



# Biotechnology

Presented by:

## **Team 5**

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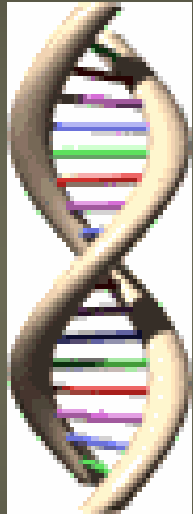
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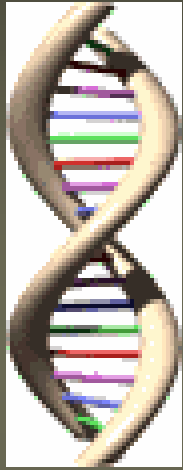






# Today's Agenda

- Introduction
- History of the Biotech Industry
- General Industrial Analysis
- Growth of the Industry
- Critical Issues Addressed
- What Could Have Been Done Differently?
- What Has Been Done Since Then? How?
- What Would Have Changed?
- Lessons Learned
- Conclusion
- Questions

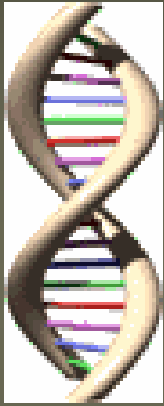






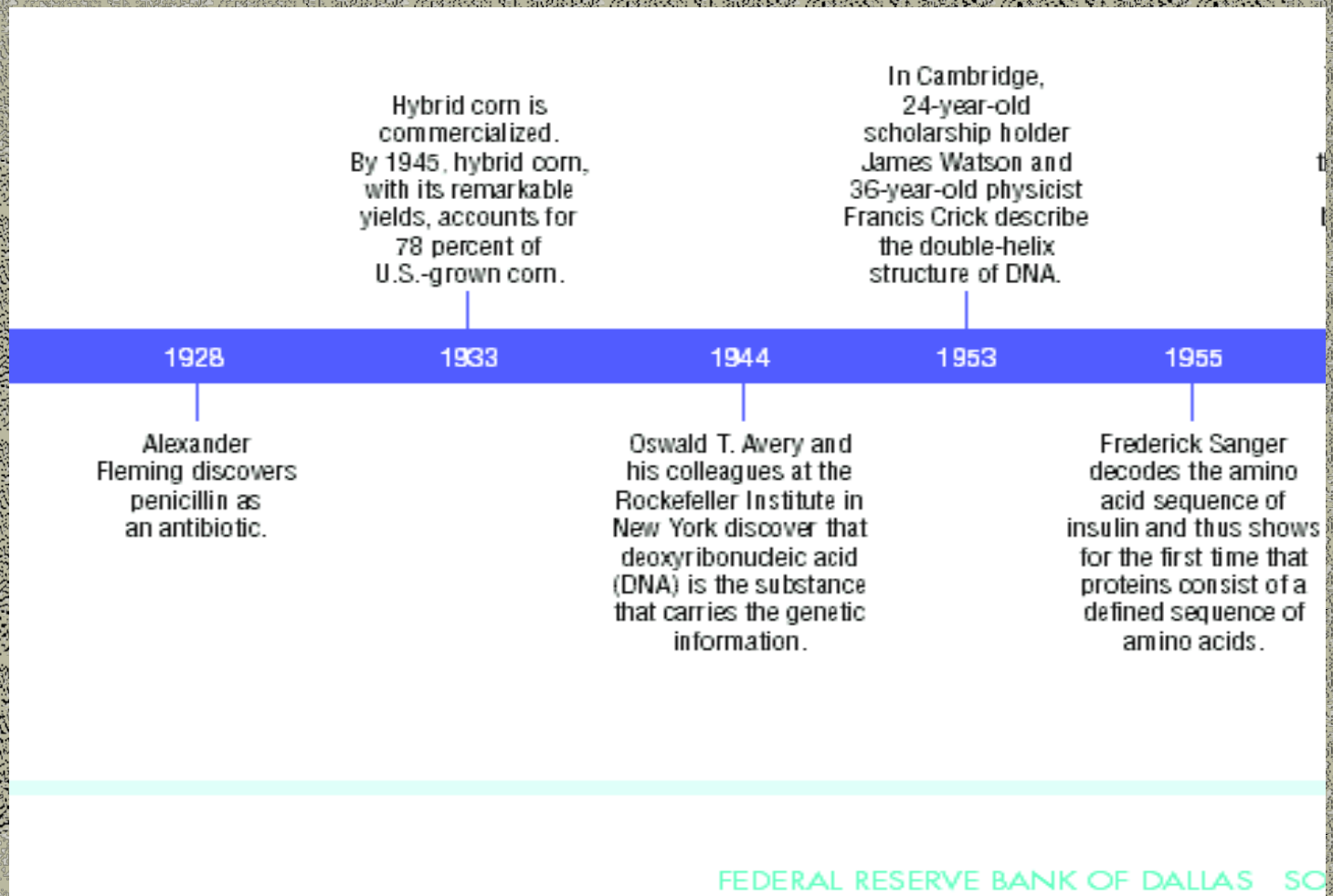
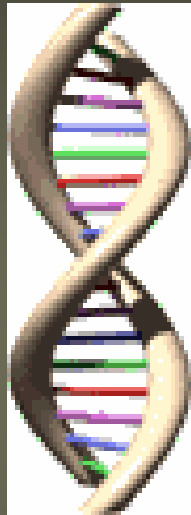
# Definition of Biotechnology

**The use of cellular and molecular processes to solve problems or make products**






# History of the Biotech Industry



# History of the Biotech Industry



The genetic code is cracked, demonstrating that a sequence of three nucleotide bases determines each of 20 amino acids.

