An Interview

with André Neves

André Neves one of the most distinguished world mathematicians was a member of the Scientific Organising Committee of the Geometric Analysis Conference, July 7-11, 2014, held at the Instituto Superior Técnico, Lisboa, Portugal organized by Miguel Abreu, José Mourão, João P. Nunes and Rosa Sena-Dias and partially sponsored by CIM

The questions presented here are based in several interviews; in particular, the interviews published in previous CIM's bulletins. CIM thanks Renato Soeiro and Alberto Pinto for organizing this interview.

The conference was a success. Among the speakers there were some of current the greatest geometers who came from Stanford, MIT, Princeton, Oxford, etc. Something you would like to highlight?

Many of them came to Lisbon for the first time and they absolutely loved it!

How important do you think that events like this are for students and researchers?

During my last year as an undergraduate at IST, many years ago, I remember having attended a conference in Geometry in which many of the speakers were famous mathematicians and this was highly inspirational/motivational to pursue a PhD in Mathematics. Hopefully, the event in Lisbon that I helped organize will also inspire some students to learn more Mathematics and write a PhD thesis.

On your research: Did you always want to be a mathematician?

Not always. I always enjoyed mathematics but only later I realized that being a mathematician was a ?real? job ! I began to study engineering and then switched to the math degree.

How did you start working in this area? What was the motivation? Could you tell us about your mathematical beginnings, and subsequent career development?

On my first year at Stanford, during my PhD, I attended a geometry course that I loved. As a consequence, I decided to do a PhD in that area with Richard Schoen, the lecturer of this course. After finishing my Phd I did a post-doc at Princeton and stayed there four years. Later, my family and I decided to go back to Europe and I went to the Imperial College in London, where I am now a professor.

How would you describe the essence of your own research to a young student?

The general idea behind of modern geometry is to understand the global shape of a given space knowing only local measures of that space. For example, if we know that the spatial universe has positive scalar curvature, what is its shape?

Which would you say are the most interesting/ challenging open (or recently solved) problems in your area, and what do you think the future reserves in your area and in your line of research?

My research area is going through a very exciting period because, in a short span of time, one has been able to solve several old problems (more than 50 years old) that could never be resolved by other methods. Examples are the Poincaré conjecture in Topology, the conjecture of Willmore in surfaces in theory, or the Penrose Inequality in general relativity.

From this point of view the future is promising because it indicates that the ideas in my field are still not exhausted and that there is plenty to explore.

Do you have a favorite result, yours and/or from others?

More than results, I am fascinated by brilliant ideas that gave great momentum to modern mathematics. For example, about 80 years ago Marston Morse realized that the question of the existence of critical points of a function on some space is closely linked to the topology of that space. In other words, analysis and topology go hand in hand! This idea had a deep impact in mathematics. Another idea that revolutionized mathematics was due to S.T. Yau in the 70s: he realized that certain general principles of analysis like the maximum principle, the heat equation, or integration by parts, can be naturally transported to geometry. This idea is the basis of the solution of the Poincaré conjecture by Perelman.

In terms of my research, the one result I am most proud of is the solution of the Willmore conjecture. For this we combined ideas from analysis, topology and geometry and that gave me a great satisfaction.

Do you have funny story, comment, on some result, or a research episode?

Before starting my PhD, 15 years ago, I went to IMPA, in Brazil, to attend a summer course. At the time, my idea was to study dynamical systems. I ended up not doing it (I went to Stanford to study Geometry) but while I was there, I met Alberto Pinto who showed me Rio de Janeiro. Since that time we became really good friends.