Britain's Ivory Tower Goes High Tech

Cambridge University's scientific talent and relaxed attitude toward off-campus work is attracting high-technology development

Cambridge, England. Some like to call it "Silicon Fen;" more recently it has become known as the "Cambridge phenomenon." Whatever the label, Cambridge University in England, despite its reputation as something of an academic ivory tower, has over the past few years catalyzed the rapid growth of a cluster of high-technology companies into one of Europe's most successful imitations of California's Silicon Valley or Boston's Route 128.

In 1959, there were about 30 high-technology firms in Cambridge; today, there are over 300, 190 of which have been created in the last decade alone. This explosion—epitomized by, but by no means confined to, the growing success of a science park established by Trinity College on the outskirts of the city in the early 1970's—has led many universities to search for the secret of Cambridge's success in order to apply it elsewhere, both in Britain and in the rest of Europe.

Their task is not easy, suggests Nick Segal, a former research scientist who is now a partner in a local consulting firm, Segal Quince and Partners, and was the main author of a report recently published by the firm on the whole phenomenon.* For in addition to conventional factors, such as a pleasant environment and easy access to a range of high-powered scientific knowledge and technical skills, the university has also contributed a number of less tangible but no less significant "cultural" factors.

One has been a traditional laissez-faire attitude toward the outside activities of its academic members. Unlike rival Oxford University, for example, Cambridge academics are not required to register (or to limit) the outside work they take on. They merely have to ensure that it does not disrupt their teaching commitments or interfere excessively with their university-based research.

A second factor has been more fortuitous. In the past, while the colleges have shown little aversion and considerable skill in making money (some are among the richest landowners in Britain), their members shared a reluctance that characterizes a substantial part of European society to do this through direct involvement with heavy industry. In contrast, the science-based industries of the 1980's, which form the backbone of the Cambridge phenomenon, have no such negative associations, and indeed have recently become a prestigious symbol of the university's relevance to the modern world.

Many of the roots of the current situation can be found in the last century. Credit for creating the right cultural conditions belongs to individuals such as William Whewell, master of Trinity College in the 1840's who, as an autocratic vice-chancellor, was largely responsible for the introduction of undergraduate degree courses in the natural sciences. He firmly endorsed the views of Queen Victoria's husband, the German-born Prince Albert, on the need to link science and industry, and equally firmly resisted attempts by central government to increase its control of the university's activities.

> "The hassle of having any regulatory procedure [for academic consulting] would not be worth it."

As the university's scientific reputation continued to grow, several companies were created by university members as spin-offs from their research. These range from Cambridge Scientific Instruments (now Cambridge Instruments), set up in the 1880's by one of Charles Darwin's sons, to CIBA, a synthetic resin manufacturers, which was subsequently taken over by Geigy and merged into CIBA-Geigy. CIBA was established by then Trinity Fellow Norman de Bruyne in the 1930's.

A brake was put on these activities in the 1950's, when many university dons, appalled at the impact on Oxford of the rapid growth of the car factories in nearby Cowley, supported the imposition on Cambridge of tight planning restrictions by regional planning authorities (backed by central government) forbidding any kind of industrial development in or around the city in an attempt to preserve its unique character as a university town.

The rules were strictly applied. In the early 1960's, IBM was refused permission to build its European research and development headquarters in Cambridge, subsequently opting for a greenfield site in the south of England. By the end of the decade, however, the mood of the university (and of the nation's leaders) had changed.

For example, a subcommittee of the University Senate, chaired by the distinguished physicist and 1977 Nobel prizewinner Sir Neville Mott, came out strongly in favor of closer links with industry, both academically and geographically, and identified local planning restrictions as "the root of the problems."

At the same time, a considerable amount of government funding was directed toward the support of high-technology research in the university, the most outstanding example being the creation of a Computer Aided Design (CAD) Center, established with active backing from the then Minister of Technology, Tony Benn.