1966

Herbert Boyer and Stanley Cohen succeed in recombining DNA for the first time. This experiment is regarded as the birth of genetic engineering.

1973

Genentech, the first biotechnology company, is founded by Robert Swanson and Herbert Boyer.

1976

The Human Genome Project—an international effort to map all the genes in the human body—is launched.

1990

Scientific journals publish the complete human genome sequence.

2001

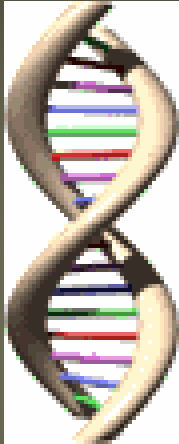
SOURCES: Biotechnology Industry Organization; Schering AG, Germany; Genentech Inc.





# Industry Analysis

## Some Facts About Biotechnology Industry

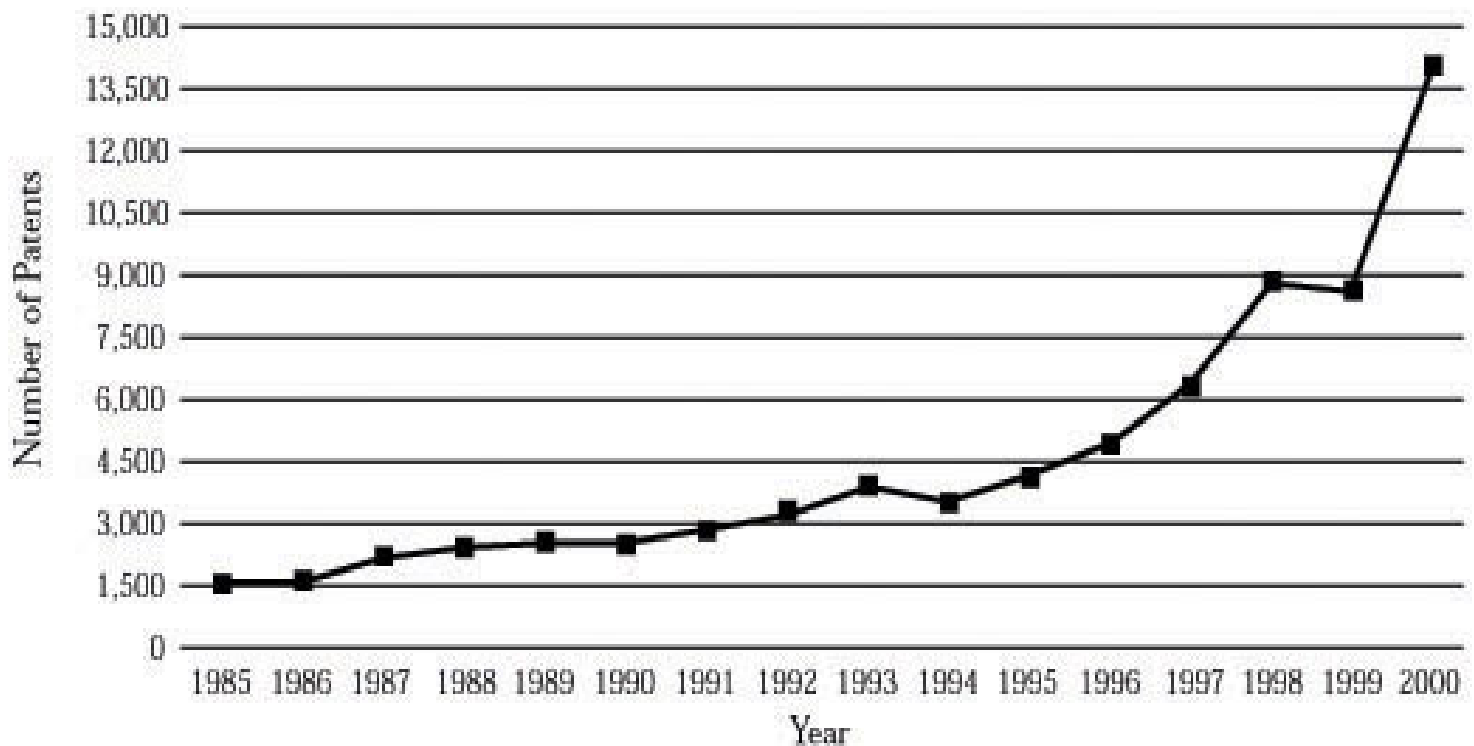
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- **Biotechnology** is one of the most **research-intensive** industries in the world. The U.S. biotech industry spent **\$15.6 billion on research and development in 2001**
  - **More than 325 million people worldwide** have been helped by the **more than 130 biotechnology drugs and vaccines approved by the U.S. Food and Drug Administration (FDA)** of the biotech medicines on the market, 70 percent were approved in the last six years.
  - There are **more than 350 biotech drug products and vaccines currently in clinical trials** targeting more than **200 diseases**, including various cancers, Alzheimer's disease, heart disease, diabetes, AIDS and arthritis.
  - **Market capitalization**, the total value of publicly traded biotech companies at market prices, was **\$224 billion** as of early May 2002.





