

## **Development of the San Diego Biotechnology Cluster**

### **Research Paper prepared for the United States Studies Centre**

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### **Executive Summary**

The report by San Diego's Global CONNECT explained the development of the San Diego biotech cluster from the 1970s and '80s to the present day, focusing on four themes:

- The challenge of remoteness
- The role of government
- The role of early successes and flagship companies
- The role of innovation intermediaries

#### ***The challenge of remoteness***

San Diego suffered from remoteness from centres of government, both state and federal, and was initially distant from sources of venture capital and established pharmaceutical firms. This and the lack of abundant resources forced a strong degree of partnering and cooperation between business, local government and university. The need for a first class university was recognised early and business and local government cooperated in the creation of the University of California San Diego and the independent research institutes in the biological and medical sciences.

Scientists and engineers from top-flight institutions were attracted to the region by the "blank slate" offered them. Their freedom to pursue path-breaking research led to new partnerships between research institutions and industry and the setting up of new companies.

San Diego interviewees considered that changes in both telecommunications technology and the global economy have reduced the challenge of remoteness. The nature of the biotechnology industry is also requiring many companies to partner across international boundaries, meaning that a company's geographic location is less of a disadvantage now than before.

#### ***The role of government***

In San Diego there had been no "government master plan". However, government in the form of the US military was important from the early days of the area in providing employment and stimulating technology-based industries. The region's wireless communications cluster (companies such as Linkabit and later Qualcomm) grew out of serving the US military. Even today, approximately 8% of regional economic activity and nearly 24% of the region's employment is affected by US government defence spending.

This is a critical difference from Australia, where technology-related industry in the three major capitals is far less supported by defence funding. Australian defence R&D spending is only 0.2% of federal government outlays, versus 2.7 % in the US.

Federal government funding on civil R&D in the US also flows to business from a variety of departments other than defence. Here Australia's share of government expenditure is similar to the US share at 2.4 %, versus 2.1% in the US.

Later, federal R&D funding was a critical influence on the development of the biotech cluster. It is notable that over half of the US federal funding is for fundamental research, rather than application-oriented development. Likewise, there was support from the State of California for research infrastructure.

Local government land-use decisions in the 1950s had an important influence on making space available in the Torrey Pines Mesa for the University of California and industry to develop.

However, the San Diego team did not see government support as directed at particular industry decisions. Rather, a mix of federal, state, and local government actions creates an environment that encourages institutions and companies to compete for resources. This is done through incentives, tax policy, regulatory policy, patent policy, bankruptcy laws, as well as competitive research and education funding.

In the US, grants are awarded on a competitive, peer-reviewed basis, meaning that only high-quality work gets funded. It also means that the region's researchers are entrepreneurial in how they seek funding. This has significant implications for the Australian situation, where it was argued by Barlow and others in the meeting that the research funding process in Australia has led researchers to work on shorter-term projects, with smaller average grants and with pressure to publish quickly.

Despite past initiatives, including the California Institutes for Science and Innovation (Cal-ISI) and the California Institute for Regenerative Medicine (CIRM) in 2005, the recent stringencies in California have forced spending cuts in the UC system, which were seen as a daunting challenge for future success.

### ***The role of early successes and flagship companies***

While San Diego benefited from the early success of Hybritech, probably the most important benefit was the creation of a cadre of experienced biotechnology executives who start up other firms. Pharmaceutical companies had entered the area in order to be close to the sources of new discoveries, but there was very little major pharmaceutical manufacturing. The advantage of their presence was funding for discoveries and their ultimate acquisition. The SAN DIEGO region regularly produces small to medium-sized companies which are either acquired by larger firms from outside the region, remain niche players, or fail.

There was a question, however, as to how important large companies are to the future success of the biotech cluster. A change in the range of activities was taking place in San Diego, towards a more fragmented value chain. Distributed partnerships were an alternative model to the vertically integrated business model, as most of the functions and services needed to develop a biotechnology innovation were present in the region. A start-up did not need to be integrated to get to the commercialisation stage.

Under the “distributed partnership model”, firms focus on one or two of the four “Ds” in the process – Discovery Research, Definition Research, Development, and Delivery. Contract research organisations have mushroomed, providing activities from research through clinical trials on a contract basis. This trend could be beneficial to companies in Australia, possibly obviating the need for the presence of a large company.

#### ***The role of innovation intermediaries***

Intermediaries, specifically CONNECT and BIOCOM, played a key role in the growth of San Diego, linking disparate components of the innovation ecosystem, reducing transaction costs and increasing the transparency of opportunities. These “intermediary” organizations span multiple boundaries by actively engaging entrepreneurs, research institutions, investors, attorneys, real estate developers, marketing specialists, and government representatives.

They helped create a social norm of collaboration and the expectation of involvement in the broader development of the community, encouraging community champions and volunteers. CONNECT is funded by the private sector, along with numerous volunteers.

The San Diego report provided data on the financial support provided by angels and venture capital firms in the region. Although San Diego has good sources of both funding mechanisms, most of its venture funding comes from outside the region. [Silicon Valley leads the nation in venture capital funding as a whole and specifically in biotechnology. In 2009, Silicon Valley accounted for 39.5% of the \$17.7 billion of venture capital spent in the United States, against San Diego's 5.1%. Biotechnology and medical devices accounted for just over one third of the total US VC funding in the year].

So, relative to San Diego, Australian cities do not appear to be greatly disadvantaged in local access to VC funding.

#### ***Seizing new technology directions***

Diversity of the local economy is one of San Diego’s strengths, which creates latent capabilities that can be deployed when new technology opportunities arise, particularly in areas of convergence such as clean technologies or health IT. Two examples are the rapid expansion of stem cell research and algal fuels technologies. Scientists who were in multiple, pre-existing relationships with colleagues in neighbouring research institutions and with local business were able to develop formalized partnerships to expand in this field.

#### ***Views on the three Australian cities as hubs for biotech commercialisation***

The San Diego report included opinions from experienced local individuals with knowledge of the innovation ecology of San Diego and Australia.

Brisbane was perceived to be the best Australian city for biotech innovation, given a more entrepreneurial culture there and a history of strong government engagement. Melbourne was noted to be the research leader and would make the best location for more research-oriented work. While it was a close second to Brisbane, it was felt by some that it did not yet have a sustainable entrepreneurial business culture. Sydney was the best location for medical devices, but had the weakest position as a biotech hub overall. A perceived lack of government leadership in Sydney and New South Wales was thought to have contributed to this.