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**CENTER FOR REAL ESTATE
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PROSPECTS FOR DEVELOPMENT OF THE
BIOTECHNOLOGY INDUSTRY IN THE
OAKLAND - EAST BAY AREA

BY

EDWARD J. BLAKELY

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**PROSPECTS FOR DEVELOPMENT OF THE
BIOTECHNOLOGY INDUSTRY IN THE
OAKLAND - EAST BAY AREA**

by

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ABSTRACT

This report is on the current structure of the biotechnology industry and the potential for its development in the Oakland/East Bay area. The Oakland/East Bay area is defined as the Northern California cities of Oakland, Emeryville, Berkeley, and Alameda. This report identifies the forces influencing the development of biotechnology industry, with particular emphasis on factors influencing locational decisions. It also assesses the capacity of the Oakland/East Bay area to support and promote development of the industry. Moreover, this report includes a series of policy recommendations intended to assist policy makers in planning the development of the region's biotechnology industrial base.

The report summarizes information obtained over a two month period from seven interviews with leaders in the biotechnology industry in Northern California, two academic administrators at the University of California, Berkeley, a civic leader in Oakland, and a developer in the city of Alameda. Most industry leaders interviewed requested they remain anonymous, so references to their comments are stated in very general terms. Information obtained from interviews was supplemented with information derived from a careful review of literature on the formation of the industry. A literature search was undertaken to identify the size, scope, and prospects for development of the biotechnology industry in the Oakland/East Bay area. A bibliography of these materials is included in the Appendix.

This report is intended to assist local legislator, councilmembers, planning officials and businesspersons develop a framework for the development of the biotechnology industry in the Oakland/East Bay area. It is intended to identify locational factors in this emerging industry and demonstrate the viability and potential for it to create a strong and economically viable long term base for the area's economy.

I. EXECUTIVE SUMMARY

SHAPE OF THE BIOTECHNOLOGY INDUSTRY

Biotechnology is one of the fastest growing industries in the nation because of its potential to produce unlimited quantities of products never before available, products currently in short supply, and products safer than those now available. The most well known and widely publicized efforts involve the development of health products to reduce life threatening diseases in man and animals. Biotechnology research is also creating the real possibility of improving food production around the world.

Several national and international trends may have significant bearing on the development of the biotechnology industry in the Oakland/East Bay area. There is some indication that the production of biotechnology type pharmaceuticals, the industry's major low skilled employment component, may locate either along the eastern seaboard region of the United States or in foreign countries. Location of this production in the eastern United States, especially New Jersey, may occur because the pharmaceutical industry there is already well established. Second, the recent emergence of large established national companies and foreign companies into the biotechnology industry may constrain the start-up of more research and development firms. Venture capitalists, expecting a shake out similar to that caused by IBM's entrance into the personal computer industry, are unwilling to invest heavily in new, high risk biotechnology firms. While local government officials and policy makers have

little control over these market forces, they nonetheless must anticipate them in their efforts to secure an industry foothold in the Oakland/East Bay area.

INFRASTRUCTURE REQUIREMENTS FOR BIOTECHNOLOGY INDUSTRIES

Biotechnology, a knowledge and information intensive industry, requires a close relationship between the university environment and commercial firms. The total socioeconomic environment must serve as an "incubator" for the development and transfer of new knowledge from universities to commercial firms. Thus, the industry requires "soft" infrastructure such as:

- Close proximity to internationally recognized research universities;
- Well developed communications facilities;
- A quality living environment;
- Excellent local and international transportation systems;
- Favorable regulatory and political environment that encourages development of the industry;
- Quality professional services, and;
- Close proximity to major advanced technology firms.

GEOGRAPHY OF THE BIOTECHNOLOGY INDUSTRY

The Boston metropolitan region and the San Francisco metropolitan region are the national centers of the biotechnology industry. Within the San Francisco metropolitan region, the Oakland/East Bay area has the largest and most dynamic

biotechnology firms. These innovative firms are currently pacing the industry's new product development. The largest clustering of biotechnology firms in the San Francisco metropolitan region, however is in the Silicon Valley area around Stanford University. Other regions in the state of California and regions in other states are rapidly gaining prominence as good locations for biotechnology firms. Unless Oakland/East Bay public policy encourages development of the biotechnology industry by forging better linkages with the major research universities and creating consistent, predictable regulation of the industry, the leadership position could disappear.

ASSETS OF THE OAKLAND/EAST BAY AREA FOR THE BIOTECHNOLOGY INDUSTRY

The Oakland/East Bay area has the opportunity to become the biotechnology center of the nation. The area's proximity to several of the major university research institutions in the nation is the primary reason for the opportunity. Within a few minutes drive from Oakland's civic center are Stanford University, the University of California, Berkeley, the University of California, Davis, and the University of California, San Francisco. These institutions form the core of the nation's biotechnology industry.

Another significant asset of the Oakland/East Bay area is its cultural and social diversity. The mixture of ethnic groups provides a rich and varied population base that makes the area one of the socially richest communities in the nation.

The Oakland/East Bay area also has a significant supply of skilled labor. A large network of quality community colleges and specialized training programs continuously supply new talent to industry.

Perhaps the least well recognized but most important asset of the Oakland/East Bay metropolitan area is the availability of quality industrial sites ideally suited for the research, development, and manufacturing of biotechnology products. Many of these sites offer unique settings for the development of the industry with campus like settings, manufacturing space, quality telecommunications, and air transportation. These attributes of the Oakland/East Bay area rival those of the Stanford-Silicon Valley area. There is every opportunity for the Oakland/East Bay area to become a recognized national center for the research, development and production of biotechnology products.

OAKLAND/EAST BAY AREA CONSTRAINTS RELATED TO THE DEVELOPMENT OF BIOTECHNOLOGY INDUSTRY

The Oakland/East Bay area, particularly Oakland, is consistently characterized as a high crime, low educational achievement area. Though unique to a few neighborhoods, this characterization of the entire area is a major impediment to encouraging the growth of new industry.

In addition, there is a need to deal effectively with the following issues:

- The shortage of affordable housing: There is a shortage of housing throughout the area, notwithstanding the fact that Oakland offers a range of reasonably priced housing types for both home ownership and rental accommodations.

- Inconsistent regulatory environment: The City of Berkeley has elected to impose restrictive regulation on the development of the biotechnology industry. Berkeley's policy towards biotechnology has a negative impact on efforts to expand the industry in other parts of the Oakland/East Bay area. Oakland, Emeryville and Alameda are in fact communities receptive to the biotechnology industry.

- Limited coordination between the major universities and the biotechnology industry: There has been considerable improvement in the interaction between biotechnology firms and the universities, particularly U.C. Berkeley. However, this remains an inconsistent and unreliable communications channel. Steps will have to be taken to bridge that gap if the university is to serve as a catalyst for economic revitalization.

POLICIES TO ENCOURAGE THE DEVELOPMENT OF BIOTECHNOLOGY IN THE OAKLAND/EAST BAY AREA.

The recommendations listed below are intended to assist public policy makers and businesspersons in designing a realistic strategy for the development of the biotechnology industry in the Oakland/East Bay area.

Recommendation #1: The University of California needs to demonstrate a commitment to development of the biotechnology industry in the Oakland/East Bay area. One way of demonstrating a commitment to the industry is to establish an institute dedicated to maintaining a strong applied research presence in the biotechnology and other emerging related industries.

Recommendation #2: The Oakland/East Bay area needs to be promoted as a national biotechnology center in order to attract other firms.

Recommendation #3: The Oakland/East Bay area needs consistent and predictable regulation from local governments.

Recommendation #4: Local governments in cooperation with academic institutions need to create a public sector regional biotechnology investment company to promote and coordinate investment in small companies.

Recommendation #5: The University of California needs to expand its capacity to joint venture with private sector biotechnology companies.

Recommendation #6: Oakland/East Bay policy makers need to develop specific programs to upgrade the image of the Oakland/East Bay area.

Recommendation #7: Local primary and secondary school systems, community colleges, and four-year post-secondary institutions need to design specialized education and training programs in biosciences.

II. EVOLUTION OF THE BIOTECHNOLOGY INDUSTRY

Biotechnology involves the use of genetic engineering techniques, particularly recombinant DNA, to manipulate, modify, or alter organisms as they naturally occur in the environment.¹

The industry uses biotechnology techniques to introduce new traits into existing organisms, thereby, creating new kinds of drugs, diagnostic tools, plants, animals, and industrial processes.

Research & Development: Biotechnology research began in the early 1970's when Stanford University's Paul Berg rocked the scientific world by splicing genes. At that time the emphasis was on theoretical research and based primarily in the university environment. Many of the people initially engaged in research saw the potential for commercial application of the new technology. Small start-up research and development companies grew rapidly with universities managing to retain many of the patents for

biotechnology processes. For example, Stanford University and the University of California, Berkeley have the Cohen-Boyer patent for the basic recombinant DNA (rDNA) process. The start-up research and development companies moved increasingly into the production, distribution, and marketing of new products.

