TRANSCRIPT

AUSTRIAN SCIENCE SERIES
LECTURE BY THE AUSTRIAN SCIENTIST OF THE YEAR 2004
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Ladies and Gentlemen,

It is a great honor for me to have the opportunity to speak to you about the magic of mathematics, and about math.space.

Let me start with math.space: a project to popularize mathematics and to present this science as an eminent cultural achievement.

What is math.space?

Let me show you a map of Europe. As you all know, Vienna, the capital of Austria, is quite in the middle of Europe.

Let us have a look from above at the center of Vienna. Here, in the very heart of the city, you will find MQ, the so-called MuseumsQuartier, one of the ten biggest museum complexes of the world. Here you see the area of the MuseumsQuartier. The white cube is the building of the Leopold Museum, where you can admire the famous works of Klimt, Schiele and other artists of the beginning 20th century. The dark grey cube is the so-called MuMoK, the museum of modern art, Vienna's little brother, very little brother, of the MoMa in New York.

And here, above the roof top of the MuseumsQuartier, on its topographical peak level – and, so we believe, not only on its topographical peak level – you arrive at math.space.
Within an area of 170 square meters, math.space is too small to be able to show exhibitions like in usual science centers – even if we restricted ourselves only to the discipline of mathematics.

But it is large enough to welcome everyone, from kindergarten children to senior citizens who want to discover and explore the world of numbers and geometrical figures.

The math.space – team organizes, arranges and performs workshops, seminaries, lectures. Since its opening in January 2003, more than 60.000 visitors have participated in numerous performances at math.space.

The event program is prepared and organized under supervision of Austrian mathematicians from the Technical University of Vienna, and sponsored by the

Austrian Federal Ministry for Education and Cultural Affairs and by the City of Vienna, with additional support from several public and private institutions.

Let me give you some examples of math.space series:

For children ages four-and-a-half to seven, math.space presents the program called “We play through mathematics.” Taught without any effort, as part of playing, children learn about the basics of mathematics in a creative way. They gain access to mathematical concepts as numbers, shapes and symmetry. We thereby not only lay a foundation for positive attitudes towards mathematics, but we hope that the children come to their parents saying how they enjoyed mathematics, and thus contradicting the usual uneasy feelings of grown-ups remembering all these numbers and variables and equations they had to learn in school.

Of course, math.space offers alternatives to the usual teaching of mathematics in schools. And we try to persuade the teachers to come with their classes to the MuseumsQuartier.
We arrange, for instance, for elementary school programs under the title “From the smallest point to the biggest number”. Here you see, how eight-year-old children literally grab the Fibonacci numbers. These famous numbers were invented by the early Renaissance mathematician Leonardo da Pisa, called “filius Bonacci”, son of Bonacci, or short: Fibonacci. Trees and rabbits obey the mathematical law according to which the Fibonacci numbers are constructed.

And we go on, in telling stories about mathematics, about the men and women who devoted their lives to this science, and also about the cultural environment in which they lived, and how they influenced it themselves.

In math.space, we are no scientists; we are storytellers.

And we invite excellent scientists and prominent persons to tell their stories about mathematics, too. For example, in November 2005 a lecture will be given by Stefan Zapotocky, who is the general director of the Vienna Stock Market. He discusses the coherency between mathematics and stock exchange transactions, connecting the dots between dull theory and thrilling practice.

Or we invited Silvia Nasar, author of the bestseller “A beautiful mind” – you probably saw the movie, starring Russell Crowe.

She told us the exciting story of the mathematician John Nash, one of the founders of the Modern Game Theory, who suddenly suffered from schizophrenia and, after a thirty-year-long life in darkness, conquered his disease and received the Nobel Prize – not in mathematics of course, this prize doesn’t exist, but in economics.

Finally math.space arranges a big lecture series on Wednesday-evenings for the general public. Last year and this year Einstein was our hero, and we discussed how he used mathematics.

Another hero is Carl Friedrich Gauss, the famous mathematician who died exactly 150 years ago, and who at least is well-known as a “Wunderkind”, a young genius, similar to Mozart: As a boy of seven, he could add all numbers from one to one hundred within a few seconds. And when he walked with his father through the forest, he told his father that there must be at least two trees here with exactly the same number of needles, because the forest contains more trees than needles can be found on a single tree.

To give you an idea about math.space-stories, I will start with the beginning of mathematics, with Pythagoras, the founder of the Pythagorean School. Legend has it that the Pythagoreans had a secret seal, the pentagram. It has a most remarkable shape: The diagonal of the pentagram is intersected by two other diagonals so that we gain four straight lines: the diagonal and the lateral of the original pentagram, and then the diagonal and the lateral of the inscribed pentagon.

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This, however, is only the beginning. Archimedes has already discovered another geometric ratio that later turned out to be irrational: The ratio between circumference and diameter of a circle, which is designated by the Greek letter pi.

Since it is irrational, pi cannot be represented as a finite decimal number – the commonly known value of 3.14159 is only a crude approximation – and can never have a periodical sequence in its decimals.

At around 1600, the Dutchman Ludolph van Ceulen inscribed – only as a mental operation of course – a polygon of 4.6 quadrillion vertices in a circle, and thus computed 35 digits after the decimal point of pi.

Naturally, this is not the accurate value either. The most powerful computer available today has produced a far greater number of digits after the decimal point, the current record is at more than 1.24 trillion digits.

The meaning of this is best conveyed by the image of a book, or rather a huge library with a quarter of a million books containing a thousand pages each, 248 million pages with 5000 characters a page, and page after page most monotonously filled with the decimal digits of pi. And no hope of even the slightest regularity in the sequence of numbers. On the contrary, the figures 0 to 9 seem to crop up as randomly as the numbers 0 to 36 at the roulette tables of Monte Carlo. And the weirdest thing about this obstinate computation of the digits

of pi is that even knowing a trillion digits will tell us next to nothing about the decimal development as such.

Even a hundred quad zillion would achieve hardly anything, because we know that the decimal development of pi does not stop. Whatever the might and capacity of the most powerful computer ever to be devised by man, it will never be able to deliver to us the infinite number of decimal digits of pi.

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So we return to the infinite, and I will give you one of the most drastic illustrations of it. This illustration is provided by the Polish-born artist Roman Opalka in France who, in a near-manic obsession, has been working since 1965 on a project of incredible size: He puts numbers in finely stenciled script on huge canvases. Starting from “one” all that time ago, he is still painting number after number – 4187313, 4187314, 4187315, …
He paints the numerals, he speaks them, he appropriates them by naming them, and by the same act, bestows them to future viewers, who unless they stand very close won’t even see them, but will see an iridescent sea of grey instead.

But the point here is that Opalka knows – and so do we – that his project is doomed. Even if he found an equally obsessed successor, and even if all of humankind joined in and continued his counting, the project would be certain to fail, the counting process being unmanageable in its dimensions.

So if everything of the universe will fade away- be it in the Armageddon of the “big crunch,” be it in the “final freeze” of total chaos- the idea of the infinite will persist.

Infinity, the topic of mathematics.

(End)