

The European pathways of Catalonia: research

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Prologue

Good afternoon. As you may remember, there is a passage in Lewis Carroll's *Through the Looking-Glass* where the Red Queen says to Alice, "Now, *here*, you see, it takes all the running *you* can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!". Well then, my intention, here, is to try to persuade you that, in fact, in the field of research, we should run "at least twice as fast" and that, unlike Alice, we can do so.

In the first place, we will look at the main aims of research generally and the reasons for it, and then we will tackle the situation of research in Catalonia. At this point we will have come to the conclusion that, we must run "at least twice as fast" and come also to the conclusion that "we can indeed do so", which will lead us to a rapid expose, somewhat critical, of the European policy on research. This, in turn, will open up the road for discussion of the role, conditionings and opportunities of research in Catalonia. I will conclude all this analysis by linking it to two main issues: Spanish Governmental policies and the attitude of our society towards science and research.

The need for research

Permit me to put on the table the ideological viewpoint from which I address today's reflections to you. It is that of historical Catalanism, in its more international version, which in these times I would accept as the will and ambition not to be just another European country. We aspire to be what we are not yet: a first-line country in Europe. I have to persuade you that this statement is closely tied to today's theme. I have to convince you that, for Catalonia to be in this first line, it will have to be a country strong in research.

What is research? Obviously, it is an intellectual human activity. In the words of Camoens, it is to sail "through seas never sailed before". For most of us, to justify research it is

enough to mention the pleasure of sailing. But, if only because we want someone to pay for this journey, you will have to allow me an approach to the more utilitarian question.

*It is not what springs from my heart, and for this reason
I ask your understanding in giving priority to the mind*

When speaking of research, we can make many distinctions. A specific piece of research can be more or less interesting, more or less important, a finishing point without consequences or a starting point brimming with consequences. A traditional distinction, fine although not very useful, separates research into pure and applied. The first directs its consideration as to how matters work, the second seeks practical results. In fact both are closely related, and, therefore, I think that this distinction should be left behind us. There is strong continuity in the succession of concepts going from pure research to innovation, passing through applied research and development.

Another classification, which I find more interesting, separates research in which the individual accumulation adds to the social, which would be mostly the social sciences and the humanities (but also art and many experimental fields needing large and unique instruments), from research more characteristic of the natural and exact sciences, which is predominated by a race for discoveries, at an international level, which accumulate in the aggregate, but where merit and the points only count for those who come first.

In any case, permit me in this discourse to refer to research generically and including all the concepts that I have just mentioned.

I will not expand on justifying the importance of research for human progress. Pasteur, at the end of the 19th century, talked about the race between the laws of war and the laws of life. It is sad to acknowledge, however, that both war and life have been favourable to the development of science and that we have arrived at the beginning of the 21st century where the sum of research and development, the so-called R+D, is a more and more important growth factor. To the point where we are tempted to define the new society as the society of knowledge. In the past, we have had waves of in-

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novation –to use Schumpeter’s expression –not based directly on scientific knowledge; this is increasingly rare.

Well then, if the importance for the world of investing in research is quite clear, it could be, on the other hand, not so for each individual country. That it is has to be justified; and it must be justified, therefore, by Catalonia. I can give you two justifications, one more or less sociological and another economic.

The first, the sociological, is very simple. It is unlikely that a country would be considered important if it is not among the innovative countries, that is to say, among the countries that produce what really counts.

Behind the important decisions there is a global cross-weave of social groups and connections. Science is becoming more and more present in this cross-weave and for this reason our influence in the development of the state of European opinion, as well as our presence in the European corridors of power, will suffer if our presence in the scientific and technological structures of Europe is not strong enough.

