

Next Little Thing

PR (if any) and propelled instead by the inventor's enthusiasm. What makes that more ironic is that small businesses these days come up with better ideas more consistently than their corporate competitors. "Rates of R&D growth among small firms tend to have been higher than among large R&D-performing firms," says John Jankowski, director of the R&D Statistics Program at the National Science Foundation.

To find these innovative companies you need a field guide, and that's where *FSB* comes in. Exploring everything from ocean-generated electricity to six-foot roses to an ATM for books, the stories on the following pages offer a preview of the companies, products, people, trends, and ideas likely to make news in 2007—all from the world of small business.

—JEFF GARIGLIANO

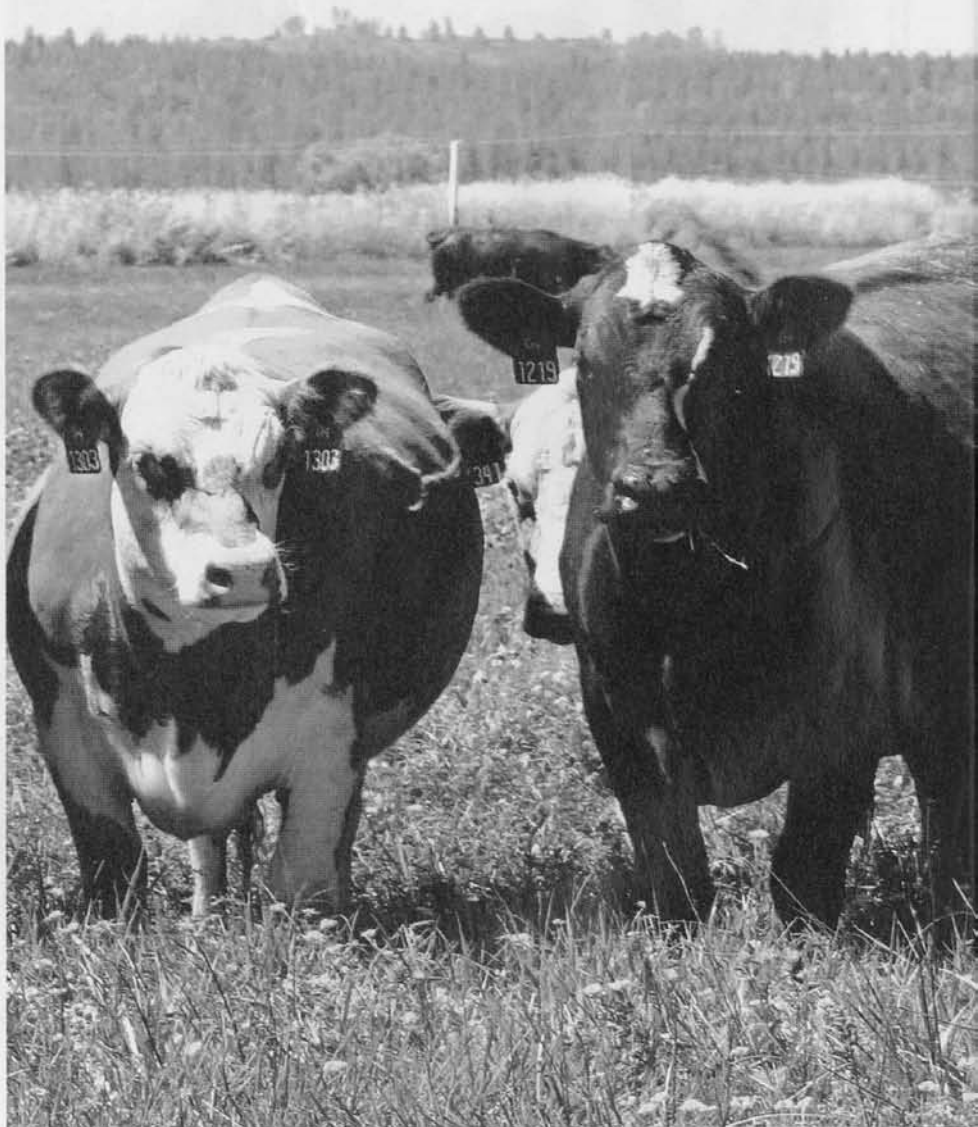
Body Parts From Bovines

REGENERATION TECHNOLOGIES

rtix.com

IN A NORTHERN CALIFORNIA valley carpeted orange with poppies, thousands of cows munch so happily on grass that they hardly ever moo. The herd is organic—never given animal-derived protein or growth hormones—and has been "closed" since 1964, meaning that no new cows have been introduced in more than 40 years. Every aspect of their lives, from conception to death, is precisely controlled by Prather Ranch in Fall River Mills, Calif., which owns the cattle and sells their dry-aged beef to some of San Francisco's top chefs. Lately, though, Prather has begun selling its cows to a new customer, one that wants more than steaks and shanks. A biotech company called Regeneration Technologies Inc. (RTI) is buying up Prather's cattle—more specifically, their bones, tendons, ligaments, and other body parts—for a new and promising segment of the medical-device industry.

Based in Alachua, Fla., RTI is one of a handful of U.S. companies that produce precision screws, spinal wedges, and hundreds of other surgical implants from biologic tis-



sue instead of synthetic materials or metal. As the company's name implies, the implants have regenerative properties, leading to faster healing, less pain, and greater range of motion than patients experience from metal or plastic parts. Until now RTI has manufactured allografts, parts made from donated cadavers. But recently RTI unveiled a line of xenografts, or animal-derived implants, from cow tissue. The company's first xenografts were implanted into patients in December 2005. In 2007 the eyes of the medical community will be on RTI as it ramps up distribution of its line of a dozen xenografts and completes its first-year clinical studies. If the results are good, these bovine bits

70%

Amount of RTI's research budget devoted to animal-based implants for human patients.

could represent the future of medical implants.

