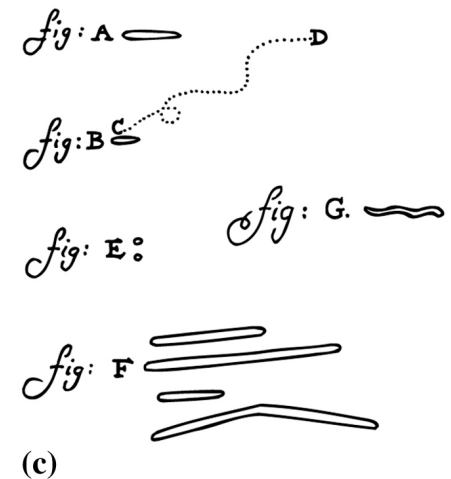
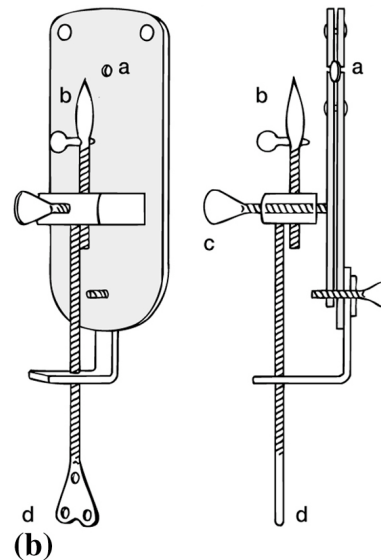
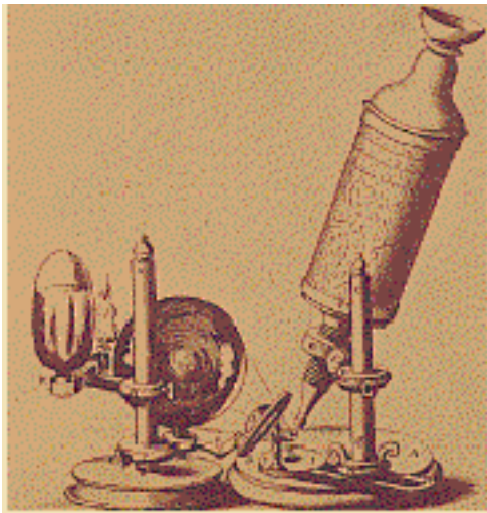


