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Cambridge: Europe's leading location for biotechnology

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Cambridge, UK has earned a reputation as one of the hot hi-tech spots in the world and today is regarded as the exemplar biotech cluster in Europe. Ask any local to describe its hallmarks and they will speak of insatiable curiosity, intense commercial activity, a spirit of ingenuity and adventure, a culture that respects risk, successful start-ups and multi-national pharma companies, top ranked research institutes, world -class universities, a strategic location on the doorstep of the worlds' largest financial market, company creators with successful track records and professional advisers who understand the unique needs of biotech companies.

Although the Cambridge area is arguably home to the most exciting cluster of technology and innovation-driven companies in Europe, this has not always been the case. Indeed, for more than 600 years, Cambridge changed little and slowly, and it was only in the 1960s that the city started its extraordinary metamorphosis from a quiet university town to a wealth creating knowledge- based business nexus. Today, Cambridge is home to over 200 biotech companies, 20% of the world's Nobel Prize winners in medicine and chemistry, 17 out of the 40 UK publicly quoted biotech companies and a quarter of Europe's top 50 public biotechs. So what brought about this change and how did Cambridge evolve into a model biotech cluster that other regions strive to emulate?

Rooted in technology

Cambridge has of course a long history of achievement in the life sciences and can lay claim to many of the early discoveries that have fuelled the biotech revolution. Despite being home to the University of Cambridge and inventors like Newton, Rutherford, Turing, Crick and Watson, to name just a few, the city seemed destined to continue its primary existence as a seat of academic learning. But something happened in the 1960s that catalyzed a profound change in the University, the city and the area around and beyond it.

A key trigger event took place in 1960 when three graduates from Cambridge University, Tim Eiloart, David Southward and Rodney Dale formed a company called 'Cambridge Consultants'. Their aim was to 'put the brains of the university at the disposal of British industry and to provide solutions to real world problems'. Other technology based consultancies followed, including PA's Biotechnology Group. These consultancies created a pool of people with world-class scientific credentials coupled with commercial skills, and many of the entrepreneurs who are active in the Cambridge cluster today originated within these firms of technical consultants.

By the time the first biotech companies were being established in the 1980s, the beginnings of a technology cluster were already in place including people whose vocabulary included words like risk capital, intellectual property exploitation, innovation, technology transfer, business skills. Moreover, the region already had a well-established pharmaceutical presence, and several major research institutes.

What is interesting is that the early companies got started without the sophisticated business infrastructure, funding sources and incubator laboratories that biotech companies enjoy today. This suggests that the key to their success was their people, scientists turned entrepreneurs, people with extraordinary energy, and a drive and ambition to succeed. This indomitable spirit is characteristic of many of the founders of Cambridge biotech companies including David Chiswell, (Cambridge Antibody Technology), Dan Roach and Alan Goodman (Peptide Therapeutics – now Acambis), Mark Bodmer (Hexagen), Iain Cubitt (Axis Genetics) and Gordon Smith-Baxter (Pharmagene). All are still active in the Cambridge bio cluster and bring a wealth of experience in addition to their personal contacts throughout the global bio-pharma industry. According to ERBI, the biotech industry group for Cambridge, there are nine essential elements to any successful biotech cluster, summarized in Box 1.

Research institutes and universities

Fundamental research carried out at institutes and university departments is the foundation of any successful biotech cluster, providing intellectual property (IP) as a base for new companies and a labour pool of qualified scientists.

There are >30 government-funded laboratories and renowned universities in the Cambridge region, many undertaking world-class fundamental research. Top of the list is the Laboratory of Molecular Biology, dubbed

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BOX 1

- World-class research institutes and universities
- Biotech companies
- Major pharmaceutical companies
- Technical service providers
- Professional advisers
- Access to finance (angel, VC and major markets, e.g. LSE)
- State-of-the-art science parks
- Networking opportunities
- Easy access to other major biotech hubs

'The Nobel Factory' because of the number of Nobel prize winners that have emanated from its laboratories – ten since Crick and Watson.

The Wellcome Trust's Genome Campus at Hinxton houses the internationally acclaimed Sanger Centre, the European Bioinformatics Institute and the Rosalind Franklin Centre for Genomics Research. The campus is undergoing a UK£100 million extension and will provide additional laboratories for scientists involved in the Cancer Genome Project. The Babraham Institute, just south of Cambridge, is also a world leader in post-genomic research.