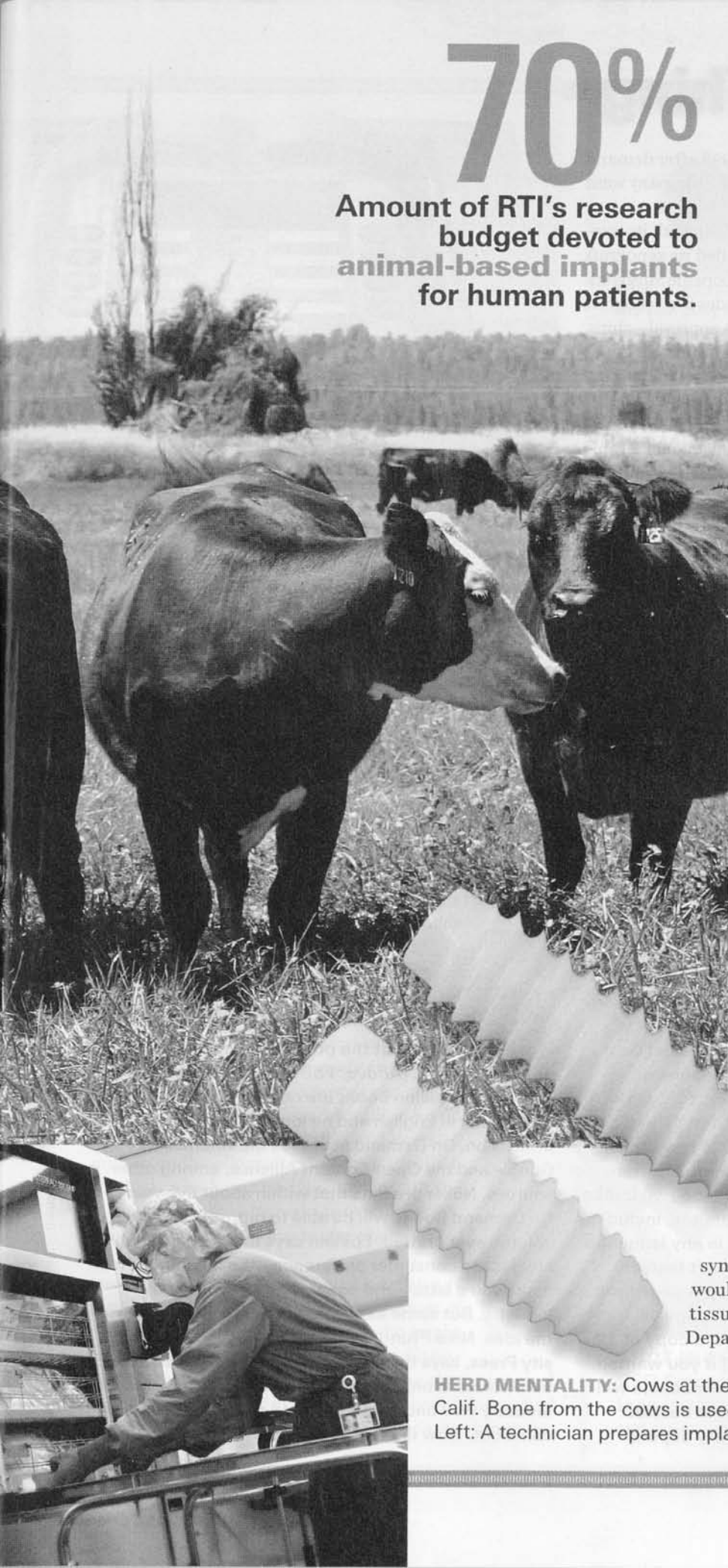
To see why RTI is taking a gamble on xenografts, head to the company's headquarters in the Florida countryside north of Gainesville. There, in a glass-walled lab, a technician dressed in blue scrubs and protective headgear stands at a seven-foot-tall machine called a Fadal, loading small white chunks of human bone into cube-shaped stainless-steel molds. He taps a code into a computer keyboard as he watches a monitor. The Fadal's drill spins. It chooses the bit needed to pierce a sugar-cube-sized spinal implant with holes for tiny pins that will secure it to a patient's spine. Fadals were designed to mill and manufacture parts for the auto and aerospace industries—or any industry requiring intricate, precise designs cut from chunks of metal. Turns out that they can work wonders on a piece of bone too.

RTI mills human tissue into everything from dental implants to bone-graft substitutes. The company's tiniest products, chips that look like newfallen snow, fill bone voids—for example, gaps left by the removal of tumors. Its largest, wedges that resemble hunks of Parmesan cheese, are used to repair large skeletal defects such as fractures. Surgeons use the products as a sort of biologic scaffold; over time they are absorbed into the patient's own bone so seamlessly that even X-rays can't distinguish where bone ends and graft begins.

RTI founder Jamie Grooms was one of the first biologists to discover that human tissue could be machine-cut with the same dependability and speed as synthetic implants. Grooms started what would become RTI while working at a small tissue bank in the University of Florida's Department of Orthopedics and Rehabili-

