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THE FIRST WORD

RUMINANTS

Bio/Technology's mission is to match technology with markets, science with resources. We have tried to discriminate the profitable from the practical from the merely possible. And we have learned how powerfully the dynamics of established markets can shape the commercial potential of even the most ground-breaking science. Markets are about patterns of consumption, mechanisms of distribution, and performance. Markets don't care whether a product springs from biotechnology, conventional synthesis, classical breeding, or simple conjuring—as long as it does what it's supposed to do and offers some quality or advantage or economy others don't.

A while back, we spent an hour with the research director of a mammoth U.S. dairy cooperative. Some processors already recover natural pharmaceutical proteins from cow's milk. And now (as three groups of researchers demonstrate in this issue), recombinant proteins seem around the corner.

The pieces are falling into place. But what kind of pieces are they, pharmaceutical or agricultural? And there's more in heaven and earth than is dreamt of in pharmaceuticals and agriculture alone, though it's easy to lose sight of them.

Two visits to very different operations concentrating on industrial enzymes and ingredients for consumer products have been eye-openers.

Genencor just opened a new plant in Cedar Rapids, Iowa, with 400 cubic meters of fermentation tankage and room to grow all around, a $250-million facility planned for flexibility and expansion. The company is now working on more than a dozen products: proteases and lipases for detergents; cellulases for "stone washing" textiles; pectinases and cutinases for fruit-juice production; chymosin and lipases for cheese-making; wild-type *Pseudomonas syringae* for ski-slope snow-making; glucose isomerases for starch-processing; sugar oxidases for diagnostics. In the distant future, Genencor wants to clone multi-gene pathways to industrial chemicals

In a way, it seems Genencor has a tiger by the tail. It has staked its future on the value of constant innovation, allowing it to produce high-performance variations on commodity chemicals, gambling that it can stay far enough ahead of the competition through constant research and creative single-source relationships with customers to command the sort of 50-percent-plus margins more typical of the pharmaceutical business—a margin that is absolutely vital to maintaining its research base. In a sense, Genencor is trying to create a completely different market and play by its own rules. Completely different market dynamics.

A little bit earlier, we had a long talk with two Europe-based researchers at an international consumer-products giant—one of the first, it happens, to point out the correlation between health problems and fats in the diet.

They march to a very different drum, swayed by the pressures of popular fashion: and the public, it seems, now wants assurances that the products it buys are non-polluting (even in their manufacture) and natural.

We were bumptious and rude, full of pharmaceutical superiority. We asked one of our hosts, a lipid chemist, in jest, whether he had ever had anything to do with any of the liposome-based face creams, the commercials for which clutter the airwaves with dreamy soft-focus photography, silly names freighted with phony French diacritical marks, and risible claims for miraculous beautifying powers. A mockery.

"Yes," said our host.

"Tsk, tsk, tsk," we said, before we could control ourselves.

The fault was ours. We just didn't understand the imperatives of the business.

"At the end of the day, it's what the consumer wants. If they want 'natural,' then we must give them natural," our host said.

Consider one project: How do you clone several entire lipid-synthesis pathways into a plant, so that you can produce all of the oils now synthesized to produce margarine? The scientific challenges are formidable and fascinating. But the object is to give the marketers an eminently promotable "all-natural, no synthetic chemicals" margarine—in every molecular detail identical to the synthetic variety. That startled us—the idea that it is worth spending money to produce a product that offers no increase in performance, no cost benefit, but a big edge in sales appeal. We had fallen into the safety-and-efficacy reflex of the pharmaceuticals, and the price-performance reflex of agriculture and agrichemicals. As we said, an eye-opener.

—Douglas McCormick