R&D 100 winners

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ing decades, entries that later became household names include Polacolor film (1963), the flashcube (1965), the automated teller machine (1973), the halogen lamp (1974), the fax machine (1975), the liquid crystal display (1980), the printer (1986), the Kodak Photo CD (1991), the Nicoderm antismoking patch (1992), Taxol anti-cancer drug (1993), lab on a chip (1996), and HDTV (1998).

The sole criterion for winning, according to a description released by the magazine, "is demonstrable technological significance compared with competing products and technologies." Properties noted by judges include smaller size, faster speed, greater efficiency, and "higher environmental consciousness."

Electro-optics, high-tech materials, and energy innovation are staples of the R&D 100 Awards, but the magazine has responded to new technologies by creating additional categories. Winners have been chosen in the fields of analytical instruments and processes, electronics, testing and measurement, software, environmental technology, and advanced biomedical devices and systems.

Winners will be presented plaques at a formal banquet in October at Chicago's Navy Pier.

Brief descriptions of the seven winning Sandia technologies follow:

SnifferStar

It's hard enough to keep track of where you are on a battlefield. Imagine trying to keep track of what you are breathing.

Helping US forces of the future may be an extremely lightweight mobile chemical sensor created by Doug Adkins with George Dulleck, Greg Frye-Mason, Pat Lewis, Richard Kottenstette, Edwin Heller, Ronald Manginell (all Sandians), and Clifford Megerle, formerly a Senior Technical Staff Member at Lockheed Martin.

SnifferStar™ mounts on a drone aircraft for remote surveillance of battlefield situations where suspect plumes or clouds are present. The detector's primary purpose is to save lives by warning soldiers that chemical weapons are present on a battlefield. Developed under a Shared Vision program with Lockheed Martin, the entire module weighs less than a golf ball, operates on less than 0.5 watts, and uses the wind generated by the motion of the craft to collect samples for analysis. SnifferStar is sensitive to both blister and nerve agents. It ignores common interferents and analyzes chemical warfare agents in 20 seconds.

Says Doug, "Such rapid analysis currently is not possible with any other package near this size."

The device also has possibilities for use in or near the ventilation systems of buildings, or, with addition of small pumps to force air into the device, on posts surrounding military bases.

— *Neal Singer*

Sandia R&D 100 Awards by year

Here are the number of R&D 100 awards Sandia has won or shared in recent years:

2003	7
2002	2
2001	3
2000	1
1999	3
1998	3
1997	8
1996	6
1995	1

RESEARCHER Kevin Krenz (8729) inspects components in the first-generation Extreme Ultraviolet Lithography tool. EUVL was one of seven R&D 100 awards won by Sandia in 2003. (Photo by Randy Montoya)

Congratulations to winners from Labs President Paul Robinson

I told a group recently that, ever since the physics advances of the 1930s and the Manhattan Project success that grew out of it, governments around the world pay much more attention to leading edge research and development. That need is what led to national labs, and one of our major functions is to participate in leading edge technology creation, in order to be alert to how to apply new developments. This year's R&D 100 Awards testify to the success we and our sister labs are achieving in that quest. Congratulations to all of the alert Sandians who pushed the frontiers and created important applications.

Extreme Ultraviolet Lithography Full-field Step-Scan System

More than 50 Sandians and collaborators from Lawrence Livermore (LLNL) and Lawrence Berkeley national laboratories were honored for this technological advance that will lead to dramatic improvements in the speed and memory of computer systems. They created the only system that can pattern full chip-size areas on silicon wafers with features as small as 50nm. It is the embodiment of a set of groundbreaking technologies that were considered by many to be impossible as recently as a few years ago. Commercialization of this breakthrough will allow advances in microelectronics to continue into the next decade.

In addition to the national laboratory team, the award is also being given jointly to Northrop Grumman Space Technology/Cutting Edge Optronics. The work was done in partnership with an industrial consortium comprising Intel, Motorola, AMD, Infineon, IBM, and Micron. Intel ordered the first production-level instrument based on this technology last year.

— *Nancy Garcia*

ETO: Mitigating electrical network problems

Lightning strikes, equipment failures, or other anomalies in electric powered transmission systems can cause brown-outs or even network failures. But a fast-response semiconductor device developed under the direction of Stan Atcitty (2522) allows a utility to rapidly convert energy stored in a DC device into AC power and minimize the negative effects of such interruptions on electrical devices.

Under the auspices of the DOE Energy Storage Systems Program, Stan led researchers at Virginia Tech in Blacksburg, Va., in the development of the advanced semiconductor unit. Called an ETO (emitter turn-off thyristor), the three-terminal semiconductor device is similar to a MOSFET (metal oxide semiconductor/field effect transistor) but capable of switching greater power at high frequencies. The ETO, rated at 4000A and 4500V, can switch power at 1-3 kHz.

"This component could become a critical part of inverters, motor controllers, and many other power electronics systems that require medium voltage and high-current switches," says Stan.

Another possible use for the device is in the US Navy's All-Electric Ship Initiative. Says Stan, "Once you mention an all-electric ship, you need high-power switching devices like the ETO to manage power flow on a ship."

The DOE program that supported the ETO development is managed at Sandia by Energy and Transportation Security Center 6200.

The ETO R&D 100 application was a joint entry with Solitronics (a Blacksburg small business marketing the ETO), Virginia Tech (ETO inventor), Sandia (which supported the development of the ETO from a concept to an actual product suitable for utility energy storage applications), and the American Competitiveness Institute in Philadelphia (which assisted the team with manufacturing engineering and prototype production of the device). — *Neal Singer*

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