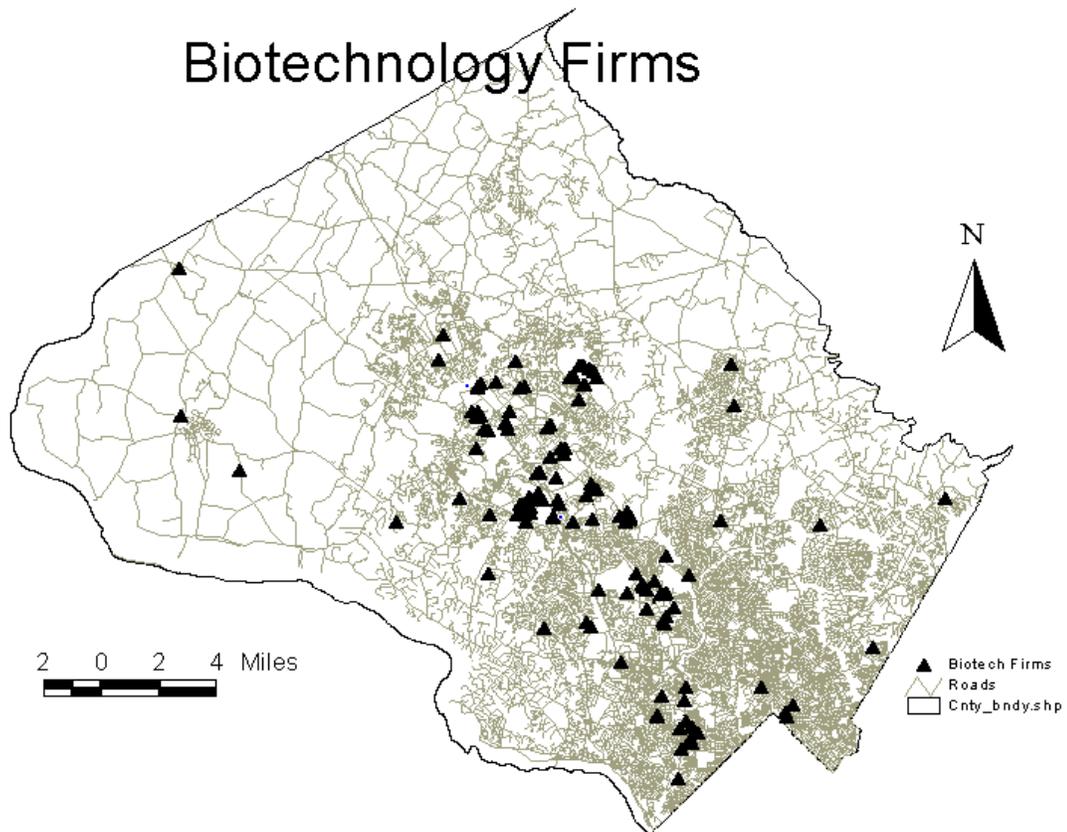


Introduction

This report outlines the nature, scope and importance of the growing biotechnology industry and places it within the local context of the Montgomery County economy. This report concentrates on the nearly 200 private organizations in the biotechnology industry within Montgomery County. As shown in the map below, they are located primarily but not exclusively in the I-270 corridor. The roles of government and institutions are covered briefly in order to provide context for our private industry report. The report also considers issues closely related to land use planning. Thirty-five interviews with representatives of biotechnology firms were conducted to determine the industry's general satisfaction



with Montgomery County as place to do business and the adequacy of County real estate for current and future business operations.

The National Industry: Definition, History, and Growth

According to the US Department of Agriculture, Biotechnology is the commercial application of living organisms or their products through deliberate manipulation of their DNA molecules.

Biotechnology-processes modify the biological capabilities of microbial, plant, and animal cells based on genetic information. In some cases, organisms are modified to achieve desired ends such as developing resistance to drought in plants. Understanding which genes are active in particular life processes or diseases and how the proteins they produce interact can be used to develop drugs and diagnostic tools. We also include related firms in the biotech industry, such as those engaged in statistical research and the manufacturing of instruments, equipment and supplies. In 1999 the national industry directly employed about 150,800 workers and produced revenues of \$20 billion, up from \$8 billion in 1993. In addition, they paid their employees and owners \$15 billion in personal income.¹

A rapid succession of discoveries and applications has been driving biotechnology innovation a over the relatively short period of the last 60 years.² Modern biotechnology began in 1940 when Oswald Avery demonstrated that DNA is the “transforming factor” of genes. Six years later, this understanding allowed for the creation of a new virus through the combination of genetic material from different viruses. In 1953, James Watson and Francis Crick published their article describing the basic double helical structure of all DNA.

What started as the province of academic research gradually turned into applications suitable for commercial development and marketing. In 1976 Genentech was founded, the first private concern to develop genetically engineered products. By 1980 the U.S. Supreme Court approved the principle of patenting genetically engineered life forms. In 1985, the National Institutes of Health approved guidelines for performing experiments in gene therapy on humans. One year later, in 1986, the Environmental Protection Agency approved release of the first genetically engineered crop. With this series of regulatory hurdles overcome, initial biotechnology products began to reach the market.

Innovation in biotechnology is being pushed forward by major new development in genetic analysis. In 1990, the Human Genome Project (HGP) was launched. The National Institutes of Health and the U.S. Department of Energy help fund this \$3 billion international effort. The HGP’s original goal was to complete the mapping of the approximately 100,000 genes found in humans by the year 2005. On June 26, 2000, The HGP and Celera Genomics made a joint announcement of the completion of their draft genome sequences. Discovering the entire sequence of DNA bases that govern human life at the cellular level promises to be a cornerstone of biotechnology in the twenty-first century. Such work is designed to give scientists one of the tools needed to understand the operations of cells. The information will aid in creating new drugs or in altering the genes themselves to health improving sequences. The accounting firm Ernst & Young in a report on this industry stated: “It is not possible to overstate what a huge milestone this will be for mankind.”³ This new chapter in biotechnology is as

¹ *The Economic Contributions of the Biotechnology Industry to the U.S. Economy*, Ernst & Young, May 2000, p.4.

² *A Timeline of Biotechnology*, The Biotechnology Industry Organization, web site, October 1999.

³ *Biotech 99: Bridging the Gap*, ” *Ernst & Young, 13th Biotechnology Industry Annual Report*, Ernst & Young. (Palo Alto, CA, 1998) p.6.

important as the proof that bacteria and viruses cause disease, the discovery of x-rays, or the creation of antibiotics.