Developments to Watch

EDITED BY OTIS PORT

HOT NEWS IN 'SPINTRONICS' RESEARCH

PHYSICISTS FROM NEW YORK'S University at Buffalo are leading a team that may have unlocked the door to a "spintronics" future. This novel branch of engineering could be the ultimate in tiny electronics. Today, each bit of data zipping around a silicon chip consists of many thousands of electrons. With spintronics, a bit can be shrunk to only one electron, with the direction of its spin determining whether it represents a one or a zero. Spintronic transistors may end up no bigger than a single molecule—so small that thousands of chips could fit on one of Intel Corp.'s existing Pentium microprocessors.

Research labs around the world are working on single-electron devices, and several have concocted prototypes. Trouble is, most function only at ultracold temperatures. Hoping to find a material that would raise the operating temperature to the relatively balmy level of liquid nitrogen, the Buffalo researchers teamed up with physicists at the University of Notre Dame and Pennsylvania State University. The semiconductor they picked is a multilayer sandwich of alternating gallium antimonide and manganese.

When they measured its properties, they got a shock: Absolutely no cooling was needed. "We got lucky," says Buffalo physicist Hong Luo. Even at temperatures all the way up to 260F, as the team reports in the May 27 *Applied Physics Letters*, the sandwich exhibits a type of magnetism that is a key requirement for many spintronics applications. Why this structure works at hot temperatures isn't fully understood, says Luo, "but we're making progress." ■

MICROWAVES: KINDER THAN MAMMOGRAMS

GETTING A MAMMOGRAM CAN BE LIKE GETTING YOUR BREAST caught in a refrigerator door. Though the painful part lasts less than a minute, many women wish there were a better way. In a few years, their wishes may be granted. Two separate teams of researchers—one led by Keith D. Paulsen, an engineering professor at Dartmouth College, and another by Susan C. Hagness, assistant professor in electrical engineering at the University of Wisconsin at Madison—are working on methods that scan for tumors using low-power microwaves. In Paulsen's approach, the patient lies on her stomach and dips her breasts into a glycerine solution. Signals from multiple directions are then combined to form a microwave tomographic image akin to a CT scan. Clinical trials with volunteers could begin this fall. Hagness is taking a different tack: The patient would lie on her back, and the antennas would pass over her breasts. Microwave imaging, in theory, could spot tumors as small as 2 millimeters across, or less than half the size that mammograms pick up. *Faith Keenan*

PUTTING LIGHT IN A BOTTLE

THREE RESEARCH TEAMS LAST year amazed the world by slowing light, then stopping it dead in its tracks—though only for an instant. Now, a group at the University of Michigan has topped that feat by generating light that's motionless from the outset.

It's done with wee mirrors—alumina particles no bigger than 30 nanometers across. That's so small it would take 10,000 to span the period ending this sentence. Pack these nanomirrors together tightly, so the space between them is only a fraction of the wavelength of light, and the light produced by zapping the particles with an electron beam literally can't go anywhere. That's what Michigan physicist Stephen C. Rand reported at the Conference on Lasers & Electro-Optics in Long Beach, Calif., in late May.

What's a stationary-light generator good for? Rand and materials scientist Richard M. Laine point to several prospects. Already, they've uncorked their bottled light to create the first continuous ultraviolet laser beam—better for certain jobs than today's pulsed-UV beams. The concept also promises laser-based fluorescent lights and brighter display screens. ■

INNOVATIONS

■ Riddell Sports says its new football helmet could help reduce the 100,000 concussions suffered annually in the U.S. Its design aims to provide better protection against blows to the side of the head, which cause 70% of all concussions, according to a study by Biokinetics & Associates funded in part by NFL Charities. Riddell is also sharing the Biokinetics study with its rivals.

■ Jogging may do more than improve fitness—it may help prevent Alzheimer's disease. Scientists still aren't sure what causes Alzheimer's, but medical researchers at the University of California at Irvine were pleasantly surprised by the effects that running had on rats' brains: It boosted the activity of genes known to be associated with learning and memory. The researchers are now digging deeper into the relationship between exercise and healthy brains.

■ A visit to Kentucky's Mammoth Cave may pay off big. Biologists from Grand Valley State University in Allendale, Mich., found a subterranean ecosystem rich in unknown bacteria. One produces a substance that seems to inhibit the growth of blood vessels. They might be used to deprive tumors of the nutrition they need to grow, according to a report by researcher Ryan L. Frisch at a recent meeting of the American Society for Microbiology.