I imagine that you will permit an economist to evaluate also the need for an economic justification, that is to say, an argument in favour of the proposition saying that R+D is necessary to the end and effect of guaranteeing that our quality of life rises at a lively rate, above the European average. I will admit, however, that if our aim went no further than to go on progressing, moving forward and living better, then we would not need an R+D policy. I think that this is not our case –his is not the way to arrive in the front line in Europe –and therefore I will give you the reasons why from this economic viewpoint it is important that we have available a potent R+D sector. In fact, I will produce the combination of two proofs.

The first proof is that the motor of Catalan growth –and of any small but very open country –lies in its competitiveness and, we could say, in the modernity of its export sector. However, the dynamism of this sector is based more and more –and could not be otherwise in today’s world –in its capacity to create new products, products incorporating new technology (that is to say, in R+D). The new technology can be acquired from outside, it does not have to be produced at home. What is more, a competitive, dynamic, exporting company has no other choice but to obtain the best technology from wherever it is.

This brings me to the second proof, which is the following: to be a good importer of technology, you need to know what to import. And the right ability to know what to import is the same ability as is developed in the context of creation of technology, which in turn requires a stimulating environment where R+D is appreciated and practised. In fact –and permit me to use the words of my profession– science and technology must also be seen as an international and very open market. If we want a system of science/technology to have sufficient quality for that our own economy to have available an expert awareness able to detect and know how to use the cutting edge technology, then the guarantee of quality of this system is that it, itself, is formed as an exporter of R+D and technology.

Let me reflect briefly around the idea of the R+D sector as

an economic sector. A strong and internationally orientated R+D sector brings the usual beneficial effects for economic life (producing varieties of goods and services), but it also becomes an economic motor for a fundamental but more indirect reason: the highly specialised human capital that needs –and, at the same time, promotes –training, and in part produces.

This capital is the basis, at the same time, of the creation and attraction from abroad of new highly competitive enterprises.

To sum up, in the 21st century, the guarantee of a dynamic and competitive economy is to have an R+D sector of the first rank.

The situation in Catalonia

Since I hope that I have now convinced you of the importance of R+D for the competitiveness of a country, it is time to analyse the specific Catalan situation.

In Catalonia, the situation of research has improved and continues improving. However, it is still far from what it must be to achieve the ends we wish. The sums invested in R+D in relation to the GDP, or the number of researchers, show us as far below the European average.

Some indices (those from publications, for example) provide us with a more positive view. But, all said and done, there is –and we have to recognise it– a significant gap between our ambition and our reality.

When we compare Catalonia to the rest of Spain, as far as research is concerned, we can see that we are not the foremost autonomous community. We are number two, a considerable way behind the Community of Madrid (which is at about the European average). Historically speaking, we have been a country of entrepreneurs, merchants, jurists, engineers, artists, etc. but few scientists. Very well, we can recognise our limitations in this field up till now, without the agonising in which we have lately seemed to indulge. However, we are improving and we are moving upwards and the distances are closing. But, as I have said, we have to move “at least twice as fast”.

We need a great leap forward, above all in quantity, although we have to persist with the improvement of quality. In the future we will have to be also a land of researchers and scientists, or we will not be outstanding.

In any event, I would like to point out, when analysing our situation, that we must not let ourselves be seduced by a type of detenninism of numbers added up. With the same resources, things can be done well or less well.

*Who would dare to say that with what we have
we cannot do better?*

In any event, our duty is to try it and our challenge is to achieve it. However well matters may go for us, what we can obtain and invest in addition will not be enough. We also need to use our resources with greater efficiency.

To follow this line, we have to recognise that we have great limitations, not directly as to resources, but in organisation and the structural order. We have little research (and few Ph.D.s) in our companies, a rigid functional structure in the public sector of research, endemic difficulties in the recruitment of support staff, etc.

The fact is that not only do we need more researchers, but, further, the good researchers we have spend too much time in doing things that are not to their comparative advantage. All these limitations must be taken into account when designing policy.

The European framework and the USA

As our aim is to be taken into account in Europe, let me briefly summarise the situation of research policies in Europe and, particularly, the maximum institutionalisation of the European Union.