# Growth of the Industry

**Total Patents Granted per Year**

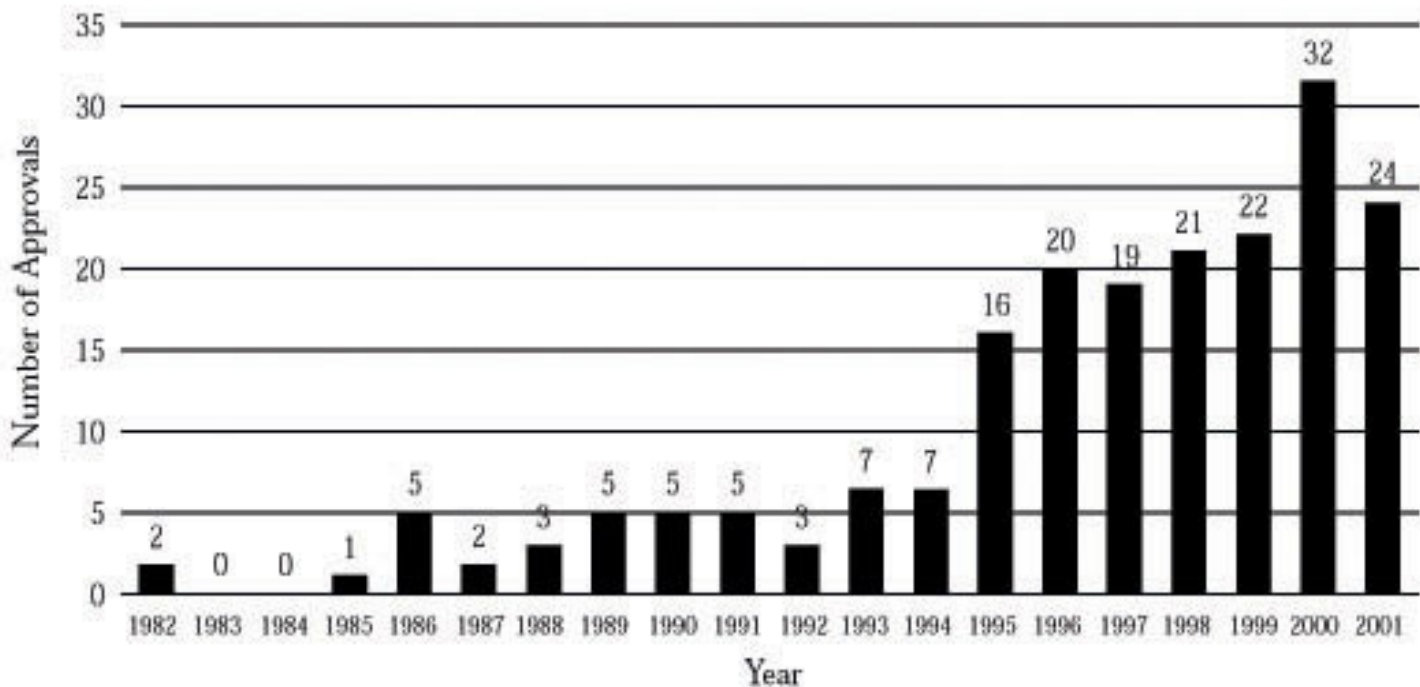


*Source:* U.S. Patent and Trademark Office



# Growth of the Industry

**New Biotech Drug and Vaccine