21ST CENTURY TECH

CHAPTER 45

How Printers Will Work

In the computing world of the future, everyone will have his or her own piece of paper. That's one—and only one—piece of paper. Actually it won't be made of paper but it will look like it. It's called electronic ink and it brings the versatility of the computer display to the convenience and portability of the paperback.

The concept behind electronic ink is that there's no reason to carry about a book filled with hundreds of pages when each of the pages, essentially, is doing the same thing. It's displaying some black marks against a background of white. The only real difference is that those marks change from page to page. Electronic ink is a single sheet of paper that is covered with millions of small balls floating in bubbles of oil. One half of each ball is painted white and has a slight positive charge. The other half is painted black, with a slight negative charge. The balls, between 20 and 100 micrometers in diameter, have been added to a transparent silicone, which when heated forms a tough, translucent rubber sheet with a layer one deep of the spheres inside it. Strips of transparent indium tin oxide electrodes or grids of electrically conductive plastic are wedded to the top and bottom surfaces. Connected to the electrodes is a processor and memory that controls the electrical charge on each of the electrodes.

Apply a voltage to the balls and they will align themselves black-up or white-up depending on the individual charge the electrodes produce for each sphere. You have a sheet of "paper" about two or three times as thick as a traditional sheet of paper, and it can be any page in any book. It draws almost no power, won't be expensive, and will be reasonably rugged.

More George Jetson? Not really. A team from MIT has already created a working prototype, and electronic ink is already making its appearance in commercial signs. A slew of electronic posters scattered through a department store can change their wording with a simple command from a personal computer. Want to hold a 10-minute, 50 percent off sale through the store or just in a single department? Tapping a few keys can instantly change just the signs you want to display the sale announcement.

Of course, the sign displays are a longer, thicker, and heavier than a sheet of paper, but if we've learned anything in computing, it's that everything gets smaller. In the meantime, there are already two competing *e-books* on the market. The e-books use LCD technology and are as thick and a bit larger than a Palm computer. But you can download to them an increasing number of books. Some in the public domain are free. For others you pay less that it would cost to buy a physical book. You can bookmark electronic pages and even scribble your own notes in the margin. It may not be as satisfying as cuddling up in bed with a warm paperback. But imagine you're, say, a medical student trudging across a campus with backpack carrying 45 pounds of textbooks. The advantage of e-books, even the crude ones of this century, is easy to imagine.

Not that paper books—on real paper with real ink—are going to pass away forever. They may become a quaint affectation, like fountain pens, or valued for their antique value more than the information they contain. Electronic books will never have that musty smell of old, yellowed paper that tells you this is a book someone else has touched and read in a different time. *Leaves of Grass* may become available on e-books or electronic ink, but you'll still give an old-fashioned, real book to your love.