In the matter of R+D, European policies have been defined by contrast: they respond explicitly to the challenge coming from America, to the perception, sufficiently well based on reality, that, with exceptions, scientific and technological innovation comes from there. Measured by many standard indicators, the quantity and quality of European academic research are not inferior to the American. But certainly, the peaks of quality are lower, in both quantity and quality and, in any case, the translation of European scientific potential into development and innovation carries a deficit.

In the summits held at Lisbon (March 2000) and Santa Maria de Feira (June 2000), the Council of Europe picked up the gauntlet of this challenge to take part in the duel. And took up a commitment that only time will tell whether it was a great turn of the helm for European policy, or a reckless statement, even frivolous: to surpass the USA in a period of ten years. The context of this undertaking in the field of research is a new idea: the European Research Area.

If European policy is defined by the need to compete successfully with the USA, I would say that we must learn from the USA. If we accept their superiority, it would not be prudent to disregard their example. In the first place, we must point out that there are structural similarities and differences between the European Research Area and the American. One similarity is scale (economic and demographic). An important difference is that most of the funding for research in Europe comes from the member states, while in the USA funding is federal.

Let me list some of the essential characteristics of the American system of research and technology:

- On the one hand, there are many companies involved in research and, of course, concerned with innovation. The synergy between university and private companies is notable, but there is a feature of great importance in this relationship, the university plays the leading role. Companies go to the universities (or they settle themselves nearby), sometimes even European companies. The university has become a true economic mo-

tor, thrusting and being thrust in a valuable cycle of quality: quality draws resources, resources generate quality.

- On the other hand, basic public funding is very important in the USA, more than is believed, since it is often done indirectly.

A distinctive feature of the American context is its ability to endorse a high-quality public system of evaluation. For big projects, but also for small. In fact, it is often forgotten that the small project is a key piece in the American R+D system: it is what leads to a proliferation of individual efforts which, in total, achieve a higher scientific productivity in relation to the money spent.

- Finally, we should take into account that in the USA nodes are more important than the network. Networks exist, clearly, but are informal. What counts in reality are the great research institutions (institutions where the researchers work physically close together), typically universities or connected with universities. Another essential feature of the American system is that there is a fierce competition between all these institutions.

When we leave America for Europe and analyse the latter retrospectively, we detect significant limitations. Most of them were listed in the report, directed by Joan Majó, regarding the external evaluation of the execution and results of European Community actions between 1995 and 1999.

I am convinced that, to a great extent, these limitations are consequence of an artificial delimitation of responsibilities between the European Union and the different member States, partly due to a significant difference in their respective budgets; and partly to the determining factors included in the foundation treaties of the European Union. The European Commission is on the defensive, under a siege mentality, with the United States as observers. And one wonders at times whether, in reality, they have a besieger's mentality.

In the decision structure of the USA the power of the individual States is on a relatively rising trajectory. The European Commission is very closely monitored and the role of regions is less important, which is a paradoxical situation since, from the viewpoint of the funding of research, the role of the regions is increasing.

In this political and intellectual environment the justification of the actions of the Commission is a concept of "European added value", which can be interpreted in different ways, but tends to be interpreted as restrictively as possible. The Commission is timid and, in this field, not very activist. The contrast with European policy is clearly seen in the case of telecommunications: European telecommunications would not have been deregulated had Brussels not determined it.

If we look into this in more detail, we note some features in European policy which I would like to highlight:

- On the one hand, strong emphasis is placed on poli-

cies of mobility and networks. In principle, these policies are fine, but the insistence is so exclusive that it also creates distortions. It should be noted that in the USA there are no formal networks. The European networks are necessary and positive, a step forward, but they are much more a sign of the relative weakness of Europe than of its strength.