Approvals/  
New Indication Approvals by Year**



Source: BIO

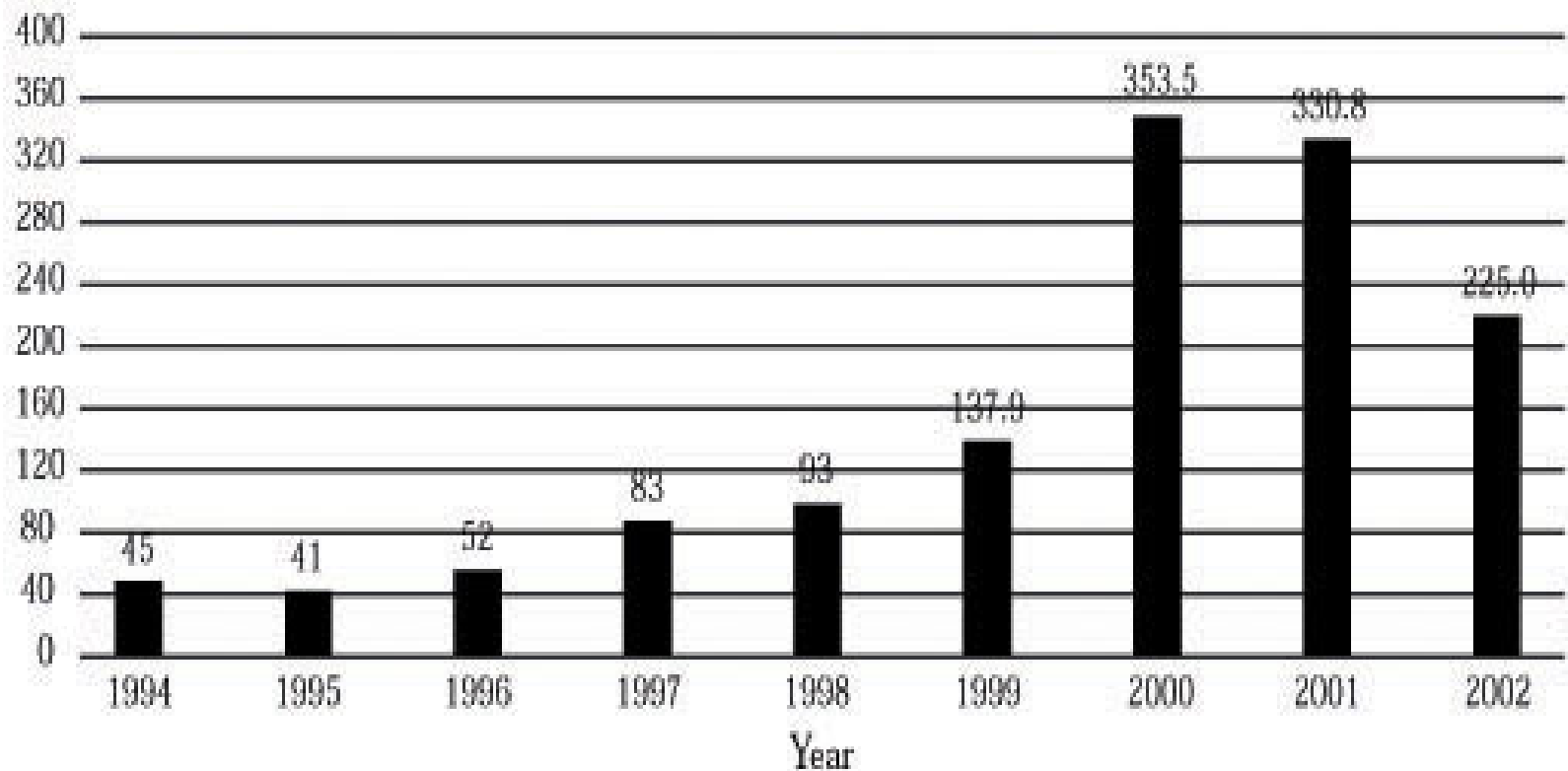




# Growth of the Industry



## Market Capitalization, 1994-2002\*



\*Amounts are U.S. dollars in billions.

