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## **Universities at a Point of Transition**

Dear Rector, dear Distinguished Guests, dear Colleagues, dear Students;

Ladies and Gentlemen.

It is my pleasure and honor to be here today in this magnificent university campus, and to be part of this prestigious event.

For a lot of us, the University is a very special place. Personally, I have spent a considerable percentage of my life in a University environment. During the last 33 years I have either studied or worked at a University, more than half of that time in the United States and for the last 15 years in Europe. Some of the colleagues in the audience have been in a University environment much longer than me. We have all visited many university campuses around the world. While each University is unique, at the same time they all share some common characteristics that we recognize and love. For academics in particular, there is no other place that we would feel more comfortable than at a University campus.

Most of us here today will agree that the traditional University environment is changing worldwide. Of course, the key players and the key facilities are still the same. There are students; there are academics and administrative personnel. We have classrooms and meeting rooms, with desks and chairs, we have laboratories and art studios. There are

still the cherished and memorable interactions between students and between students and professors, and there are still late night debates of how to change the world.

The changes at the University environment are not at the surface of what we see, but they are taking place below the surface, in the way that Universities operate. If we think of Universities as a place for Teaching and Research, there are really big changes taking place in both the Teaching and the Research domains.

Let's first consider teaching, where the changes are just now beginning. The format of teaching has changed little during the last 50 years. However, in the next 50 years I believe that we will witness a phenomenal transformation in the way that teaching, training, and mentoring are taking place at a university level. Nobody really knows what will be the result of this transformation and how long it will take. However, it is clear that technological advances are beginning to facilitate an environment where students are able to receive the very best instruction from the best professors at any place and at any time. Moreover, this instruction does not need to be restricted to traditional class notes, but it can be interactive, personalized and it can be combined with relevant material of the practical implications of the covered topic. And, last but not least, this type of education can cost less than traditional teaching.

We should not underestimate the economics of university education. Overall, the tuition fees in Europe are still at a manageable level due to governments covering part of the tuition costs. However, in some countries like the United States, the cost of university education is way above what people can afford. It is quite common for students to graduate with loans exceeding \$200,000, which becomes alarming if combined with the potential of unemployment for some period of time. Some economists are referring to student loans as the next Big Bubble. This type of environment and the advances in technology will, in my opinion, instigate big changes in university education, which may start from the USA, but it will soon spread around the world.

It is important for Universities to recognize the eminent changes and prepare for it. In fact, the most successful universities will be the ones that not only adapt to upcoming changes but they take the lead in defining the direction of reforms in education and the associated teaching methods. We don't want to follow the example of Kodak, which was

by far the leading company in photography, but it was very slow in transitioning to digital photography, ultimately resulting in its bankruptcy.

Let's now consider changes taking place in the domain of Research. Here, the changes have already long been happening. The challenges for a young academic today beginning a career in a University are quite different than those we faced 25 years ago.

How does a young academic today start his or her research career? Should they focus on doing fundamental research or try to apply a methodology on a real-world problem? Should they try to approach other researchers working in complementary fields in order to pursue multidisciplinary research or simply continue working on their main field of expertise, the one that they feel most comfortable with? How do they obtain research funding? How can they get involved in European projects, many of which require large consortia involving not only universities, but also industrial partners, large and small, and possibly government or non-profit organizations? Should they try to pursue innovation aspects of their research or simply remain within the traditional academic research world?

All these dilemmas can be overwhelming for young academics, no matter how smart they are, how hard they work, how organized they are or how creative they are. Somebody may claim that being a university professor is one of the hardest jobs in the world.

When I started at my first academic job in 1992, I thought I was doing ok but looking back it is now clear that I didn't know what I was doing. Not only I was lost, but I didn't even realize how lost I was. I was trying to find a balance between teaching, research and proposal writing. But I had no plan. I started investigating the topic of fault diagnosis in order to get research funding from a NASA University Center for Health Management Technology, however by the time I obtained my first results and was ready to submit a proposal, NASA stopped supporting the Center, and so it closed down. Nevertheless, I continued my research in fault diagnosis and it is currently one of my key research areas, and the topic of the ERC Advanced Grant that I was awarded in 2012.

During the last 25 years, I have learned a lot. Some of the initiatives I tried were successful, while others failed or didn't lead anywhere. I have learned a lot more by the

failings rather than by the successes. You should not be afraid to fail. Failing is part of the development process. Young children learn at a much faster pace than adults partly because they are not afraid to fail. An unsuccessful attempt is an opportunity to learn. If we simply blame the rest of the world for one of our unsuccessful effort then that is a missed opportunity.

One of the first things that I have learned is to work with people whose personality I like. My research has nothing to do with Chemistry, however having good chemistry with my co-workers is one of the most important components of my research philosophy. Working with people that you enjoy working with can make all the difference in the world. Most people are in jobs that don't allow them to have the luxury of selecting the people that they will collaborate with. In academia, it's possible, and it is important to take advantage of it.

