paid to full professors, i.e. starting at approximately €40,000.00 gross yearly. The optimum age for a researcher to enter permanent employment, and therefore to be eligible for an ICREA Senior contract, should be not much more than 30.

the one covered by ICREA Junior contracts who have entered employment in Catalonia by way of the Ramón y Cajal programme operated³⁴ by the Spanish Ministry of Education and Science and are still under contract this year. Those researchers represent 80% of the 640 researchers who obtained a contract within the framework of the Ramón y Cajal programme at any time during its first five years (2001 to 2005).

This programme offers five-year contracts to researchers with doctorates who have been actively involved in research for at least 24 months at different host institutions. Public aid for the universities and centres that hire these researchers consists of the full cost of the first year of the contract, with that contribution decreasing by 10% progressively and cumulatively per year over the course of the next four years. In the case of universities and certain research centres, the cumulative co-funding of 10% yearly of the contracts in Catalonia is covered on a fifty-fifty basis by the host institution and the Directorate-General for Research.³⁵ An article by Josep Maria Camarasa in number 6 of this journal³⁶ provides a comprehensive analysis of the results of the first three editions of this programme in Catalonia.

Autumn 2006 saw the expiry of the first contracts with researchers selected in the initial edition of this programme. For the most part, the beneficiaries are highly competent individuals with a very good education in research who should be stabilised with universities and research centres in Catalonia. The Catalan Autonomous Government has undertaken to procure the means that will allow this to be accomplished.

On the one hand, in May 2005 the Spanish Ministry of Education and Science, concerned mainly with continuity for Ramón y Cajal researchers finishing their five-year contracts, set up the I3 Programme of incentives for incorporation and intensification of research activities, which we will look at in the following section. On the other hand, in 2003 the Catalan Autonomous Government, jointly with universities and the Quality Assurance Agency for the University System in Catalonia (AQU), had implemented the Serra Hunter Plan for recruitment of research lecturers, and for some years has been promoting the creation of research centres needing highly qualified researchers. Both those initiatives are funded by the Directorate-General for Universities and the Directorate-General for Research, among others, and they provide possible avenues of continuity for those researchers.

Since last year the Catalan Autonomous Government has co-ordinated the necessary actions with the Spanish Ministry, universities and research centres to make it possible for all researchers with Ramón y Cajal contracts and good evaluations to be stabilised by any of the institutions involved by any means possible

Since last year the Catalan Autonomous Government, mainly through the Directorate-General for Research, co-ordinates the necessary actions

³⁴ Ramon y Cajal programme. Available from: www.mec.es/ciencia/cajal.

³⁵ In addition, this programme provides researchers with a minimum sum (up to €15,000 in the most recent edition) to allow them to start up their own research programme.

³⁶ CAMARASA, 2004.

Table 12
Individuals hired under the Ramón y Cajal Programme in Catalonia (2001-2005)

	2001	2002	2003	2004	2005	Total
Universities	124	101	101	37	23	386
Research centres	32	27	50	16	29	154
CSIC	41	24	27	8	?	100
Totals	197	152	178	61	52	640

with the Ministry, universities and research centres to make it possible for all researchers with Ramón y Cajal contracts and good evaluations to be stabilised by any of the institutions involved by any means possible, in keeping with the commitments undertaken.

I3 programme

In May 2005 the Spanish Ministry of Education and Science published a ministerial order³⁷ setting up the programme of incentives for incorporation and intensification of research activities (I3). The aim of that programme is to provide incentives, in the first place, for the offer of permanent positions at universities and research centres to foster the stable incorporation of research lecturers with outstanding backgrounds in research, recruitment of foreign researchers and return from abroad of Spanish researchers with recognised experience, and the entry of young researchers into consolidated and emerging research groups. Secondly, the I3 programme aims to favour the intensification of research activities by researcher lecturers at their universities or other research centres.

With those goals in mind, two lines of action were established: the stabilisation line, which receives the bulk of the available funding, and the intensifi-

cation line. Through the stabilisation line, the Ministry of Education and Science plans to finance newly created positions with two modules: €130,000 over three years for positions of equivalent rank to professor, which are the majority, and €150,000 over three years for positions equivalent to full professor, on an exceptional basis.

This programme is open to all working researchers and to university lecturers with sufficient experience who, while holding a contract or permanent position with a university, research centre or other R&D entity, pass an evaluation by the National Evaluation and Prospecting Agency (ANEP).

The programme is funded by the Spanish Ministry of Education and Science, although it is managed in Catalonia by the current Commission for Universities and Research of the Department of Innovation, Universities and Enterprise, with the exception of application to CSIC centres, under a general protocol signed in June 2005. The two governments agree yearly on financing, the proportion between the stabilisation and intensification lines and the corresponding number of positions. In 2005 the I3 programme was defined here only for the stabilisation line, while actions in the intensification line were established for 2006 in agreement with universities.

³⁷ I3 Programme. Available from: www.mec.es/ciencia/programai3.

The major problem taken into account by the former Department of Universities, Research and the Information Society (DURSI) when setting priorities for the resources provided to Catalonia through the I3 programme was the stabilisation of Ramón y Cajal researchers, with no provision for continuity at the end of their five-year contracts. It is important to bear in mind that as of 1 January 2005 there were 500 researchers with Ramón y Cajal contracts in Catalonia, obtained through the various yearly offers. Of that total number of researchers, there were 120 from the first offer whose contracts were going to expire in November and December 2006, of whom 102 were at universities and research centres not belonging to CSIC. DURSI saw the need to stabilise those researchers before their contracts expired and for that reason it gave priority and continues to give priority to funding of universities and research centres on the basis of the number permanent positions that have been filled by researchers who had previously been working under Ramón y Cajal contracts.

In 2005 and 2006, Catalonia will benefit from funding from the I3 programme for a total of 144 positions in the amount of 18,920,000, in addition to a small amount of funding for the intensification line. Of those positions, just over half are

Table 13
Permanent positions for beneficiaries of the I3 programme in Catalonia

	Permanent teaching staff under contract	ICREA Senior researchers	Other types of contracts	Total
2005	35	12	5	52
2006 (forecast)	44	13	35	92
Total	79	25	40	144

When setting priorities for the resources provided to Catalonia through the programme of incentives for incorporation and intensification of research activities (I3), the Directorate-General for Research took into account mainly the stabilisation of Ramón y Cajal researchers

associate professor positions financed through the Serra Hunter Plan. Another 25 are for ICREA Senior researchers, fifteen of whom previously had Ramón y Cajal contracts and are now working at universities or research centres, while the other ten are from other countries and are currently working at research centres. Lastly, another 25 positions correspond to permanent contracts offered by research centres to researchers who were previously working under Ramón y Cajal contracts.

Marie Curie funding for reintegration

Catalan researchers outside Catalonia who are working in their profession outside Europe and who have consolidated their careers there and do not rule out returning to work in Catalonia should bear in mind that the European Union's Marie Curie actions include a category of aid for "reintegration and return" that provides for two types of funding, namely European Reintegration Grants, consisting of offers to researchers who have taken part in the Marie Curie programme for at least two years for funding of their research project in a member state, and International Reintegration Grants, aimed at researchers who have been working outside Europe

for five years or more and wish to return. Those grants are available for funding clearly defined research projects to be carried out in a member state over one or two years.