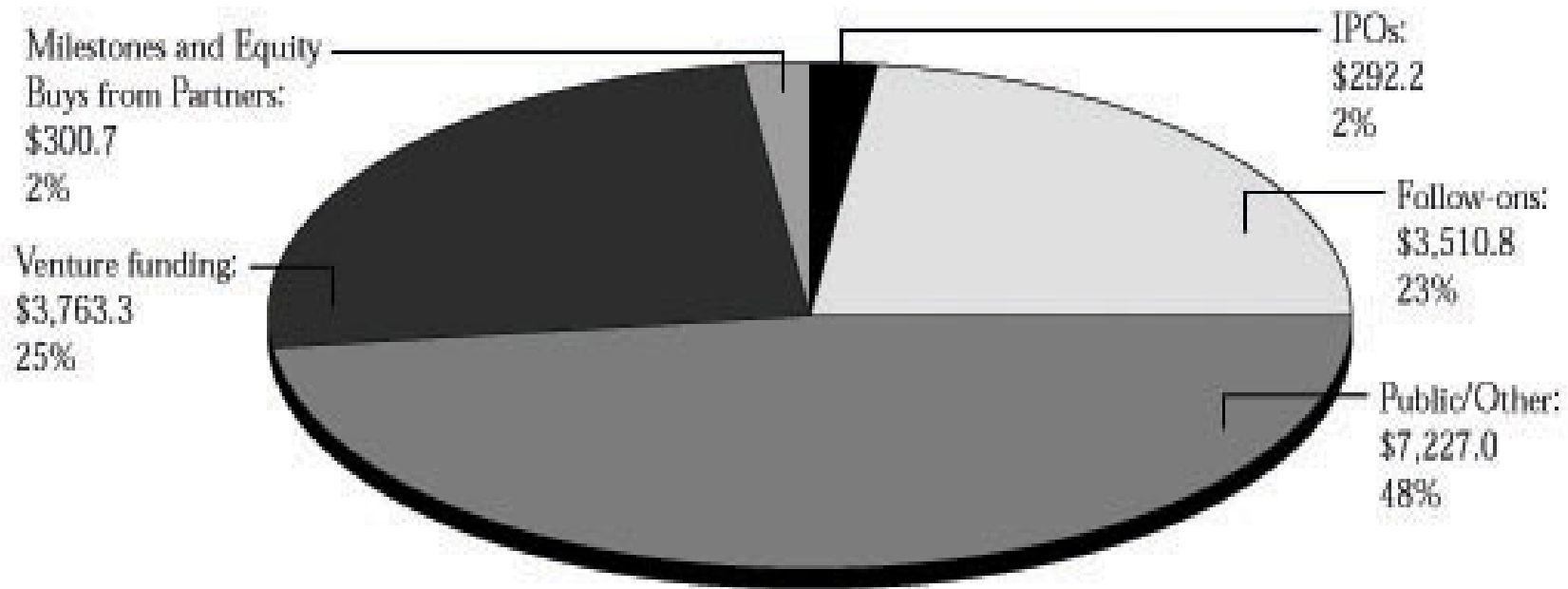
Source: Ernst & Young LLP and BioWorld



# Growth of the Industry

## Biotech Industry Financing, 2001

*Total: \$15,094 Million*  
(all figures in millions)



Source: BioWorld





# Critical Issues Addressed



*“Success in the science translates to success in the business.  
Everything was focused toward the same thing:  
How do we get this product into the marketplace?”*

*Robert Swanson  
Founder of Genentech*





# Critical Issues Addressed

## ➤ Commercialization of Scientific Technology

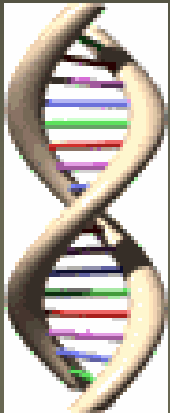
- ✓ Basic science drives technological development. New industries begin upon the innovation of the radically new basic technology. Biotechnology is grounded in molecular biology and it depends upon the explosion of scientific knowledge. In biotechnology companies basic science and applied science is combined and “scientific technology” concept is emerged.

## ✓ University/Industry Linkages

- ✓ Since biotech research intensive industry, in the startup biotech companies universities played a crucial role.

## ➤ Government Role in Biotechnology

- ✓ Supporting R&D activities: National Institute of Health (NIH), National Science Foundation (NSF), government Departments such as Agriculture (USDA) and Energy (DOE) and universities.
- ✓ Regulating Role: Food and Drugs Administration (FDA), the Department of Agriculture (USDA) and Environmental Protection Agency (EPA)







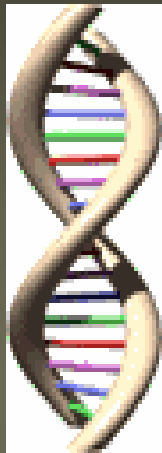
# Critical Issues Addressed

➤ Emerging Biotech Industry Characteristics

✓ Embryonic Companies:

✓ Early Entry Barriers:

- ❑ High cost of R&D
- ❑ Long waiting for FDA approval (typically seven years)
- ❑ Technological uncertainty
- ❑ Product uncertainty
- ❑ Intellectual property and patent situation
- ❑ Access to distribution channels