Such moves laid the ground work for more recent events. "Mrs. Thatcher's policies have really only reinforced what was happening anyhow," says Segal. The Mott report, for example, convinced many academics of the relative desirability of science-based industry compared to the "smokestack" variety, particularly when (as is now largely the case) this industry concentrates on research and development, with large-scale production carried out elsewhere.

The report also helped persuade regional planners to relax their restrictions so as to allow the setting up of small, high-technology companies in and around the city. And when many of those who had come to Cambridge to work in units such as the CAD Center found that the university, faced with tight staffing restrictions, was no longer able to offer them a secure future, they decided to stay around by setting up in business on their own.

Several of the new companies created by such individuals found a home in Trinity's science park. This had been established by the college primarily as a real estate investment in 1970.

After a slow and cautious start—only seven companies had signed up for

**The Cambridge Phenomenon: The Growth of High Technology Industry in a University Town* (Segal Quince and Partners, Hall Keeper's House, 42 Castle Street, Cambridge CB3 England), £15.

premises in the park by 1978—the science park's success has snowballed in recent years. Despite some of the highest rents in the area, there are now over 40 companies renting premises from the college. These range from small software companies created by groups of graduates from the university's computing and engineering departments, to multinational firms such as Schlumberger and IBM, keen to establish what Trinity senior bursar John Bradfield describes as "listening posts" tuned into a wide range of research being carried out in the university's laboratories.

Despite the publicity that the science park has attracted, Segal emphasizes that its success is as much the consequence as the cause of what he calls the "Cambridge phenomenon" for which, he says, there is no simple explanation.

Some factors which have contributed to the phenomenon are relatively conventional, in that they are shared by many other European universities. Cambridge's academic preeminence in a wide range of scientific fields, from mathematics to, most recently, computers and molecular biology, has created a geographically compact community with a broad range of high-powered technical skills and expertise.

"It means that you can solve most problems without going out of Cambridge" says Peter Dean, director of research and development of Agricultural Genetics, a company recently set up to encourage the commercial exploitation of government-backed agricultural research which chose to locate its activities on Trinity's science park.

Another factor has been a ready supply of top-quality graduates from the university who have wanted to stay in the area, but have either been unable to find permanent research posts in university laboratories, or have been attracted by the significantly higher salaries offered by the small, high-technology companies. For example, a 24-year-old postdoctoral student who would receive perhaps $8,000 a year working in a university research department might expect to increase this to $10,000 or $12,000 as a starting salary for carrying out virtually identical work in the science park.

Recent cuts in government support for both higher education and research have also encouraged a broad acquiescence among university staff in the creation of closer links with the commercial world. Martin Evans of the university's department of genetics, for example, suggests that "most people are either indifferent to what is happening, or do not mind," pointing out that a biologist who carries out work for a company is doing little different from one who complements his or her salary by writing textbooks or publishing novels.

Another factor that has helped the "Cambridge phenomenon" to take off—and makes it similar, if smaller in scale, to its U.S. counterparts—has been a steady flow of government research contracts. In particular, several of the small software companies that form the core of the phenomenon, such as Cambridge Consultants and Topexpress, have depended heavily on contracts from the Ministry of Defense. Others have carried out work for the National Health Service and British Telecom.

There are, however, several additional reasons why the Cambridge environment is particularly sympathetic to an active interaction between the university and the high-technology companies that are beginning to surround it. One is the low-key role played by the university in regulating the activities of its staff, stipulating little more than that lecturers must live within 5 miles of the city center or 12 miles if they can demonstrate their regular presence in the university.

