

## Imation Restructures R&D

Last year, Minnesota Mining & Manufacturing (St. Paul, MN), commonly known as 3M, completed a tax-free spinoff of its imaging and data storage units. The new publicly owned company is called Imation Corp., a conflation of "imaging" and "information." Based in Oakdale, Minnesota, the company began life July 1 with annual revenue of about \$2.3 billion and approximately 9,400 employees. At the same time, 3M discontinued its \$650-million-per-year audio- and videotape business, laying off about 5,000 workers worldwide. This was prompted by the increasing displacement of tape products by compact discs (CDs).

In its first quarter as an independent company, Imation reported nearly \$560 million in revenue and a net profit of \$11.8 million. Spending on R&D was \$39 million, about 7% of sales revenue. According to CEO William Monahan, for the next three years Imation will continue to devote between 7

and 8% of its revenue to R&D expenses.

When it reorganized as a corporation, Imation consolidated its seven research labs into two labs and reduced the number of labs supporting business units from seven to five. About 1,200 people remain in Imation's R&D units. Core technologies include magnetic and optical recording materials and systems, materials science, and the manufacturing of coatings and thin films. "The R&D direction is a synergistic combination of imaging and memory technologies," says Krzysztof Burhardt, Imation's vice president of technology development.

Physicists play an important role in Imation's R&D, according to Burhardt, and there are about 80 physicists on staff working in areas ranging from materials development for optical and magnetic recording to advanced imaging technologies. "We're beginning to look for new hires," he adds.

Imation is aggressively targeting the com-

puter removable-media storage market with its line of Travan minicartridges, which store up to 4 gigabytes. A 10-gigabyte version is expected to be shipped this year. Imation has inherited from 3M the technology for the new LS-120 disk drive, which is expected to replace the standard 3.5-inch floppy drive in PCs. The LS-120 removable disk, which Imation and its licensees make, stores 120 megabytes. The drive can also read from or write to standard floppy disks. Imation has also set up a facility to manufacture the new digital video disks (DVDs) and offers DVD mastering, replication, packaging, and fulfillment services.

Medical imaging is another market Imation is targeting. The company has begun shipping its new line of DryView laser imagers, which eliminate wet processing for X-ray and ultrasound images. Imation is also a major supplier of medical-imaging and photographic film. A third targeted area is

printing and publishing; Imation's Rainbow and Matchprint color-proofing systems are widely used in the publishing industry. □

## Radio ID Tags

The market for radio-frequency identification (RFID) systems is no longer just a niche market, thanks to continuing improvements in RFID technology and a significant reduction in the cost of installing and operating these systems.

RFID tags, the size of a grain of rice, automatically recorded the finishing times of 40,000 runners in the Boston Marathon; motorists with RFID transponders zip by the booths on new toll expressways in Orange County, California, and Toronto, Ontario, at 65 miles per hour; and increasing numbers of pets wear RFID tags. On the business front, RFID is being used to monitor people in high-security areas, to automatically identify and conduct inventories of equipment and other assets, and to control access to buildings, rooms, parking lots, and ski lifts.

Although parts identification and inventory control were early applications for RFID, perhaps the most familiar application is for theft prevention in stores and libraries. Many farm animals are also now adorned with ear tags, one of the most popular being the TIRIS tag from Texas Instruments.

An RFID system consists of three components: a transponder, usually called a tag; a detector, or reader; and a computer. The tag can be as simple as an inductive coil and capacitor or a magnetic material. It is detected by the perturbation of the electromagnetic (EM) field generated by the reader's antenna.

These passive tags can be paired with EM fields that are high frequency (850–950 MHz or 2.4–5 GHz), intermediate (10–15 MHz), or low frequency (100–500 KHz).

The new generation of RFID tags incorporates an integrated circuit (IC) that stores the ID code and as much as 1 kilobyte of additional data. When the tag is energized by an EM field, the IC steps through each memory location and transmits the stored data to the detector. Some active RFID tags have built-in batteries that allow them to record and transmit data without an EM field.

Some tags are write-once; others have read/write capability and can be modified during operation. Advanced Systems Group International (Sterling, VA), for example, has developed the NeuroTag system, based on the Neuron microprocessor made by

Motorola (Schaumburg, IL), that includes read/write tags. The system is able to read multiple tags simultaneously.

Because of advances like these, RFID tags may eventually replace bar codes on consumer products. In one demonstration, a supermarket cart filled with 35 tagged items passed through a detector that scanned the whole load in less than three seconds. □

## Microsoft Expands R&D

Under the direction of theoretical physicist Nathan Myhrvold, R&D is booming at Microsoft (Redmond, WA). Myhrvold expects to triple the number of people in the company's basic-research lab, Microsoft Research, over the next few years, from the current 170 to about 500.

Microsoft Research, set up in 1991 to conduct basic and applied research in computer science, now has more than a dozen separate research groups, including the Bay Area Research Center (BARC). Areas of expertise include adaptive systems, decision theory, speech and vision technology, new programming tools, and new systems architectures. (For more information, see Microsoft Research's home page: [www.research.microsoft.com](http://www.research.microsoft.com)).

Myhrvold, 37, who holds the title of chief technology officer, recently was appointed to Microsoft's executive committee, the top decision-making body in the company. He heads the Advanced Technology Group, which provides the technical leadership for Microsoft's R&D.

The company's R&D expenditures are expected to hit \$2.1 billion in the 1997 fiscal year, a 50% increase over 1996 and 250% of 1995 expenditures. This dramatic rise in Microsoft's R&D spending parallels a record jump in revenues, which hit \$8.7 billion in 1996, a 46% increase over sales in 1995. Revenues in the first half of the 1997 fiscal year were up 18%, to almost \$5 billion, and spending on R&D was \$917 million, a 49% increase over R&D spending in the first half of the previous year.

R&D spending is increasing not just in absolute dollars but also as a proportion of revenue; in 1995, it was 14.5% of revenue, in 1996 it was 16.5%, and in the first half of fiscal 1997, 18.4%. By comparison, Intel (Santa Clara, CA), the world's largest maker of computer chips, spent \$1.8 billion for R&D in 1996, which amounted to 8.7% of its revenues of \$20.8 billion. □