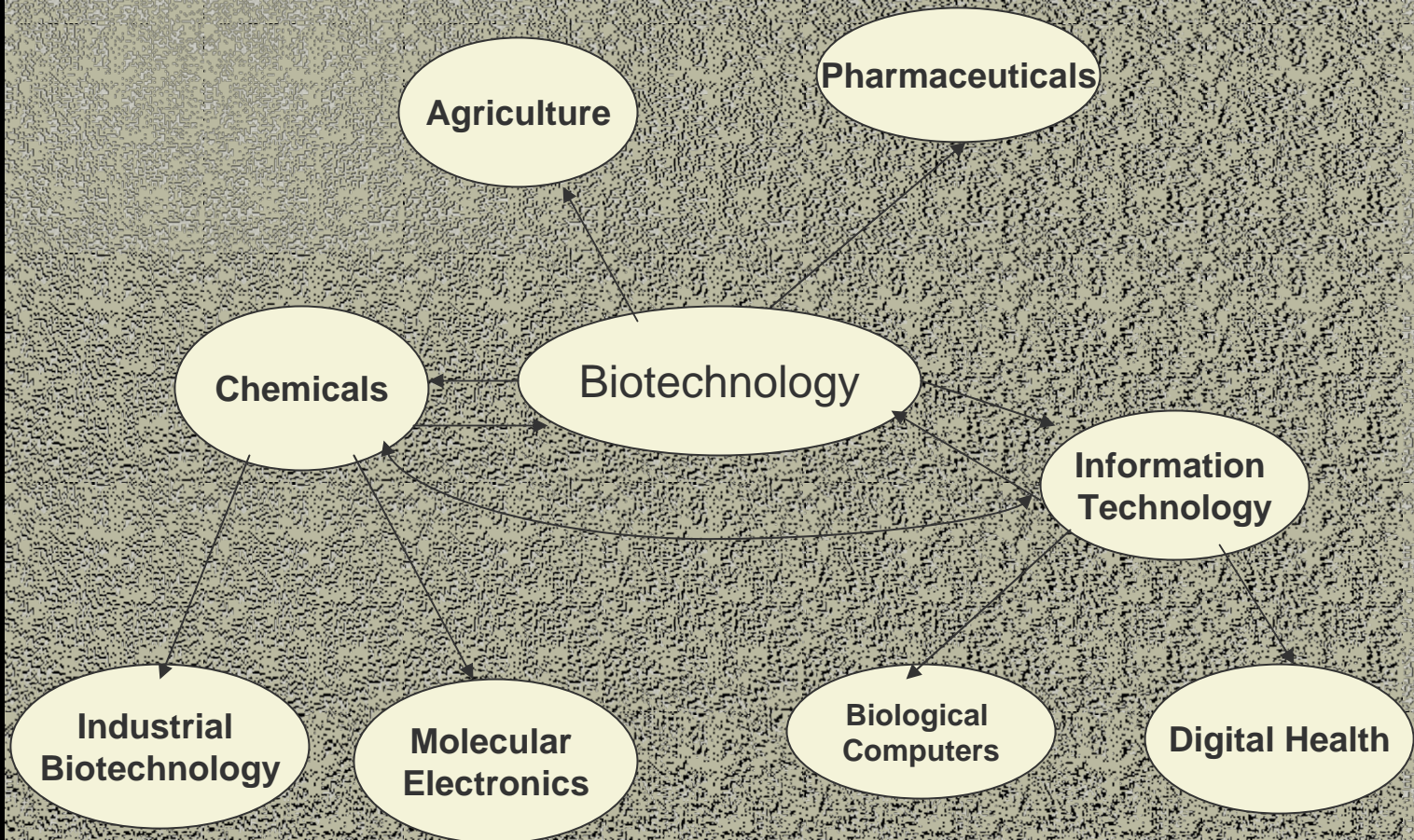


# Critical Issues Addressed

- 
- Emerging Biotech Industry Characteristics (Con`d)
  - ✓ Global Emergence: It requires global perspective in operations of biotech companies.
  - ✓ Strategic Agreements with Pharmaceuticals Companies:
  - ✓ Growing Public Concerns: Fear of technology has always existed and promises continue to into foreseeable future.
  - ✓ Convergence of the Industry: Many companies are operating in multiple sectors at the same time. Market or technology convergence.



