



Wall Street & Technology

search wst

Go

Advanced Search

news and analysis

The IT Wire
In Depth
Current Issue
Back Issues
WS&T Week
Supplements



wst marketplace

Data-Mgmt. Challenge
STP Challenge
Wealth Mgmt. Challenge
Product Functionality
Charts
Market & Credit Risk
Operational Risk
Portfolio Mgmt. Sys.
Trade Order Mgmt.
WST Buyers' Guide
Solutions Center
RFP Central

resources

Resource Centers
Electronic Trading
Invest. Mgmt. Tech.
Market Data
Risk Mgmt. Tech.
STP
Wireless
Tech Library
IT Career Center
Reader Advisory Board

events

Upcoming

- ▶ Electronic Communication Compliance Solutions: To Build or To Buy
- ▶ Wealth Management Conference
- ▶ Capitalizing on CRM: The Wealth Management Connection

Previous



Wall Street & Technology
online
Part Of The InformationWeek Media Network

[Home](#) > [techwire](#) > [Story](#)

Darpa Head Skeptical About Quantum Computing

Date: Aug 21, 2003

Publication: EET

By: Ron Wilson

PALO ALTO, Calif. - The director of a Pentagon technology office offered a bit of welcome caution about the prospects for quantum computing at the Hot Chips conference here on Tuesday (Aug. 19).

Robert Leheny, director of the Microsystems Technology Office at the Defense Advanced Research Projects Agency (Darpa, Arlington, Va.), offered his office's view of the future promises-and possible dead-ends-in microelectronics at a keynote speech. He covered the future of digital CMOS, for new materials and MEMS.

It was quantum computing that came in for the most skepticism. "They have elegant mathematics," Leheny observed. "What they do is to set up an equation, and let the quantum devices solve it over time. But that is an analog computer.

"And it has all the problems of an analog computer," Leheny continued. "You might observe that the current through a capacitor is almost a perfect integrator. But how do you solve an n-th-order differential equation with it? The problem with analog computers was always scaling, and that is the problem with quantum computing as well."

Leheny said the concept of self-assembly was often cited as an advantage of nanoscale systems. "But it's not new," he argued. "If you think that today's ICs aren't to an extent self-assembling, you haven't paid attention to what's going on in IC fabrication. And you can bet that as we get closer to the physical limits of IC processing, we will see chemical processes for self-assembly playing a greater role."

Following the Moore's Law curve toward an eventual physics-induced train wreck somewhere near 25 nm, Leheny forecast that the computing power on a single die would approach that of the largest "gymnasium-sized machines" available today. Noting that IBM's most recent supercomputer had defeated chess masters, he suggested that before the end of scaling single chips would emerge that would be capable of something approaching human thought.

But this might not happen without changes. Leheny noted that both SiGe and InP materials were showing far better ability to handle high frequencies than did native silicon. Today, he said, SiGe had a distinct advantage because SiGe devices scaled far better than InP devices.

Darpa is funding work on modified InP transistors that could solve this problem.

Leheny predicted two major advances in optics. One is based on the fact that vertical-cavity, surface-emitting lasers (VCSELs) have fabrication costs near those of LEDs, allowing designers to fabricate them in numbers on a system-level chip. This, he said, would open new avenues for interconnect technology. One of these, based on the ability to fabricate dense, very regular arrays of optical waveguides, might be the development of a form of dWDM on-chip.

Leheny said the ability of MEMS structures to vibrate at radio frequencies and to be electrically tunable offers the possibility of tunable MEMS RF filters. Another was at the interaction between MEMS and optics. He went on to suggest that synthetic aperture techniques, entirely analogous to those used in radar, could be used to extract high-resolution images from tiny compound lenses on an IC.

Utilities

- [Print this article](#)
- [e-mail this article](#)

Subscribe

[Subscribe to WS&T magazine](#)

[Subscribe to Wall Street & Technology Week](#)

[Renew Wall Street & Technology Week](#)

White Papers

Search our TechLibrary:

Go

Related Articles