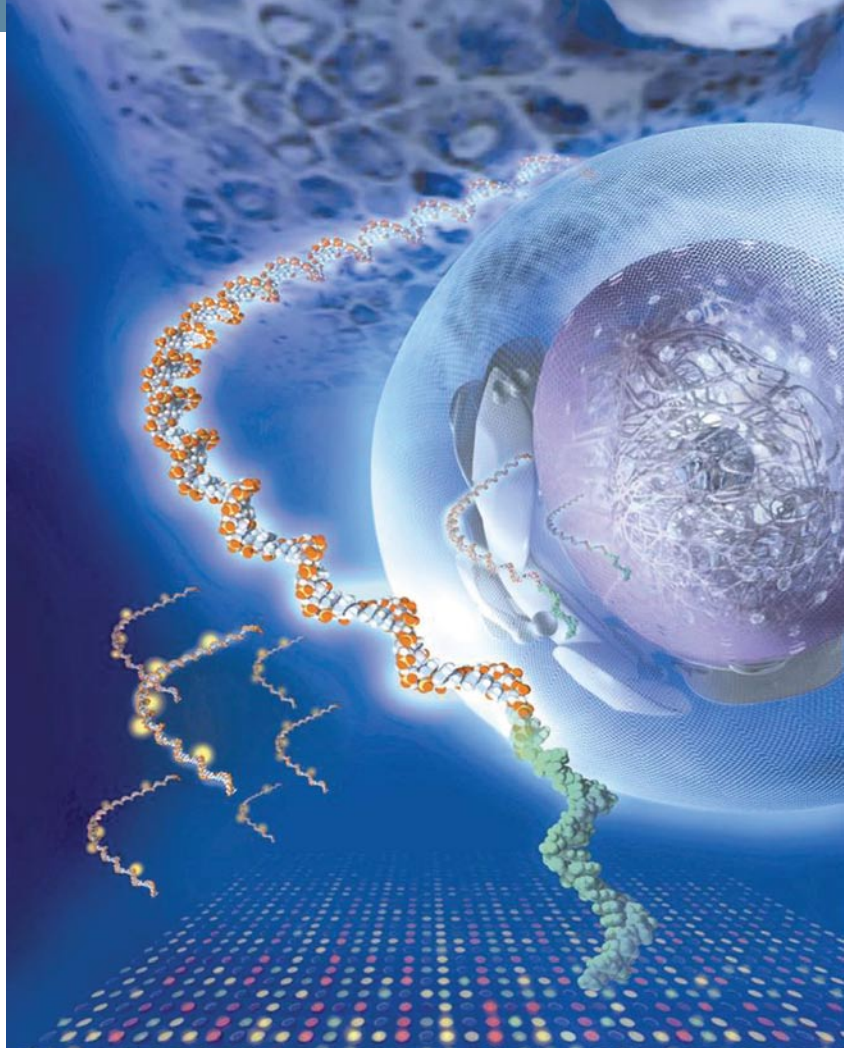

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Breathing New Life into Biomedical Markets:

The Story of Arcturus Bioscience

Giacomo Vacca

How Arcturus Bioscience went from one-man show to a diverse, market-leading business worth tens of millions of dollars in fewer than 10 years.

When Thomas Baer, Ph.D., walked into the offices of the National Institutes of Health in 1996 to discuss his proposal for a partnership to commercialize laser capture microdissection (LCM), Arcturus Bioscience consisted of one person: himself. Baer had set out to pursue business opportunities created by the mapping of the human genome in the mid-1990s.

Several people in the genomics community realized that the sequencing and identification of human genes would enable the development of previously unimaginable tools for both life science research and clinical diagnostics. Among them were several senior researchers at the National Cancer Institute, part of the National Institutes of Health (NIH): Robert Bonner, Michael Emmert-Buck and Lance Liotta (now at George Mason University).

At that time, scientists could tag and image single genes (consisting of specific RNA and DNA sequences) located in a cell on a histology slide; however, only one target at a time could be labeled reliably. Baer and his NIH colleagues recognized the need for a general method to measure the expression levels of many genes simultaneously, and map them as a function of position within a tumor biopsy. Ideally, researchers wanted to measure and map in a biopsy the expression levels of all the 25,000 human genes to see how the expression levels changed between normal and cancerous cells.

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Single white blood cell captured with LCM.

Molecular Devices Corp.

