

Biotechnology and Genetic Engineering-PBIO 450/550

Biotechnology terminology

Common hosts in biotech research

Transcription & Translation

Prokaryotic gene organization & expression

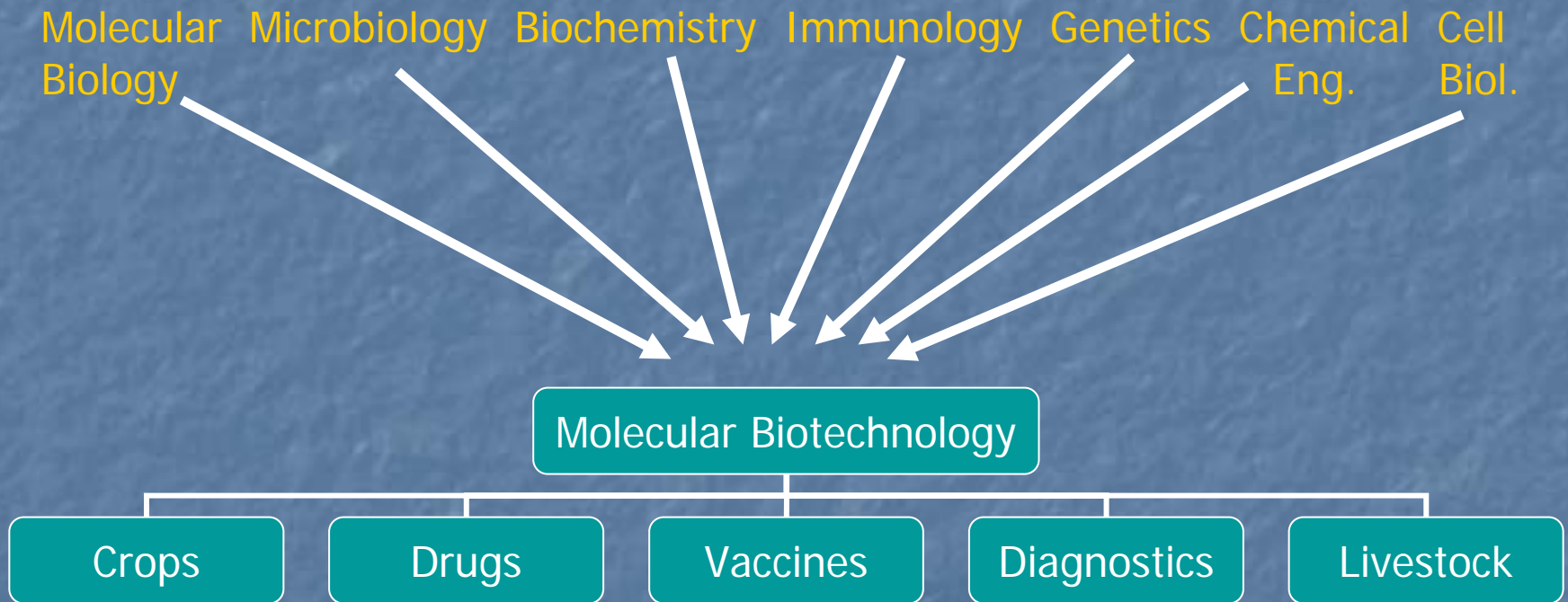
Terminology

- **Biotechnology**-production of goods and services using biological organisms, systems, and processes
- **Recombinant DNA technology**-a set of techniques for manipulating DNA, including: the identification and cloning of genes; the study of the expression of cloned genes; and the production of large quantities of gene product
- **Genetic engineering**-the process of transferring DNA from one organism into another that results in a genetic modification
- **Molecular biotechnology**-rDNA technology + biotechnology

Table 1.1 Selected developments in the history of molecular biotechnology

- 1944-Avery, MacLeod & McCarty determine DNA is the genetic material
- 1953-Watson & Crick determine the structure of DNA
- 1970-first restriction endonuclease isolated
- 1973-Boyer & Cohen establish recombinant DNA technology
- 1976-DNA sequencing techniques developed
- 1980-U.S. Supreme Court rules that genetically modified micro-organisms can be patented
- 1981-first DNA synthesizers sold
- 1988-PCR method published
- 1990-Human genome project initiated
- 1996-Complete DNA sequence of a eukaryote (yeast) determined
- 1997-Nuclear cloning of a mammal (a sheep named Dolly)
- 2000-*Arabidopsis* genome sequenced
- 2001-Human genome sequenced
- 2002-Complete human gene microarrays (gene chips) available