# Observation of microorganisms

- Antoine van Leeuwenhoek
- Robert Hooke



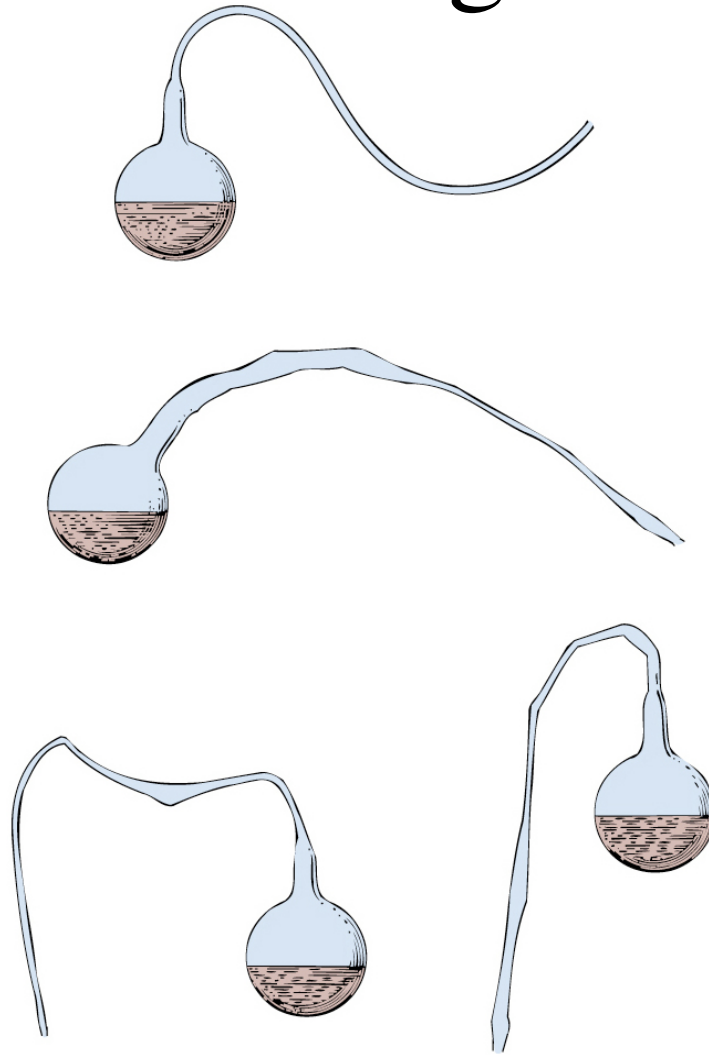
# Spontaneous generation

- Francesco Redi (1688)
- John Needham (1745)
- Lazzaro Spallanzanni (1799)
- Rudolf Virchow (1858)
- Louis Pasteur (1861)



Francesco Redi

# Pasteur's experiment dispelling spontaneous generation



# Germ theory of disease

- Early historical references
- Giralolamo Fracastoro (1546)
- Antonio Bassi (1844)
- Ignaz Semmelweis (1850)
- John Snow (1854)
- Joseph Lister (1867)
- Robert Koch (1877)





## Koch's postulates

- 1. Specific organism must be isolated from sick, but not healthy individuals
- 2. Must be able to cultivate organism outside of the host in pure culture
- 3. When introduce organism into susceptible host, it shows signs of disease
- 4. The same organism must be isolated from diseased host and cultured

# Koch's other credits

- Culture conditions for bacteria
  - Fannie Eilshemius
  - Richard Petri
- 1882- identification of *Mycobacterium tuberculosis*
- “Golden Age of Microbiology” begins



# Pasteur's other credits

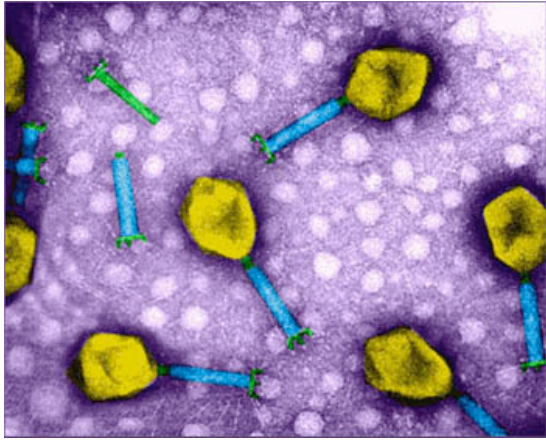


[F]ermentation is a  
result of life without  
air.

—The Physiological Theory of  
Fermentation

*Louis  
Pasteur*

- Fermentation
- Pasteurization
- Aseptic technique
- Vaccination
  - Chicken cholera
  - Anthrax
  - Rabies



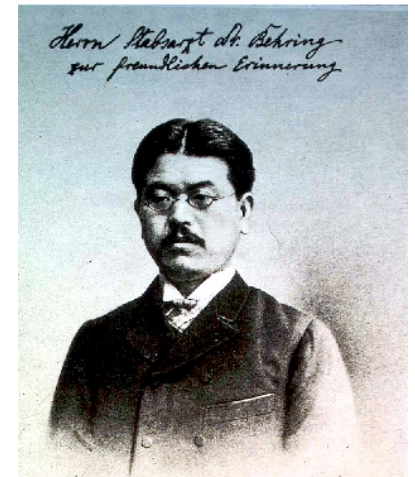
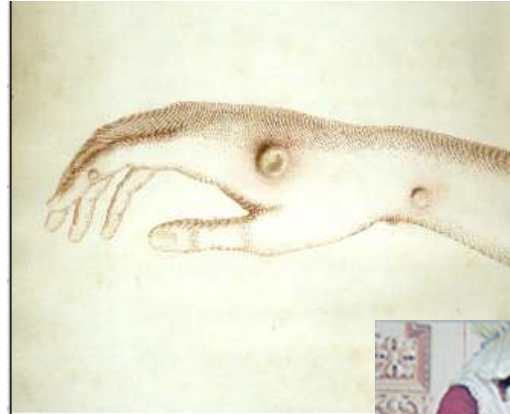
# Virology