3.5. Research careers in professional context. Organisations hiring researchers

According to the Frascati Manual,³⁸ a researcher is a professional who works on the conception or creation of new knowledge, products, processes, methods or systems and on management of the corresponding projects. That is a very broad definition and in fact it is evident that the organisations that host researchers cover a very wide range, as does researchers' degree of training, which will depend on the sector concerned. In theory, as we have already mentioned, the gateway to a research career is a doctorate, although, since there is a very direct and absolute relationship in the academic world between the fact of being a researcher and having a doctorate and teaching (all university R&D is carried out mainly by people who have a doctorate or by graduates who are working on obtaining one), the number of people with doctorates working in the private sector is low, with a higher proportion there of graduates, engineers and technicians.

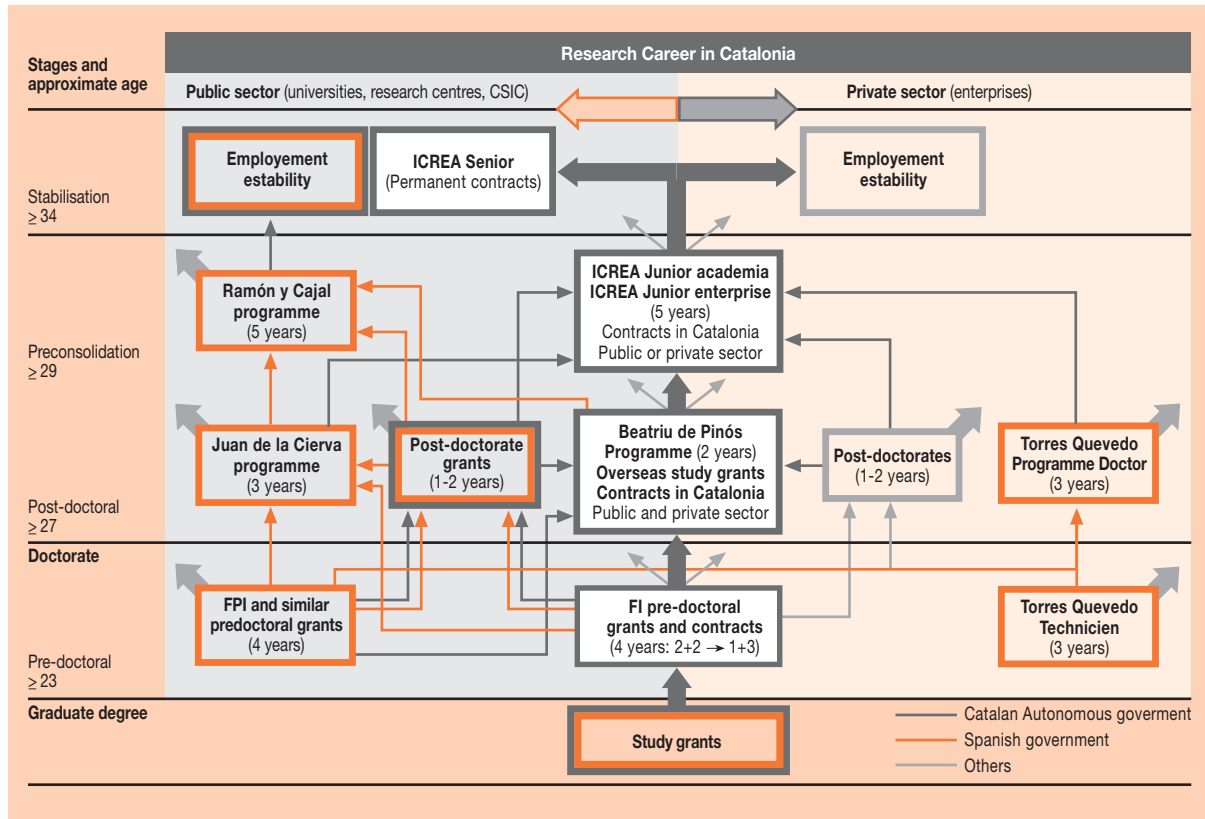
The specific career defined by the Catalan Autonomous Government for those who wish to become researchers must be understood in the particular scientific and professional context of Catalonia, where it co-exists with other possible career paths. In the public sector alone, the stages defined for the research career must be complementary and equivalent to the careers and stages defined for other fields. First of all, at universities, where we

also find civil service research and teaching staff regulated by the Spanish Universities Organic Act, namely assistants, professors and full professors, and contract research and teaching staff regulated by the Catalan Universities Act, namely associates, lecturers, associate professors and full professors. The categories established for researchers working at hospitals and other medical research foundations and institutions must be equivalent to the employment categories established at those units and in addition the researchers working there must be able to combine, as in the case of teaching at universities, their research tasks with their medical duties. Of course, the stages defined for the research career must also be compatible with the different categories of researchers found at research centres and other research entities in Catalonia, with the research career stages defined by other autonomous government ministries, such as the Catalan Ministry of Health, which is also working on definition of the research career in the field of healthcare, as they must also be compatible – and allow mobility – with the career defined by Spanish research institutions, such as the CSIC and the Spanish Ministries of Education and Health.

Consequently, we find researchers, both in training and stabilised, in a variety of host organisations. At each host organisation, there are researchers at different stages in their careers, with differing employment circumstances (different types of grants and contracts for a variety of purposes) for

³⁸ FRASCATI 2002.

Figura 2
Research career in professional context. Career paths in research in Catalonia.