Fig. 1.2 Many scientific disciplines contribute to molecular biotechnology, which generates a wide range of commercial products



Common host organisms used in molecular biotechnology

- *E. coli*
- Yeast (*Saccharomyces cerevisiae*)
- Insect cell lines
- Plant cell lines
- Animal cell lines

Review protein secretion and protein targeting

- Signal peptide sequences
- Consider gram negative vs. gram positive bacteria
- Consider eukaryotic cells
- In eukaryotic cells, short peptide sequences (or other modifications) tell a protein precisely where to go

Central Dogma of Biology

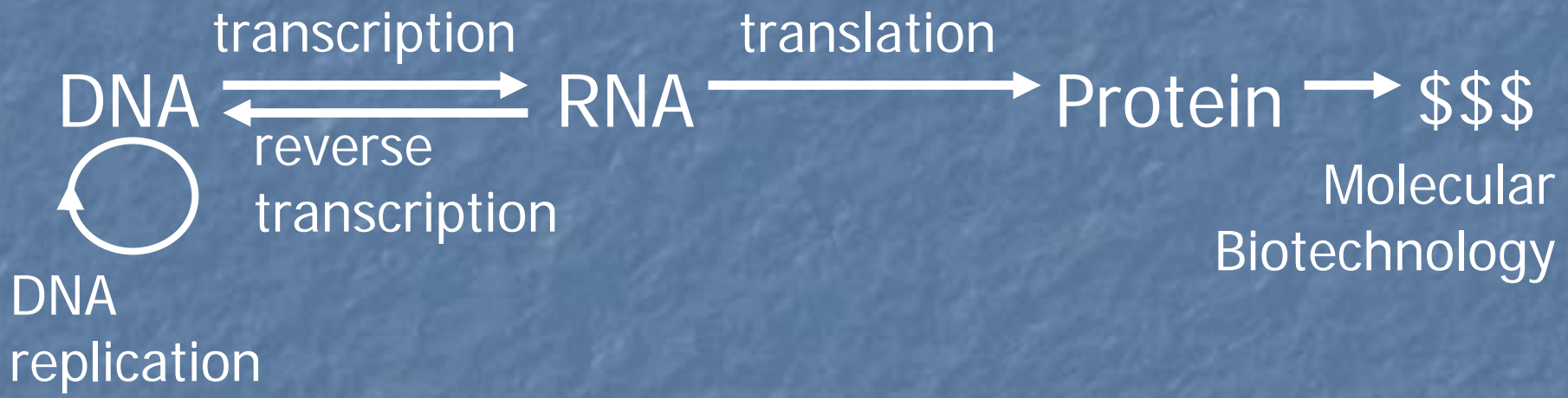


Fig. 3.1 Chemical structure of DNA & RNA

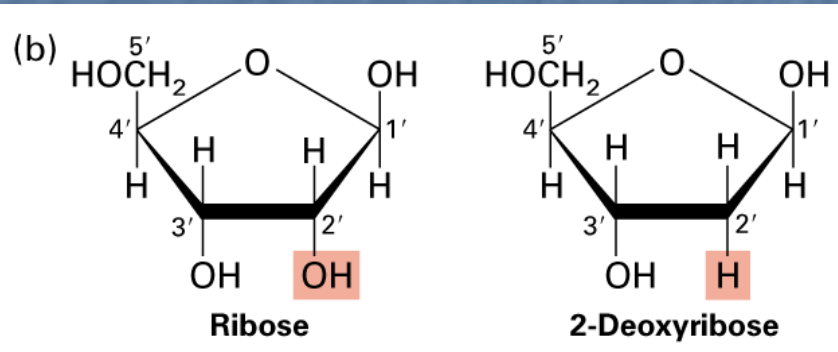
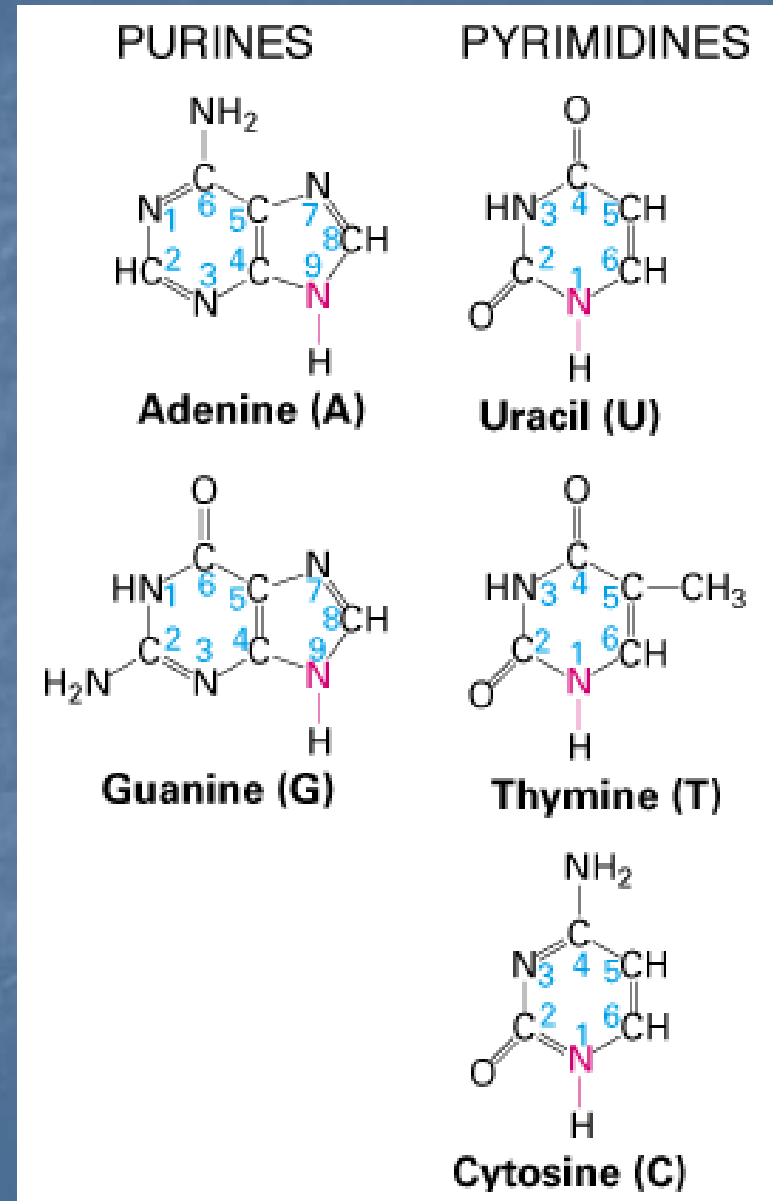