Neither does the insistence on networks and co-operation give enough weight to the objective of stimulating competition. Perhaps it is believed that the encouragement of competition is a matter for the individual member states and that, in consequence, it does not have European added value. We need a more refined concept of European added value; a concept that takes into account that, at times, when something might be done but is not done, it is because, basically, it cannot be done. Another serious mistake is to consider that the only competition that matters is non-European. For many years, in the parallel field of economy, it has been well understood (as Michael Porter has forcefully argued) that internal competition is a precursor of external competition. Those who have stayed the course and won at home are those who, later, can choose to triumph in the international arena.

- On the other hand, the European panorama has made a significant move towards promoting short-term and industrial research. Perhaps this is the product of a rather mechanical reading of the American example regarding the university/business relationship. Or perhaps it is a distortion due to the need to disguise the subventions for the promotion of the aeronautical and aerospace industries as subventions for research. (In the USA, these operations are made through the Defence Department, an unavailable option in Europe.)
- We can also see that the European Union has failed to develop an evaluation system as effective and with the same quality as the American. Unfortunately, recognition of this has not led to any correction, but to the abandoning of the talk and to the temptation, very advanced, to discontinue the financing of small projects, vital to many of the small and medium-scale European research centres.

The 6th Framework Programme of the European Union, which has to be approved in 2002 under the Spanish presidency, is the most important step proposed by the EU for the constitution of the European Research Area.

In brief and bearing in mind that there is still nothing definitive, this will be characterised by:

1. the emphasis on mobility;
2. the so-called integrated programmes (specifically, fewer small projects and more inter-linked super-projects);
3. the wish of co-financing with the member states (perhaps unacceptable), and

4. the promotion of networks of outstanding centres.

The funding as a whole may increase, but not spectacularly. The weight of public financing of research will continue to be with the member states.

As regards the 6th Framework Programme, we can make a double judgement, from the European viewpoint and from the viewpoint of Catalonia and Spain.

- From the European viewpoint, it is clear that funding what is good is a good thing. However, on the whole, the Programme does not seem to be very different from what has been done up till now. In general, we do not get the impression of a substantial change. Therefore, I think that this Programme will not be the motor for a realignment favourable to Europe of the correlation between Europe and the USA.
- From the Catalan and Spanish points of view, there are elements for concern over the non-central EU countries, countries with few large installations, few large centres and difficulties in arriving at the critical mass of researchers. On the one hand, before it is too late, we must try to moderate the Programme in its preparation phase. For instance, the move from a policy promoting outstanding centres to a policy promoting *networks* of outstanding centres is artificial from the European point of view, but surely a move favourable to us.

On the other hand, it is important for us to monitor the preparation of the Plan, to anticipate what is coming upon us and adapt ourselves to it.

In short, a great challenge.

As you see, my opinion is that the policy of the European Union on the subject we are meeting on today is deficient. Not only for ourselves, but also from the global European viewpoint of competitiveness. Of course, the research policy of the EU is not the only European research policy. In fact, the member states all have their own, at times behind the European Union's back but at the same time watching over it and maintaining a good connection. This is a very unsatisfactory situation which, for us, is not a cause for rejoicing but of concern. However, on the other hand, it has an implication that must be noted: Europe represents an objective for us, but not an absolute model to follow. Our ambition to be taken into account in Europe is also a realistic ambition to innovate and even in some domains to lead in Europe.

A research policy for Catalonia

If we turn now to Catalonia to define our research policy, the objective is clear: to make progress up to the European front line. We have just gone over what is, what it wants to be, this Europe of research into which we want to insert ourselves. It is, then, time to talk about "how", about the pathways to follow to achieve it. We have established that we can do it, al-

though, I can tell you in advance, it will not be easy. It must be said in all these aspects that the situation of Spain and Catalonia is not very different (in some ways we represent the Spanish average). In consequence, a programme for Catalonia is, to a great extent, a programme for Spain. However, there exist some contrasts and tensions and I will speak about them as well.

Our general framework is Europe, but our reality has its own features, which must be kept very much in mind. Therefore, it is important to be lucid and to recognise that some of these features unfavourably condition the Spanish and Catalan policies.