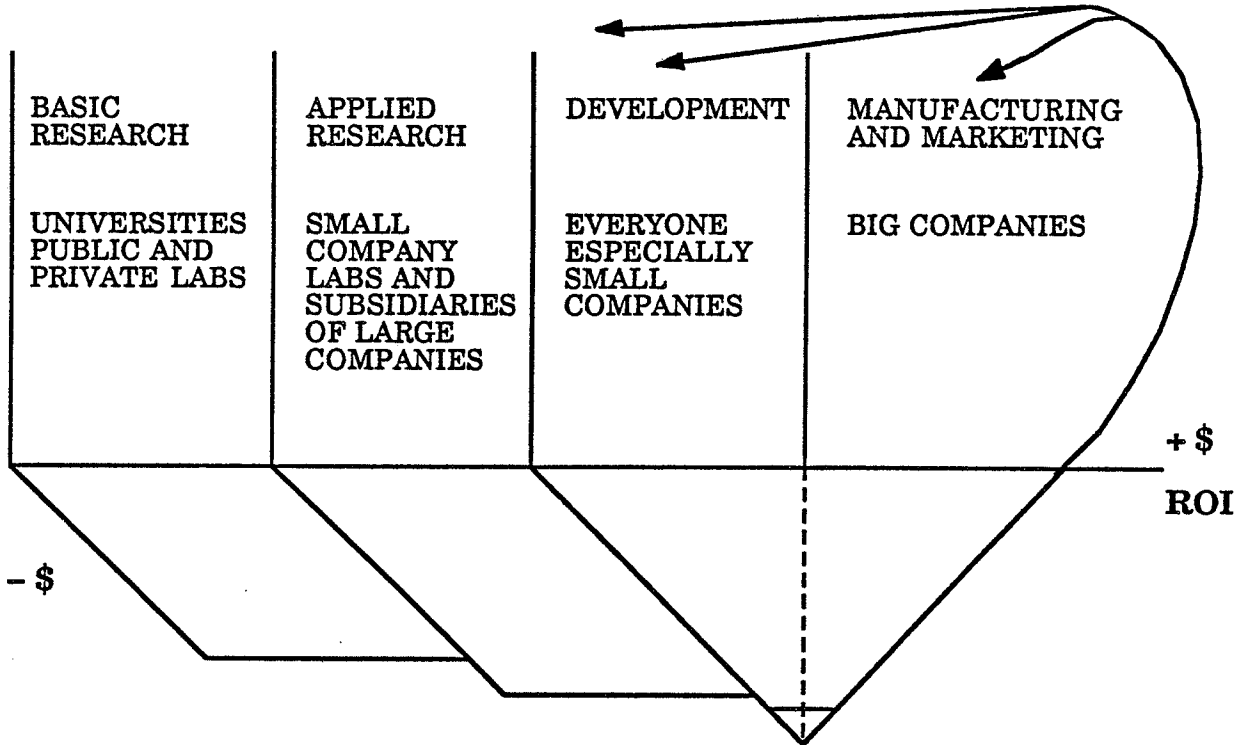
In much the same way as IBM stood on the sideline while small personal computer companies perfected the micro-computer technology, the major corporations are just now establishing a presence in the biotechnology industry.²

Product Development, Marketing and Distribution: Small Research and Development companies are now beginning to bring products to market. They typically lack the capital, facilities and marketing expertise to produce large quantities of products or support sophisticated marketing programs. As a result, many new products are licensed to large established companies, and the smaller development companies receive royalties. An increasingly popular form of cooperation for bringing products to market is the joint venture. Under these arrangements smaller companies may retain control over the production of a product and have the large companies market it under their trademark. The development process discussed above is illustrated in Chart 1.

CHART 1

THE DEVELOPMENT PROCESS

DEVELOPMENT RELATIONSHIPS IN BIOTECH



Adapted from Regis McKenna

-\$ = Heavy Investment with Low Return

+\$ = Investment with Return

ROI = Return on Investment

III. BIOTECHNOLOGY PRODUCTS AND INDUSTRIAL POTENTIAL

There are three basic processes used to develop biotechnology products. First, products can be made using genetically engineered organisms as substitutes for conventional methods of production such as chemical synthesis and extraction from tissues. These substances are produced using a fermentation process where nutrients and raw materials are supplied to living cells in a reactor vessel that converts raw materials into products. This process is used most frequently in the development of medical, pharmaceutical and chemical products. Second, biotechnology may be used to produce unprecedented amounts of scarce biological compounds of which certain regulatory proteins provide the leading examples. Third, biogenetically engineered new organisms are being developed to do such things as leach or concentrate minerals from ores, increase the extraction of oil from wells and reduce the freezing temperature of plants. This method of biotechnology has found its greatest use in the agriculture field. Scientists are using genetic engineering techniques to change the genetic constitution of micro-organisms, plants, and animals to make them more productive, more resistant to disease, and more resistant to environmental stress.³

A. Current Biotechnology Product Emphasis

Development of Monoclonal Antibodies: These antibodies are used in research, chemical separation and purification, diagnostic tests and treatment of disease. Monoclonal antibodies for diagnostic testing are popular product areas because they can

be rapidly developed, tested, and brought to market. Human and animal pharmaceuticals have much higher costs associated with development and regulatory approval. Monoclonal antibody product development has occurred almost exclusively in the pharmaceutical industry.

Development of rDNA Products: Recombinant DNA research has focused on development of "gene expression products." Synthesized DNA is introduced into the host organism where it can be "expressed" in the form of messenger RNA and protein. Product development using rDNA techniques include tissue, plasmenogen activates to break up blood clots, polio vaccine, and hepatitis B vaccine. Again, most of the rDNA products have been in the pharmaceutical industry.⁴

B. Trends in the Biotechnology Industry

There has been a slow down in the creation of independent biotechnology research and development start-ups. Chart 2 shows the dramatic growth of the nation's biotechnology industry between 1979 and 1981 and the subsequent slow down.

Large established companies such as Chevron, Eli Lilly, Upjohn, Monsanto, DuPont and Miles Laboratory are rapidly entering the biotechnology industry, creating their own research and development subsidiaries.

Some industry analysts believe that the entrance of the large established corporations will result in the same type of "shake out" experienced in the computer industry as a result of

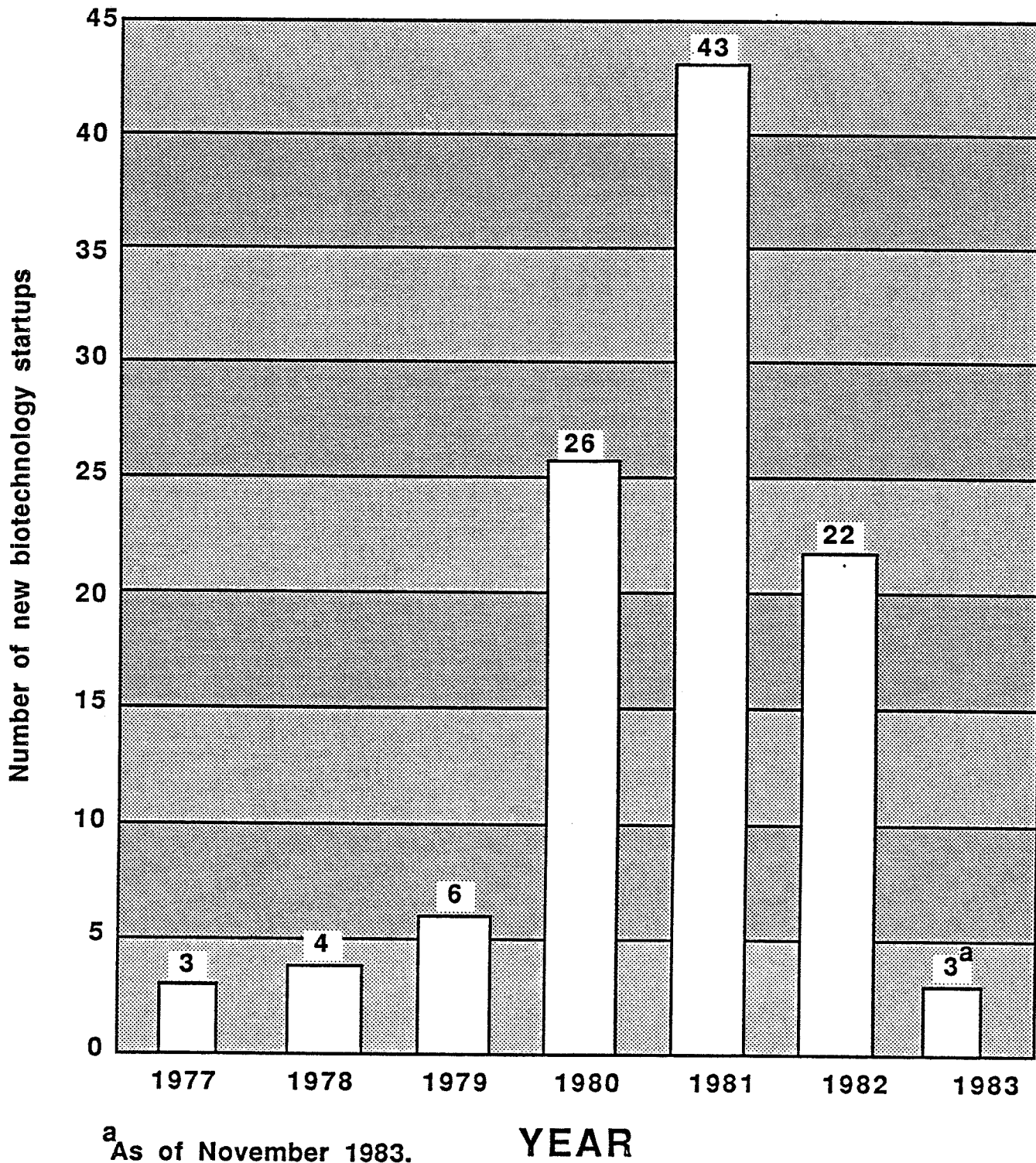
IBM's move into the personal computer market. It is expected that only a handful of the start-up biotechnology companies will be able to develop the marketing expertise and manufacturing capability to grow into large companies. Unlike the computer industry, analysts expect that as many as two-thirds of these firms will be merged into or acquired by the major drug and chemical companies rather than go out of business.⁵ The anticipated shake out and the overall performance of technology start-up companies has resulted in a lack of investment enthusiasm. "What little venture capital activity remains is being aimed at highly specialized companies."⁶ A comparison of Chart 2 with Chart 3 shows how the reduction in investment capital paralleled the slowdown of start-up biotechnology ventures.

The current industry emphasis is on targeting the research and development of products which can be quickly brought to market. As a result much of the current product development work involves monoclonal antibodies in the area of medical diagnostic testing.

In order to bring products to market, the biotechnology industry representatives, working with companies in the research and development phase, indicated that they are licensing products or joint venturing with large established companies. They believe that it is more cost effective to subcontract the production of a biotechnology product until its commercial viability can be determined.