Universities

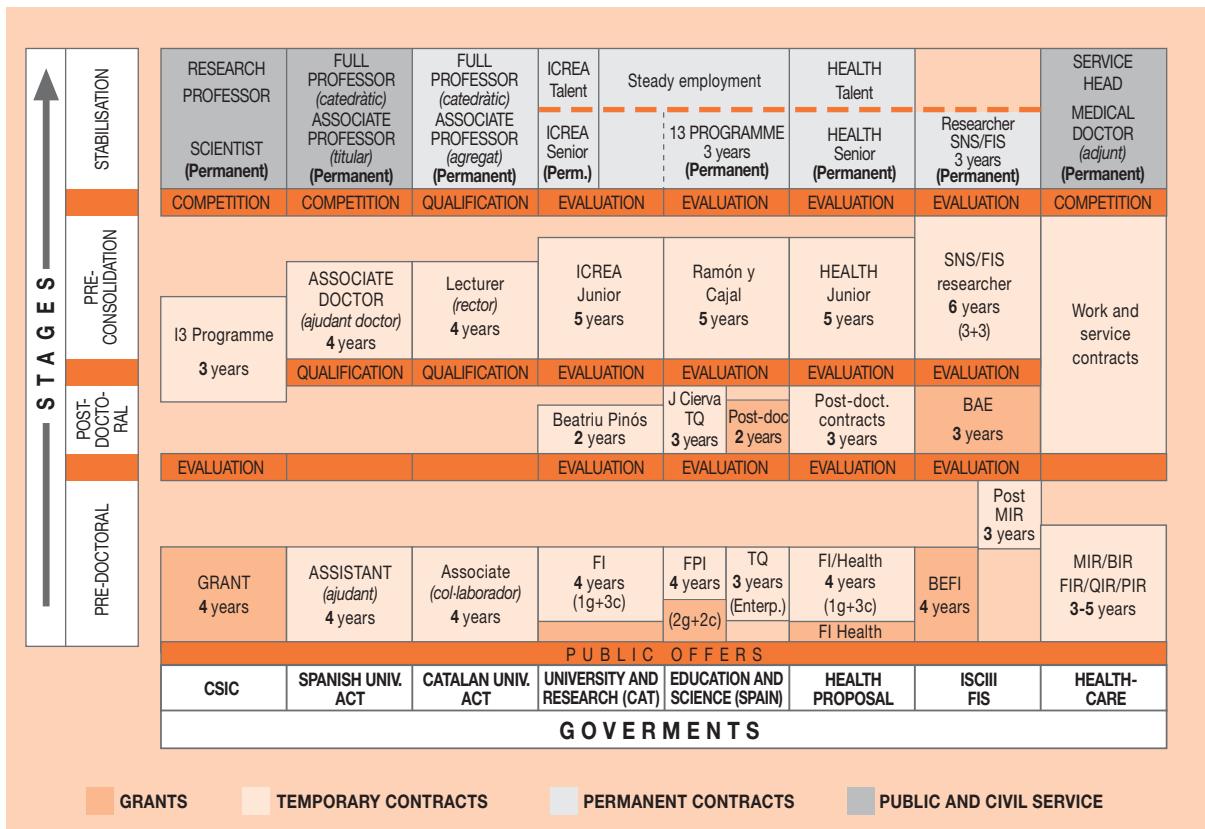
Universities are and have been traditionally the organisations that host researchers. On the one hand, it is important to bear in mind the dual nature of academe that comprises teaching and research. Furthermore we must take into account that most of the researchers who benefit from the programmes mentioned so far in this article, whether at the stage of training or the stage of

stabilisation, pursue their careers at universities. A teaching career at universities must, by definition, always run inseparably parallel to a career in research. At present, there are two parallel career paths via which a researcher can become a university lecturer in Catalonia, namely as a civil servant or under contract. The Spanish Universities Organic Act^{39, 40} and the Catalan Universities Act provide for different categories of lecturers

³⁹ LOU: Organic Act of universities 6/2001 (Spanish Official Bulletin, BOE nº 307, of 24/12/2001, in Spanish).

⁴⁰ LUC: Act 1/2003 on Catalan Universities (Catalan Official Journal nº 3828 of 20/2/2003 in Catalan, Spanish Official Bulletin, BOE nº 60 of 11/3/2003, in Spanish).

Figura 3
Equivalence of professional categories in research career stages.



that are equivalent to those that have been established for the various stages of the research career. Thus, for example, under the Catalan Universities Act the individuals with doctorates that a university hires to perform teaching and research tasks at the beginning their careers are lecturers (a category equivalent to a post-doctorate). The category of full professor involves a consolidated career in teaching and research, equivalent to an ICREA Senior professor,

while the category of associate professor implying a proved capacity for teaching and research would be equivalent to a junior researcher.

According to the Catalan Universities Act, public universities can hire their own researchers from among individuals having a doctorate not older than two years from other universities, for a term of up to five years. These are people under contract with the university and working within the

scope of the university although either mainly or exclusively in research. It is true that not all the academic staff of universities dedicate the same proportions of their time to research and to teaching, as is only right. At the same university we will find lecturers who concentrate mainly on teaching, while others concentrate mainly on research. That same sort of specialisation may also be found (and there are, in fact programmes that foster specialisation, such as the “Honours for promotion of university research”)⁴¹ in the same person at different stages of their career. Thus, a researcher working at a university must be aware that one of the main functions of such an institution is teaching and that they will have to dedicate a portion of their time to teaching, although that dedication need not be the same in all cases and can be varied over time depending on personal factors and the workload and academic requirements of the department where the researcher is working.

Research centres

Over the past five years, the Department of Universities, Research and the Information Society, now the Commission for Universities and Research, has followed a determined policy for creation and development of research centres of excellence in certain lines of research and scientific-technical areas considered to be top priority. Those research centres are set up as foundations or consortiums presided by the Catalan Autonomous Government with the participation

of Catalan universities. The aim is to make those centres into European reference points for the competitive edge of Catalan research in international circles. Insofar as concerns the subject of this article, those research centres, many of which are still in the phases of growth and consolidation, make it possible to recruit and stabilise researchers at the different stages defined in the plan and to attract talent. In that respect, in the past four years over 1,000 researchers have been added to the staffs of research centres, a truly significant fact that has contributed to the advances achieved in the development of the research career in Catalonia.

By way of example, of the 137 researchers hired by ICREA under permanent contracts, 51% carry out their work at universities and the other 49% at research centres. Among researchers with Ramón y Cajal contracts, 56% of the contracts in effect in 2006 are at universities, 18% are at CSIC centres and the remaining 26% are at research centres linked to the Catalan Autonomous Government. It is also worth noting, for example, that under the resolution for the 2005 offer through the Ramón y Cajal programme, without counting the individuals entering CSIC centres in Catalonia, 45% of the successful researcher candidates joined universities while the other 55% joined research centres, indicating that research centres are in practice a much more viable option for the entry of researchers.

⁴¹ In 1999 the Catalan Autonomous Government established the distinction of “Honours for promotion of university research” with the aim of encouraging high-level research activities by research teaching staff in the Catalan universities system. That distinction is based upon the model of Institut Universitaire de France. Members of teaching staff who attain that distinction can intensify their dedication to research activities for a period of four years. The host university received a specific amount of yearly funding to be applied as agreed by the university and the person attaining the distinction, with the intention of the research group to which that person belonged being the main beneficiary. The distinction was awarded for the fifth and final time in 2004. (Catalan Official Journal, DOGC núm. 4110, of 13/4/2004, in Catalan).

Table 14
Research centres owned in part and promoted by the Catalan Autonomous Government (Departament of Innovation, Universities and Enterprise, October 2006)

