DESCARTES PRIZE EXCELLENT SCIENTIFIC RESEARCH

VNR Ist-QuComm

TC IN : 00 :03 :00 :00
TC OUT : 00 :11 :34:15
DURATION : 00 :08 :34 :15

TRANSCRIPT :

Voice Off:
TC IN: 00:03:34:18
The Institute of Experimental Physics at Vienna University. Researchers from all corners of Europe meet regularly to discuss their common passion: quantum physics.
TC OUT:00:03:46:20

ITW AntonZeilinger, Universität Wien, Austria
TC IN: 00:03:51:07
"Quantum physics saw the light at the beginning of the twentieth century, in an effort to describe the behaviour of atoms and elementary particles. Today, we know that quantum physics lies at the foundation of many technologies on the cutting edge, such as semi-conductors and consequently computers, lasers and many more."
TC OUT:00:04:15:12

Voice Off:
TC IN: 00:04:16:01
This network of European researchers contributes to a common project called IST Qucomm, referring to Long Distance Photonic Quantum Communication. The project particularly deals with a fascinating property of quantum physics: quantum teleportation. It takes another concept, called intrication, to understand quantum teleportation.
TC OUT:00:04:36:10

ITW Anders Karlsson, Kungl Tekniska Högskolan, Stockholm, Sweden
TC IN: 00:04:36:15
"You know that twins have identical characteristics: they wear the same clothes and have similar comportment. With twin photons, which are twin light particles, these characteristics are much stronger than anything accepted by traditional physics."
TC OUT:00:04:54:18

ITW Wanton Zeilinger, Universität Wien
TC IN: 00:04:55:12
"Intrication means that two systems become identical when they are measured – the two particles acquire the same properties – whereas before the measurement, neither of these particles was in a particular state."
TC OUT:00:05:08:14

Voice Off:
TC IN: 00:05:10:00
The very first step in quantum teleportation therefore consists of producing intricated light particles.
TC OUT:00:05:16:03

ITW Andreas Poppe, Femto Lasers, Vienna, Austria
TC IN: 00:05:16:14
"Here is the source of our intricated photons. It is an ultraviolet laser diode focused on a non-linear crystal. The two intricated photons are created in this junction; the photons are then carried by optic fibres to receptors, where they can be measured."
TC OUT:00:05:42:05

Voice Off:
TC IN: 00:05:42:05
At this time, we can truly speak of teleportation. This, of course, is not the teleportation of a living being like on "Star Trek". Scientists have managed to teleport the quantum state of intricated photons. This includes their polarisation, their magnetic fields, their movements. In other words the information contained in these light particles.
TC OUT:00:06:00:20

ITW Anders Karlsson, Kungl Tekniska Högskolan, Stockholm, Sweden
TC IN: 00:06:01:04
"Follow my reasoning. I take my intricated photons. If I separate them, they still maintain their twin characteristics. If I want to teleport a third photon, its structure, its characteristics, I take it and measure it with regard to one of the two intricated photons. Then by means of a normal channel, I send some information to the twin that is over there. Since these two are identical, I can measure the characteristics of the teleported photon as compared to the first twin. Finally, the entirety is teleported from the first twin to the third photon, without displacing it. It was teleported."
TC OUT:00:06:48:11

Voice off:
TC IN: 00:06:50:00
What is new here is not the teleportation in itself – that was accomplished for the first time in 1998 – but the conditions of the experiment. It is being done outside a laboratory over record distances. Researchers have in fact managed to teleport photons from one bank of the Danube to the other.
TC OUT:00:07:07:01

ITW Rupert Ursin, Universität Wien, Austria
TC IN: 00:07:09:00
"We were standing on one of the banks of the Danube, in the Alice Laboratory. This is the name we have given to the teleportation centre to which we are connected – with an optic fibre that we call "quantum channel" connected to the other bank of the Danube 600 m away. That's where Bob and his receptor are located. This is where he receives the quantum states of these light particles. To make an analogy, we could say that I am describing all the quantum states of my photon on this book and that I transmit them to Bob by means of what we could call the quantum channel. But for Bob to know where he has to start reading, Alice and Bob also need a normal channel, in this case a microwave connection. This normal channel lets Alice explain to Bob where he has to open the book to be able to measure the correct value of the photon."
TC OUT:00:08:12:14