Another lesson that I have learned is the great benefit of working with people that come from a different background. It is much, much easier to work with people who have exactly the same technical background as we do. However, the resulting benefits of a research collaboration can be much higher if you end up collaborating with someone from a different background, and it is definitely worth the higher initial "cost". Most of the key technological and societal challenges that we are currently facing require solutions that are multidisciplinary. Therefore, investing in multidisciplinary collaborations is very important.

When it comes to pursuing a career in Research, selecting what to work on is of paramount importance. On one hand, you want to work on research topics that are important and relevant – the so called hot topics – while on the other hand you don't want to keep on switching from one hot topic to another. In computer science and in business administration, this is sometimes called the *Explore-Exploit dilemma*. You would like to allow time to explore new research directions so that you don't end up being the last one to work on a specific research topic. But you also need to allow time to go into depth. One of the things that I have learned over the years is to try to avoid following others. Instead you want to be the one that others are following. This implies that it may be a good idea not to get into a topic that is already hot and many other

people are already pursuing, especially if you don't have the expertise to add a new dimension to it.

When trying to select research topics, it is important to choose themes that will have impact in the world. I know from personal experience how tempting it is to pursue directions which may lead to interesting results, which however have no connection to reality. How can we tell if what we are working on may have significant impact? After all, Universities is the place where breakthroughs and ground breaking ideas are developed.

For me the litmus test is the following hypothetical scenario: it is Sunday afternoon and I am at a gathering of relatives of different ages, none of whom is in academia or has a technical background. Can I explain to these people what I do for my research and get them excited that I am working on something of significant impact to the world?

I really like the double meaning of the ERC slogan: *Bringing great ideas to life*

Giving life to great ideas, making them a reality. But also, bringing the great ideas to the real world. To life.

Even researchers that are excellent in their individual fields find it hard to compete for funding in the H2020 programme, which is approaching its midway point. Except for the ERC programme and some of the Marie Curie initiatives, the rest require consortia from different technical fields and from different countries. A key philosophy behind the H2020 programme is that not only it tries to integrate the social sciences within the overall programme but it also requires that the exploitation of the results is specific and incorporated into the project. For most individual researchers, having all the contacts and the expertise to put together such a consortium, is out of reach.

To address this issue, I believe it is important for Universities to motivate and invest in the creation of Research Centers, which will have the critical mass and the complementary skills to address specific topics from many different angles. Personally, I am of the opinion that these Research Centers should be created from the bottom-up rather than from the top-down, so that there will be good chemistry between the members – something that is critical to its success and long-term sustainability.

I have focused on all the challenges that academics are facing. Of course, these challenges have always been there, but with the changes that are happening in the University environment, as we speak, they are becoming harder to deal with. Despite these challenges, or maybe because of these challenges, being an academic is one of the best jobs in the world.

Being in an environment of continuous learning is an invaluable privilege. Having the capability to pursue your own research interests and to do that with people that you enjoy working with, should not be taken for granted. We live in a fast changing technological world. Not only are we part of the technological revolutions, but we have the opportunity to define where it will go. As Alan Kay said, the best way to predict the future is to invent it.

Of all the benefits of being an academic, I think by far the most important one is that we are in a position to impact in a positive way the future of young people. For the most part, children that are born in well-educated, wealthy families will grow up to form well-educated, wealthy families themselves; and their children will do the same. Conversely, children that are born in underprivileged families have a high probability to grow up in a similar environment themselves.

I like to think of the University as a shuffling box that can change these straight lines from generation to generation. I like to think of the University as the nonlinear function that can take as input a young man or woman of deprived background and convert them to a well-educated adult, who can lead a meaningful and productive life and can contribute positively to their community; convert them to adults that can educate their own children so that they can also be a positive force in the world; adults who will have the aptitude to vote for the politicians who will put in place the right policies and will safeguard our natural resources for the next generations.

Being part of a University environment that can have such an important impact in people's lives, is why being an academic is one of the best jobs in the world.

I would like to finish with one of my favorites quotes by Albert Einstein.

*Education is what remains after one has forgotten what one has learned in school.*

It refers to how one may forget various facts or formulas or elements of knowledge learned in a school or a university environment; but there are some skills that remain, and these skills are really the fruits that one's education bears. These skills constitute the core added value of a University education. Universities will continue to serve that role even as they may be going through uncertain transformations.

Thank you!

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# Universities at a Point of Transition

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- Changes in Teaching
- Changes in Research



# Lessons Learned

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- Don't be afraid to fail



# Lessons Learned

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- Don't be afraid to fail
- Good Chemistry



# Lessons Learned

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- Don't be afraid to fail
- Good Chemistry
- Multidisciplinarity



# Lessons Learned

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- Don't be afraid to fail
- Good Chemistry
- Multidisciplinarity
- Explore-Exploit dilemma



# Lessons Learned

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- Don't be afraid to fail
- Good Chemistry
- Multidisciplinarity
- Explore-Exploit dilemma
- Research with impact to the world





*Bringing great ideas to life*



# Lessons Learned

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- Don't be afraid to fail
- Good Chemistry
- Multidisciplinarity
- Explore-Exploit dilemma
- Research with impact to the world
- Create a critical mass





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the best jobs in the world?



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Why being an academic is one of  
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*Universities can transform people's  
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