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MAY 14, 2001

SCIENCE & TECHNOLOGY

By Otis Port

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## Commentary: The Future of Optical Chips Is No Illusion

Fiber-optic technology has been badly bruised by Wall Street's pounding of the telecommunications sector. But dig beneath the gloom, and you'll find investors who say that the next generation of chip-based fiber optics will dwarf what is out there now. Call it the Chip Revolution, Part Two.

"It's like turning back the clock two-plus decades," says Michael A. Ricci, a vice-president at Intel Corp., to a time when today's Silicon Valley chip giants were barely teenagers. In the decades that followed, silicon paved the way to riches and fame for many chip managers and investors. Part Two should do the same. Only this time around, the focus will be on "optochips" that handle optical signals instead of electronic ones.

Intel ([INTC](#)) is an opto-bull. Since the mid-1990s, the microprocessor king has bet some \$5 billion on so-called photonics. It has grabbed small stakes in 25 startups and taken over a half-dozen outfits--three of them in April. And Intel isn't about to pull in its horns. The telecom-parts business is growing at a 30% to 50% annual clip, explains Ricci, "and that's much healthier growth" than Intel's mainstay markets.

Optochip fever is raging at Morgenthaler Ventures. This Menlo Park (Calif.) venture-capital firm is the No. 2 backer, after Intel, of optical components startups, notching 15 of the 71 VC deals signed since 1996. Five have been inked so far this year, and partner Gary Shaffer expects to underwrite five or six more by yearend. "Some of these companies are so promising," he says, "that you want to reach for your wallet before they've finished their presentation."

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Vcs know, of course, that new startups are more likely to fail than succeed. Even big-name stocks are never a sure thing. Lots of investors got burned by the sudden reversal at big optical players such as Lucent Technologies ([LU](#)) and JDS Uniphase ([JDSU](#)).

Still, despite the risks in trying to pick the next winners (table), the trend is clear: Optochips will do for telecom gear what microprocessors have done for computers. They will usher in vast increases in power, along with huge savings in costs. Today, most fiber-optic equipment is assembled from a bunch of separate modules. That's expensive. For example, an optical amplifier that rejuvenates signals within fiber-optic networks is the size of a microwave oven and costs \$20,000. But when the same task can be performed by little "op-amp" chips, the cost should drop to \$100, says Alan Huang, founder of Menlo Park startup Terabit Corp. and a former photonics researcher at Lucent Bell Laboratories.

Right now, some of the hottest optochips are miniature counterparts of yesteryear's plug-in switchboards. These chips typically connect calls using teensy mirrors that tilt to direct the laser beam coming out of one optical fiber into another. Such optical switches are much simpler and faster than existing switches, in which the incoming beam is converted into electronic signals, routed by silicon chips, then converted back into photonic pulses.

**LASER'S EDGE.** Optical switches, however, are just a warm-up for the main act: multifunction optochips. A few companies already combine two functions, such as a laser with a "modulator" that chops the beam into pulses. "Now, we're starting to see integration that merges three and four functions," says Morgenthaler's Shaffer. Because one of these chips will replace 100 discrete devices, he adds, "they're going to kick butt over the next 20 to 30 years."

Materials are also due for an overhaul. For tomorrow's ultrafast switching speeds of 40 billion bits (40 gigabits) per second, optochip makers will turn to exotic semiconductors such as indium-phosphide, says Todd A. Brooks, a partner at Mayfield Fund, another Menlo Park venture capitalist. Today, only a few companies have much experience making indium-phosphide chips. The leaders are aerospace companies like TRW Inc. ([TRW](#)) and Hughes Electronics Corp. ([GMH](#)), which pursued nonsilicon chips because they can withstand the rigors of space. But Brooks says some silicon chipmakers are now looking to convert chip plants to indium.

So don't be fooled by the opto-pessimism on Wall Street. The layoffs at big, old-line companies are hogging headlines and souring the outlook. But the all-optical technologies being hatched by dozens of startups will ultimately clear the gloom. A second chip revolution is coming.

Port covers emerging technologies from New York.

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