Centre	Year created	Legal nature	Participant institutions
Mathematics Research Centre, CRM	1984	Consortium	Institute of Catalan Studies and Ministry of Innovation, Universities and Enterprise
Demographic Studies Centre, CED	1985	Consortium	UAB, Ministry of Innovation, Universities and Enterprise, Ministry of Economics and Finance and Ministry of Presidency
Institute of Agrifood Research and Technology, IRTA	1985	Public enterprise	Ministry of Agriculture, Ranching and Fisheries
International Centre for Numerical Methods in Engineering, CIMNE	1987	Consortium	Ministry of Employment, Ministry of Innovation, Universities and Enterprise, Ministry of Regional Policy and Public Works and UPC, with collaboration of the Spanish UNESCO Commission
Centre for Ecological Research and Forestry Applications, CREAF	1987	Consortium	Catalan Autonomous Government, UB and Institute of Catalan Studies
Physics Institute for Alternative Energy Sources, IFAE	1991	Consortium	UAB, UB, Ministry of Innovation, Universities and Enterprise
International Economics Research Centre, CREI	1993	Consortium	UPF, Ministry of Innovation, Universities and Enterprise and Ministry of Presidency
Computer Display Centre, CVC	1994		Ministry of Innovation, Universities and Enterprise, CIRIT (Catalan Autonomous Government) and UAB
Catalan Space Studies Institute, IEEC	1996	Foundation	FCRI, UB, UAB, UPC, CSIC and Ministry of Innovation, Universities and Enterprise
August Pi i Sunyer Institute for Biomedical Research, IDIBAPS	1996	Consortium	UB, CSIC, Ministry of Innovation, Universities and Enterprise, Ministry of Health and Hospital Clinic
Catalonia Forestry Technology Centre, CTFC	1996	Consortium	Solsonès Local Council, UdL, Lleida Provincial Council, Catalan Foundation for Research and Innovation, Catalonia Integrated Rural Development Centre (CEDRICAT), and Catalan Autonomous Government
Institute of Geomatics, IG	1997	Consortium	UPC, Ministry of Innovation, Universities and Enterprise and Ministry of Regional Policy and Public Works
Catalan Institute of Classical Archaeology, ICAC	2000	Consortium	Ministry of Innovation, Universities and Enterprise, URV and CSIC
Genomic Regulation Centre, CRG	2000	Foundation	UPF, Ministry of Innovation, Universities and Enterprise, and Ministry of Health
Catalan Institute of Cardiovascular Science ICCV	2000	Consortium	Ministry of Innovation, Universities and Enterprise, Ministry of Health, Hospital de la Santa Creu i Sant Pau Healthcare Management Foundation and UAB
Catalan Institute of Chemical Research	2000	Foundation	Ministry of Innovation, Universities and Enterprise and URV
Catalonia Telecommunications Technology Centre, CTTC	2001	Foundation	Ministry of Innovation, Universities and Enterprise, UPC and URL
Institut of Photonic Sciences, ICFO	2002	Foundation	Ministry of Innovation, Universities and Enterprise and UPC
Catalan Institute of Nanotechnology, ICN	2003	Foundation	Ministry of Innovation, Universities and Enterprise and UAB
Barcelona Regenerative Medicine Centre, CMRB	2004	Joint foundation	Ministry of Health, Ministry of Innovation, Universities and Enterprise, Spanish Ministry of Health and Consumer Affairs, CSIC, Barcelona Town Council, UB, UAB and UPC
Institute of Human Palaeocology and Social Evolution, IPHES	2004	Foundation	Ministry of Innovation, Universities and Enterprise, Tarragona Town Council and URV

Centre	Year created	Legal nature	Participant institutions
Barcelona Institute of Biomedical Research, IBI	2005	Foundation	Ministry of Innovation, Universities and Enterprise, Ministry of Health, UB and Barcelona Science Park (PCB)
Environmental Epidemiology Research Centre, CREAL	2005	Foundation	Ministry of Health, Ministry of Innovation, Universities and Enterprise, Municipal Institute of Medical Research (IMIM) and UPF
Catalan Institute of Bioengineering, IBEC	2005	Foundation	Ministry of Innovation, Universities and Enterprise, Ministry of Health, UPC and UB
Barcelona International Health Research Centre, CRESIB	2006	Foundation	Ministry of Health, Ministry of Innovation, Universities and Enterprise, UB, Hospital Clinic i Provincial de Barcelona and August Pi i Sunyer Institute of Biomedical Research (IDIBAPS)
Catalan Institute of Water Research, ICRA	2006	Foundation	Ministry of Innovation, Universities and Enterprise, UdG, University of Girona Science and Technology Park and Catalan Water Agency (ACA)
Institute of Predictive and Personalised Cancer Medicine, IMPPC	2006	Foundation	Ministry of Health, Ministry of Innovation, Universities and Enterprise, Badalona Town Council, UAB, Catalan Institut of Health (Hospital Germans Trias i Pujol) and Germans Trias i Pujol Institute of Scientific Research (IICSGTIP)
Catalan Institute of Cultural Heritage Research, ICRPC	2006	Foundation	Ministry of Innovation, Universities and Enterprise and UdG
Catalan Institute of Palaeontology, ICP	2006	Foundation	Ministry of Innovation, Universities and Enterprise and UAB
Catalan Institute of Climate Science, IC3	2006	Foundation	Ministry of Innovation, Universities and Enterprise and UB
Vall-Hebron Institute of Oncology Research (VHIO)	2006	Foundation	Ministry of Health, Catalan Institute of Health and Vall-Hebron University Hospital

Governments and hospitals

There are many government organisations that are not research centres in the strict sense of the term but nonetheless are entities where, given their nature and concerns, R&D plays a significant role and as such have the potential for hosting researchers. We are referring, for example, to oenological stations, public health laboratories, technical and study agencies, meteorological observatories and other similar entities. Unfortunately, in Catalonia the presence of researchers at those types of organisations is sparse and one of the main challenges facing us at present is to increase that presence, if we wish to make R&D a driving force in our society.

Hospitals are a special case. Many hospitals have set up research foundations to carry out their research. Those foundations are normally able to recruit their own researchers, although most of their staff members, while dedicated exclusively to research, hold positions in the different categories of the health care system. Researchers working at those foundations are often hired as technicians under contracts for positions with lower categories than their medical equivalents. Although all beneficiaries of all the programmes operated at the different career stages that we have set out above are eligible to enter such foundations, those organisations are

heavily populated by grant-holders and individuals with contracts originating with the Health Research Funds managed by the Social Security system (FIS) and offered by the Spanish Ministry of Health and Consumer Affairs.⁴²

Technological centres and enterprises

Enterprises should be the organisations that host the majority of researchers. That is in fact the case in the countries with the most advanced and competitive economies. Table 1 shows the proportion of researchers (FTE) by occupational sectors in different countries. We note that in Catalonia, and even more so in Spain, the percentage of researchers in the private sector is low in comparison with other countries. At the majority of Catalan enterprises, most of which are small and medium-sized, the role played by research remains negligible. The only exceptions to this general rule are technology-based enterprises and university spin-off companies located at university science parks. At such enterprises, the percentage of employees with university degrees, and even doctorates, is very high.

Entrepreneurial initiatives are another option open to researchers. Most technology-based enterprises have been created by research groups linked to universities or by entrepreneurs with post-graduate studies.

Some of the researchers working in this sector are employed at technical centres, whether private or public. Such centres are highly specialised organisations that are often supported by several enterprises in the same industry and formed by research groups

and units with the aim of converting research into business innovation and providing technological innovation services to Catalan enterprises.

3.6. Contractual relations at different stages of the research career

A person pursuing a research career is initially a student who has obtained an undergraduate degree and enters the first phase of pre-doctoral education for a period of up to four years, and then moves on to post-doctoral training for two years, and upon completion of that training enters a stage of research consolidation for a period of five years, then finally being stabilised as a researcher. The types and contractual regimes of research careers can vary and they have been adapted to each stage.

