

BUSINESS

The technology trap

The widely admired US system for transferring ideas from the lab to the marketplace is showing signs of distress. Virginia Gewin reports.

For years, the US university innovation machine has been the envy of the world. The system — which gives universities the patent rights to technologies and lets them exploit these rights pretty much as they see fit — is generally credited with nurturing Silicon Valley and building the powerful US biotechnology industry.

Yet there are murmurs that the system isn't quite as successful as it seems. Universities' revenue from patent licences is modest: last year, it totalled \$1.3 billion, just 3% of their total research spending. Many good ideas are still left sitting on the shelf. Industrial corporations in sectors such as information technology and biotechnology say that their interactions with universities are problematic. For the first time since 1980 — when the Bayh-Dole Act handed over property rights from the federal government to the universities — there is a growing movement to overhaul the way in which technology transfer works in the United States.

"Universities are struggling in their drive to become more entrepreneurial," says Don Siegel, an economist at Rensselaer Polytechnic Institute in Troy, New York, and editor of the *Journal of Technology Transfer*. Indeed, most technology-transfer offices at universities fail to cover their own expenses, much less generate revenue streams. Siegel adds that meeting local politicians' expectations for research-related economic development is another pressure on public universities. At the same time, industry is tiring of disputes over intellectual property and, in some cases, withdrawing from collaboration with universities.

There is a widespread view in some industries that the university's technology-transfer offices are too focused on biotechnology, where a single, blockbuster patent is likely to be the key to a successful commercial product. In most other sectors, a single patent is just part of a complex mosaic of ideas that contribute to a product. Much of the drive to reform the system comes from major information-technology companies, such as Hewlett-Packard and IBM, that don't think it is working for them.

"Many of the rules of the game are being generated from successful areas such as the life sciences, but are applied across the campus

with little awareness of how unusual biotechnology is," says Woody Powell, a Stanford University sociologist who has followed the development of the biotech industry.

"University technology transfer is overly focused on the life sciences," agrees Lesa Mitchell, vice-president of the Ewing Marion Kauffman Foundation, a charitable trust based in Kansas City, Missouri, "and this has had a negative effect on university-industry collaborative models." The foundation is helping to support an effort by the Government-University-Industry Research Roundtable at the National Academies to try and find ways of improving the system.

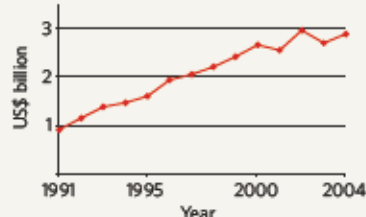
Levelling off

Stan Williams, head of quantum science research at Hewlett-Packard's laboratories in Palo Alto, California, says that universities have had trouble fulfilling their expectations for technology transfer into sectors such as semiconductors, in which it is relatively easy to invent around patent constraints.

"Going forward we could go from unfulfilled expectations to unmitigated disaster," he warns, given what he sees as the tendency of universities to overvalue their intellectual property. If a product requires dozens of patents, for example, and each university wants 5% of the profits, it soon becomes unfeasible to do the work, he adds.

"Fewer and fewer companies want to work with universities on sponsored research because they feel it doesn't make good business sense," says Susan Butts, external technology director at the Dow Chemical Company. "Companies could disadvantage themselves if it produces inventions that they are ultimately

INDUSTRIAL RESEARCH SPENDING AT US UNIVERSITIES



Locked in the lab: intellectual-property disputes make it hard for research to escape.

unable to license," she adds. Industry analysts point out that the growth in the flow of industry research dollars into universities has slowed and become more volatile in the past five years (see graph).

Complaints of troubled and lengthy negotiations prompted Butts and Bob Killoren, director of sponsored programmes at Pennsylvania State University, to approach the National Academies with the idea of hosting a project called Re-engineering Intellectual Property Rights Agreements in Industry-University Collaborations. With funding from Hewlett-Packard, IBM and foundations including the Kauffman, the project is intended to find ways of boosting collaborations between industry and universities in high technology.

After much vigorous debate, the project's participants feel they have found some common ground. They now intend to put together a model that can be readily customized to suit the requirements of different business sectors and project types. The resulting software package, dubbed 'TurboNegotiations', will be designed to help technology-transfer offices with the negotiation process — and keep a lid on legal bills. According to the Association of University Technology Managers (AUTM), universities spent \$205 million on patent

lawyers in 2003, of which \$86 million was recouped in legal fees from licensees.

Some industry watchers, such as Al Berkeley, former vice-chairman of NASDAQ, see the rifts between industry and academia as nothing new. The problem, as Berkeley told an AUTM meeting last year, is that half the technology-transfer job — discerning and marketing the potential revenue-generating patents — isn't being done. "They need to put just as much effort into marketing patents as investment banks put into marketing companies," he says.

Berkeley suggests that creating documents that point out key patent features, as well as where money could be made, would aid commercialization. To that end, the Kauffman Foundation released a web-based portal in September designed to help the research community connect with industry.