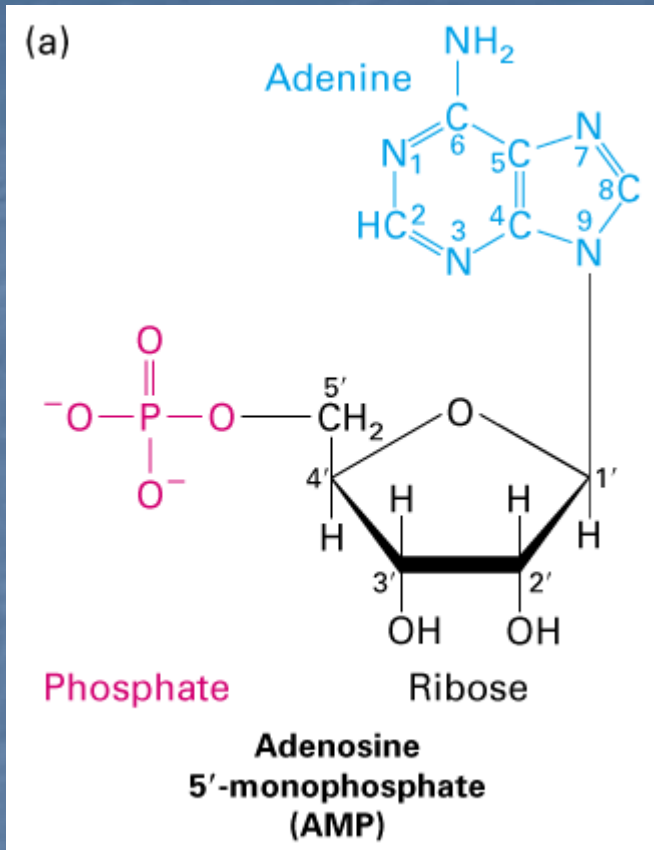
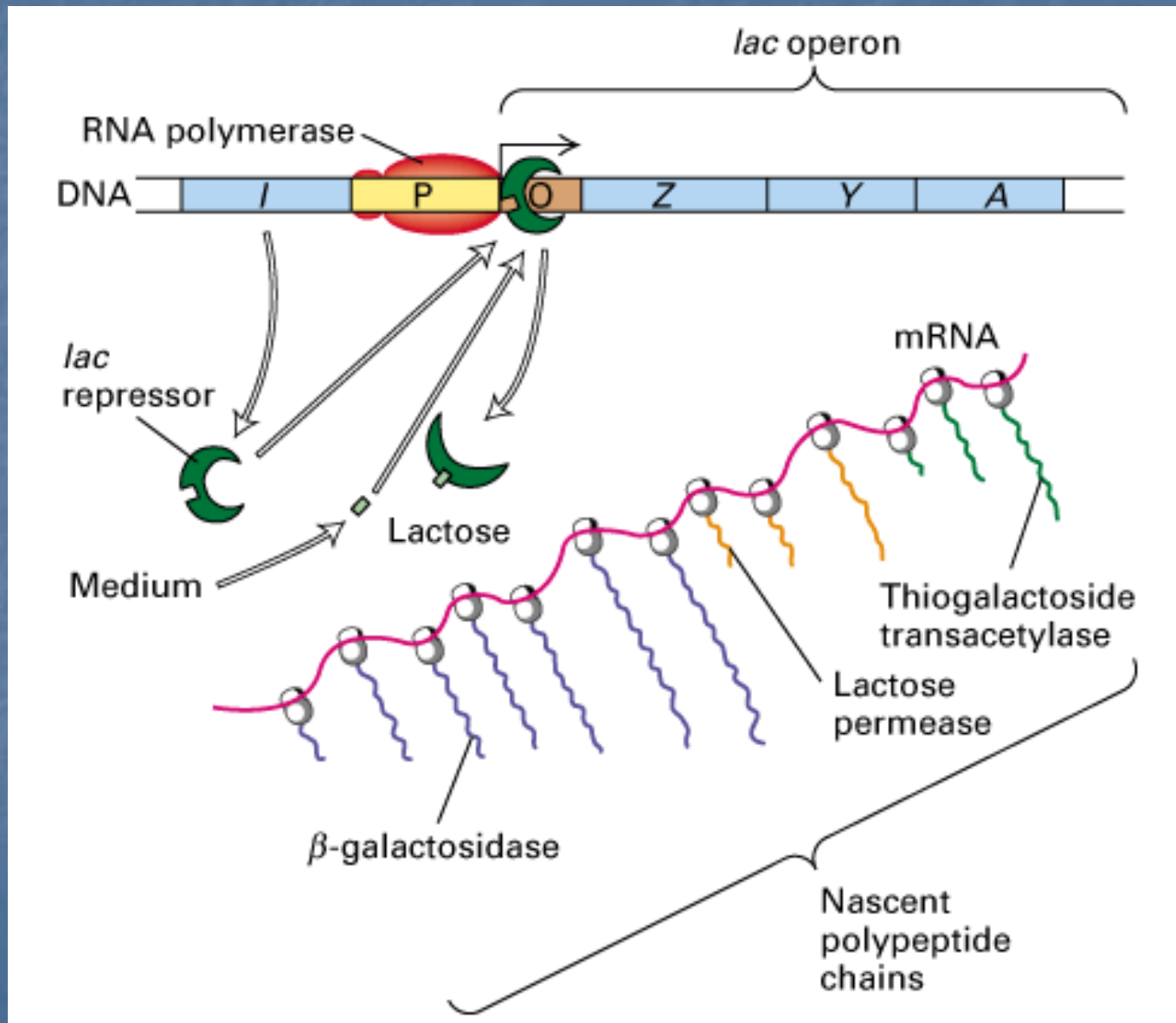
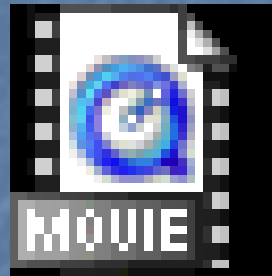


Fig. 3.10/3.19 Prokaryotic gene expression



Prokaryotic gene expression



Regulation lac Operon.mov

Fig. 3.19 In prokaryotes, RNA polymerase binds to the -10 and -35 regions of the promoter relative to the start site of transcription (+1)