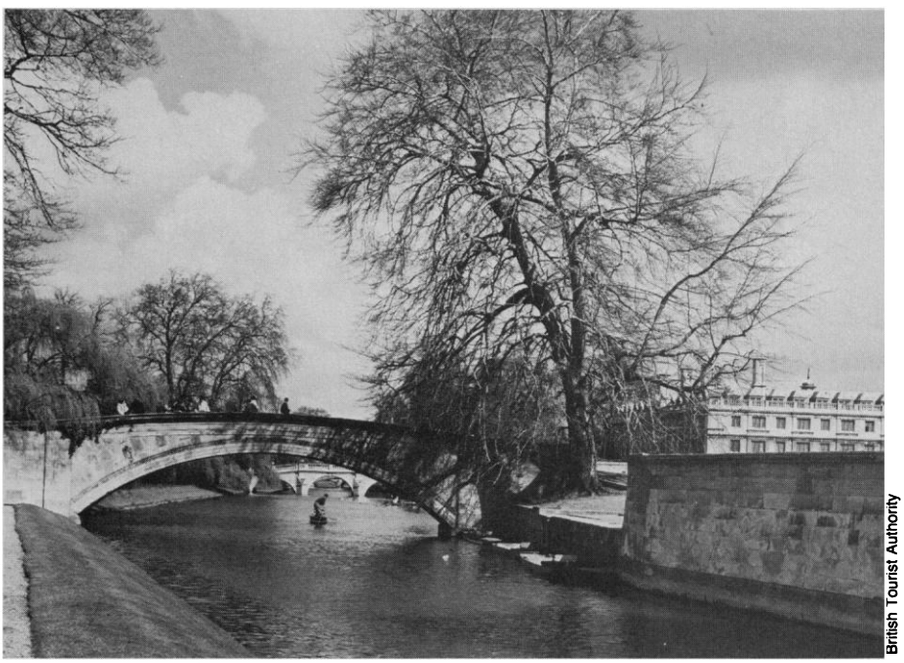
"American universities such as Stanford seem to have tight rules because they know that people will work up to the limit; here we do not require tight rules because people don't," says Roger Needham, one of the founders of Cambridge Consultants and now head of University Computing Laboratory.

Needham claims that the system works through "balance and common sense" suggesting that "the unusually rule-free situation" stems from a general feeling in the university that, to the extent to which there are abuses, these are so small "that the hassle of having any regulatory procedure would not be worth it."

As a result, departments such as his have what he describes as a "friendly and open attitude to all companies," openly encouraging them to come to the university for advice, freely distributing their research ideas and, rather than seeking substantial research contracts, asking for relatively modest contributions from those who seek the department's advice on the basis that "it is customary not to forget the guide."

The lack of a strongly centralized administration in the university, and a tradition of primarily informal links to the outside world, is also reflected in the absence of any organized effort to seek industrial support for research contracts. Queries either from research staff seeking possible outlets for their ideas, or from companies looking for solutions to particular problems, are handled through a one-man Industrial Liaison Unit set up by the private Wolfson Foundation.

The Liaison Unit's director, Stephen Bragg, argues that his role is primarily as a catalyst rather than a matchmaker. But he also points out that the apparent informality of relationships can be deceptive, for the effectiveness of the Cambridge environment also depends heavily on the fact that the university is able to attract top-caliber talent in all fields of re-



British Tourist Authority

No smokestacks, please

Cambridge dislikes heavy industry but is encouraging high-tech companies.

search—and that such individuals often tend to be highly opinionated.

Many of them are also adept at making money, though in the past they have tended to apply these talents less to themselves than to the colleges which support them. Partly as a result, there is no shortage of start-up capital in Cambridge. Some comes from established financial institutions (the local branch of Barclays Bank has been a particularly important source of funding) or from venture capital firms. In addition, several colleges have been able to provide important investments in basic facilities required by embryonic companies. St. John's College, for example, has recently announced that it is linking up with Utah entrepreneur Wayne S. Brown to set up an Innovation Centre on land close to Trinity's Science Park, drawing heavily on the experience of a similar center established by the University of Utah in 1978.

The mythology that provides a key ingredient to the Cambridge "culture" does not always work, however. Acorn Computers, a local company with close links to the university computing laboratories, was widely quoted as one of Cambridge's success stories but it virtually collapsed last month and was bought out by the Italian company Olivetti. Acorn blames part of its difficulties on its failure to achieve a targeted 10 percent of the American educational computer market (it currently enjoys 75 percent of the British equivalent). This was despite an aggressive advertising campaign in the U.S. press featuring a double-spread photograph of Trinity College, and a reminder that the company's computers come from the same home as Isaac Newton.