CHART 2

Emergence of New Biotechnology Firms, 1977-83



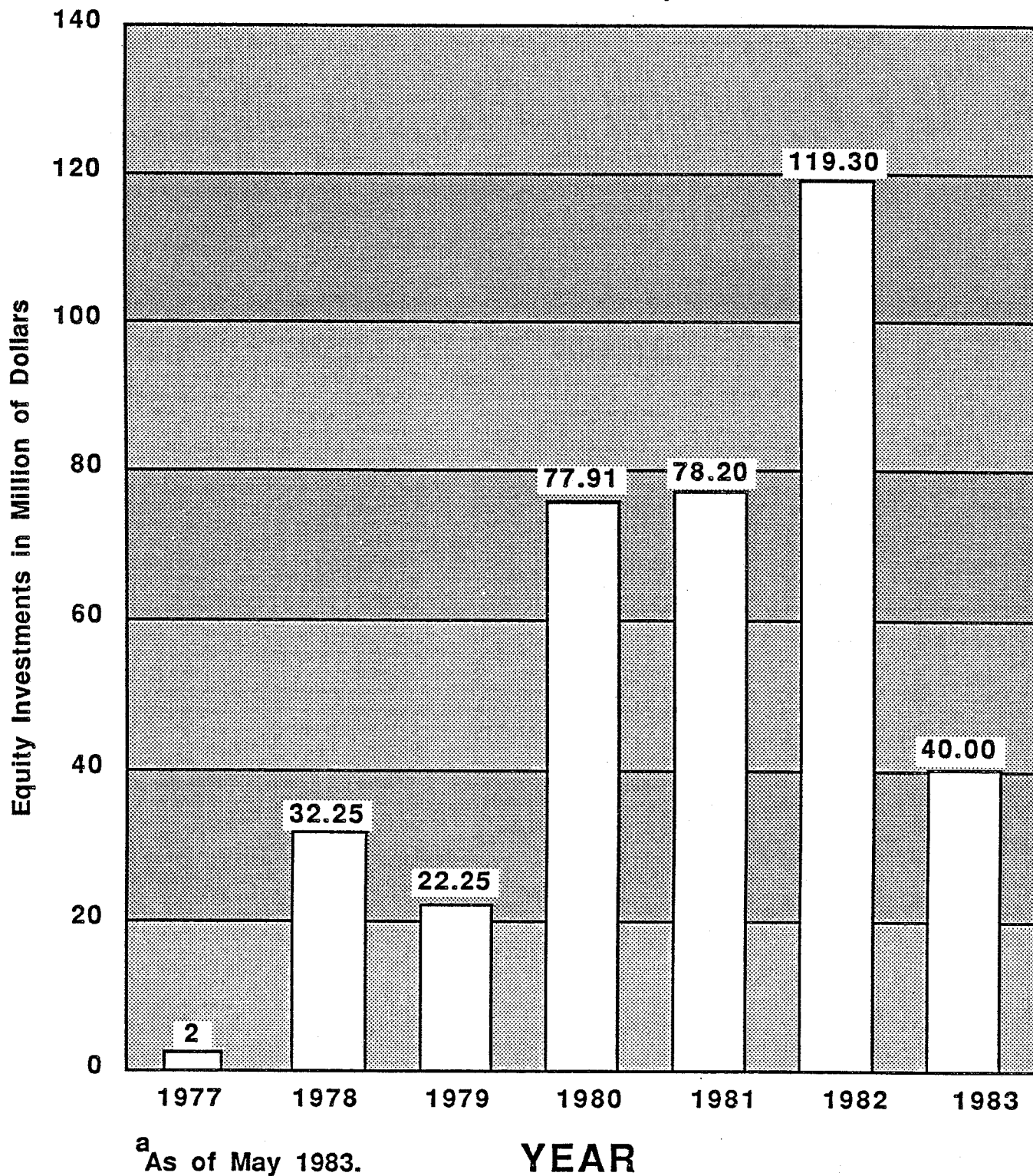
^aAs of November 1983.

YEAR

SOURCE : U. S. Office of Technology Assessment

CHART 3

Aggregate Equity Investments in New Biotechnology Firms
by Established U.S. Companies, 1977-83^a



SOURCE : U. S. Office of Technology Assessment

Several biotechnology industry representatives interviewed indicated that as companies move from the research and development phase with increased sales of commercially profitable products, they create their own production facilities in close proximity to their research and development laboratories. Other companies indicated that they were either currently doing the bulk of their production offshore or planning to do so.

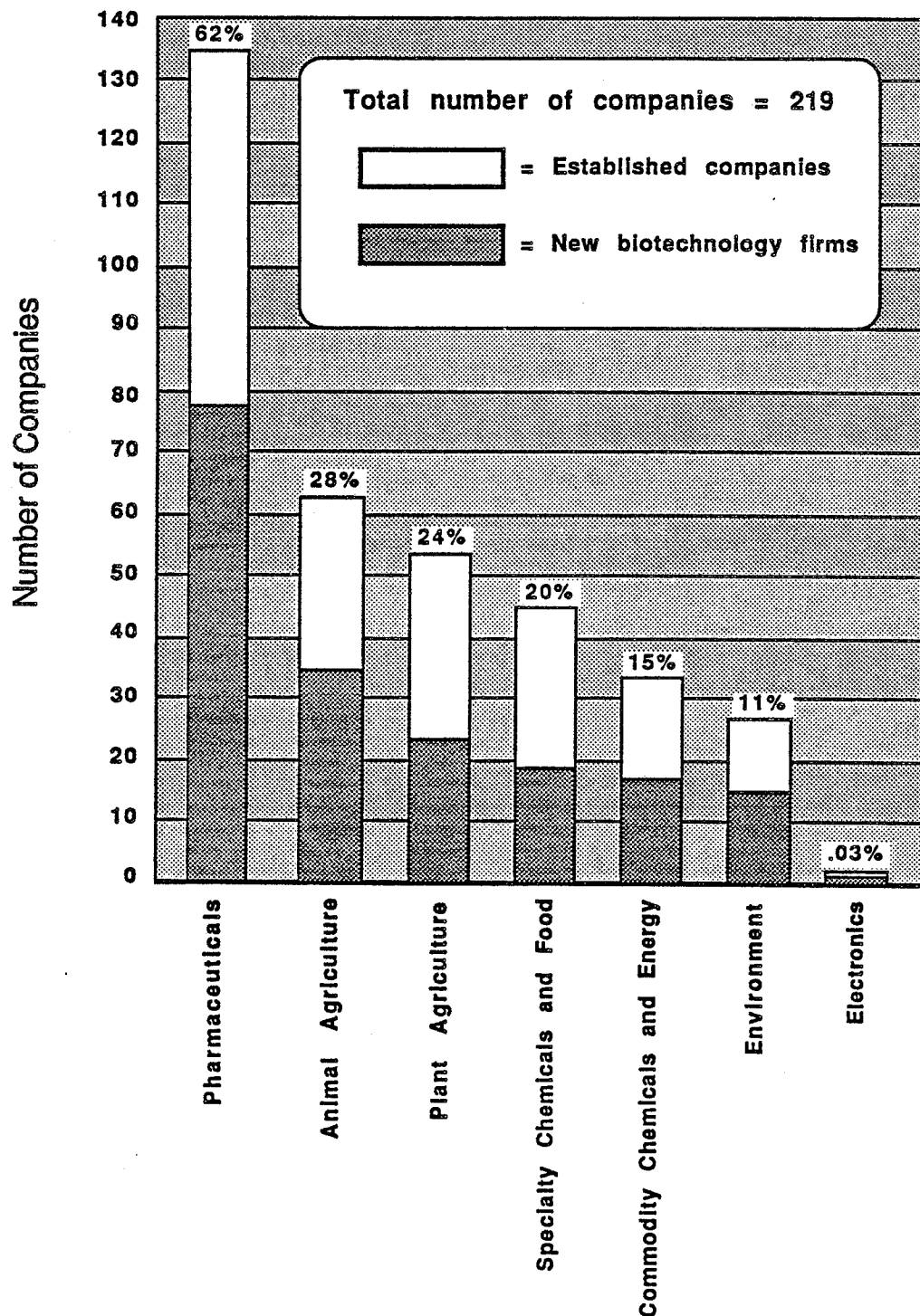
In addition to the entrance of larger companies into the biotechnology industry, foreign competition, particularly from Japan and Europe, is impacting the industry's development. For example, by January, 1984 U.S.-owned companies had signed fifteen technology-transfer agreements with Japanese companies.⁷ Japanese companies have entered the industry with the assistance of government financing. European emergence into the biotechnology arena has progressed more slowly because of a lack of venture capital to form new companies.

A recent report by the Stanford Research Institute International (SRI) indicated that the industry's production component could easily move out of the San Francisco Bay region and the State of California because California is not positioned as a major manufacturing center of the pharmaceutical industry.⁸

Chart 4 shows that pharmaceutical companies are the most active participants in the biotechnology industry representing sixty-two percent of the firms pursuing application of biotechnology techniques.

CHART 4

Percentage of Firms in the United States Pursuing Applications of Biotechnology in Specific Industrial Sectors*



*The total percentage of firms exceeds 100 percent because some companies are applying biotechnology to more than one industrial sector.

SOURCE : Office of U. S. Technology Assessment

IV. EMPLOYMENT IN THE BIOTECHNOLOGY INDUSTRY

The biotechnology industry is in a phase of rapid growth. Chart 5 shows the astronomical growth of a select group of Northern California biotechnology firms. While data is not available on the growth of employment in the industry, the growth of sales is a good indication that biotechnology will generate a tremendous number of employment opportunities.

Typically biotechnology firms engaged in research and development have a small number of clerical and low-skilled employees. Together these workers account for less than twenty percent of all jobs in the industry. Among the companies interviewed, ten percent of the work force is composed of management and clerical occupations and less than one percent are low skilled service workers. Twenty to thirty percent of the biotechnology work force are employed in semi-skilled technical occupations with the remaining fifty to sixty percent active in highly skilled professional/technical occupations. Chart 6 shows that PhD's within research staffs range between twenty percent and fifty percent of all employees in biotechnology firms. The wide range of PhD staff was explained by one industry representative as an indication of the firm's stage of development. In the research and development phase, companies have little or no need for low-skilled workers. As they move into the production phase, the research and development staff remains constant while low-skilled labor undergoes a substantial increase.