HERD MENTALITY: Cows at the Prather Ranch in Fall River Mills, Calif. Bone from the cows is used to make surgical screws (inset). Left: A technician prepares implants for sterilization.

PRATHER RANCH; REGENERATION TECHNOLOGIES (2)



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tation. The university spun off RTI in 1998 after demand for his allografts began to take off, and the company went public in 2000.

Now RTI is hoping to make a similar leap with its cow-derived xenografts. The company unveiled its xenograft line at the American Association of Orthopedic Surgeons' annual meeting in March. The line includes five xenograft products for which RTI has received FDA approval—chips, cubes, wedges, and screws. (A xenograft lumbar spinal implant is under review.) RTI has also received regulatory approval to distribute those and several other xenograft products in Europe.

For RTI, cow-derived xenografts boast considerable advantages over human-derived allografts. The animals are much easier—and cheaper—to procure than cadavers, and while the average human donor yields 20 to 30 grafts, RTI's technicians can manufacture more than 300 from a single cow. So far, the company's studies show that such grafts are just as biocompatible and safe as those from donated human tissue. They are also stronger and stiffer—although still much more flexible than the top synthetic equivalents made from plastics or metal. RTI officials hope that the results of its first-year clinical studies,

An ATM for Books

Coming soon: The most inclusive reader's catalog in the world, at your fingertips.