Let me highlight two :

- The first feature is the age pyramid of the research group, especially in the university .As Anna Cabre says, the dominant demographic feature can be summarised in one word: ageing. At a rate, in the universities, of half a year every year .

It is very high

Moreover, the age distribution is not even and in the next ten years relatively few researchers will retire. Everyone knows this: there is an obstacle blocking our research structures, an obstacle creating anguish and demoralisation, something that, unluckily, drives away from the scientific vocation many young people well-gifted for research and science. This lack of enthusiasm could mean that we lose a generation of scientists.

- The second is the contractual structure for researchers (university professors included). This structure is dual. On the one hand, there is a rigid administrative structure with little motivation, a corset that makes innovation very difficult. On the other hand, there is the postdoctoral group in a temporary contractual situation which is wholly inadequate. The administrative situation does not make for motivation. And the temporary contractual situation does not offer peace of mind. Both these things are needed for a successful result: incentives (that is to say, rewarding success) and basic security .

An essential part of any programme for progress must tend towards the replacement of this duality by better-defined scientific careers. *We will speak about it further.*

Sometimes, two problems have the same solution, so that, when you solve one, you help to solve the other. I have already said that, in the framework of a Europe-oriented policy, our research personnel is quantitatively insufficient. Therefore, we must expand it. This must be an essential part of our research policy and we have included it as a central element in the III Catalan Plan for Research, which was approved by the Government of the Generalitat in March 2001 and will be presented shortly with the Innovation Plan.

The generation change, which will not yet be achieved through retirement, we can begin to implement by new re-

cruitment. These new engagements have to be made in both the private and public sectors. As regards the public sector (we leave the private sector to make its own decisions), there is little room for error. The fiscal environment, which also comes from Europe, will not allow a high number of new contracts. It will be essential to value each of these contracts as a very scarce commodity.

We cannot allow these contracts to be assigned other than in the best possible way. We must be guided by quality and nothing else.

With your permission, I would like to digress here to tell you what I think should be the three essential elements of a research policy concerned with research staff and their future :

1. Every scientist should have the prospect of a professional scientific career that, beginning with an initial period subject to revision, must include a steady contract, preferably not as a public official.
2. Mobility is crucial. The step from the initial period to an indefinite contract, if taken, does not need to be, nor should be, in the same institution. Transfers from public bodies to private companies should be promoted, as well as reassignment and mobility between public bodies. The researchers who recently stated in the magazine "Nature" that Spain is one of the scientifically advanced countries in the world with least circulation between institutions, are right.

We are not better, rather the contrary, for the fact that most of our younger colleagues are our own former students, institution by institution –*there are always some exceptions.*

3. Training abroad is an important issue for our researchers and for our research system. We must encourage it. That many people go abroad for training is not a problem. In fact, it is desirable.

What is important is that our system should not be a closed one, meaning that, specifically, there should be a substantial proportion of positions open to public competition, that is to say, without any preference given to an internal candidate.

Given the demographic situation, accomplishing this will not be easy, but it is crucial. *And the sooner it is done, the better.*

The second axis of our research policy, in view of the European policy of preferring research structures of a certain scale, must be the promotion of centres. As is also stated in the III Plan, this line consists of creating and strengthening centres of a critical scale and, of course, seeking quality .

I believe, but I am not going to expand on this now, that it is essential for these centres to have their own legal personality, the capacity to make their own contracts and, so to say, well-defined owners. Finally, in this context, you should not forget this motto: concentration is good, splitting up is not.

Should we give priority to research areas? This question has been discussed during the preparation process of the

III Catalan Plan for Research. The answer is not easy, but we can list some general principles: –It is essential to be present in the major areas of knowledge, and in those that, although not major in themselves, have priority in the European and member state programmes: this is where the resources are. We must add that the priority areas of the European Framework Programme have a clear logic and are reasonably chosen to serve the European ambit. However, there are also some absences, which are difficult to justify .