# Dynamics of Industry Convergence

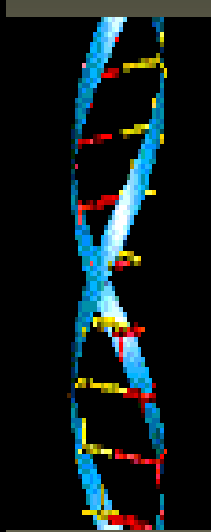


Source : Ernst& Young LLP



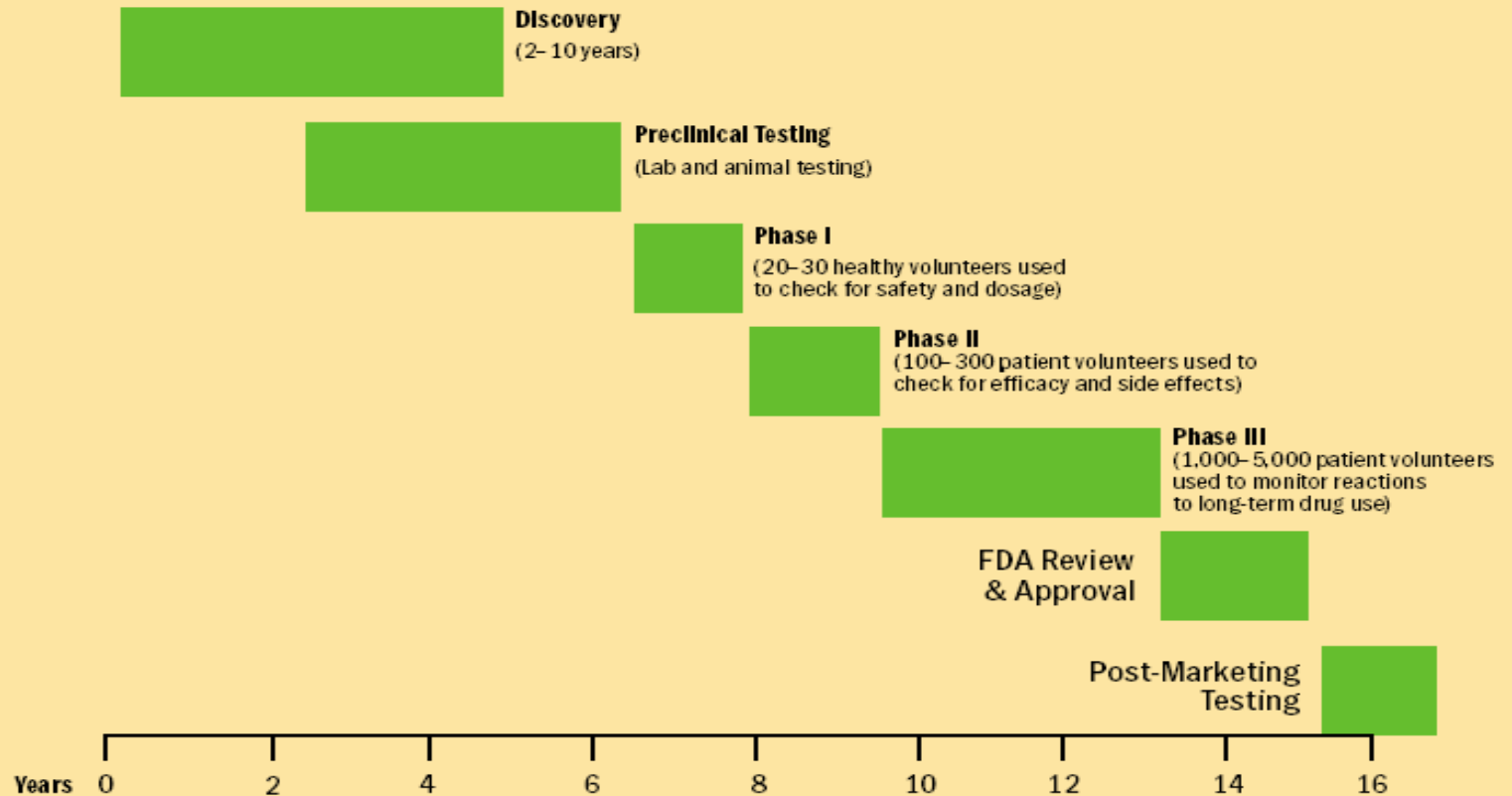


# What Could Have Been Done Differently?

- 
- **Analysis of Drug Discovery / Development Process**
  - **Marketing Analysis for Sales Projections**
  - **Proactive License Agreements**
  - **Gradual Growth**