In legal terms, the regime of contracts in the research career is regulated generically by the Spanish Universities Organic Act, the Catalan Universities Act, Act 13/1986, on promotion and general co-ordination of technical and scientific research⁴³ (Article 17) and the Workers Charter⁴⁴ (Article 15) and the royal decrees implementing the Workers Charter⁴⁵ or amending it, particularly recently.⁴⁶

It is also important to bear in mind that the Catalan Autonomous Government is not responsible for establishing or regulating types of contracts, as that is an authority that is clearly reserved for the Spanish government.

There are two types of contracts that can be applied to the research career, namely the training

⁴² For further information: http://www.isciii.es/jsps/organizacion/evaluacion_fomento/convocatorias/Fondo_convocatorias_plantillable.jsp.

⁴³ Act 13/1985 on promotion and general co-ordination of technical and scientific research (Spanish Official Bulletin, BOE 93, of 18/4/1986, in Spanish).

⁴⁴ Workers Statute, Royal Decree 1/1995.

⁴⁵ Royal Decree 2720/1998 on implementation of Article 15 of the Workers Charter.

⁴⁶ Royal Decree 5/2006.

contract and the contract for work or services. A training contract can have a term of up to five years (as an exception to the provisions of Article 11 of the Workers Charter, which establishes a maximum term of two years for such contracts). A contract for a specific service or work (Article 15.1.a of the Workers Charter) allows the researcher to pursue their career on an autonomous basis within the framework of a remunerated employment relation, subject to no time limit. Although the law does not provide for any specific time limit, when this type of contract is applied it must normally be for a specific term.

At the third stage of the career, i.e. consolidation, the established time limit is five years.

The offers for 2006, at the commencement of the career (pre-doctoral stage) combine a period of aid, though a system of grants (one year), with a contractual period under a contract for work and services (three years). For the post-doctoral stage, a training contract was proposed (2005) for all formats, although the offer for 2006 allowed beneficiary entities of the B2 format the freedom to enter into full-time employment contracts with candidates under current applicable law for a minimum term of two years, and the conditions for that offer establish a minimum salary for successful candidates. The host enterprise or institution where the researcher is to carry out their work enters into a contract of that type with the researcher, while the government covers the portion of the cost of the contract allowed by law. That portion is one hundred per cent of the cost of the contract if it involves a public entity (university or research centre). For aid in the B2 format (to the private sector), the aid funds a part of the total cost of the contract depending on the activities for which funding is requested and as allowed by current applicable

law. In the later stages of the career, it is the Catalan Institute of Research and Advanced Studies (ICREA) that contracts researchers and the corresponding research activities can be carried out in either the public or the private sector. The Catalan Institute of Research and Advanced Studies hires its researchers on the basis of employment contracts, whether permanent (ICREA Senior) or temporary (ICREA Junior Academic), except in connection with calls for entry of individuals with doctorates into enterprises, technological centres or industry associations (ICREA Junior Enterprise), where variable aid is offered (depending on the type of project to be carried out jointly) with the aim of fostering the entry of young people with doctorates into research or technological development departments.

It is important to bear in mind that the Catalan Autonomous Government is not responsible for establishing or regulating types of contracts, as that is an authority that is clearly reserved for the Spanish government

Application of any type of grant or contract is always subject to revision, with the aim of finding, at each stage of the researcher's career, the most satisfactory formula for all concerned that will be compatible with the following stages.

Consequently, it has been necessary to apply existing employment law, with the specific aspects for which the aforementioned Act 13/1986 on the promotion and general co-ordination of technical and scientific research provides, having mainly to do with the following factors:

- Research activity must be evaluated on a regular basis by government organisations, whether or not they are parties to the employment relation.
- Training contracts may be extended to five years.
- Where they are parties to the employment relation, universities must be the beneficiaries of government grants or aid for the temporary hiring of researchers.

We must do away with the idea that, on the one hand, enterprises are not receptive to new ideas and projects originating at universities, and, on the other hand, that researchers, trained in the academic world, have difficulty fitting into the private sector

4. Research careers with enterprises

4.1. Background and needs

At present, no one would argue that knowledge is not the basis of innovation and that innovation is not the only way for Catalan enterprise to be competitive. Knowledge is obtained through research, which is carried out by researchers. Countries that provide incentives for innovation train professionals, mainly at universities, who are highly qualified for research and who are hired by enterprises to work for them. Mobility of researchers between universities and enterprises, collaboration and teamwork are what allow those enterprises to be competitive and have prospects for sustainability. We must do away with the idea that, on the one hand, enterprises are not receptive to new ideas and projects orig-

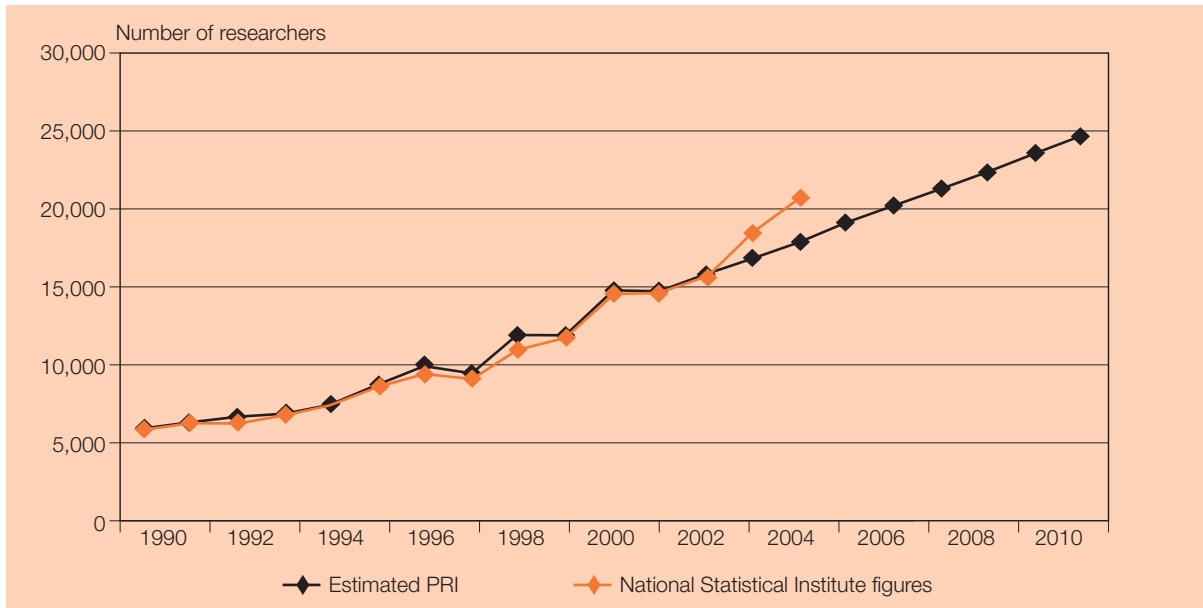
inating at universities, and, on the other hand, that researchers, trained in the academic world, have difficulty fitting into the private sector.