BUYING A BOOK COULD BECOME AS EASY AS buying a pack of gum. After several years in development, the Espresso—a \$50,000 vending machine with a conceivably infinite library—is nearly consumer-ready and will debut in ten to 25 libraries and bookstores in 2007. The New York Public Library is scheduled to receive its machine in February.

The company behind the Espresso is called On Demand Books, founded by legendary book editor Jason Epstein, 78, and Dane Neller, 56, but the technology was developed six years ago by Jeff Marsh, who is a technology advisor for New York City-based ODB (ondemandbooks.com). The machine can print, align, mill, glue, and bind two books simultaneously in less than seven minutes, including full-color laminated covers. It prints in any language and will even accommodate right-to-left texts by putting the spine on the right. The upper page limit is 550 pages, though by tweaking the page thickness and type size, you could get a copy of *War and Peace* (albeit tough to read) if you wanted. Neller says that future versions of the machine will accommodate longer works with fewer hassles. Prices for the finished product will vary depend-



ing on locations, but the production cost is about a penny per page. (Above, FSB's interpretation.)

Some 2.5 million books are now available—about one million in English and no longer under copyright protection. On Demand accesses the volumes through Google and the Open Content Alliance, among other sources. Neller predicts that within about five years On Demand Books will be able to reproduce every volume ever printed. Epstein says that the larger obstacles are consumer preference—the machine can't make you a latte—and convincing skeptics in the industry. But some early adopters are already sold on the idea. Niko Pfund, a publisher at Oxford University Press, says the evolution away from traditional bookstores is only natural. "For hundreds of years the industry was unchanged," Pfund says. "Then audio came out. Now it's time for digital." —EMILY MALTBY

In about five years, On Demand Books will be able to reproduce any book ever printed.

which will be completed throughout 2007, will boost acceptance of xenografts, particularly among orthopedic surgeons who have never worked with bovine tissue.

Perhaps most important, xenografts could decrease RTI's exposure to the taint of scandal that clings to human-based products. In 2001 a healthy 23-year-old college student died from an infection caused by a contaminated

knee implant sold by one of RTI's competitors. The case was an anomaly—the cartilage came from a corpse that had sat unrefrigerated for 19 hours—but the ensuing press coverage tarnished the reputation of the entire allograft industry. In 2005, RTI was implicated in a scandal involving one of its 300 suppliers, BioMedical Tissue Services (BTS), based in Fort Lee, N.J. Police arrested BTS's two principals—an oral surgeon whose license had been revoked and a Staten Island funeral home director—and two other men for stealing tissue from cadavers. Authorities say the four men secretly carved bones and other parts from hundreds of bodies and, to mask the crime, replaced the bones with PVC pipes. They also are charged with forging family-consent forms and paperwork required to ensure that transplant donors are disease-free. FDA officials fear some of the stolen parts were diseased and call the risk of infection “unknown.” One of the bodies allegedly plundered was that of Alistair Cooke, the legendary journalist and host of PBS's *Masterpiece Theater*, who died of cancer at 95. Cooke's advanced age and the spread of the disease to his bones, would have made him ineligible as a donor.

RTI voluntarily recalled products linked to that supplier, but not before some 8,000 of its products made from BTS tissue were implanted. By June 2006, 50 federal lawsuits had been filed against RTI and two other companies in the industry. RTI, which posted revenues of \$75 million in 2005, took a \$4 million hit on legal fees related to the lawsuits and lost \$3.5 million on the allograft implants it recalled. Its stock, which was trading at about \$10 the month before the news broke in October 2005, lately has been struggling to stay above \$6.