Overall, however, the failures have been relatively small. Segal claims that the "Cambridge phenomenon" should not be compared to the Silicon Valley of today, but to where it was 25 years ago. Others are reserving judgment, pointing out, for example, that so far the number of new jobs created in the area has been relatively low. But Cambridge is in no hurry for instant remedies; a university that was endowed in 1231 is used to thinking in the long term, and can afford to wait.—**DAVID DICKSON**

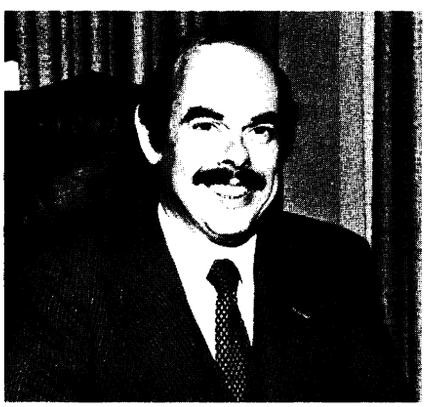
Who Runs NIH?

Pending legislation would create two new institutes and several new commissions; NIH calls it micromanagement by Congress

Although biomedical researchers often like to think otherwise, the National Institutes of Health (NIH) is very much a creature of the United States Congress. It has ever been thus, but the ties that bind the NIH to the will of Congress are growing stronger as legislators take more and more initiative in directing research from Capitol Hill.

For several years, Congress has been trying to agree on comprehensive new legislation governing the NIH. Late last year the House and Senate finally approved a compromise bill that would substantially extend congressional reach into NIH's programs and projects. That bill, which President Reagan vetoed in October, would have added two new institutes to the current 11—one for arthritis and one for nursing.* It would have established in law the requirement that NIH create a new administrative post for "disease prevention" in some institutes, and mandated numerous special task forces or commissions to study problems singled out by members of Congress and the special interest groups that lobby so effectively. Among the new commissions would be one on lupus erythematosus, one on spinal cord injury, and one on so-called "orphan" or rare diseases.

The Administration consistently opposed the reauthorization bill and on 30 October the President vetoed it, saying that the new institutes and special committees were "unnecessary" and "expensive."



Henry A. Waxman

Shaping NIH from the House.

But the Health Research Extension Act, over which Congress labored so painstakingly, is anything but dead. It is expected that by the end of March the bill will be reintroduced in both houses of Congress with no more than minor modifications to language in the vetoed version. The new bill will be no more appealing to the White House than the old and a second veto is widely anticipated. However, circumstances in Congress have changed. The first veto came on a bill passed in the waning days of a congressional session just before the election. Congressional aides predict that this time the chances that a veto will be overridden are very good.

The bill will also be considered at a time when congressional interest in NIH is high because of the fight that is taking place over the Administration's recent move to subvert the intent of Congress by ordering the institutes to fund only 5000 new grants in 1985, rather than the 6500 grants the budget would have allowed (*Science*, 1 March, p. 1016). Legislators have been flooded with complaints about the unexpected cutback and as a result Congress is acutely aware of the biomedical research community right now, and largely sympathetic. In fact, pressure has been so great that there are signs the Administration may be forced to work out a compromise in which the number of new grants is, perhaps, in the 5800 to 6000 range.

The issues that are being debated in the context of the pending legislation go to the heart of the question, "Who's running NIH?" Two aspects of this are important: those pertinent to provisions in the current bill and how they got there, and those related to provisions that were left out in the process of House-Senate compromise but which

*The history of the reauthorization bill and its veto by the President was traced in a series of news articles in the following issues of *Science*: "NIH bill passes House," 2 December 1983, pp. 992–993; "A nursing institute for NIH?," 23 December 1983, pp. 1310–1312; "Congress votes NIH a big budget boost," 26 October 1984, pp. 417–418; "Veto looms over NIH legislation," 2 November 1984, p. 517; "President vetoes NIH bill," 16 November 1984, pp. 811–812.