The region is home to seven universities, all of which have life science departments. The University of Cambridge is arguably the top-ranked university in the UK for science with 14 of its life science and related departments achieving a 5* rating for research and teaching in the UK government's audit. Papworth Hospital, a global leader in cardiothoracic disease, and Addenbrookes Hospital, collaborate closely with the university for research and teaching. Cranfield University, the region's post-graduate university, is recognized globally for it's outstanding work in bio- sensors and has a long history of successful collaborations with industry.

When it comes to agricultural biotech, the region is also a global leader. The Norwich Research Park is home to the largest concentration of scientists in plant, food and microbial science in Europe. Research Institutes at the park include the John Innes Centre, the Sainsbury Laboratory, the Institute of Food Research and the University of East Anglia. Moreover, Rothampstead Research is also located in the East of England. Research funding for food related biotechnology is set to rise as researchers demonstrate their skills at developing health-enhancing foods such as cheese that reduces cholesterol (Chemical Engineering at the University of Cambridge) and broccoli that reduces the risk of cancer (Institute of Food Research at Norwich).

Biotech companies

In the Cambridge biotech cluster, 80% of the commercial activity in biotechnology is focused on drug discovery, enabling technologies and technical services. Although there is considerable churn, the number of companies continues to rise with ~200 biotech companies currently operating from a base in the region (see Table 1).

These include: **Overseas companies, Successful locally established companies, Spin-outs from universities and research institutes, Spin-outs from biotech companies.**

Major pharma

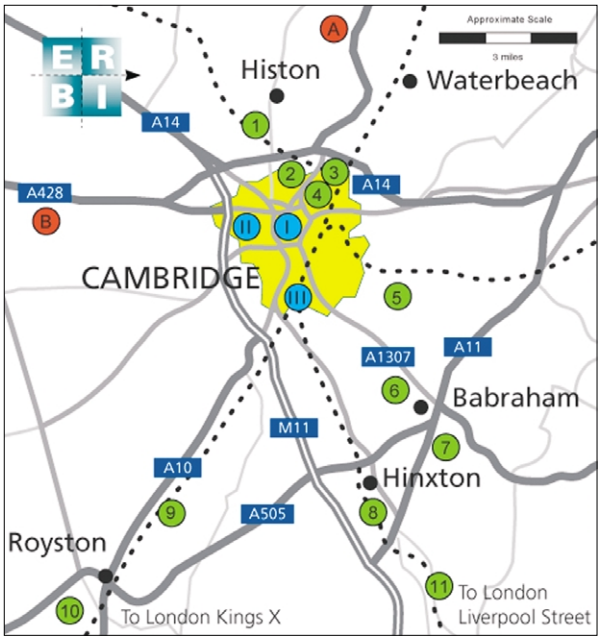
The role of major pharma as a source of both scientific and commercial staff has also played a major role in the development of the cluster. The region houses the global research centres of pharma giants GlaxoSmithKline and Merck Sharpe and Dome in addition to Astra Zeneca, Elan, Schering Plough, Genzyme, Amgen, Bayer and Monsanto, all of which undertake a mix of clinical development, regulatory affairs, sales/marketing or manufacturing.

Technical services, professional advisers, finance and venture capital

Companies in the region enjoy access to local suppliers of technical and professional services and this has created a regional supply chain that is unrivalled in Europe. Having access to finance at all investment stages has also been critical to the growth of biotechnology in the area. The business angel network in Cambridge is one of the most active in Europe and as for venture capital (VC), current estimates put the amount of capital available from locally active VCs such as 3i, Merlin, Avlar, Apax, Gateway Fund, Abingworth and Schroeder, at around USD$1 billion.

