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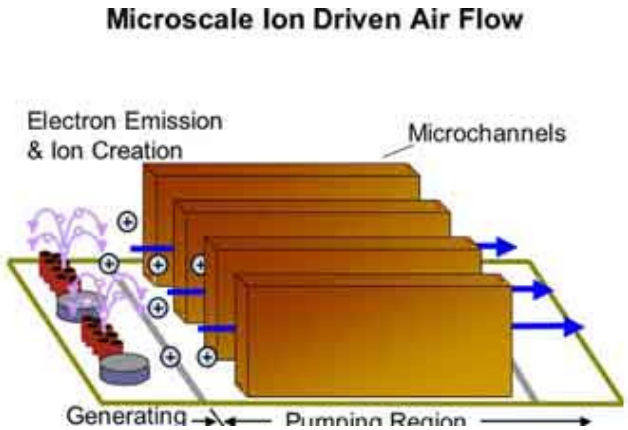
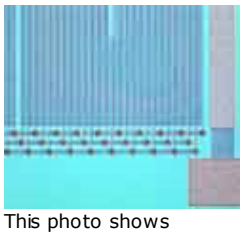
Press Release 04-039

A Tiny Wind to Cool the Tiniest Circuits

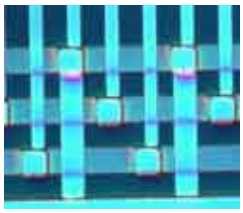
Researchers develop miniature cooling system that generates nanoscale breezes



This diagram depicts one version of a new type of cooling technology for computers.
Credit and Larger Version



This photo shows electrodes in a "pumping region" of the device.
Credit and Larger Version



This is a close-up photo of electrodes in the "pumping region" of a new type of cooling te
Credit and Larger Version

March 31, 2004

ARLINGTON, Va.—Researchers have crafted miniature cooling systems similar in concept to the silent fans now available to filter and circulate the air in homes, but the miniscule "fans" are only microns (millionths of a meter) across. Using minute voltages, the devices generate ions that discharge to create small breezes -- perfect for cooling cell phones, laptop computers, and the tiniest devices.

As electronics shrink, so must the cooling systems that keep them from overheating. The new technology developed at Purdue University is at the right scale for tiny electronic machines. The system's electrodes are crafted from carbon nanotubes only five nanometers (billionths of a meter) across at the tip, and the device does not use water or other cumbersome cooling fluids.

As power per chip shrinks, hotspots are confined to a smaller place and localized, says Richard Smith, a thermal systems expert and the National Science Foundation program officer who oversees some of the Purdue research team's funding. In this research, the total amount of energy to dissipate is not as important as the energy dispersed at such a fine scale.

The researchers behind this discovery include: Suresh

Garimella, a professor of mechanical engineering at Purdue University, West Lafyette, Ind. and the NSF Compact High Performance Cooling Technologies Research Center (CTRC); Timothy Fisher, associate professor of mechanical engineering at the university; Daniel J. Schlitz , who recently earned a doctoral degree from Purdue; and doctoral student Vishal Singhal. Schlitz and Singhal were awarded business startup funds from Purdue to commercialize the cooling system.

What the researchers say:

"This device has the potential to make a cooling system that is an order of magnitude smaller than current technology." - Dan Schlitz

"The exciting attribute of this work is that it has the potential to provide heat removal rates that are similar to that of liquid cooling, but accomplishes this with air and in a very compact volume." - Suresh Garimella

NSF comments regarding the research discovery:

"Temperature control of sub-millimeter electronic systems is critical for a wide variety of advanced technologies that rely on computer chips and small-scale electronics." - Richard Smith

"Cooling with air, if successful, is an elegant solution because air is readily available and doesn't need to be stored, and unlike some other chemicals, air is part of our environment, not a potential contaminant." - Richard Smith

"Novel cooling techniques may prove essential for the next generation of laptop computers, cell phones, sensing systems, and many other types of portable microelectronics." - Richard Smith

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For additional information, see the Purdue University release at:
http://news.uns.purdue.edu/UNS/html4ever/2004/040322.Garimella.nanolight.html

Compact High Performance Cooling Technologies Research Center (CTRC)
www.ecn.purdue.edu/CTRC

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Last Updated:
December 7, 2004
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