

felt commitment on behalf of entrepreneurs to do everything possible to achieve such an event. After all, venture-capital investing is a cyclical business of raising money for a new fund, making investments, managing those investments, and then liquidating the fund. So, one excellent question to ask a venture capitalist is, 'where is the venture fund in that cycle?'. A negative response from a venture investor may simply mean that he or she does not have money to invest at that time. □

Diane Gershon is assistant editor, new technology, at Nature Medicine. e-mail: techmed@earthlink.net

Careers and recruitment in Nature

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Funding brings high-risk technologies to the marketplace

For start-up companies that find they have few financing options available, funding vehicles such as the Advanced Technology Program (ATP) can prove to be a lifeline. The programme is managed by the US Commerce Department's National Institute of Standards and Technology. "For us, the programme really worked. I honestly doubt if [the company] would be in existence if it hadn't been for the ATP," says Christopher Becker, president and co-founder of GeneTrace Systems in Alameda, California.

Becker and his colleague Joseph Monforte founded GeneTrace Systems in 1994 to develop DNA sequencing systems that combine DNA probing, sequencing and sizing reactions with laser-based time-of-flight microscopy. The aim is to develop analysis methods that are faster and cheaper than gel-based approaches. Since the company received ATP funds of about \$2 million, GeneTrace has entered into equity and licensing agreements with Incyte Pharmaceuticals and Monsanto, and now has 60 staff.

Becker's sentiment seems to be echoed by a report¹ that evaluated the first group of completed ATP-funded research projects. The report provides an assessment of the 38 ATP projects completed by March 1997 (12 projects were terminated before completion). Two-thirds of the companies would not have proceeded with their projects without ATP funding, while the rest reported gains of 18 months or more in product development as a result of the ATP award (see Table 1).

Typically, ATP funds high-risk, pre-competitive, generic technologies that have

the potential to produce significant commercial payoffs and benefits to the US economy. Although any size of company can apply, more than half the awards go to individual small businesses or to joint ventures led by a small business. Awards are made after a rigorous competitive review process that assesses the technical merit and economic potential of the project. ATP does not provide funds for basic research or for product development, and has funded an average of 12% of industry proposals received since 1990 when the programme began. Funding for single-applicant companies and joint ventures is on a cost-sharing basis. Single-applicant companies are expected to cover all the indirect project costs, although ATP may cover up to 100% of direct costs.

"The step between 'is the theory real?' to 'can you do it practically?' is where ATP typically sees its role," says David Gibson of X-ray Optical Systems in Albany, New York. The company designs optical systems that bend and focus X-rays, which have potential applications in fields as diverse as medical imaging, material analysis, X-ray lithography and astronomy. The company received almost \$2 million from ATP, which took it to the point where it could make X-ray optics reliably and repeatedly to specification. Although it was not yet commercial, it had begun to explore ways to use the optics in specific applications. "Most of the technical risk was gone," says Gibson.

X-ray Optical Systems' financing story has an all too familiar ring about it among start-ups. The company was founded by two scientists, one from the United States and the

other from the Soviet Union. Gibson, a former management consultant with an engineering and economics background, was brought in initially to do a six-month feasibility study to determine whether the technology would work, and whether the company could create economic value with it and then capture that value. Before the company secured ATP funding in the early 1990s, it was financed largely by its founders, who mortgaged their homes, borrowed on credit and then from friends and family.

Gibson says venture capital was not an option at the time because of the degree of technical risk involved and because investors tend to shy away from physics-based technologies. Also, although the company had the potential to create a lot of value, the venture capitalists correctly identified that it was not going to be able to capture all that value because it would be in the business of making components for sale to end users and equipment manufacturers.

It was for these same reasons that the company's project was a good fit for ATP, although its application was turned down first time around. Gibson says they did look into the possibility of raising money through strategic partnering but, because the X-ray optics had such a broad range of potential applications, it was hard to identify a potential suitor. Although the company probably could have raised money that way, Gibson believes that at the time the founders would probably have had to give up a majority stake in the company to do so, and it would most likely have been a non-US company that would have been interested.

"ATP allowed us to keep it in the US and to keep it independent," he says. And ATP funding provided technical validation that has unlocked some private money, says Gibson. Although the company is now at a point when perhaps it could consider venture capital, "it's still not clear that it would be a good choice for them or us", he says.

For more information about ATP, see <http://www.atp.nist.gov> **D.G.**

1. Long, W. *Advanced Technology Program: Performance of Completed Projects — Status Report No. 1*. Special Publication 950-1 (NIST, Gaithersburg, Maryland, 1999).

Table 1 Impact of ATP funding on conducting projects

Would have proceeded without ATP funding	Number of ATP projects	%
Yes, but at a slower pace with a delay of:		
18 months	4	
21 months	3	
24 months	3	
60 months	1	
No	21	64