THE MAN CHARGED WITH IMPROVING RTI's fortunes looks like the sort of middle-aged fitness hound who might someday need the company's orthopedic implants. Brian Hutchison is 47, with the strong jaw and broad shoulders you'd expect from someone who worked his way through college—Grand Valley State University,



Ink comes sealed in tiny polymer balls. When a laser hits, the ball dissolves and your body reabsorbs the ink.

Removable Tattoos

A new ink for the commitment-phobic.

LIKE A VEGAS WED-ding, getting a tattoo can be a regrettable experience. While about one out of four Americans now has a tattoo (up from one out of six in 2003), 17% will seek to have it removed at some point, according to a recent study. Worse, the FDA does not regulate the tattoo industry, and some inks contain harmful toxins. However, a Manhattan-based startup called Freedom-2 (freedom2ink.com) aims to solve both issues with

a new durable but removable tattoo ink.

Co-founder Rox Anderson, a professor of dermatology at Harvard University who pioneered several non-scarring laser treatments for blemishes and skin lesions, helped design the ink using FDA-approved, digestible pigment particles. Freedom-2 ink tattoos are professionally applied with a standard needle, but they can be removed with a simple laser treatment that will release the ink from the skin into the body, where it can be safely reabsorbed.

The laser removal treatments cost about \$1,000, compared with the \$5,000 to \$10,000 spent to remove conventional tattoos. CEO Martin Schmiege, whose upper left arm sports a removable tattoo in the shape of the Freedom-2 logo (gothic font, biker style), expects the ink to begin appearing in about a dozen tattoo parlors early in 2007 and to cost about four times the price of standard ink.

—BRANDI STEWART



DENNIS KEENAN

SHOT IN THE ARM: CEO Schmiege gets his logo checked at a tattoo parlor in Yonkers.

near his hometown of Muskegon, Mich.—hauling two-by-fours for a lumber yard. He spent 12 years working for medical-products giant Stryker before joining RTI in December 2001. Since then Hutchison has done what he can to reassure RTI's varied customers—distributors, doctors, hospitals, and patients—that its products are safe. He wrote letters and launched a public-information campaign promising that RTI's proprietary sterilization process, called BioCleanse, eliminates any risk of disease transmission, including HIV, hepatitis, and syphilis. Since it began using BioCleanse in 2000, the company has distributed more than 700,000 allograft implants with no incident of infection, according to the FDA. (Nevertheless, Miami lawyer David Jagolinzer says that even if his clients who received the allografts in question don't test positive for disease, "you cannot deny that these recipients are suffering pretty severe emotional distress.")

RTI now spends about 70% of its R&D budget on xenografts—essentially a bet on the future. So far just 16 U.S. hospitals and clinics have placed orders, and the company posted second-quarter sales in that division of about \$100,000. The biggest question is whether the new products will work as well in the long run as they have so far. Raymond Myers, medical technology analyst at Emerging Growth Equities, a brokerage firm in King of Prussia, Pa., says that physicians will want two to three more years of clinical studies to make sure that the implants are durable and don't trigger an immune reaction. (Doctors have been implanting heart valves from cows and pigs in human patients for decades, but several other types of xenografts have been rejected by recipients.) Hutchison insists that the company's sterilization expertise reduces that risk, but time will prove whether he's right. "It's hard to be a market leader, because the practice of medicine changes slowly," Myers says. "Over several years, not six months." —CYNTHIA BARNETT

Electricity From Wave Power

OCEAN POWER TECHNOLOGIES
oceanpowertechnologies.com

IF YOU WANTED TO CHOOSE THE PERFECT location for capturing the ocean's energy, you couldn't do much better than the Oregon coast. Waves arrive there with immense power, having traveled across thousands of miles of open water with few barrier islands, reefs, or other obstruc-

50MW

Energy from a field of Ocean Power Technologies' wave buoys, enough to power about 50,000 homes.



How It Works

OPT's newest buoy, which will be installed off the Oregon coast in 2007, is nearly 50 feet long (though only about nine feet project above the surface). As waves pass, a piston in the buoy moves up and down, and the mechanical motion gets converted to electrical power via a generator near the top of the buoy. Undersea cables route that energy back to the shore, where it feeds into the power grid.