

*Your Majesty, Abel Prize laureate, Honourable Minister of Education and Research, distinguished guests, ladies and gentlemen.*

It is a great privilege and pleasure for me to give this address in my rôle as President of the European Mathematical Society, to honour and to congratulate Professor John Willard Milnor, the recipient of the Abel Prize of the year 2011. This gives me also an exceptional opportunity to praise and to thank the Norwegian Government for having established the Niels Henrik Abel Memorial Fund and the Abel Prize.

By establishing such a prestigious award, the Norwegian Government has turned an old desire of a large part of the mathematical community into a reality. The Abel Prize, which acknowledges scientific contributions of exceptional depth and of the highest significance in mathematics, now fills the gap left by the Nobel Prize in the recognition of one of the more ancient and fundamental sciences.

Within its short existence of just nine years, the Abel Prize is seen as one of the most prestigious awards in mathematics. Brilliant mathematicians from different fields have seen their works rewarded. The Prize is a tribute to the extraordinary minds that have contributed significantly to the progress of the discipline and therefore, to the progress of science and culture. In fact, since the origin of science as a human activity, mathematics has held a privileged position in the core of knowledge.

Your Majesty, it is extremely laudable that your government has achieved the political consensus to create the Abel Prize. Its creation helps maintain the awareness of the international community of Norway as a learned nation, and exhibits worldwide your generous commitment to the fostering of knowledge.

It is also a sign of the intellectual strength and wise vision of Norwegian politicians, to consider raising the status of mathematics in society and stimulating the interest of young people and children in mathematics, as two of the main contributions and reasons for the existence of the award.

Today, some of you have learnt for the first time about the exceptional discoveries by Professor Milnor in topology, geometry and algebra. We have heard and read highly appreciative appraisals of his work: it contains *profound insights, vivid imagination, elements of surprise, supreme beauty.*

It is possible that there is a certain feeling of disorientation among those in the audience who are not mathematicians.

Since our childhood, we have associated geometry with something very concrete: figures that can be drawn and constructed. For example, a rectangle that represents the contour of the house where we live, a sphere that represents the planet Earth that hosts us. But we are much less prepared to grasp the meaning of the *exotic smooth spheres in seven dimensions* that Professor Milnor has discovered. This leaves many of us perplexed and speechless.

Let me go further and mention that, to the eyes of a topologist (a specialist in the mathematical field of topology) like Professor Milnor, there is no single difference between the distorted and melted timepieces of the Catalan painter Salvador Dalí and the classical and harmonious Santos watch, a masterpiece by Cartier. Quite bewildering! Our curiosity, but also incomprehension, will certainly increase.

By the way, it is remarkable that Dalí, my compatriot, has bequeathed such beautiful illustrations of homeomorphisms that all can appreciate and admire.

The general public's lack of understanding of the job of a mathematician is more than a stereotype, it is a frequent and real fact. This happens even in learned circles. In my opinion, two reasons might be that mathematicians often do not use words as material substratum in their process of thinking, and record their thoughts in an esoteric notation. Both of these raise the bar to comprehension.

However, those who understand mathematicians and mathematics, even if partially, (and there are not few of them) praise our beloved discipline. Obviously, we feel very pleased and flattered by this.

Recently, the Minister of Education of my country, the philosopher and professor of metaphysics Ángel Gabilondo, when addressing an audience of mathematicians, said that in his opinion, *mathematics is the central axis of culture; this is by its ability to simplify and to codify what cannot be grasped, by its ability to challenge chance, and to struggle with the logic of paradoxes*. This seems to me an exact perception of the rôle and

characteristics of this science.

But what is the job of a mathematician about?

According to Noam Chomsky, our ignorance can be divided into problems and mysteries. If we accept this statement, then one can say that mathematicians contribute to overcoming ignorance. With our discoveries, we solve problems, and by inventing theories, we resolve mysteries.

It is not now the right time to go into the vivid philosophical debate about whether we discover or invent when we do mathematics. Personally, I place myself at the side of those who think that the two are interwoven. In any case, most will agree that these intellectual processes are very close.

Both involve a large dose of imagination. Presumably, most mathematicians would agree that mathematical discovery is a natural consequence of a process of logic and systematic arguing, and that as such, there is no need for a Muse to transport our minds to a state of irrational perception. Perhaps this detracts a bit of glamour from the profession. There is no need to wait for a Beatrice to lead us to Paradise, as she did for Dante.

Nevertheless, there are many similarities between the intricate process of mathematical discovery and artistic creation. It all starts with a long preliminary work, sometimes at the level of the unconscious. In this step, a huge number of ideas and arguments combine themselves through a tricky exercise. Many of these combinations turn out to be useless or inappropriate. After a selection procedure, the most robust prevail. The French mathematician Jacques Hadamard says that such a choice is imperatively driven by the sense of beauty. In my view, it is steered by something even more immaterial: by the talent and the creativity of the mind that finds the path.

Then, suddenly and unexpectedly, like a thunderbolt, illumination invades the mind. This is a very difficult moment to catch and to describe accurately, because of its instantaneous high intensity. It is a critical point. After this, thoughts retreat, and become more linear, in order to carry out their materialization. This is done with words, with signs, with any of the forms of mathematical language. And with a toolbox, to check, to compute, to make the results precise, to make them useful and available to others. Today, we are honouring John Willard Milnor, a discoverer and an inventor

of the highest calibre. Someone who has fully experienced the intricate steps of the creative process. Someone whose talent has produced exceptional results. A mathematician who has generously shaped his thoughts with an extremely clear and elegant language, making them available to our disposal, and for our pleasure.