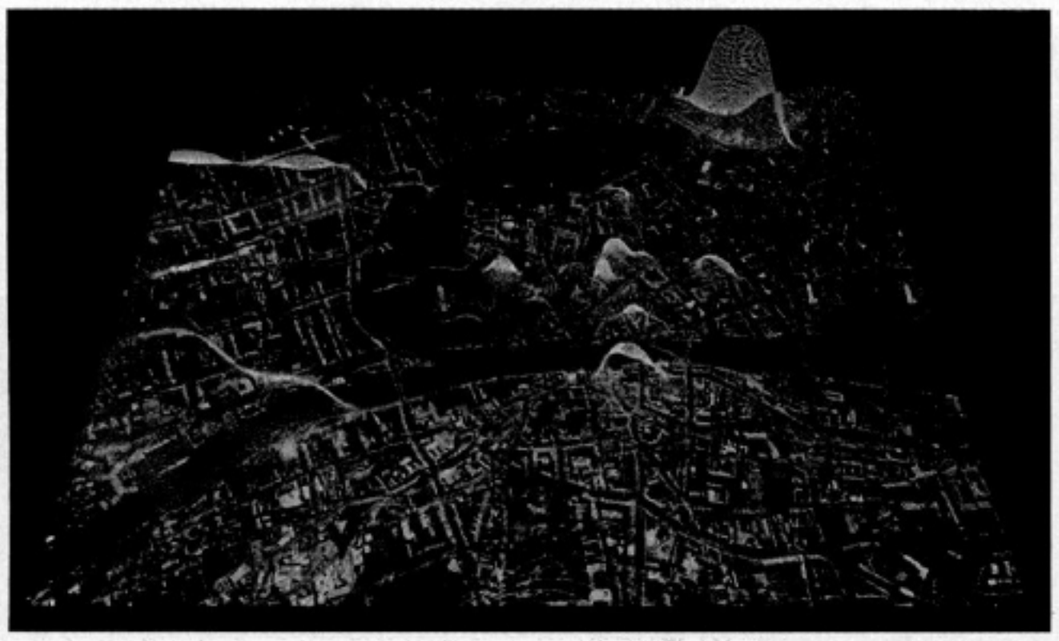

RESEARCH UPDATE
BY MATTHEW MILLER

Electronic maps track cell-phone use

Researchers at the Massachusetts Institute of Technology's Mobile Landscapes project have mapped the city of Graz, Austria, in real time by monitoring the usage of tens of thousands of cell phones. The researchers obtained anonymous cell-phone data from the leading cell-phone operator in Austria, A1/Mobilkom (www.a1.net), to develop the project. The technology creates electronic maps of cell-phone use in the metropolitan area of Graz, Austria's second-largest city.

To obtain the maps, researchers used the density, origins, and destinations of cell-phone calls and the position of users they tracked at regular intervals. They used this data to create computer-generated images that they then overlay with one another and with geographic and street maps of a city to show the peaks and valleys of the landscape, as well as the peaks in cell-phone use (photo). Locating and tracking mobile devices target use in law enforcement and urban planning. "This technology opens up new possibilities for urban studies and planning," says Carlo Ratti, an architect and engineer at MIT. "The real-time city is now real: a system that can continuously sense its condition and can quickly react." To learn more, go to http://web.mit.edu/newsoffice/2005/cellphones.html. For real-time images of Graz, go to http://senseable.mit.edu/projects/graz/graz.htm.

Massachusetts Institute of Technology, www.mit.edu.

Ethernet-over-optical transmission achieves 100 Gbps

Lucent Technologies has announced the first transmissions of 100-Gbps Ethernet-over-optical technology. A research team at the company delivered a 107-Gbps optical-data stream, representing 100-Gbps data transmission and a 7% overhead for error correction. The technique uses duobinary signaling and a single-chip optical equalizer. Duobinary signaling uses positive, negative, and zero signal levels to represent a binary signal for communications transmission. The signals require less bandwidth than traditional NRZ (non-return-to-zero) signals. The optical equalizer, which Bell Labs invented two years ago, compensates for almost all intersymbol interference arising from modulator-bandwidth limitations in an optical, 107-Gbps, NRZ, electronic-time-division-multiplexing transmitter.

Lucent Technologies, www.lucent.com.

