

TELECOM

LIKE MANY OF THEIR SILICON Valley brethren in the mid-1990s Amir Makleff and Eli Pasternak fell under the spell of a new wireless technology that seemed both magical and cursed.

Back then companies like Terabeam, Winstar and Teligent vied to build gizmos that could, in a second, shoot a billion bits of data through the air between two fixed antennas. They all flopped. Along the way their investors blew \$10 billion.

Yet Pasternak, Makleff and their company, BridgeWave Communications, have not only managed to survive but also are taking a shot at the same market they first tackled in 1995.

This time physics and economics might be on their side. The Santa Clara, Calif. company uses new chips that can catch tiny airwaves less than half a centimeter long. The signals can penetrate fog and rain, barriers that flummoxed the early generations of wireless. The gear for one connection costs \$20,000, a third the price of older systems. BridgeWave aims to keep cutting prices. Cheap spectrum helps, too. Cellular companies pay billions for the right to emit longer wavelengths, while BridgeWave pays the government only \$75 per connection for a license.

Their next challenge: finding a lucrative market for the product. Thanks to the tsunami of traffic generated by users of iPhones, Pres, BlackBerrys and other smart phones, the BridgeWave founders may have finally licked that problem, too.

While smart phones connect to cell towers using a different wireless technology (known generically as "3G"), getting the signals from towers back to the Internet has become a bottleneck. Most of the 240,000 cell sites in the U.S. were designed to ship voice calls back to the phone network. One iPhone user generates 30 times the traffic of an old-fashioned phone customer, forcing many of the towers' owners to install high-capacity links back to the main Internet. This year cell phone companies will buy \$12 billion of gear for these upstream connections. Spending on these links is now growing 25% a year and

Gigabit Dreamers

Amir Makleff and Eli Pasternak aim to succeed where a generation of wireless wizards has failed. By Scott Woolley

will jump even higher as smart phones flood the network and force upgrades.

At the handful of U.S. and European cell sites already linked by fiber-optic cables, no such capacity problem exists. But the large majority of cell phone towers rely instead on older, low-capacity microwave links or copper lines. BridgeWave hopes that a \$20,000 antenna will look more appealing to these companies than digging a trench for fiber.

BridgeWave has so far installed only 2,000 systems and expects revenue this year of just under \$20 million. Most customers have been corporations with buildings just off the fiber grid. Highland Village, Tex. uses BridgeWave gear to beam footage from the city's network of surveillance cameras to the police. Big U.S. and European cellular carriers, the real target market, are testing the company's gear but have yet to install it.

Finally the curse on fixed wireless is lifting, Makleff says. "This time will be different," he vows.

Makleff, 61, and Pasternak, 58, founded

their first company 25 years ago. Both men were born in Israel, had studied electrical engineering and became friends when they were assigned to an Israeli army unit responsible for designing communications gear.

Then as now, Makleff focused on straightforward engineering tasks while Pasternak chased wild theories. Makleff still marvels at how Pasternak took a communications device made of 50 parts and redesigned it to need only 3. It worked.

That was a sign of things to come. In 1981 Pasternak moved to St. Louis and invented his first successful product. At the time, doctors were using radio waves to cauterize tiny blood vessels in the eye. Pasternak built a minicauterizer that was easier to use and didn't leak electromagnetic energy into the operating room.



THOMAS BROENING FOR FORBES



Big hopes riding on shortwaves: BridgeWave's Pasternak and Makleff hope cell towers will use their gear to blast billions of bits a second to the Internet.

Makleff, meanwhile, was working for Bell Northern Research in Silicon Valley. He visited Pasternak in St. Louis, and the pals began kicking around ideas for companies. Pasternak had just sold the rights to his cauterizer for a few hundred thousand dollars and had caught the entrepreneurial bug. "After selling that I found myself with much more confidence to do what I want," he says.

In 1984 the duo started a company called Telestream with funding from

Kleiner Perkins Caufield & Byers. They aimed to build computing systems that could speed data through the old phone network, but customers proved scarce. Telestream was sold for scrap in 1987.

A few years later Pasternak helped found Netro, a pioneer in high-speed fixed wireless. The idea was to use tiny airwaves, much shorter than the radio waves used to carry cell phone calls or Wi-Fi. Longer waves are typically more useful, as they travel farther and penetrate trees, walls and

other objects. But shorter waves are abundant—and as long as one antenna has a clear line of sight to another, sending data over shortwaves can offer vastly more capacity.

Pasternak became chief technical officer and tapped Makleff to be chief operating officer. After disagreements with the other founders the two men both quit Netro in November 1998 and formed BridgeWave, raising \$35 million. They proposed building wireless cable modems that used a Pasternak-devised analog compression scheme. The gadget worked but wasn't cheap enough to displace existing modems.

After the 2001 market crash the pair fired three-quarters of the company's 85 employees and pumped in \$10 million of their Netro profits to stay afloat. They also changed course. They became convinced that Netro and its pioneering peers had been too early. By using newer chips and higher frequencies (60 to 80 gigahertz), Pasternak and Makleff bet they could make money where others had failed.

Physics could help them where it hurt their competitors: At a wavelength of a half-centimeter, electromagnetic radiation causes oxygen molecules in the air to resonate, absorbing the signals' energy. Transmissions wouldn't go far, no more than a mile. But since that absorption prevents stray signals from interfering with one another, there's no need to buy a pricey spectrum license.

BridgeWave, Cisco and other tech companies were able to convince the Federal Communications Commission that even shorter airwaves could be cheaply shared. The FCC agreed to let anyone set up a link at 80 gigahertz for a mere \$75.

Makleff and Pasternak say their next step is to build more of the basic radio components, mainly waveguides and filters, out of silicon. That will slice costs by 90%, Makleff asserts.

While the two pals are clearly still entranced by the magic of their machines, they have learned the hard way to focus on building a complete system that is reliable, easy to install and cheap. Observes Pasternak: "Wireless companies focus on wireless technology, and that's a mistake." **F**