- Martinus Beijerinck and Dmitri Ivanowsky (1890's)
- Walter Reed and James Carroll (1900)
- Frederick Rous (1911)
- Wendell Stanley (1935)



# Vaccination

- Edward Jenner (1798)
- Louis Pasteur (1880)
- Emil von Behring and Shibasaburo Kitasato (1890)



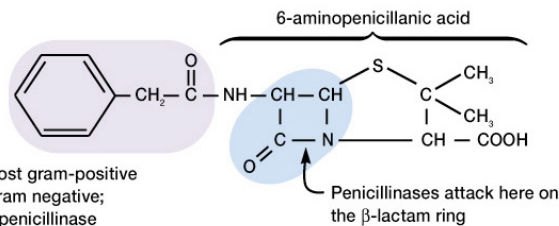
# Antibiotics

- Alexander Fleming (1928)
- Selman Waksman (1944)



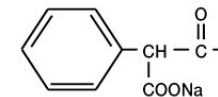
Penicillin G

High activity against most gram-positive bacteria, low against gram negative; destroyed by acid and penicillinase



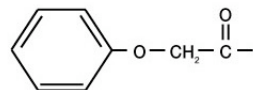
Carbenicillin

Active against gram-negative bacteria like *Pseudomonas* and *Proteus*; acid stable; not well absorbed by small intestine



