

ERC-2008 College de France:

Good afternoon, to answer the question of What this ERC award represents for me, I would like to remind you two striking events of this year 2008:

Although the US kept their first position at the Olympic Games, China demonstrates its excellence in winning the most and impressive number 51 Gold medals, which shows that excellence is moving to the East.

The second event is the Science debate 2008 where for the first time, presidential candidates had to position themselves in front of 14 major questions related to science and technology and their consequence for the US economy and leadership.

Thus, while at the Olympic Game, we learnt the determination of China, the second event told us that the USA is now struggling to maintain its leadership (confirmed by Bill Gates testimony before the congress of the decline in the US economy competitiveness). The 60-years of US leadership is due to two massive immigration waves first initiated by the WWII and coming from Europe and second initiated by the collapse of Soviet Union and of course by the constant major investment in science and technology motivated by Economic, energetic, basic research and Military matters.

Thus in this international context ERC-SG is for me a moderate but necessary response of Europe to create the basis for the emergence of new ideas in science and technology. The new economy is not coming from digging wells in the ground to collect oil, but rather coming from innovation in science and technology: in some sense, selling a start up company based on new complex algorithms for 100 of millions of Euros is the modern incarnation of the old alchemistry prophecy of transforming heavy metals into gold. I would like to continue by focusing on the direct impact of ERC for me, which can be summarized in three words: **Recognition, Hopes and Responsibilities.**

Recognition: many years ago, I decided to switch from doing pure mathematics all day long to modeling cellular biology. To make this transition possible, I quitted my lecturer position in Paris to start a Postdoc position at the Weizmann institute of Science. This jump was risky and insecure, but challenging. But today, this ERC award shows that I did the right choose. Not only the ERC recognizes this new emerging field at the intersection between applied math, cellular biology and statistical physics, but also my peculiar situation of having a group of theoretician immersed in a department of biology. In addition, this grant was timely, since the proposal aims to continue supporting my on going research which won this ERC-SG competition was unfortunately rejected twice at a national level. Between Perish or survive, I got the opportunity to continue my research. But this situation leads me to the second point of ERC consequence for me, which are hopes:

Hopes:

The process of ERC selection, which involved 27 countries to recognize young scientists is a great opportunity: It sharpens the selection process to support ambitious and creative projects and prevent many of the local politics to interfere with the integrity of the selection process. I would like to report to your attention that at least 8 out 34 projects here in France and financed by ERC were turn down by our National Research Agency. This represents a rate of 23,5 percent of what can be seen as miss evaluation, which is way too high and should not be tolerated especially when written reasons are “too young” or "this project warrants to be coordinated by a known senior scientist". Last year decision by the French ministry of Research to help financing projects that were recognized by ERC but did not go to the end of the process is a great mark of ERC influence in our country. The lecon of ERC, as I see it, is that at the national level, more European leader scientists should be invited to the final step of grant evaluation, and not only called as anonymous referees.

Responsibilities:

So we are expecting to perform outstanding research which starts with hard work, as reminded by us with the legendary picture of the governor who was my boss when I was working at UCSF. We are supposed also to show leadership and I hope that I will be able to attract students especially in Europe which contrary to Asia and India are leaving science. Science is now an open and global market and to win the technology and economy competition, salaries here in France should become normal and challenging. Finally, I hope that through our research, we will be able to put Europe economy number one.

Instead of scientist, we could all have been called the Gipsy of Science: I did my PhD at Paris VI university in the department of Mathematical Physics, then move for 6 months to Italy to Pisa. I continue with another postdoc at Weizmann Institute: there I started to learn and work on biology, learning about neurons, it was in 2000, before cellular modeling attract attention. To complete my learning in biology, I moved to UCSF, the Californian medical center, where I worked on photoreceptor, synaptic and cortical plasticity. I then return to the Weizmann but got in 2004 I was awarded a “Chaire d’excellence” to settle a research group in France.

Today, my group is composed of around 10 members, each one working in understanding cellular biology processes. Let me mentioned some of them.

-In the field of phototransduction, we are interested in understanding how rods can detect a single photon while cones cannot. It turns out that from our modeling, we can predict the undesirable effect of Viagra in inhibiting non specifically, a fundamental enzyme necessary for vision called Phosphodiesterase, thus affecting night vision. We should stress that people should not drive in a dark road after taking a Viagra pill, better to stay overnight when possible.

-We are also interested in cellular organization, synaptic transmission and we develop modeling and numerical methods to simulate molecular dynamics in microdomains that are still unreachable from direct experiments.

- To understand the generation of epilepsy, we are currently modeling the interaction of large population of neuron and glial cells, and use simulation to analyze the condition that lead to epileptic crisis.
- We work on mathematical modeling of refined molecular processes.

My ERC project: Eukaryotic cells are well compartmentalized in many organelles. Proteins and molecules have to travel from the place where they are synthesized to their functional location which can be far away. Similarly, viruses have to reach the nucleus for replication. Single particle tracking has revealed complex trajectory that we would like to understand. In general, **the major goal** of the project is to model molecular intracellular trafficking.

To finish, I would like to thank the CNRS for making this event possible and for invited me. The CNRS is a unique and original research structure in Europe, although it has modest resources. However, in a world dominated by stress and pressure, this institution allows us to enjoy the freedom necessary for long term and deep projects. Thank you.