- In each area, the good and competitive must be fostered. There would be no sense in trying at a Catalan level to have a map of excellence in many different fields, neither could any planner decide in what, precisely, we should be excellent at (it is not clear that this would be reasonable on a European level).

When we go beyond the major areas, into a finer structure, the only principle must be to support and promote what we do well. If a certain group stands out in Europe, and we do not say in the world, we should not think twice: we must support it at once. *Being outstanding in Europe is not easy.*

- The comparatively low cost consideration and the function in the sea of knowledge have to be taken into account, not forgetting the humanities and social sciences.
- There are also some issues that are particularly interesting for Catalonia. In the framework of the III Plan for Research, we have adopted the viewpoint that, when considering public initiative, we must start from the political management of the different Government departments, in our case those of the Generalitat. These are the so-called “agreed areas “ between departments, co-ordinated by CIRIT .

Let us now make a quick analysis of the role of the company. We will not be considering companies as users of technology –the company’s own competitive policy is decisive here– but the company as a possible promoter of research in Catalonia. Here we list some ideas:

- To stimulate company investment in research, indirect incentives (fiscal) are more effective than direct subsidies, as can be understood from the report of the Advisory Committee of Science and Technology of the Generalitat (CACIT), presented recently by its president, Antoni Vila i Casas, to the *Cercle d’Economia*.
- That our companies commission research studies from our own laboratories and not from the international ones depends on the quality of our laboratories and our research. Here we have, once again, a fundamental reason for not renouncing the principle of excellence: excellence brings resources.
- Companies have to develop smaller research units, manned by Ph.D.s; however, these units will more and

more form a bridge through secondment to the research centres.

I do not want to go further into this resume of our research policy. We have been through this before and it can be found in various publications of the Department, especially the III Plan for Research. It can also be seen in our web-site.

Today I am interested in going more deeply into the ideas that encourage the scientific policy and the framework in which it stands. In this line, I would like to focus on the relationship between Catalonia and the State, and the relationship between Catalan society and science.

No current opinion on Catalan scientific policy can be understood if it does not include an attitude and demeanour with respect to the Spanish Government. Today , then, I would like to present a specific political option: that of the hand proffered for co-operation. In fact, I would like to propose that we should define an implicit contract between the Spanish Government and ourselves. A contract because it involves obligations on both sides. Implicit because there is no need to write it; we only need to put it into practice. And I want to add that we are willing to put it into practice unilaterally, at least for a time, and although it may be risky .

Our part of the agreement would bind us to articulate a policy based on confidence in the Spanish Government. In the confidence that it will not play with marked cards to favour one territory more than another. In the confidence that “large installations” or “large state centres” would not automatically mean projects located in Madrid. (However, it is evident that, in the normal course of events, many of them will be settled there. It is not our intention to weaken the scientific potential of Madrid)

In fact, in the confidence that the resources for research will be awarded through public invitation and competition; which will sometimes be awarded to us and sometimes not, which will be stimulating for us. We are convinced that, if the Government acts according to the said agreement our confidence will be returned and the Spanish scientific structure will develop into a multicentre model similar to that of Germany. This is the model we like: there will be major centres, but they will be scattered throughout the country , as in Germany. And who would dare say that it has not been a good model for Germany?

It is sufficiently clear that with this open hand policy we run a risk, and there will be some who think, with some reason, that it is a little ingenuous. But this is what we want to do, or at least, try to do.

In fact, the policy of confidence in the Spanish Government, to succeed, requires reciprocity .This is the other side of the implicit contract. What will happen if this implicit agreement does not work? Let me tell you a secret: a government policy based on a centralist programme and apprehensive of us is no good to us. If the State, or even Spanish public opinion, wants to reduce our strength, they can do so. However, that would mean that they are reducing their own force at the same time. Simply, Catalonia is not so insignificant as to be disregarded.