Science parks

Companies in the region have a wide choice of biology and chemistry laboratories. Many of these are located on state-of-the-art science parks in and around the greater Cambridge area. The Cambridge Science Park is home to 24 biotech companies, while tenants at Granta Park, a bespoke biotech



Science/Business Parks and Incubators

1 Vision Park
2 Cambridge Science Park (CSP)
3 St John's Innovation Centre (SJIC)
4 Biotech Innovation Centre (BIC)
5 Peterhouse Technology Park
6 Babraham Bio-Incubator (and future business park)
7 Granta Park
8 Hinxton Genome Campus
9 Melbourn Science park
10 Royston estate
11 Chesterford Park

University and Hospital Research/Incubator sites

I Central University site
II West University site
III Addenbrookes and University/MRC site

New Business Parks

A Cambridge Research Park
B Cambourne Business Park

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TABLE 1

			Comment
Overseas companies	Amgen USA	www.amgen.com	The world's largest biotech company manages their European clinical trials from a base on the Cambridge Science Park
	Genzyme USA	www.genzyme.com	Established a research centre in Cambridge last year to focus on antibodies
	PPD USA	www.ppd.com	Employs over 300 people in clinical development at Granta Park
	Medivir Sweden	www.medivir.com	Swedish biotech company with drug discovery programmes in Cambridge in infectious diseases
	Li-Cor Biosciences USA	www.licor.com	US bio-instrumentation company with a sales and marketing office in Cambridge
	ProMetic Life Sciences, Canada	www.prometic.com	Originally a spin-out from the Institute of Biotech at the University of Cambridge, now owned by Prometic of Canada
	UCB Group Belgium	www.ucb-group.com	Acquired the UK's longest established biotech Celltech last year.
Successful locally established companies	Cambridge Antibody Technology	www.cambridgeantibody.com	Cambridge's largest biotech company. ten human monoclonal antibody drugs in clinical trials have originated at CAT, more than any other company.
	Alizyme plc	www.alizyme.co.uk	Public, virtual biotech company with five products in clinical development. To date it has focused on obesity and related diseases, such as diabetes, and on gastrointestinal disorders.
	CeNeS Pharmaceuticals plc	www.cenes.co.uk	CNS drug development company focusing on precedented mechanisms, with clinical assets in Phase III and Phase II studies
	Vernalis	www.vernalis.com	Biotechnology company involved in a wide range of clinical and pre-clinical development programmes targeting large potential markets, principally thrombotic diseases, pain and Parkinson's disease.
	KuDOS Pharmaceuticals Ltd	www.kudospharma.co.uk	Holds a leading position in the discovery and development of drugs based upon the science of DNA-damage sensing, signalling and repair to address unmet medical needs in cancer treatment.
	Domantis Ltd	www.domantis.com	Develops a range of platform technologies for the *in vitro* evolution and engineering of recombinant proteins. They exploit the multiple therapeutic applications of Domain Antibodies:
	BioFocus Discovery Ltd	www.biofocus.com	A leading integrated drug discovery company that provides a range of products, programmes, lead series and services to pharmaceutical and biotechnology partners on a global basis as well as their in-house discovery programme.
Spin-outs from universities and research institutes	DanioLabs Ltd	www.daniolabs.com	A therapeutics company that is using world leading zebrafish-based phenotype driven technology to discover new treatments for human disease.
	Akubio Ltd	www.akubio.com	Develops and commercializes acoustic detection technology for profiling molecular interactions in the life sciences, drug discovery and *in vitro* diagnostics markets.
	Astex Technology Ltd	www.astex-technology.com	A fragment-based drug discovery company pioneering the use of high-throughput X-ray crystallography for the rapid identification of novel drug candidates..
Spin-outs from biotech companies	Pharmorphix Ltd	www.pharmorphix.com	Formed in July 2003 when Millennium Pharmaceuticals closed its Cambridge laboratory. Provides a unique package of solid-form services and research to the R&D sector of the pharmaceutical and biotech industries.
	Sareum Ltd	www.sareum.co.uk	Structure-based drug discovery company developing highly valuable clinical candidates in a range of therapeutics areas for partnering with pharmaceutical companies.

science park close to the Genome Campus, include UCB, PPD, Vernalis, Gilead, Cambridge Antibody Technology and Alizyme. The Babraham Research Campus is home to the UK's most successful bio-incubator providing affordable, flexible laboratories and offices for small companies. Recently completed laboratories at Babraham provide essential grow-on space for both new and existing tenants. The Cambridge Research Park is set to become a major location for biotechs in the future whereas Chesterford Research Park is already home to the Wellcome Trust and seven leading bio companies. There are about ten other parks around the Cambridge region

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and a total of 1.5 million square feet of laboratory buildings.