Drug problem

In the meantime, there are signs that technology transfer isn't even working well in the sector to whose needs it is most attuned — biotechnology. There are many possible reasons why fewer newly approved drugs have emerged from the system in the past ten years, including the fact that many of the more obvious approaches to finding drugs have already been explored.

Yet some critics of the system contend that the Bayh-Dole Act, which virtually gave birth to the US biotechnology industry, may now be strangling it, as universities seek patent protection on nearly everything (M. A. Heller & R. S. Eisenberg *Science* 280, 698–701; 1998).

Leaders of medical schools and industry have acknowledged that intellectual-property issues are a roadblock to the drug-development process. At a January 2004 meeting hosted by the Food and Drug Administration, they agreed to take steps to better define, and find ways to share, 'precompetitive' research findings. They also promised to explore 'pooled' patents, already used by the information-technology industry, which grant broad access to entire suites of them at once.

"We've grown up expecting a certain return on investment in pharmaceuticals, and it isn't happening," says Frank Douglas, director of the newly established Center for Biomedical Innovation at the Massachusetts Institute of Technology. "People are beginning to question whether we're using the right model."

Douglas wants more precompetitive ideas and research tools to be shared freely, without the need for licensing. "If we could get people to agree on what is considered precompetitive," he says, "we might have a more rational approach to licensing fees and royalties." ■

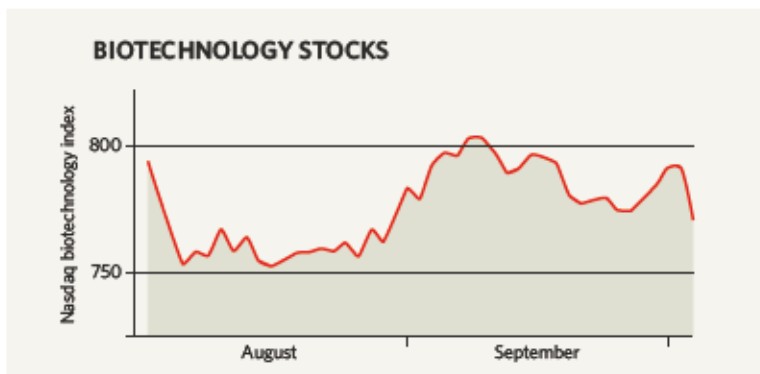
IN BRIEF

STEM-CELL SOURCE The National Institutes of Health has awarded \$16 million to the WiCell Research Institute at the University of Wisconsin to create and run the US government's first human national stem-cell bank. The grant will "dramatically reduce the cost of these cell lines to investigators", says James Thomson, WiCell's scientific director, who first isolated stem cells in 1998. Researchers have complained about the \$5,000 fee that WiCell currently charges to provide federally approved stem-cell lines (see *Nature* 435, 272; 2005). This will now drop to \$500.

CHIPS IN Global semiconductor sales are growing rapidly and are set to comfortably exceed last year's record total. Sales this year up to the end of August totalled \$144 billion, the Semiconductor Industry Association says — 6% up on the same period in 2004. Semiconductor demand actually dropped in Europe, the United States and Japan, but grew sharply in the rest of Asia. Last year, the industry predicted that sales would flatten out in 2005.

NO CURE YET Human Genome Sciences of Rockville, Maryland, suffered a setback when it reported that LymphoStat-B, a drug it is developing to fight the autoimmune disease systemic lupus erythematosus, wasn't as effective as it had hoped during phase 2 trials. Shares in the 13-year-old company, which has yet to bring a drug to market, lost nearly a third of their value on the news. But the drug did subdue some symptoms of the disease, and Thomas Watkins, the company's chief executive, says he still hopes to move on to larger, phase 3 trials.

MARKET WATCH



This week Wood Mackenzie, an Edinburgh-based research and consulting firm, reviews recent trends in biotechnology stocks.

After a sustained increase from June, the Nasdaq biotechnology index was flat during the August holiday season. It then rose slowly in early September, driven by acquisition activity and better than expected earnings, before tailing off somewhat towards the end of the month.

Some US companies had a strong summer. MedImmune of Gaithersburg, Maryland, for example, regained the US marketing rights to Synagis, the company's respiratory-infection drug, from Abbott. The resulting increased earnings forecast ignited speculation that the company may be acquired, further boosting its share price. And California-based Gilead Sciences, meanwhile, continued to reap rewards from its flu treatment Tamiflu, which is marketed by Roche and is in high

demand because of fears of a global epidemic.

Chiron's share price rose after a \$4.5-billion acquisition offer by Novartis, even though the offer was rejected by Chiron's board (see *Nature* 437, 317; 2005). And Eyetech Pharmaceuticals of New York saw its share price jump on the announcement of its acquisition by OSI Pharmaceuticals, also based in New York state. But OSI's share price fell sharply, because of fears among investors that the object of the deal, Eyetech's eye drug Macugen, will lose sales after 2006 following the anticipated approval of rival treatments.

Although the Nasdaq biotechnology index has recently outperformed more general indices, there is little evidence of any improvement in the financing environment. This suggests that mergers and acquisitions are likely to feature strongly in the industry's medium-term future. ■

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