Together we can contribute the best of ourselves; we can collaborate and we can compete: we can innovate and we can experiment; we can copy from each other what in fact works; we can celebrate the successes of the one or the other; and we can encourage a vision of European policies closer to our own realities. Separate, we belittle ourselves altogether. A centralised State Research Area based on mistrust will be unstable. It will be like a blunted dagger. If we want to be outstanding in research, there is no alternative.

To be outstanding in research demands the same concentration and resolution as was needed by the cutler in a poem my mother used to make me recite at Christmas:

*“Sharpen and sharpen, I make daggers, cutler,
/daggers sharp enough I to go through chain mail”*

Allow me rhetorically to give you a specific example of how mistrust can be damaging to us (there are others). This is the story of the synchrotron project.

Some years ago, Catalonia launched an initiative to promote a synchrotron for the Spanish State, to be located at the Autonomous University of Barcelona. A very good technical project was prepared and the Spanish Government agreed to co-fund it.

The discussion about whether Spain needs to build a synchrotron or not is still going on. However, there is a strong feeling that it would be a good opportunity to have our own major installation on the map of Europe. However, the decision was not taken when it should have been, when a new generation of synchrotrons was on the way, when new uses of biology were appearing, when France was not willing to renew the Paris synchrotron. We have been wasting time.

We have wasted it, I am really convinced of it, since many who, at the beginning, were interested in the project, were not at all enthusiastic about its being done in Catalonia. Meanwhile, France changed its mind and now they have started to build a new large synchrotron in Paris. They have taken this decision because of scientific nationalism, because they are convinced that their role in Europe requires it.

And now the French tell us, in their turn, what the United Kingdom said to France: that since they are building such a large synchrotron, we have no need for another. And why should Spain not participate in financing theirs. And Spain vacillates.

I would like to put a question to all those scientists and politicians of the State who would approve the project of building a synchrotron, but, you will see why, they do not want it to be a Catalan project: Are you sure that you are not mistaken? Are you sure that Spain will be stronger, scientifically and industrially, for having a synchrotron in Paris instead of in Barcelona?

It is time to conclude, but I could not do so without touching on a last issue, perhaps the most important of all. It is the attitude of our society towards science and research.

Although it is widely known, I think it is important to insist that a vibrant scientific structure is only possible if society wishes it. Society must believe that private investment in research is important and must promote it and praise it. And, equally, society must believe that research—sometimes abstract and appearing esoteric—must be the recipient of public funds, sometimes in a privileged way.

These matters are not easy to attain, although they may seem natural for us, being old hands in the trade. We cannot use any magic formulas to make our society, which we should remember has no tradition in this field, provide the means and the organisation to “run at least twice as fast”.

Now, there are some strategies that should be pressed with decision. Let me define two of these strategies, they are complementary: the first going from down to up, the second going from up to down. The down-to-up starts with education and the formation of public opinion, being implemented through many initiatives by our own people, people who are experts in science; understanding the scientific implications and substratum of many of the important topics of today. We have improved in this field: Science and Technology museums, the science week, the CIRIT awards for schools, etc. However we still have a long way to go.

On the other hand, the up-to-down strategy would have an impact on the capacity to generate enthusiasm for excellence. If we communicate well about what we have done and the new things that we are doing, if we explain that our research is good, that it gives us international visibility, and that it can be a reason for pride in our country, the regard of our people towards research and science will grow, of this I am sure.

Therefore, we can see here the ingredients of another implicit agreement, this time between society and its researchers and the research managers. These last must make the effort to achieve the quality of excellence and also the effort of communication.

You will see that, if we do it with realism, enthusiasm and confidence in ourselves, society will begin by following us and then will spur us on. Society will call us to account, and this is a good thing. We will render them accounts with great pleasure, since we will have used the resources given to us well, since we will have the basket full of fruit, and because we will be convinced that we deserve it: that it is a good thing for our people to invest in our research. In short, because all of us, professionals of the field, will have been able to run “at least twice as fast”.

Thank you very much.