CHART 5 : GROWTH OF SELECTED NORTHERN CALIFORNIA BIOTECHNOLOGY FIRMS

FIRM	LOCATION	1983		1984		1985	
		SALES	%GROWTH	SALES	%GROWTH	SALES	EMPLOYMENT
Applied BioSystems, Inc.	Foster City	7,644	175	21,848	69	35,563	273
Bioresponse, Inc.	Hayward	10	4860	496	400	2,476	75
California Biotechnology, Inc.	Mountain View	4,795	40	6,713	12	7,548	112
Cetus Corp.	Emeryville	18,465	99	35,853	27	45,365	595
Chiron, Inc.	Emeryville	1,579	564	2,469	138	5,886	130
Collagen Corp.	Palo Alto	12,402	15	14,312	15	16,425	225
GenenTech	South San Francisco	42,373	55	65,627	24	81,635	893
MonoClonal Antibodies, Inc.	Mountain View	160	661	1,217	215	3,831	97
Advanced Genetic Sciences, Inc.	Oakland	139	1560	2,307	—	—	—
TAGO	Burlingame	1,073	8	984	59	1,561	57

SOURCE : STANDARD & POORS

*SALES FIGURES ARE IN THOUSANDS OF DOLLARS

CHART 6

NUMBERS OF PH.D. LEVEL RESEARCH STAFF WITHIN SOME BIOTECHNOLOGY COMPANIES

Company	Total no. of employees	No. Ph.D.s within research staff
Amgen	100	45
California Biotechnology	44	21
Collaborative Research	125	44
Genex	219	54 (approx.)
Integrated Genetics	125	25

Source: 1983 Company annual reports and prospectuses

The minimum qualifications for technical workers is four years of college with a BA, BS, or AA degree preferably in the biological or chemical sciences. Production or semi-skilled workers are generally required to have high school diplomas, or in some firms, at least two years of college. Company representatives, however, noted that the skill level of production workers is rising as the industry is becoming more automated.

The bBiotechnology companies interviewed, indicated they either intend to conduct their production activities within the San Francisco/Oakland region, in close proximity to their research and development activities, or in a foreign country. These two options argue against SRI's concern that location of the production of pharmaceutical products is most likely to occur in the established eastern United States seaboard. Production within California or offshore suggests that the availability of expertise and intellectual environment are more important factors in determining where to locate production activities.

V. REQUIREMENTS FOR DEVELOPMENT OF THE BIOTECHNOLOGY INDUSTRY IN CALIFORNIA

Biotechnology industries have different requirements than traditional industries. Whereas, traditional industries require a proximity to markets, sources of materials, low transport costs, and a skilled labor force, biotechnology industries require special support systems. These support systems vary in each phase of development. The following developmental factors, summarized in Chart 7, are general requirements of the biotechnology industry. An exhaustive discussion of location and development factors, by phase of development and by type of product development, is beyond the scope of this report.

Internationally Recognized Universities with Strong Connections to the Biotechnology Industry

The constant exchange of new ideas and research information is essential to the continuous development of commercially viable biotechnology products. Closeness allows for the development of special social and professional relationships within the scientific community. One biotechnology representative stated that such relationships are often the primary factors for stimulating new ideas.

Biotechnology companies rely heavily on university research programs for original theoretical research and for clinical testing. All of the biotechnology companies interviewed maintained relationships in the form of research and development

consulting contracts, or license agreements with twenty to thirty universities around the country.

A Strong Information, Communications, and Research Environment

Biotechnology companies need to be in constant contact with university affiliates around the globe for the exchange of research results, new ideas, and administration of agreements. Advanced telecommunication is essential since the formation and dissemination of new developments is a very rapid process.

A Quality Living Environment

A quality living environment includes residential amenities, access to education, cultural and recreational facilities, and modern shopping centers. Affordable housing in relatively close proximity to company facilities is of primary concern to companies looking for a suitable location. Affordable housing is essential for attracting and retaining talented employees.

A primary concern of companies looking to locate in an area is the educational environment for their employees' children and the educational level of prospective employees. Companies often request regional test scores of children from elementary through high school, as the first step in evaluating a possible site. Access to cultural amenities and a safe environment are also high on the list of locational factors. The government official interviewed felt that such amenities are essential to attracting new professional talent.

CHART 7

REQUIREMENTS FOR BIOTECHNOLOGY INDUSTRIES BY STAGE OF TECHNOLOGY PROCESS				
REQUIREMENT	RESEARCH	DEVELOPMENT	DIFFUSION	PRODUCTION
Information Communication Strategic Relationship	Social interaction Library Data Base	Center/Hotel	Innovation Centers Information Bureaus	Publication Media Marketing
Human Resources	Research Scientists Inventors	Skilled Technical Staff	Entrepreneurs Venture Capitalists	Top Management Skilled Workforce
Education and Research Facilities	University Research Institute	Research Labs	Conference Facilities	Community College Technical Institutes
Environmental Quality	Quality living and working environment	Quality living and working environment	Quality living and working environment	Quality living and working environment
Government Support	Government contracts for applied research, Offsets	Joint ventures	Information support services	Offsets, Export incentives
Finance	Research grants	Private investments and venture capital	Private investments and venture capital	Institution finance
Technology Image	Quality residential areas	Reputation among luminaries	Clear identification with specialized tech firms	Top quality companies
Enterprise facilities	Research Institutes University & National Labs	Incubator Innovation building centers labs	Incubator Innovation building centers labs	Technology, Business and Quality Industrial Parks
Infrastructure	Basic infrastructure for research facilities	Research stations Testing areas	Research stations Testing areas	Fiberoptics Airports, waste disposal

Excellent Local and International Transportation Systems

A major requirement of the biotechnology industry is location close to airport facilities. Although many existing products demand close proximity to a major consumer market for paring transport costs, biotechnology products can be produced and shipped via air from any location in the country without losing their competitive edge. Airport access is also essential as the industry requires constant travel by its scientists and administrators.

Special Facilities and Infrastructure Designed to Accommodate Biotechnology Companies

Research and development laboratories and administrative offices can usually be accommodated by existing commercial space suitable for construction of laboratories. One firm representative, however, cautioned that after going the rehabilitation route, the numerous unanticipated construction problems caused his firm to build new facilities in the future. Production activities require substantially more space, especially for products which require fermentation and sophisticated waste disposal facilities.

Fermentation products will often produce unusable side products such as non-fermentable portions of raw materials and the fermenting micro-organisms themselves. Thus far, biotechnology company officials said that their companies have carefully pre-treated biological waste before releasing it into sewers. The existing plants, primarily set up for research and

development, have limited waste disposal capacity. As more products come to market, the need for waste treatment plants will probably increase. Therefore, future locational issues revolve around the willingness of local governments to grant sewage connection permits to particular treatment plants.

A Favorable Local Regulatory Environment

Predictable application of location land-use and public-health regulations are crucial to the location of biotechnology firms. Because of the highly competitive nature of the industry, companies must be assured that their development activities will not be hindered by inconsistent application of regulations. Three of the seven companies interviewed stated that the local political climate and regulatory structure was pivotal in their location decisions.

Easily Available Quality Professional Services

The development of any high technology industry requires experienced lawyers, accountants, financiers, developers, and marketing specialists. Skilled professionals are needed to handle complicated research and development tax laws, patent registrations, securities transactions, and industrial laboratory design.

Major Advanced Technology Firms or Institutions

Advanced technology institutions are needed to provide a stimulus for further growth and clustering of industries. These institutions can include hospitals, government science laboratories, and agriculture and marine research centers.

VI. GEOGRAPHY OF THE BIOTECHNOLOGY INDUSTRY IN CALIFORNIA

Biotechnology companies have located in areas traditionally identified as electronic industry nodes, namely Santa Clara County and the Los Angeles Basin. (See Map A) Such clustering of biotechnology companies suggests that establishing an area's identity as a particular high technology node fosters the development of other such industries.

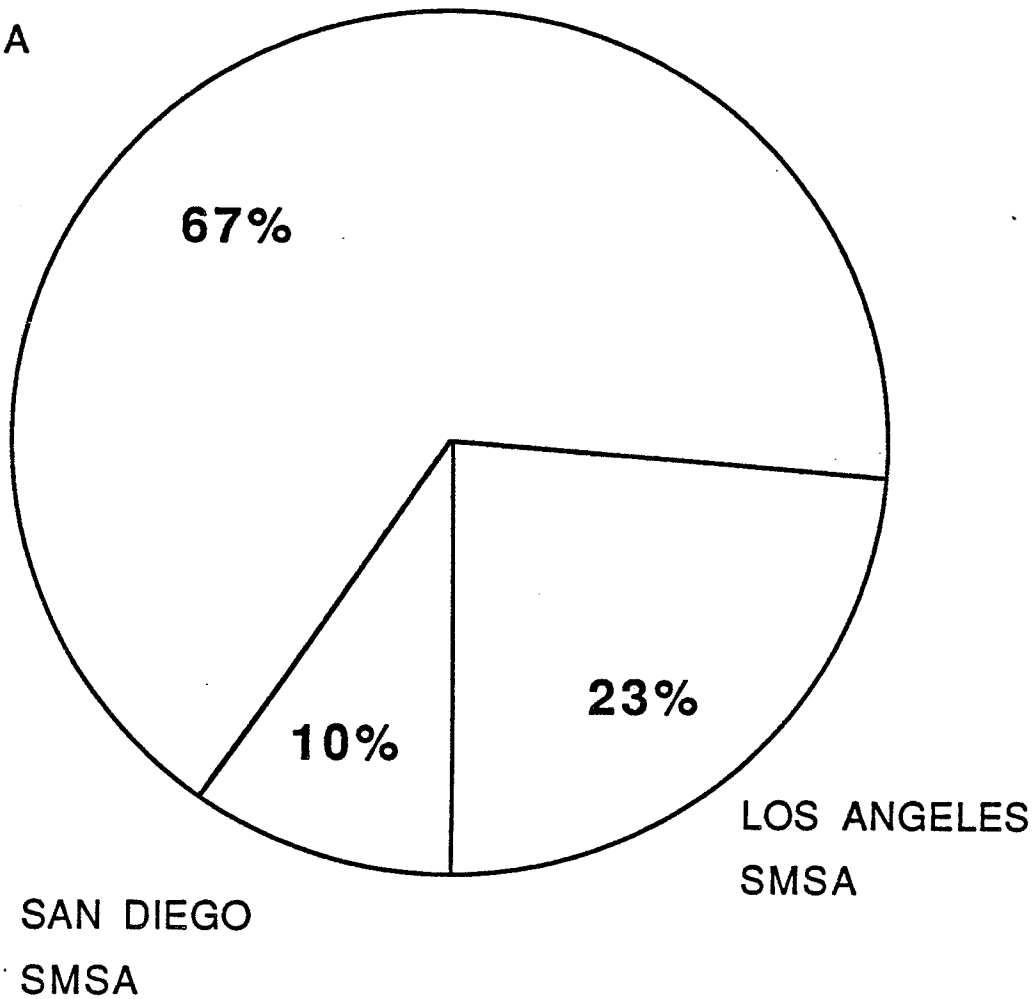
Chart 8 shows that Northern California accounts for more than sixty percent of California's biotechnology firms.