The NIH scientists invented a way to selectively extract the tagged biopsy material, enabling the desired multiplexed analysis. This invention consisted of two critical aspects: the use of a polymer "glue" to stick to and capture portions of a histology sample, and the use of a laser to make the polymer sticky in just those areas of the sample that would be captured. The captured portions could then be purified, amplified and analyzed for genetic anomalies, free of

the overwhelming contamination from the rest of the sample. Thus, LCM was born.

The next step was for NIH to find partners to commercialize the technology. The initial vehicle was a Cooperative Research and Development Agreement (CRADA), a partnership between NIH and the nascent Arcturus Bioscience to develop the LCM technology into a viable business. Through a CRADA, Baer gained licenses to the technology, and NIH gained a commercial partner willing to develop it. Nine months after the CRADA was signed, Arcturus Bioscience (by then three employees strong) shipped its first instruments to NIH.

This development tour de force underscores several of Baer's guiding principles in starting a business:

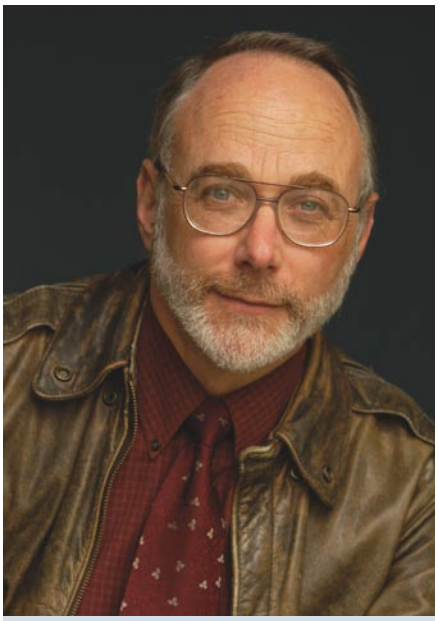
▸ *Hire good people*

Having worked for a total of 15 years in senior roles at Spectra-Physics and Biometric Imaging, he could tap into a wealth of professional connections to talented engineers with multidisciplinary bents. He managed to keep the initial payroll small by asking everyone to play multiple roles. In this way, Arcturus Bioscience was able to reach profitability within two years after its first shipment, and with only $0.5 million of "angel" and personal investments.

This bootstrapping approach, where ownership dilution is kept to a minimum in the early stages when the company's value grows very quickly, worked well for Arcturus. However, Baer is quick to point out that it is not necessarily always the best approach or the one that maximizes return on investment.

▸ *Work with people you trust*

Early in the growth of Arcturus, Baer turned to his friend Milton Chang, Ph.D. (then CEO of New Focus, and currently managing director of Incubic, an early-stage venture capital firm). Chang contributed seed money and joined the company as chairman at that time. By having a trusted voice to provide a knowledgeable counterpoint to his own role as CEO, Baer established the kind of sanity check that he feels is very important in any business, and particularly a fledgling one.



As Arcturus grew, Baer planned his own transition out of day-to-day management. He stepped down as CEO in 2004, remaining as chairman until the following year; he is now executive director of the Stanford Photonics Research Center and the current vice president of OSA.

▸ *Choose a growing marketplace*

Once the company became profitable by delivering high-end instruments to the research market across the life sciences, the time was ripe to grow the business further. From the beginning, Baer's vision had been to exploit the explosion of information available through genome sequencing for the purpose of providing new and improved diagnostic tools for clinical use.

To do so, it was necessary to boost the company's R&D capabilities. Venture capital funding was sought and obtained, in several rounds: first $2 million, then $5 million and finally, in 2000, $20 million, which was used to develop the diagnostics product line, particularly in the area of cancer detection. Twenty employees were added to the roster (in both life-science research and product development), as new reagents and accessories were developed to pursue various markets.

The company was now poised to exploit its competitive advantage in two overlapping yet distinct fields: life science research and clinical diagnostics. As Arcturus grew, Baer planned his own transition out of day-to-day management. He stepped down as CEO in 2004, remaining as chairman until the following year; he is now executive director of the Stanford Photonics Research Center and the current vice president of OSA. The company's growth made each of its two main target markets—scientific research and clinical diagnostics—viable in their own right.

To better focus the company, the new CEO, Antonius Schuh, guided it through a splitting of the two businesses. At that point, the LCM business unit of the company was generating sales of more than $20 million per year and employed more than 75 people, with well over 1,000 units installed worldwide. The market-pioneering LCM scientific product line was sold to Molecular Devices, retaining the Arcturus brand. The rest of the company, which was renamed AviaraDx, now solely concentrates on diagnostics. ◭

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