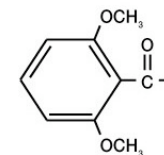
Penicillin V

More acid resistant than penicillin G



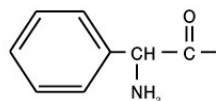
Methicillin

Penicillinase-resistant, but less active than penicillin G; acid-labile



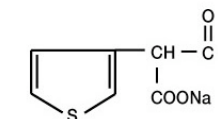
Ampicillin

Active against gram-positive and gram-negative bacteria; acid stable

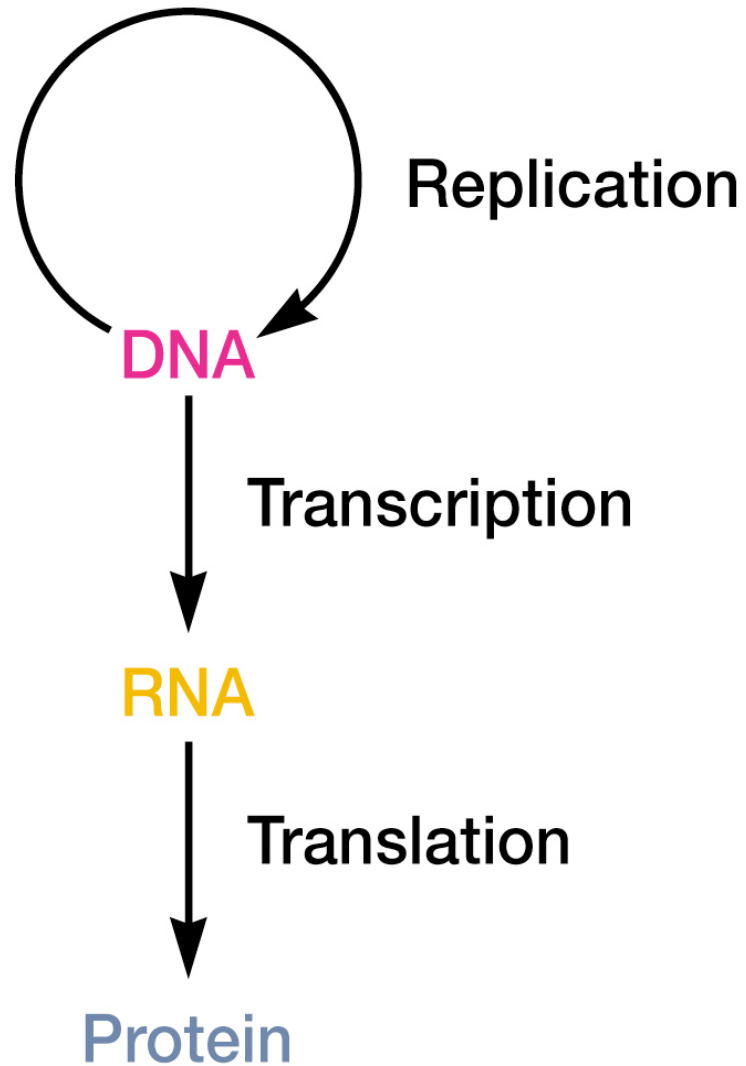