# Overview of the Drug Discovery Process



Source: Ernst & Young



# What Has Been Done Since?

- **Licensing agreements**
- **Knowledge Management**
- **Acquisitions**







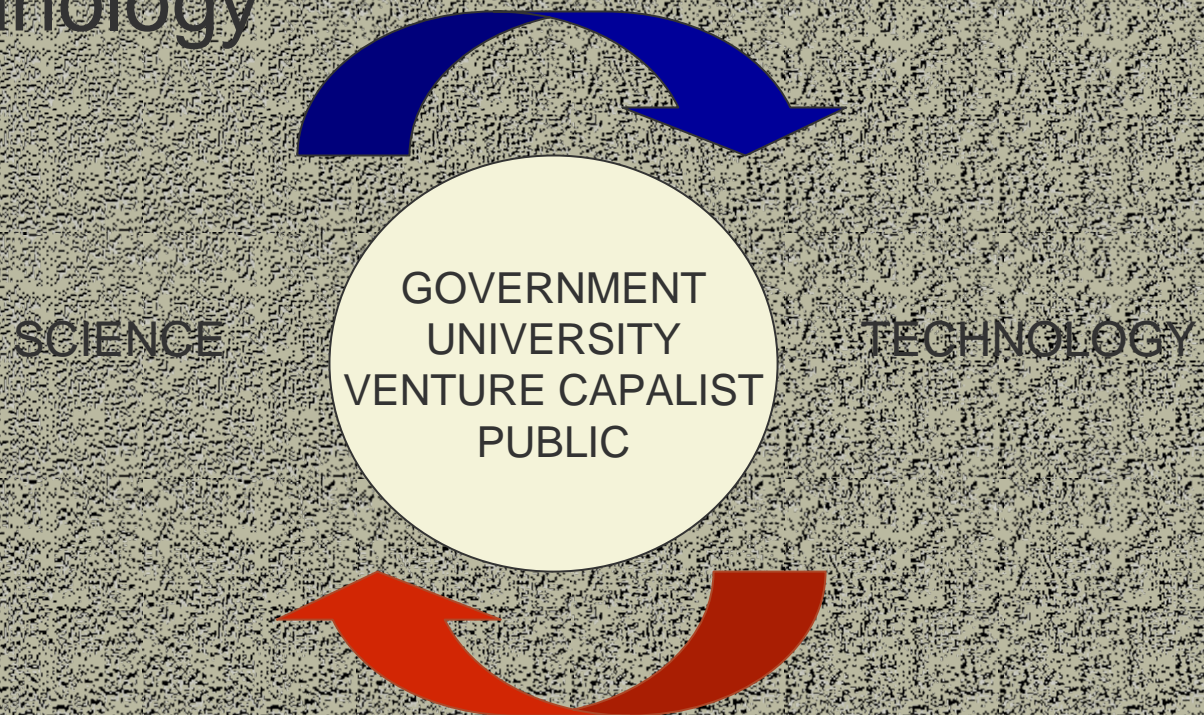
# Lessons Learned

- Overlook the challenges
  - Technology Uncertainties
  - Product Development
  - Marketing
- Portfolio Management
  - Market Forecast
  - Market Attractiveness
  - Risk Identification, Analysis, and Mitigation
- Cross-market Strategic Alliances
  - Partnerships, Licensing, and Joint Ventures
- Fail to recognize the importance of patent



# Lessons Learned

## ■ Commercialization of Science Technology







# Influence of Technology in Society

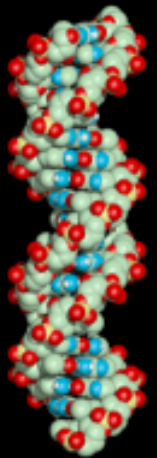
- Issues to be considered
  - Lessons learned by other industries
  - Exponential technology growth
  - Life expectancy growth
- Those who manage “life technology” will control the world?



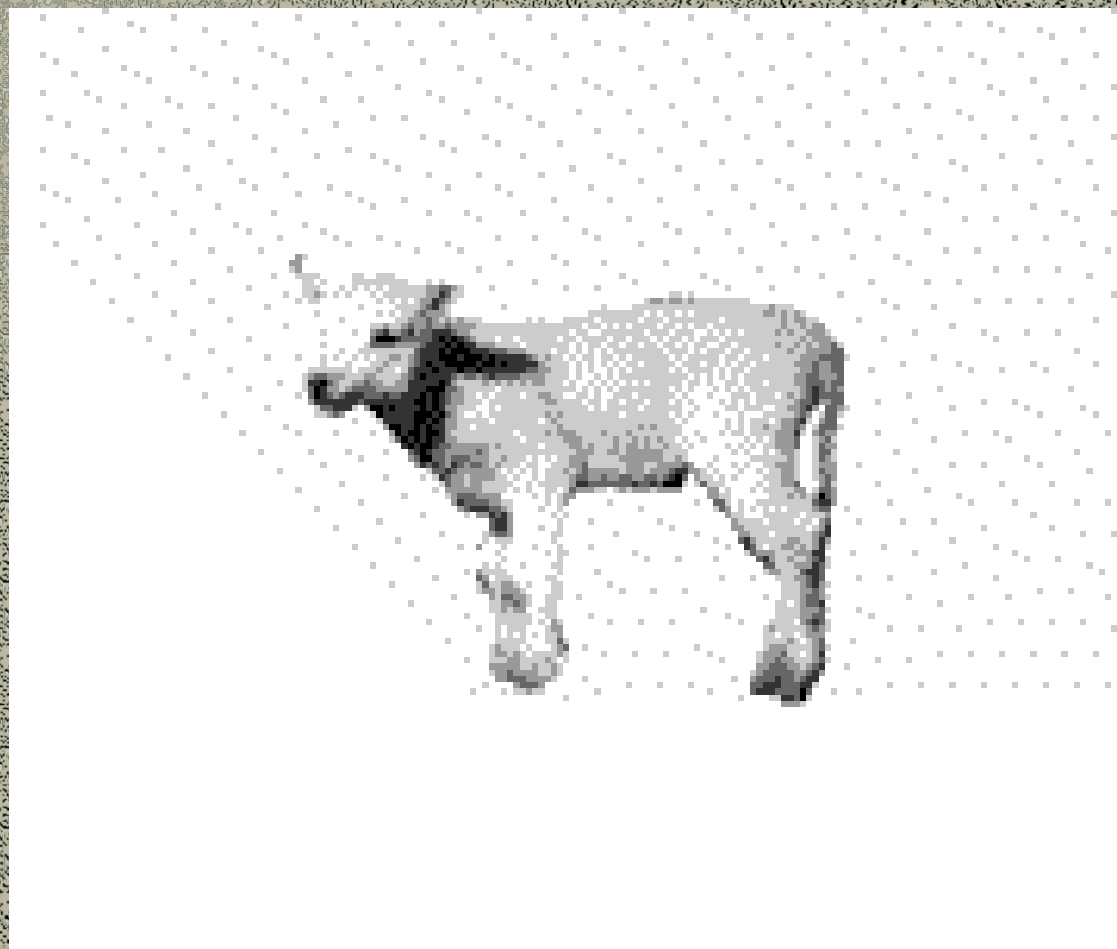


# Conclusion

- “The genius of the future lies not in technology alone, but in the ability to manage it”









# Questions?