Networking opportunities

In addition to ERBI's activities (special interest groups, network meetings, annual conference, partnering event and purchasing consortium), networking takes place informally across the cluster. Ask any of the bio entrepreneurs about the value of networking within the cluster, and without exception they will rate it highly as a business tool. There is a huge amount of sharing of best practice, contacts and experiences, and newcomers to the cluster can easily and quickly integrate into the scientific and business communities.

Strategic location and access

Easy access to the financial markets in London, other UK clusters (London, Oxford, Manchester) and major bio hubs in Europe is also important to the bio community. The strategic location of the region enables companies to sell products and services to established and emerging markets throughout Europe. Just 35 min from Cambridge, Stansted airport offers scheduled flights to most major European cities giving fast and easy access to the bio communities in continental Europe.

So much for the elements of a biotech cluster, but what are the hallmarks of a successful cluster?

Despite difficult market conditions, companies in this region are raising finance, striking ambitious deals, expanding research facilities and pushing products through the clinical pipeline. We believe these are all indicators of a successful cluster. For example, companies in the Cambridge cluster have more products in clinical development than the whole of Germany, particularly drugs in Phase 2 and 3 of development (Figure 1).

Despite the current difficult financial climate, companies at all stages of development consistently punch above their weight in terms of attracting investment and forming strategic alliances with global pharma companies. In addition to venture capital, companies are using merger and acquisition (M and A) as a route to raising cash. Examples of recent activity include:

- AstraZeneca£120 million investment in Cambridge Antibody Technology,
- Arakis, an emerging specialty pharmaceutical company that raised £29 million of private equity in September 2004, recently secured, with its partner Vectura, the largest biotech out-licensing deal in Europe worth £375 million
- Biovitrum's acquisition of Cambridge Biotechnology Ltd in March 2005

Companies in the region are also on the M and A trail, as evidenced by the recent acquisition by Paradigm of its neighbour Amedis and Solexa's merger with the NASDAQ quoted Lynx Therapeutics.

This critical mass of activity in the region has given rise to what is known locally as the 'bio re-cycling' phenomenon – in this region, nothing is redundant for very long. People, laboratories, IP, and equipment are quickly re-absorbed into the local biotech cluster. For example, when Millennium Pharmaceuticals announced the closure of its research facility in June 2003, over 90% of its 180-strong workforce were re-employed by local companies in a matter of months. Xention, another start up company that raised a further $6.5m in venture capital in 2004, acquired assets from CeNeS and BioFocus including CeNeS' AutoPatch technology, a pioneering technology which enables the functional screening of ion-channel drug targets at throughputs not previously possible.

So what does the future hold for Cambridge in biotech? There is no doubt that the outstanding reputation of the research institutes and universities will continue to attract funding and the brightest scientists from all over the world, allowing vital fundamental research to progress. In terms of commercial activity, as one local entrepreneur put it, Cambridge is Europe's low risk location for high risk businesses – and that perhaps underpins all of the elements of this successful cluster.

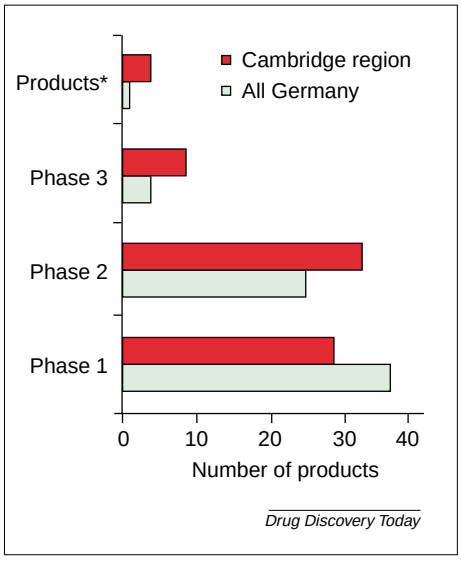

FIGURE 1

Comparison of Germany (Ernst and Young – Through Rough Ways to the Stars) and Cambridge (ERBI), 2004. (* excludes UCB)

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