Voice Off:
TC IN: 00:08:12:15
Not far from the Danube, another experiment in quantum physics is still going forward. Scientists are trying to increase the distance of teleportation, but directly in the atmosphere rather than through optic fibres. The scientists are using telescopes pointed at each other. The source is located at the Kuffner Stermnwarte observatory in the Vienna hills and the receptors are housed at the summit of two buildings in the centre of town. They are 5 and 8 km from the observatory.
TC OUT:00:08:39:13

ITW Kevin R. Esch, Universität Wien, Austria
TC IN: 00:08:40:12
" One advantage of the free space links is that there are situations when it is not possible to put optical fibbers. One could imagine the case where two airplanes wanted to communicate with each other via optical signals, or one situation that we are considering is ground-based station communicating with an orbiting satellite. This is one of the applications for the future. »
TC OUT:00:09:06:18

Voice off:
TC IN: 00:09:07:13
"These quantum properties pay a major role in tomorrow's computer communications. Intrication also provides an optimal response for data security. Because it authorizes an exchange of messages coded in the properties of the teleported objects, if a hacker tries to break into the network, both parties would be informed immediately."
TC OUT:00:09:27:20

ITW Anton Zeilinger, Universität Wien
TC IN : 00 :09 :27 :21
"The main application is quantum cryptography. By measuring many pairs of intricated particles, we get random sequences of results. These can be used to send a message in a code that is impossible to break."
TC OUT:00:09:46:04

Voice off:
TC IN: 00:09:48:00
Quantum computers will probably be made in about twenty years' time. The 0 and 1 in binary language will be replaced by quantum bits, offering inconceivable calculation power.
TC OUT:00:09:58:05

ITW Anton Zeilinger, Universität Wien
TC IN: 00:10:02:12
"The main objective for the future is to develop quantum computers. Two quantum computers could dialogue by means of teleportation. A quantum computer is designed so that the central unit is composed of atoms; in other words, this is a milieu where quantum laws apply perfectly. The output of a quantum computer will therefore be a quantum state. Teleportation would be the perfect means of using this as input in another quantum computer."
TC OUT:00:10:36:02

Voice Off:
TC IN: 00:10:36:03
The success of these many experiments shows the effectiveness of research in a network. For this reason, these scientists' general project has just won one of the two Descartes 2004 prizes – a European prize awarded not to a team of researchers but to several teams of researchers. Like the Nobel prize, this distinction recognizes significant discoveries in the field of sciences.
TC OUT:00:11:02:10

ITW Anders Karlsson, Kungl Tekniska Högskolan, Stockholm, Sweden
TC IN: 00:11:06:00
"I really like the idea of the Descartes prize, because it throws a better light on European research and underlines the collaboration between European researchers. So the population can better understand that research is useful and that in a way its successful results recover the financing it has been awarded."
TC OUT:00:11:34:15

INTERNATIONAL VERSION :

TC IN : 00 :12 :00 :00
TC OUT : 00 :20 :34 :15
DURATION : 00 :08 :34 :15

RUSHES :

1. **ITW Andreas Poppe**

TC IN: 00 :21 :00 :00
TC OUT:00 :21 :26 :10

2. **ITW Rupert Ursin**

TC IN: 00 :21 :26 :11
TC OUT:00 :22 :29 :23

3. **Scientists entering a building**

TC IN: 00 :22 :29 :24
TC OUT:00 :22 :55 :13

4. **Scientific experiment**

TC IN: 00 :22 :55 :14
TC OUT:00 :23 :53 :06

5. **Scientist working on machines and computers**

TC IN: 00 :23 :53 :07
TC OUT:00 :24 :30 :17

6. **Scientist walking under the Danube**

TC IN: 00 :24 :30 :18
TC OUT:00 :25 :15 :14

7. **Scientist working on an experiment**

TC IN: 00 :25 :15 :15
TC OUT:00 :25 :23 :16

8. **Several views of a building**

TC IN: 00 :25 :53 :17
TC OUT:00 :26 :53 :01

9. **Several views of Vienna**

TC IN: 00 :26 :33 :02
TC OUT: 00:27 :54 :11

10. **Scientists talking in font of a black board**

TC IN: 00 :27 :54 :12
TC OUT:00 :28 :33 :11