Location Patterns of the Biotechnology Industry Within the San Francisco/Oakland Region

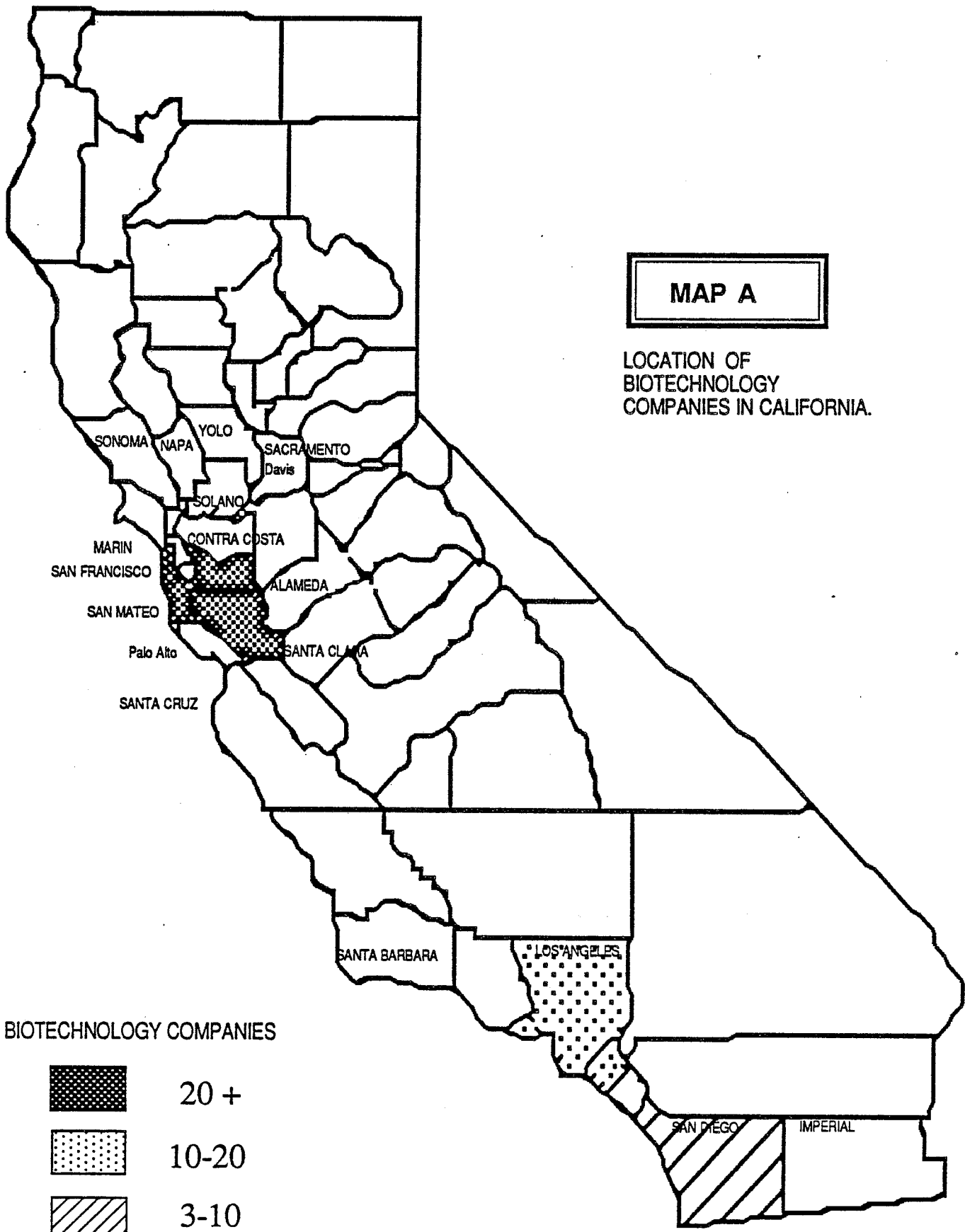
Within the San Francisco/Oakland region biotechnology firms have clustered around Stanford University in Palo Alto. This clustering is displayed in Map B. A smaller number of firms, though larger in size and much better established, have located in the Oakland/East Bay area.

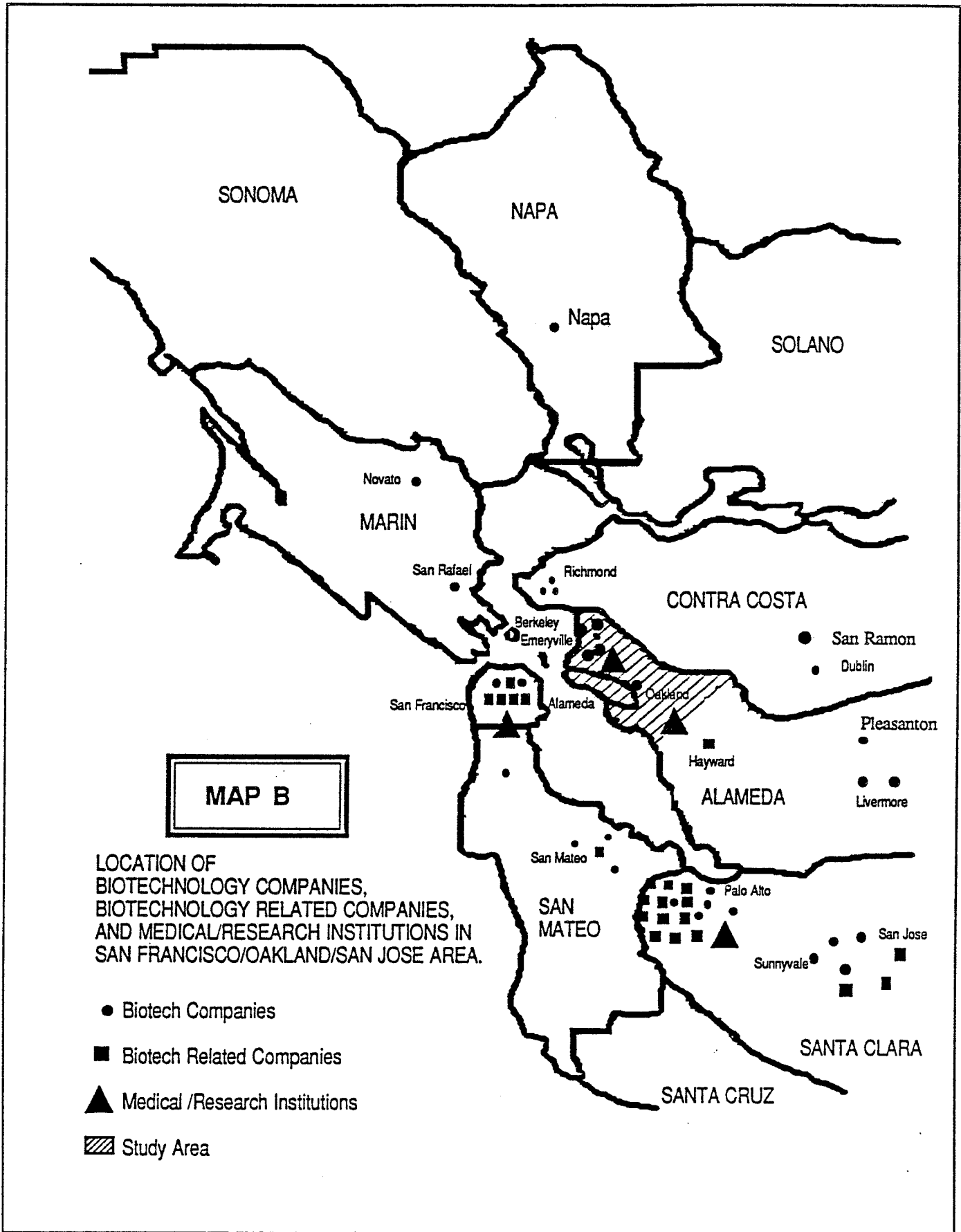
CHART 8
LOCATION / DISTRIBUTION OF
BIOTECHNOLOGY FIRMS IN CALIFORNIA

SAN FRANCISCO / OAKLAND
SMSA



* Based on Random Sample of Seventy
California Biotechnology Firms





The City of Emeryville and the City of Alameda's Harbor Bay Business Park have been especially popular among new start-up firms and new subsidiary firms. Firms locating in Emeryville cited the low cost of existing industrial facilities and proximity to the University of California, Berkeley as a primary attraction. Harbor Bay Business Park in Alameda is seeking to become a new magnet for biotechnology firms because it offers a campus atmosphere, high technology amenities and contains a large amount of undeveloped industrial land. In addition, Harbor Bay offers easy access to all transportation and communications infrastructure because of its location adjacent to the Oakland airport and integrated telecommunications facilities. Both areas are within a one-hour drive of Stanford University and the University of California, San Francisco Health Sciences campus.

