ed one of his algorithms and confirmed Grover's idea," Bucksbaum said.

"It is important to keep this study in perspective," he said. "Quantum phase data storage is a new concept. Most researchers are using the spin of a quantum particle as a storage medium. Our work may turn out to be a step on the pathway to a viable quantum computer system or it could be a complete dead-end. The field is still too new to know which approach will succeed."

John Reffner Receives 2000 Williams-Wright Award

John A. Reffner, technical director of SensIR Technologies, has been named recipient of the 2000 Williams-Wright Award from the 2000 Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy held in March in New Orleans, Louisiana. He is being honored for his work toward the development of infrared microspectroscopy (IMS).

In collaboration with colleagues, Reffner raised the standards for Fourier transform infrared spectroscopy (FTIR) microscopes and expanded the applications of IMS, which led to the development of new infrared microscopes and rapid advances in infrared microanalysis, spectral mapping, and quantitative microspectroscopy.

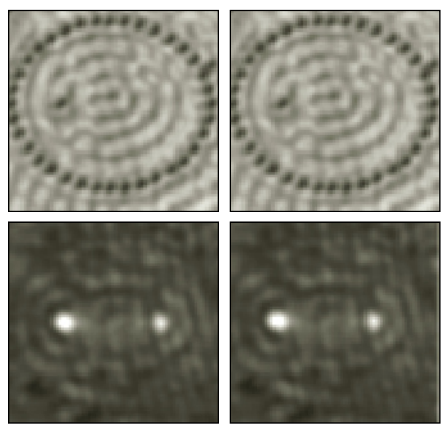
Reffner received his PhD degree from the University of Connecticut, where he was assistant director of the Institute of Materials Science and a member of the chemistry faculty. He has held research and scientist positions at B.F. Goodrich, W.C. McCrone Associates, American Cyanamid, and Spectra-Tech. He joined SensIR Technologies in 1998. Since 1974, Reffner has served as forensic consultant to the Connecticut State Police. He is a Fellow of the Academy of Forensic Science and serves on the editorial board of the *Journal of Forensic Science*. He is a member of several scientific and professional associations, including the Coblentz Society and the Society of Applied Spectroscopy.

This award has been presented by the Coblentz Society since 1978.

"Quantum Mirage" May Enable Atom-Scale Circuits

As computer-circuit features shrink toward atomic dimensions, the behavior of electrons changes from being like particles described by classical physics to being like waves described by quantum mechanics. For example, on such small scales, tiny wires do not conduct electrons as well as classical theory predicts. Therefore, quantum analogues for many traditional functions must be available if nanocircuits are to achieve the desired performance advantages of their small size. Researchers at IBM Almaden Research Center have discovered a way to transport information on the atomic scale that uses the wave nature of electrons instead of conventional wiring. They call this phenomenon the "quantum mirage" effect.

Physicists Hari C. Manoharan and Christopher P. Lutz and IBM Fellow Donald M. Eigler, lead researcher on this project, describe their research in the February 3 issue of *Nature*. Using a low-temperature scanning tunneling microscope (STM), they created the quantum mirage by first moving several dozen cobalt atoms on a copper surface into an ellipse-shaped ring. The ring atoms acted



This four-part composite image shows the "quantum mirage" effect in action. When a magnetic cobalt atom is placed at a focus point of an elliptical corral (upper left), some of its properties also appear at the other focus (lower left), where no atoms exist. In this case, a change in the surface electrons due to the cobalt's magnetism—the Kondo resonance—appears as a bright spot at each focus. When the cobalt atom is placed elsewhere within the ellipse but not at a focus point (upper right), the mirage disappears (lower right), and the Kondo effect is detected only at the cobalt atom itself. The corral is made of 36 cobalt atoms positioned on a copper [111] surface.