Along the lines already mentioned above, the research career is conceived from the outset as a professional career that can be pursued in both the public and private sectors. To date, a substantial portion of research efforts have been directed mainly at the public sector (universities and research centres), a circumstance that has contributed to the impressive growth of that sector. Now, however, we need to concentrate mostly on the private sector. If Catalonia wishes to strengthen competitive enterprises, the only way of accomplishing that aim is for such enterprises to pursue research, technological development and innovation intensively to produce high value added goods and services. In order to be able to do so, they need to hire staff members who have the skills and abilities of researchers.

Consequently, in order to increase the number of researchers by facilitating their training and employment, as already mentioned, one of the basic goals of the career defined for Catalonia is to boost the percentage of researchers working in the private sector and to correct the current distribution. If we wish to attain the European Union's targets for 2010, we need not only to increase total number of the researchers, but also to develop a model for distribution of researchers that is similar to the European model.

Taking into account the trend to growth over the past few years and the total number of researchers that must be added in Catalonia to reach the EU target for 2010 (approximately 11,000 to reach a proportion of 8 researchers per thousand working inhabitants), if we use the figures of the National Statistical Institute for 2001 as our starting point,

Graphic 1
Development and estimate of the number of researchers in Catalonia



we can estimate the number of researchers that will need to be added each year until 2010 and we note that if the efforts made in recent years in the public and private sectors in that respect are maintained, we will be able to achieve the targets that we have set. In fact, the most recent figures published by the National Statistical Institute (2005) show that the efforts made have given rise to an increase that surpassed the estimate for 2004 (see Graphic 1).

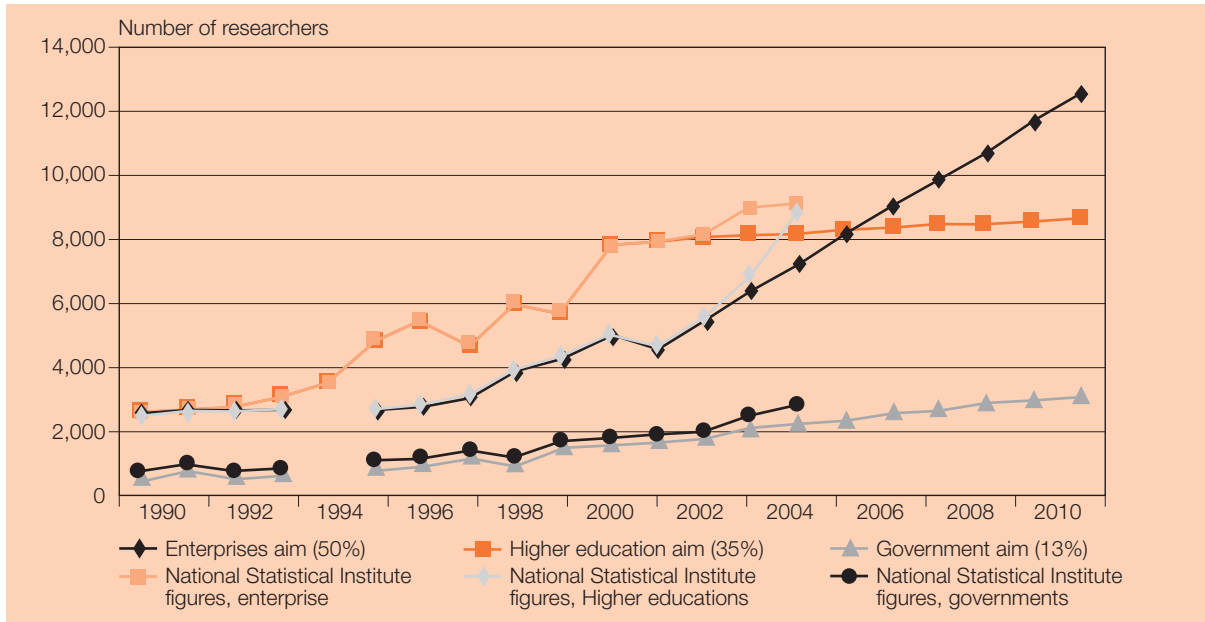
With the estimate for growth set out above, and taking as our objective the distribution of researchers in the different sectors according to the European model or as applied in the US and Japan (50% in enterprises, 13% in governments and 35% in higher education), we note that the number of researchers working in enterprises must be increased considerably, while that

same increase in higher and education and governments will not need to be so pronounced.

One of the basic goals of the career defined for Catalonia is to boost the percentage of researchers working in the private sector and to correct the current distribution

In order to achieve both the targets established in the Plan for Research and Innovation, the number of researchers per year that need to enter each sector will be what we can see in table 15 and graphic 2.

Graphic 2
Development and estimate of the number of researchers by sectors in Catalonia



When the Plan for Research and Innovation was implemented, the target of attaining a proportion of 50% of researchers working in the private sector by 2010 meant that over the period of 2002–2008 the number of researchers in that sector would have to be increased by some 5,300. Taking into account that during the immediately

preceding six-year period only some 2,000 researchers entered the private sector, it is clear that actions had to be taken to facilitate the entry of researchers into the private sector with the explicit commitment of business and industry. Graphic 2, which includes figures on researchers in enterprises up until 2004 (taken from the survey performed by the National Statistical Institute and published in 2005), shows that the actual increase of researchers in the enterprise sector was higher than forecast.

Table 15
Yearly increase and distribution of researchers to be added by 2010*

Sector	Yearly increase	Total 2010	Percentage
Enterprise	871	12,513	51
Higher education	73	8,594	35
Governments	146	3,190	13
Total	1,090	24,302	

* Own estimate.

4.2. Main initiatives on the part of the Catalan Autonomous Government

Offers for enterprises (FI, BP, ICREA-E)

It is held that the best way to transfer knowledge is through human resources. Consequently, at the different stages that have been defined, aid has been implemented to provide incentives that

will allow researchers to pursue their careers in the private sector and thereby transfer their acquired knowledge in the most immediate and effective way. That aid is meant to contribute to development and enhancement of competitive edge through the recruitment of employees who are qualified in areas of strategic interest to enterprises. These people are expected to be able to act in enterprises as agents to stimulate research and innovation plans in direct contact with research groups at universities, research centres and technological centres. However, in addition to the integration of researchers into enterprises, these plans are intended to foster the acquisition of skills by researchers in the area of business. Another aim is to facilitate contact and communication between universities and enterprises.

From the standpoint of enterprises and other private non-profit entities with experience in or potential for R&D, the career that has been defined offers them the tools and incentives that they will need to avoid wasting the potential of researchers and to take advantage of and increase that potential by favouring work and their recruitment for the enterprise at a very low cost.

At the pre-doctoral stage, the offer for training of researchers (FI) in 2005, as mentioned earlier, included for the first time the possibility of applying for a grant for preparing a thesis at an enterprise. As a result, 23 FI enterprise grants were made. This year saw the introduction of aid for pre-doctoral contracts with enterprises (FIE)⁴⁷ with a term of three years, with enterprises headquartered in Catalonia that carry out R&D activities to perform

industrial research or technological development projects and wish to hire pre-doctoral researchers. The candidates hired by such enterprises must have an undergraduate, engineering or architecture degree and they must be involved in a doctorate programme at a Catalan university in addition to having a tutor or director in the enterprise where they take part in the performance of the R&D project, thereby facilitating technology transfer from universities to enterprises. Those candidates will be individuals who, after receiving their undergraduate degrees, have decided to continue their education with the aim of pursuing a career in research. The grants are provided for one year and can be renewed for a further year, and although the gross

The offer for training of researchers (FI) in 2005 included for the first time the possibility of applying for a grant for preparing a thesis at an enterprise

yearly remuneration under such contracts is €20,000, including the employer's Social Security contributions, the minimum gross remuneration to be received by the trainee researcher is €15,000. Enterprises or entities that take part in the programme must co-finance the cost of the contract on the basis of percentages that depend on the type of R&D activity to be carried out by the researcher and the dimensions and situation of the beneficiary enterprise.