VII. RESOURCES WHICH POSITION THE OAKLAND EAST BAY AREA FOR DEVELOPMENT OF THE BIOTECHNOLOGY INDUSTRY

The Oakland/East Bay Area Enjoys Close Proximity to Major Research Universities.

The Oakland/East Bay area is approximately sixty miles south of the University of California, Davis, forty miles north of Stanford University, ten miles east of the University of California, San Francisco and immediately adjacent to the University of California, Berkeley. Scientists at these four institutions pioneered the development of the theoretical basis of today's biotechnology industry. Moreover, Oakland is a major

health science center with teaching and research facilities at Peralta, Kaiser, and the US Navy's Oak Knoll hospitals. Finally, the Oakland/East Bay area is near the national laboratories at Livermore, Berkeley and Mountain View (Ames Research Center), all of which are engaged in significant biotechnology research and new technology development.

The Oakland/East Bay area has a Sizable Skilled Professional, Technical, and Scientific Labor Force

The availability of higher education opportunities in the Oakland/East Bay area has resulted in a large supply of highly skilled workers. Because many of these institutions provide heavy concentrations in the bio-sciences and engineering fields, the skilled labor force is well represented within the area at all occupational levels including scientists, technicians, and low skilled workers.

The Oakland East Bay area has a Good System of Public and Private Educational Institutions

The Oakland/East Bay area has an extensive system of primary and secondary schools, junior and four year college programs. Both public and private primary and secondary schools are available to youth. Many of the junior and four year colleges offer graduate programs in engineering and the biosciences. While some local public school systems have had below average academic performance, overall the Bay Area schools are among the best in the nation.

The Oakland/East Bay Area has a Sophisticated Network of Land, Sea, and Air Transportation Facilities

Oakland's cargo container port, international airport, railway connections and trucking operations makes the East Bay a national and international distribution center.

The Oakland/East Bay Area has Sophisticated Telecommunications Facilities and a Unique Location for Communications to the Far East and Europe

The Bay Area Teleport, located in the Harbor Bay Business Park, connects the world to 20 locations in nine Bay Area counties through an integrated digital microwave system. The network allows for connection to PBX, TELEX, CODEC computers and provides teleconferencing services. California lies in the narrow longitudinal corridor where most of the worlds markets can be reached from a single satellite earth station site. (At Niles Canyon) California is also in a time zone which allows for communications to both Asia and europe within the normal eight hour working day.

The Oakland/East Bay Area is Socially and Culturally Diverse, Offering a Wide Range of Activities for the Total Family

The San Francisco/Oakland region is populated by people with cultural backgrounds from around the globe. These people bring to the Bay Area cultural activities ranging from chamber music to ethnic dance. The Bay Area is also within two hours drive to some

of the best skiing, hiking and fishing locations in the country.

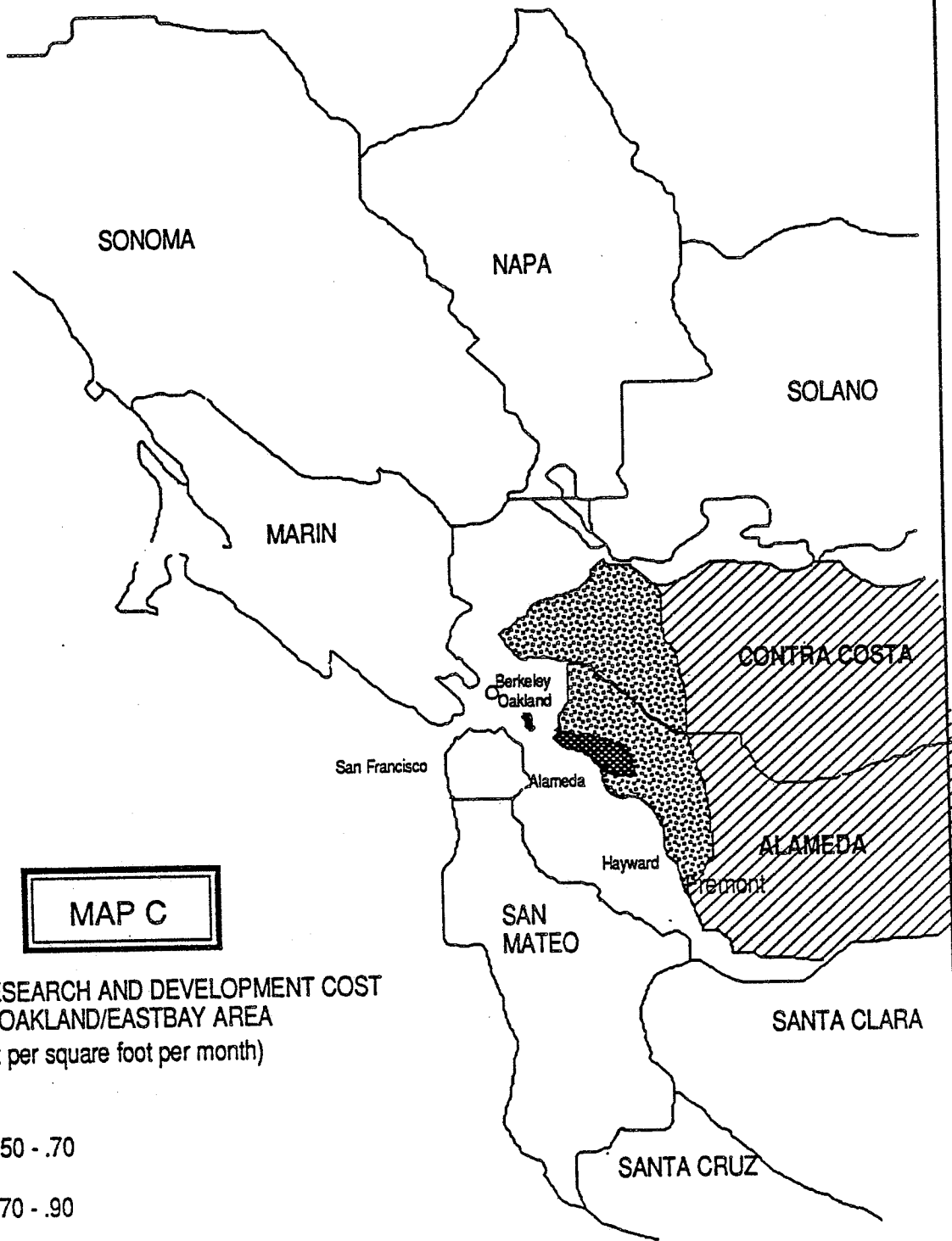
The San Francisco/Oakland Region has an Experienced Professional Community

San Francisco/Oakland region's law, accounting, architectural, and venture capital firms have provided quality professional services to California's high-technology industry for over two decades. In that time these firms have gained a wealth of valuable insights into the successful structuring and management of high technology ventures.

The Oakland/East Bay Area has a Range of Existing Commercial Research and Development Space and Assembled Parcels of Land


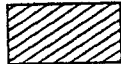

The Oakland/East Bay area has an exceptional range of land within the urban core which can be assembled as campus-type developments, multiple use or industrial sites. All of these sites are within easy access of good transportation, housing and cultural amenities.

Map C shows that excellent and competitive facilities for research and development can be identified within the Oakland/East Bay area.



MAP C

AVERAGE RESEARCH AND DEVELOPMENT COST
 IN OAKLAND/EASTBAY AREA
 (Cost per square foot per month)

	.50 - .70
	.70 - .90
	.90 - 1.10

Source: Coldwell Bankers, 1985 Market Report

VIII. CONSTRAINTS TO DEVELOPMENT OF THE BIOTECHNOLOGY INDUSTRY IN THE OAKLAND/EAST BAY AREA

There are Substantial Misconceptions About the Oakland Metropolitan Area

East and west Oakland and south Berkeley are consistently cited as areas having high crime rates, high unemployment, and low educational achievement. Overall unemployment in the Oakland/East Bay area is among the lowest in the country, averaging around six percent. East Bay youth overall test at or above the national averages for both reading and mathematics. Negative press and over emphasis on a few weak neighborhoods have damaged the Oakland/East Bay area's image.

The San Francisco/Oakland Region has a Shortage of Affordable Housing

The Bay Area's housing costs are among the highest in the nation with a median housing price in 1984 of \$150,000 compared to a national median of \$80,000. Rental housing is also well above national averages. High housing prices are the result of demand exceeding supply. Nonetheless, The Oakland/East Bay area offers the most affordable housing within the San Francisco/Oakland region.

The Local Regulation of the Biotechnology Industry is Inconsistent

Most Oakland/East Bay area local governments provide little or no regulation of the biotechnology industry beyond their local permit granting function. Others have regulations which specifically address local concerns about the safety of the industry. The City of Emeryville requires compliance with the National Institute of Health (NIH) Guidelines. Firms locating in Emeryville must also provide descriptions of their research and certification by a qualified expert that their facilities meet the NIH guidelines.⁹ The City of Berkeley has gone further and requires on site facility inspections with no assurances of confidentiality or trade secret protection. On the other hand the cities of Oakland and Alameda have actively encouraged development of the biotechnology industry.¹⁰

Limited Coordination Between the University of California, Berkeley and the Biotechnology Industry

U.C. Berkeley currently provides support for faculty wishing to engage in applied research in the form of patent assistance and university/industry agreements. The process for securing such agreements, however, is long and time consuming. Delays are untenable in an industry where competitive advantages often turn on the speed with which a company moves a product from research and development to clinical testing.

The Location of the University of California, Berkeley Away from the Primary Industrial Areas of Oakland, Berkeley, Alameda and Emeryville

The area immediately surrounding the University of California, Berkeley is not designated for industrial purposes. Indeed, the land area within a fifteen mile radius of the university is almost fully developed. Major undeveloped parcels exist in east Oakland and Alameda. While access to the industry is not a problem, the lack of presence of the university in areas currently being developed for the biotechnology industry precludes the close campus like association necessary to the development of new ideas.