Ticarcillin

Similar to carbenicillin, but more active against *Pseudomonas*



# Central Dogma



# Frederick Griffith (1928)

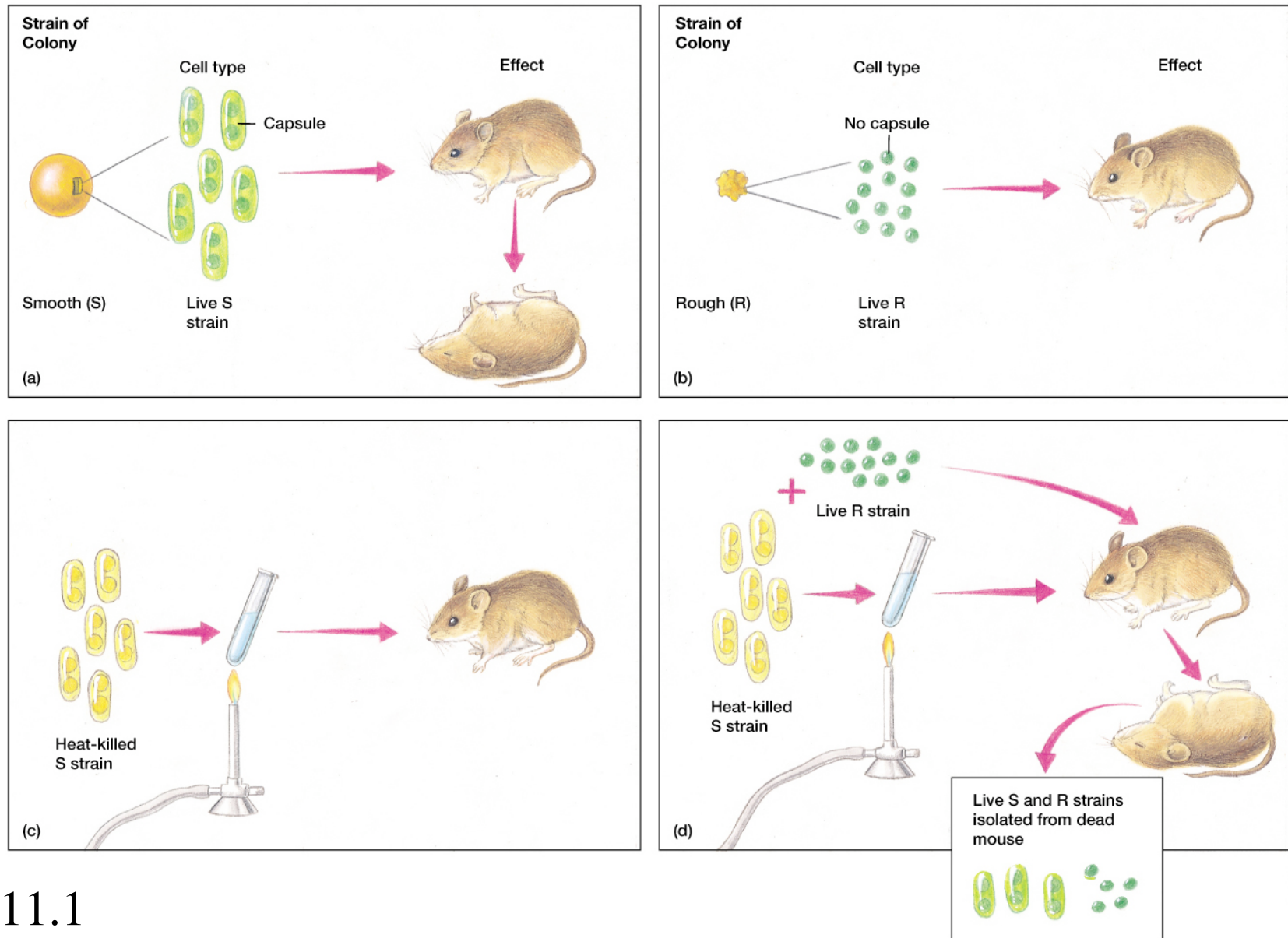


Fig. 11.1

# Hershey and Chase (1952)

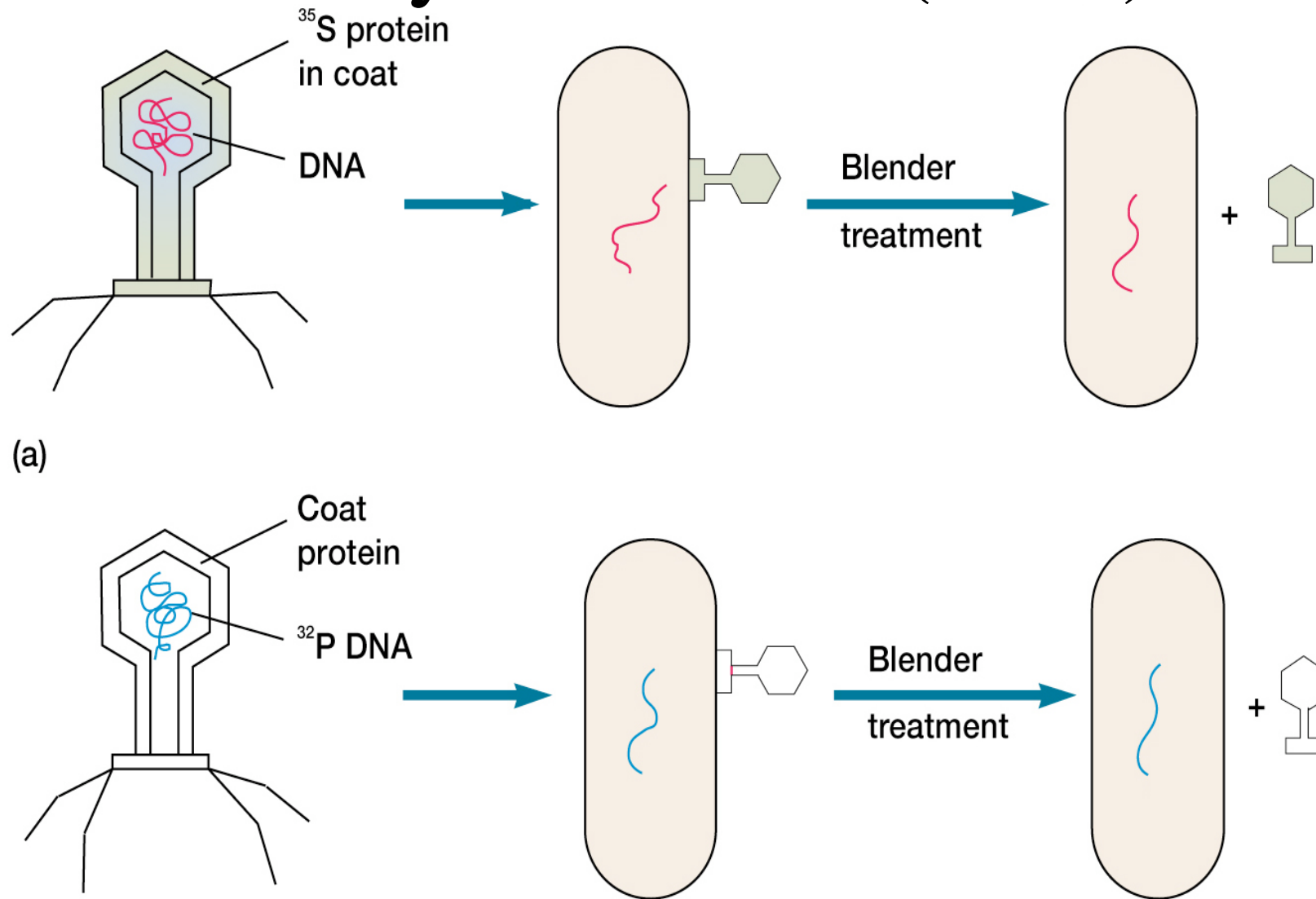


Fig. 11.3<sup>(b)</sup>

# Jacob and Monod (1961)

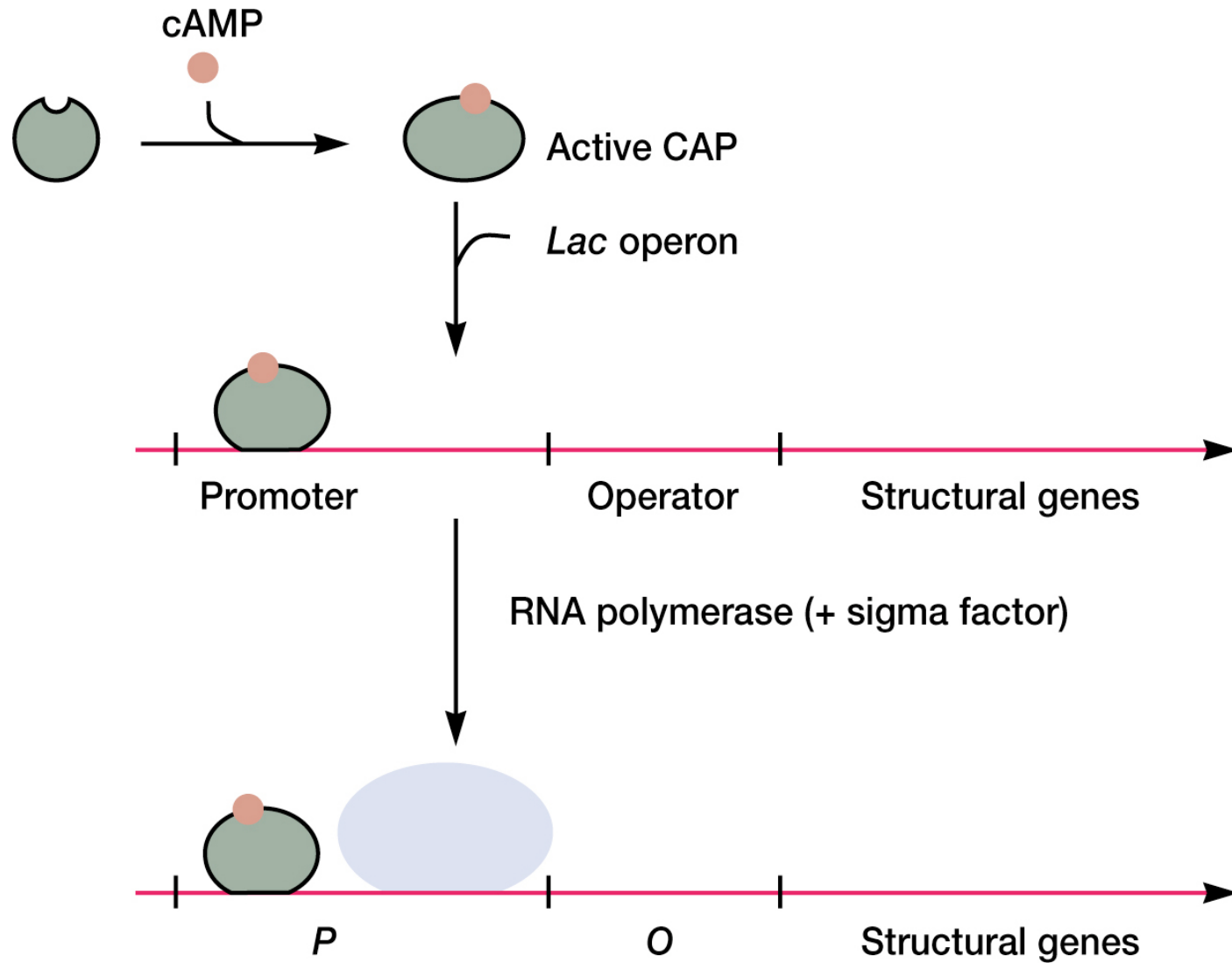


Fig. 12.27

# Molecular Biology and Biotechnology

- 1969-Restriction endonuclease cloned (Arber & Smith)
- 1970-Reverse transcriptase (Temin & Baltimore)
- 1973-Recombinant plasmid (Cohen & Boyer)
- 1977-DNA sequencing (Gilbert & Sanger)
- 1982-Commercial production of insulin
- 1984-Polymerase chain reaction (PCR) (Mullis)
- 1995-Entire genome sequenced (*Haemophilus influenzae*)