⁴⁷ Aid for enterprises with research projects that wish to hire pre-doctoral researchers: «Resolution EDU/2892/2006 approving the conditions and establishing the offer of pre-doctoral aid under the FIE 2006 programme». (Catalan Official Journal, DOGC 4717, of 13.9.2006, in Catalan).

In 2006, as in 2005, post-doctoral aid has been offered through the Beatriu de Pinós programme,⁴⁸ which, in the B2 format, is meant to facilitate the hiring of post-doctoral researchers by enterprises and entities in the business sector with their headquarters in Catalonia and carrying out R&D activities to perform industrial research or technological development projects or technical feasibility studies as a preliminary to industrial research or technological development projects. The individuals hired by the beneficiary enterprises must have a doctorate and cannot have been hired recently by the same enterprise, except in the case of researchers

The aim of doctoral seminars is to lead individuals who are completing a doctorate in Catalonia to discover the world of innovation and enterprise and make them aware of the skills and abilities that they need to acquire in the course of their doctoral studies in addition to theoretical knowledge in a specific field

involved in the FI Enterprise programme. Aid is provided for two years. The gross yearly remuneration under such contracts, including Social Security contributions, is €31,900 and the minimum remuneration to be received by the hired researcher is €23,900 gross yearly. The aid provided finances a part of the cost of the contracts, as in the preceding case, on the basis of percentages that depend on the type of R&D activity to be carried out by the researcher and the dimensions and situation of the beneficiary enterprise.

Lastly, 2005 also saw the start-up of the ICREA Junior Enterprise contracts with a term of five years and with an approximate cost per contract of €41,000, which is subsidised by ICREA at rates of between 25% and 75%, depending on the type of R&D activity performed by the researcher and the dimension and situation of the beneficiary enterprise. The conditions of the ICREA Junior offer in 2005 allowed for positions in both the private and public sectors. Only one grant was made to the private sector, since the quality of the rest of the applications did not meet the expected standards for this stage of the career. In 2006, the ICREA Junior Enterprise offer (for junior researchers in the private sector) was differentiated from the ICREA Junior Academic offer (for the public sector). Fifteen positions were offered. At the time this article was written, the applications were being assessed.

Doctoral seminars

In parallel to the research career, for this stage doctoral seminars have been fostered and generalised.⁴⁹ These are organised jointly by the Catalan Autonomous Government's Directorate-General for Research and the Catalan universities, with the collaboration of other entities such as AGAUR, FCRI and CIDEM. The aim of these seminars is to lead individuals who are completing a doctorate in Catalonia to reflect on professional futures, prompting them to discover the world of innovation and enterprise and making them aware of the skills and abilities that they need to acquire in the course of their doctoral studies in addition to theoretical knowledge in a specific field. These seminars are open to all doctoral candidates and the Catalan Autonomous government and the Catalan public universities have organised them for the past five

⁴⁸ Offer of post-doctoral grants and aid through the Beatriu de Pinós programme 2006: EDU/2714/2006; (Catalan Official Journal, DOGC 4705, of 25/8/2006, in Catalan).

⁴⁹ www.doctorials.net.

years, although since 2005 they have been compulsory for all predoctoral personnel hired by the Catalan Autonomous Government. In 2005, a total of 240 trainee researchers took part and in 2006 a total of 270. Over the course of one week the doctoral candidates take part in a variety of activities, lectures, round table discussions and exchange of experience in connection with their entry into employment, addressing the following issues:

- Making individuals with doctorates more competitive on the employment market.
- Learning to take advantage of the skills acquired during doctoral studies.
- Knowing the needs and demands of the business world and the role of individuals with doctorates.
- Developing management skills.
- Understanding the variables involved in R&D and enterprise.

Doctorate programmes with participation by enterprises

Another initiative taken by DURSI in 2005 was the first offer of support for doctorate programmes created jointly by universities and enterprises and programmes in which enterprises play an important role.⁵⁰ The aim of that offer was to foster doctorate programmes that, in addition to the basic contents, include other knowledge and skills relating more directly to the employment market. The offer for 2005 led to the concession of a total of sixteen grants. That offer provided for two formats: one for existing programmes that could involve participation by enterprises (ten grants provided) and another for new programmes calling for collaboration with enterprises (six grants provided). The areas of knowledge concerned in

the beneficiary programmes are highly varied, including engineering and architecture, social sciences, science, life sciences, medical and health sciences and humanities. There were also a number of different universities in creating programmes (two from UPC, one from URL, three from URV, two from UdG, four from UB and four from UAB), as well as a variety of enterprises.

5. Final remarks and future prospects

Policy in respect of researchers is a key factor in the area of research, technological development and innovation. Backing R&D and innovation in Catalonia necessarily implies taking a series of innovative measures for the training and professional development of researchers and technologists in this country.

As we have pointed out in this article, over the course of the past five years the research career has been strongly promoted in Catalonia, mainly by means and initiatives taken by the Catalan Autonomous Government. Nevertheless, the greatest challenge that must be faced in the next few years will be to attain a substantial increase in the number of researchers and technologists working in enterprises of all types in all industries. Attaining that end will require greater involvement on the part of the private sector and the clear and radical assumption of the fact that competitive edge depends upon decisive pursuit of R&D and innovation by enterprises and, consequently, upon the entry of highly qualified employees, researchers and technologists who can lead the transformation of Catalan enterprises.

⁵⁰ Aid in support of doctorate programmes with the participation of the business sector (SPDE): Resolution UNI/2317/2005; (Catalan Official Journal, DOGC 4439, of 2/8/2005 in Catalan).

In that context, one of the priorities that has started to be implemented is the ability to draw top-level international talent and researchers, whether through the return of Catalans and Spaniards to Catalonia or through the incorporation of foreign researchers who see Catalonia as a preferred destination to carry out their R&D and innovation activities in a competitive international context. The ICREA programme has provided one of the most successful experiences in that regard, with the incorporation to date of over 137 top-level researchers at Catalan universities and research centres.

The actions of political decentralisation and application of the principle of subsidiarity to R&D remain to be accomplished and they cannot be ignored when research, technological development and innovation are the most critical factors for the economic, social and cultural progress of our society

The improvement of real and effective co-ordination between governments is also clearly needed. As we have seen throughout this article, the programmes and initiatives carried out by the Spanish government have not been agreed or co-ordinated⁵¹ with the autonomous communities, in our case with the Catalan Autonomous Government, which has exclusive authority in respect of technological research and development. This has all too often made the actions taken

by governments to be excessively reactive, unco-ordinated and with little room for medium- and long-term planning. In that connection, we will need to wait and see how new statute of autonomy regulating that matter is implemented. The actions of political decentralisation and application of the principle of subsidiarity to R&D remain to be accomplished and they cannot be ignored when research, technological development and innovation are the most critical factors for the economic, social and cultural progress of our society.