IX. BIOTECHNOLOGY INDUSTRY "FIT" TO THE OAKLAND/EAST BAY AREA

"Fit" is an economic development concept for evaluating how well a particular industry satisfies the needs of a particular community and vice versa. "Fit" may involve environmental impacts, type of employment opportunities, quality of infrastructure, or the availability of housing and cultural amenities. A good fit exists where the community provides an atmosphere which stimulates growth and where industry in turn adds to a stable economic environment.

The Oakland/East Bay Area Provides a Strong Environment for the Growth of the Biotechnology Industry

The Oakland/East Bay area has most of the major locational elements for development of the biotechnology industry. These elements include a skilled labor force, a strong academic conditions, good cultural and living environment, good telecommunications and transportation facilities and available commercial office space. On the other hand, the shortage of affordable housing may work as a deterrent to encouraging quality professionals to locate in the area.

The Biotechnology Industry could Create Employment Opportunities for Low and Semi-Skilled Workers in the Oakland/East Bay Area

Since the production component of the biotechnology industry is labor intensive, location of the industry within the east Oakland coliseum area could provide low-skilled employment opportunities. This possibility, however, is largely dependent on whether the biotechnology firms decide to integrate research and development activities with production activities in the Oakland/East Bay area.

Most biotechnology firms indicated that they foresaw establishing production facilities in the Oakland/East Bay area because of the need to maintain strict quality control over products. As a result, the Oakland/East Bay area could facilitate the integration of the biotechnology industry's research and development activities and production activities. This would keep the industry in the state and build jobs for local residents.

X. EVALUATION OF INDUSTRIAL SITES WITHIN THE OAKLAND/EAST BAY AREA

Existing commute patterns and rush hour traffic patterns are seen by biotechnology companies as a factor affecting their ability to attract and retain employees. The optimum location is one with quick, easy freeway access and requiring commutes away from major rush hour traffic congestion.

Following is a brief description of the major industrial areas within the Oakland/East Bay study area seeking to attract biotechnology firms. Several industrial locations not within the study area are discussed because they are in direct competition with the Oakland/East Bay locations.

Berkeley/Alameda Waterfront

Berkeley's regulatory environment caused several of the firms interviewed to decide not to locate there. These firms explained that while they liked the overall university environment, they received little cooperation from the city. In addition, they felt that the Berkeley's biotechnology ordinance was too intrusive and could possibly threaten the security of their trade secrets. Moreover, the City of Berkeley has restricted waterfront development to commercial and residential uses. The research and development component of the biotechnology industry might be considered commercial, but the production component certainly falls within the light industrial land use classification.

Emeryville

Emeryville has become a hotbed of biotechnology activity, currently housing two of the industry's largest firms, Cetus and Chiron. The city's primary attraction is an abundance of inexpensive and existing industrial structures conducive to renovation. Emeryville lacks affordable housing and has little or no cultural activities. Housing and cultural activities are, however, available in neighboring Oakland and across the bay in San Francisco.

Oakland Coliseum Area

This area of Oakland has an abundance of industrial space and excellent access to the Oakland Airport and Port of Oakland container freight facility. The area's location along Highway 880 places it in one of the Bay Area's heavier rush hour commute corridors. Housing and cultural amenities are within close proximity.

Alameda Harbor Bay Isle

Harbor Bay Isle, a planned community integrating housing, social and work activities, has a large supply of undeveloped land and a sophisticated telecommunications system. The owners of the development work intimately with prospective occupants to ensure efficient and timely processing of city permits. The park currently houses Triton, a biotechnology subsidiary of Shell Oil Company. On the down side, traffic access is poor since commuters

must either travel through the largely residential portion of the city of Alameda or use the constantly congested airport access off Highway 880. The developers of Harbor Bay Isle have recognized this limitation and are actively working with local officials to improve freeway access. Another disadvantage of Harbor Bay Isle is the lack of moderately priced rental housing. Such housing is available in neighboring Oakland.

Richmond Hilltop

The Richmond Hilltop area has a large amount of assembled industrial land, a good supply of affordable housing in close proximity, and easy commute access. The area, however, is isolated from San Francisco/Oakland's quality living environment and lacks any sophisticated telecommunications facilities.

Pleasanton (Hacienda Business Park) and San Ramon (Bishop Ranch)

Pleasanton and San Ramon are among the Bay Area's fastest growing cities with a good supply of affordable rental and ownership housing. They are also located away from the East Bay's major commute corridors. Nonetheless, they lack the close proximity to the University of California, Berkeley and San Francisco and they do not afford quick access to the Bay Area's cultural and social amenities.

XI. POLICY RECOMMENDATIONS FOR ENCOURAGING DEVELOPMENT OF THE BIOTECHNOLOGY INDUSTRY IN THE OAKLAND/EAST BAY AREA

Establishment of a University of California Advanced Technology Research Institute

The University of California needs to establish a firm commitment to the development of the biotechnology industry. One demonstration of the commitment would be the establishment of an applied technology institute dedicated to maintaining a strong applied research presence in the biotechnology and other related technologies.

Promotion of the Oakland East Bay area as a national biotechnology area

The Oakland/East Bay area's natural resources, without any assistance by local policy makers, has caused it to become a major area for development of the biotechnology industry. With all the biotechnology activity, however, the Oakland/East Bay area is not nationally or internationally recognized as a biotechnology node. Such promotion would encourage the location of other biotechnology firms in the area much as the recognition of Santa Clara County as an electronics node stimulated development.

Another component of providing this identity would be the relocation of the Office of the President of the University of California within the Oakland/East Bay area. This would continue

the attention brought to the Oakland/East Bay community by the location of the Office of the President in Berkeley. A location in Oakland, closer to biotechnology firms, would reduce the perceived physical distance between the University of California, Berkeley's campus and the industries locating in the greater Oakland/East Bay area, particularly Emeryville, Oakland, and Alameda.

Consistent and Predictable Local Regulation of the Industry

Though most cities within the Oakland East Bay area provide limited regulation of the biotechnology industry, there is no required coordination of local environmental regulation. Consequently, firms seeking to locate within the area may impute the attitudes of one or two communities to the entire area. Moreover, restrictions placed on the industry get far more media attention than the positive efforts to promote development of the industry. Each community needs to establish uniform regulations consistent with federal and state requirements.

Creation of a Public Sector Regional Biotechnology Investment Company to Promote and Coordinate Investment in Small Companies

The anticipated "shake out" in the industry has limited the willingness of venture capitalists to invest in new small start-up companies. Private venture capital firms by definition seek high risk, high return ventures. As a result, the anticipated shake out and failure of existing firms in the industry has

resulted in a shortage of available capital. A public investment institution would be in a position to accept greater risk with less potential return on investment.

Expansion of University of California's Capacity to Joint Venture with Private Sector Biotechnology Companies.

Since strong university and industry relations are essential to the development of the industry, the University of California, Oakland/East Bay's primary university asset, must strengthen its connection to the industry. The University currently maintains no office or department dedicated to facilitating industry/university joint ventures.

Specific Programs to Upgrade the Image of the Oakland/East Bay Metropolitan Core Area

Local governments must implement more neighborhood improvement and crime prevention programs. These programs should be publicized in order to change the negative perceptions of the core metropolitan areas.

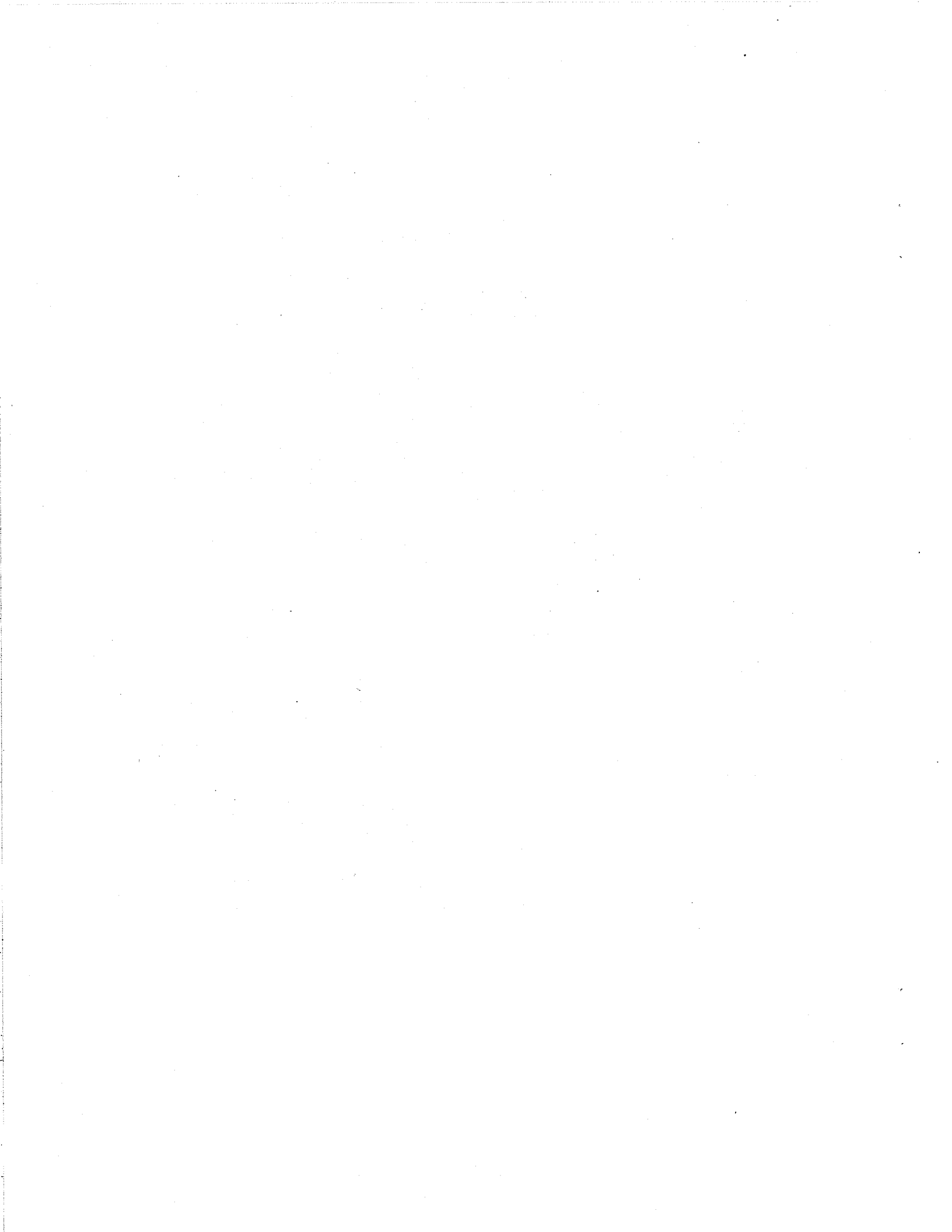
Image improvement could be promoted in the Oakland/East Bay area through the publication of a biotechnology newsletter similar to the science insert in the San Francisco Chronicle/Examiner, or the electronics insert in the San Jose Mercury News.