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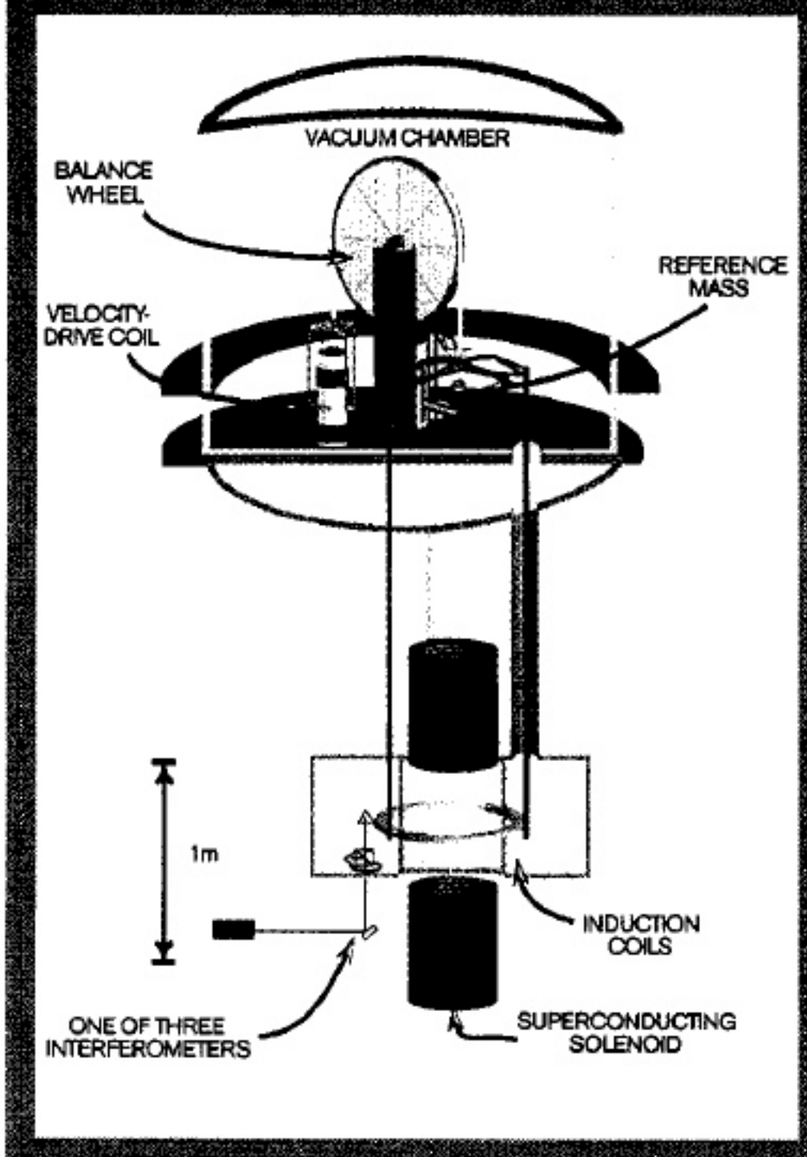
Watt-balance method accurately defines the kilogram



Researchers at the National Institute of Standards and Technology have spent years conducting experiments to find a reliable definition based in nature to replace the current international standard for the kilogram, a century-old cylinder of platinum-indium alloy about the size of a plum. Now, they have achieved that goal, using a watt-balance method they first tried in 1998. This time, they received the same results as with earlier experiments but with better accuracy, thanks to improved hardware.

The watt balance is a two-story-high apparatus that redefines mass in terms of fundamental physics and quantum standards. It measures the force necessary to balance a 1-kg-mass artifact against the pull of the Earth's gravity, as well as two electrical values (photo). The watt balance is one of two leading approaches for redefining the kilogram. The other approach counts how many atoms of a specific atomic mass equal the mass of 1 kg. The latest NIST measurements have an uncertainty of 0.052 ppm compared with 0.087 ppm in the 1998 experiments. These measurements are more precise than any previous results by any research group using either approach.

For additional background on efforts to redefine the kilogram in terms of natural properties, see www.nist.gov/public_affairs/newsfromnist_redef_kilogram.htm.

▸ **National Institute of Standards and Technology**, www.nist.gov.