The plans and policies of the Catalan Autonomous Government in respect of the research career have been positive and clearly at the leading edge in the context of Spain. We must also admit that it is probably still too early to make a more comprehensive assessment of those plans and policies, which have only been in place for the past two, three and four years. Nevertheless, we note that the Catalan Autonomous Government has applied a policy in respect of researchers in Catalonia that has been recognised by different international forums and institutions.

Thus, the aspects of that policy followed by the Catalan Autonomous Government that we consider the most positive are the following:

- Substantial increase in the amount of public resources dedicated to offers and aid for the research career in recent years.
- Recognition and progressive dignification of trainee researchers (widespread use of contracts, increased contributions to grants and contracts, social benefits, dedication to projects, etc.)
- Promotion over the past two years of incentives

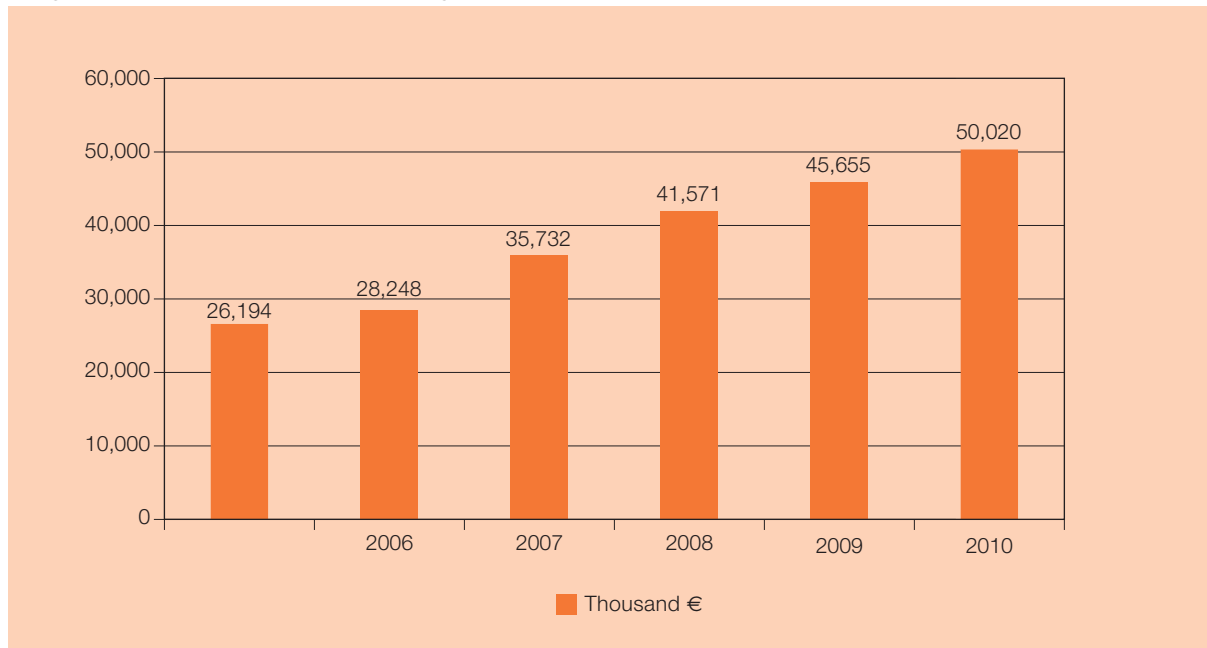
⁵¹ With the exception of the I3 programme, insofar as concerns its performance, although not its conception.

to increase hiring of researchers by all types of enterprises in different industries (pre-doctoral programme for enterprises, post-doctoral programme for enterprises, ICREA Enterprise programme, reduction of Social Security costs, extension of doctoral seminars, promotion of science and technology parks).

- Creation and development of a number of research centres of excellence by the Catalan Autonomous Government and universities. The consolidation of those centres has involved the capacity to recruit and stabilise a large number of researchers in certain areas and lines of technological research and development.
- Recruitment, stabilisation and attraction of talent through the ICREA programme.
- New initiatives for completion of the research career in the post-doctoral and pre-consolidation stages in Catalonia.
- Relative success in participation in and obtaining funds in the competitive offers operated by the Spanish government (FPI grants, Juan de la Cierva programme, Torres Quevedo programme, Ramón y Cajal programme).
- Enhanced professionalisation of management by the Catalan Autonomous Government (Directorate-General for Research, University and the Agency for Management of University and Research Grants (AGAUR), universities, etc.).

In that respect, it is important to point out the need for all those policies and plans to remain in effect in

Graphic 3
Budget forecast of the research career programme 2005-2010



the long term. The most effective science and technology policy must not only be well directed and planned, but also stable and ongoing, above and beyond events and changes in politics and

The most effective science and technology policy must not only be well directed and planned, but also stable and ongoing, above and beyond events and changes in politics and governments

governments. In graphic 3 are set out the budget forecasts by the Catalan Autonomous Government's Directorate-General for research for the Research Career Plan for Catalonia, calling for sustained increase and medium-term application of all those initiatives and projects. The figures for 2005 correspond to the actual budget applied while figures for other years are forecasts on the basis of the budgets of the Directorate-General for Research for the FI, Beatriu de Pinós and ICREA programmes.

We must also mention a series of actions that need to be carried out to correct certain negative factors over the next few years, namely:

- Substantial improvement of co-ordination between governments, applying the principles of political decentralisation and subsidiarity on the basis of the agreement between the Spanish government and the Catalan Autonomous Government, in this case in respect of the research career in Catalonia; likewise improvement of co-ordination with Catalan universities

and research centres.

- Attain a greater degree of involvement by the business and industrial sector in the promotion of R&D and innovation and in effective support for recruitment of researchers and technologists in the private sector.
- Improve aspects relating to the management of researchers and personnel policies common to the Catalan science and technology system: working conditions, remuneration systems, incentive and scientific and social recognition policies, recruitment, selection and hiring policies, etc.
- Clearer specification of what is expected of trainee researchers (groups, lines of research, related projects) and better tracking and ongoing guidance by group leaders, thesis directors and department directors.
- Supplement training of researchers with skills, attitudes and aptitudes in line with the current demands of the employment market in both the public and private sectors, on the basis of generalised implementation of doctoral seminars and other more specific instruments aimed at fostering entrepreneurship, creation of technology-based enterprises and entry of researchers into employment in the private sector.
- Incentivise scientific vocations beginning at younger ages (primary and secondary schools) through curricula and more effective initiatives.
- Continued pursuit of the policy of capture of international talent to facilitate integration into Catalan groups, centres and enterprises.
- Continue promotion of research centres of excellence by the Catalan Autonomous Government in close co-operation with Catalan universities and fostering of specialisation by universities in priority areas and fields to attain an international competitive edge for science and technology produced in Catalonia.

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