**Designing Specialized Education and Training Programs in
Biosciences in the High Schools, Community Colleges and Four Year
Colleges**

It is obvious that biotechnology is an industry sensitive to its human resources. The Oakland/East Bay area could have a major advantage if it strengthened its education and training opportunities to attract students into these emerging fields. The training capacity already exists; it merely needs amplification and better articulation with the industry.

**APPENDIX A
FOOTNOTES**

1. The traits and characteristics of a given species are maintained and passed on to future generations through the information system contained within DNA molecules. The Biotechnology industry is the result of scientists discovering how to split the DNA, double stranded helical molecule and recombine it to form exact duplicates or modified versions of the original molecule. These molecules control the protein producing function of cells in the same manner for all organisms.
2. The large established companies have waited to see that commercially viable applications of biotechnology techniques existed before entering the industry. See, Business Week, Biotechnology Comes of Age, Jan 23, 1984.
3. For a more detailed discussion of biotechnology processes see, Steve Olsen, Biotechnology: An Industry Comes of Age (Washington D.C.:National Academy Press, 1986)
4. For a more detailed discussion of biotechnology products see, U S Congress, Office of Technology Assessment, Commercial Biotechnology: An International Analysis (Washington D.C., 1984).
5. Business Week, Biotech Comes of Age, Jan 23, 1984, p.89.
6. Ibid, p.89.
7. Ibid, p.89.
8. SRI International, Public Policy Center, Meeting California's Competitiveness Challenge, Dec 1985.
9. Emeryville, California, Resolution no. 77-39, Resolution Adopting Safety Guidelines for Recombinant DNA Research in the City of Emeryville, 1977.
10. Berkeley, California, Ordinance no. 5010-n.s Regulating the Use of Hazardous Biological Research in the City of Berkeley, 1978.



**APPENDIX B
BIBLIOGRAPHY**

Business, "Oakland biotech firm signs deal with DuPont," The Tribune, 30 September, 1986.

Business Briefs, "Emeryville Arising From the Mud: The 'Rottenest Little Town in the West' is now a major biotech center," San Francisco Chronicle, ____ October, 1986.

Business Briefs, "Chiron Says J&J will Expand Stake" San Francisco Chronicle, 9 October, 1986.

California Assembly, Committee on Economic Development and New Technologies, The Future of the Biotechnology Industries in California: Committee Report and Record of Hearing, 1984.

Cover Story, "Biotech Comes of Age," Business week, 23 January, 1984.

Image, "Engineering Nature Ice-Minus," San Francisco Examiner, 10 August, 1986.

Joan Kureczka, "Biotechnology and Governmental Regulation: Overview and Recommendations," Public Affairs Report, (Bulletin of the Institute of Governmental Studies, U.C. Berkeley, June 1984).

John Griffing, California Senate, Office of Research, Silicon Valley II: A Review of State Biotechnology Development Incentives, 1985.

Karen Southwick, "Biotech's Medical Wonders in Spotlight at Conference," San Francisco Chronicle, 10 October, 1986.

"Key Step in Research: Hepatitis B Now Grown in Lab," San Francisco Chronicle, 6 October, 1986.

Peter Daly, The Biotechnology Business: a Strategic Analysis (New Jersey: Rowman & Allanheld Publishers, 1985).

Robert A. Hall, A Report on Biotechnology in California: A Public Health Perspective (Berkeley: California Department of Health Services, 1985).

Sittig and Noyes, Genetic Engineering & Biotechnology Related Firms World Wide Directory, 5th Ed., 1986.

SRI International, Meeting California's Competitiveness Challenge, December 1986.

SRI International, California and the 21st Century: Foundations for a Competitive Society, January 1986.

Standard & Poors, Standard Corporation Descriptions, 1985.

Steve Olsen, Biotechnology: An Industry Comes of Age (Washington, D.C.: National Academy Press, 1986).

U.S. Congress, Office of Technology Assessment, Commercial Biotechnology: An International Analysis (Washington, D.C., 1984).

**APPENDIX C
INSTITUTIONS AND BIOTECHNOLOGY FIRMS CONTACTED**

<u>Firm/Institution</u>	<u>Location</u>
Advanced Research Institute (Formally Agrion Corp.)	Oakland
Association of Bay Area Governments	Oakland
Bio-Rad Laboratories	Richmond
County of Alameda	Oakland
Doric Development	City of Alameda
Genentech	South San Francisco
Hana Biologics	Berkeley
Integrated Diagnostics	Berkeley
Monoclonal Antibodies	Mountain View
State of California, Senate Office of Research	Sacramento
United States Office of Technology Assessment	Washington D.C.
University of California, Berkeley	Berkeley
University of California, San Francisco	San Francisco

APPENDIX D: SAMPLE OF SURVEY OF BIOTECHNOLOGY FIRMS

SURVEY OF BIO-TECH FIRMS

The following survey has been developed to serve as an guide for informal interviews of Bio-tech firms located in the San Francisco/Oakland Bay Area. The purpose of the survey is to identify some key locational factors that may have influenced the firms to locate in the area. This is not intended to be a scientific survey. Telephone surveys and person-to-person interviews with representatives of Bio-tech firms will have addressed the following topics:

STRUCTURE/TYPE OF FIRM

Name of firm _____

Name of respondent _____

What stage of Bio-Tech development are you in?
R&D _____ Production _____ ?? _____

How long has this firm been in business? _____

Do you expect to expand in the future? _____

What applications are your products designed for? _____

How has the local community responded to your industry?
Pos. _____ Neg. _____

What were some of the community's concerns? _____

Does the Bio-Tech industry have any constraints that are endemic to the nature of the industry itself? _____

How important is your accessibility to the University or academic research programs in the bio-technology fields you are pursuing?

LAND & FACILITIES

How long has this firm been located in the present site? _____

Why were the site and community chosen? _____

How large is the total space utilized by your firm at this site?
_____ Number of buildings? _____ Buffer zones? _____ How
large is the main facility? _____

Does this site have any physical requirements that are unique to your industry such as ceiling height, bulk, temperature, special seals, wall coverings, etc.?

What kind of access do you need for trucks, rail service, etc.?

Do you anticipate or expect to expand your operations in the future? If so, at this site? _____ Another site in Bay Area? _____ In another community? _____

INFRASTRUCTURE

Does the activity of your firm require special uses of electricity? Gas? Water?

Does the activity of your firm require special telephone, computer, or communications facilities?

Does the activity of your firm require a special method for disposal of solid and water wastes?

EMPLOYMENT STRUCTURE

How many people do you currently employ including consultants and contingency workers _____?

How many people did you employ last year (September 1985)? _____

Do you expect to lay off any people during the next 12 months? _____ If so, how many? _____

Do you expect to increase the numbers of employees within the next 12 months? _____ If so, how many?

What percent of your total employment would you say worked in the following five categories?

Management _____ Professional/Technical _____
(Scientists, researchers, chemists, etc.)

Clerical _____ Production workers _____
(Machine operators, testers, mechanics,
materials handlers, packers, etc.)

Service workers _____
(Janitors, cleaners, etc.)

What percent of your total work force are consultants, contract workers, or contingency workers? _____

What occupations does these workers fill? _____

Just focusing on the Professional/Technical workers, what kinds of occupations do you most often need or seek?

How much training or education do you require of these workers?

How much experience do you require of these workers?

What other special requirements do you have for these workers? (bonding, certificates, publications, etc.)

What kinds of new skills do you anticipate will be required by these workers in the next five years to be competitive in your industry?

What is the salary range for these workers? _____

Taking the production workers, what kinds of occupations do you most often need or seek? _____

How much training or education do you require of these workers?

How much experience do you require of these workers?

What other special requirements do you have for these workers? (bonding, certificates, publications, etc.)

What kinds of new skills do you anticipate will be required by these workers in the next five years to be competitive in your industry?

What is the salary range for these workers? _____

What kinds of social or cultural amenities do you feel are important for your employees (housing, music, theater, etc.)?

What kinds of special privileges or fringe benefits do you provide your employees?

CAPITAL REQUIREMENTS

When your firm located here, were there any financing incentives available that encouraged your location to this site or area?

Would your firm locate to an area that offered financing and/or investment potential?

Generally, how many dollars were invested for each job that was created? _____

REGULATORY ENVIRONMENT

What kinds of environmental requirements govern the location of your firm?

Are there special regulatory obstacles that Bio-Tech firms must address at the local level (zoning, water quality, noise, etc.)?

What kinds of Federal and State regulations govern product testing (FDA, university, field tests, etc.)?

What agencies do product or procedure testing?

SUPPLIERS AND SUPPORT SERVICES

What kinds of goods do you purchase for the activity of your firm (glass, paper products, raw materials, instruments, machinery, etc.)?

What percent of your suppliers are located: in the Bay Area_____, California _____, the United States _____?

Does your firm purchase any special services (such as waste removal, equipment cleaning, computer data services)? _____

What kinds of special services are required to support your activity? list _____

Is the availability of these services an important criteria for your location in this area?

ACCESSIBILITY TO MARKETS

What is the primary market you hope to capture?

Who will consume your products?

Are the consumers and end users of your product located: in the Bay Area_____, California _____, the United States _____? Other countries _____?

How are your products transported to your consumers or end users?

Are there special packing or handling equipment or facilities required to transport your products to your consumers or end users?