

## **Dietrich Leibfried**

Dietrich Leibfried has been working in the field of quantum information since his post-doctoral time in David Wineland's group at NIST in 1995. From 1998 to 2001 he collaborated with Rainer Blatt in the other leading group pursuing quantum information processing with trapped ions, holding an assistant professor position at the University of Innsbruck. In spring 2001 he joined NIST on a permanent basis as co-leader of the group working on quantum information with trapped ions there.

Born 1965 in Stuttgart, Germany, Leibfried was interested in many things other than physics during high school, but decided that physics could be a solid foundation for becoming an airplane designer when he started college in 1985 at the Ludwig-Maximilians University in Munich. The foundation proved to be so interesting that he soon decided to dig deeper instead of flying high. He received his diploma (1991) and doctors degree (1995) in physics while working on precision laser spectroscopy of hydrogen with Theodor W. Hänsch at the Max-Planck Institute for Quantum Optics in Garching, Germany. Ted Hänsch won the 2005 Nobel-prize for his contributions to laser based precision spectroscopy.

The start of Leibfried's post-doctoral time in David Wineland's group of at the National Institute of Standards and Technology (NIST) was almost coincident with Ignacio Cirac and Peter Zoller's proposal for quantum computation based on trapped ions (1996). Consequently he was working on some of the first experiments demonstrating the control over quantum states in trapped ions to back up Cirac and Zoller's ideas. The NIST group also came up with several key ideas on how quantum computers based on trapped ions could be advanced to a large scale. After that, he joined Rainer Blatt's team at the University of Innsbruck in 1998. Starting from an empty lab in 1996, Blatt's team has now established itself as the second leading group in quantum computing with trapped ions.

In 2001 Leibfried returned to NIST to take the position of co-leader (together with David Wineland) of the group working on quantum information with trapped ions. Since then, the group has demonstrated a new technique for quantum gates that is slightly different from Cirac and Zoller's approach. Based on this gate technique and the ideas for scale-up originating in 1997 the NIST group was able to demonstrate several milestones towards larger scale and robust quantum computing such as quantum teleportation, quantum error correction, a three-qubit quantum-Fourier transform and entangled states of up to six qubits.

Leibfried's honors include the 1993 Helmholtz-prize of the German national institute for physics (PTB), the 2000 START-prize for young researchers of the Austrian Science Foundation (FWF) and the 2004 Rudolf-Kaiser prize of the Stifterverband der Wissenschaften in Germany. He has published more than 60 peer-reviewed articles.