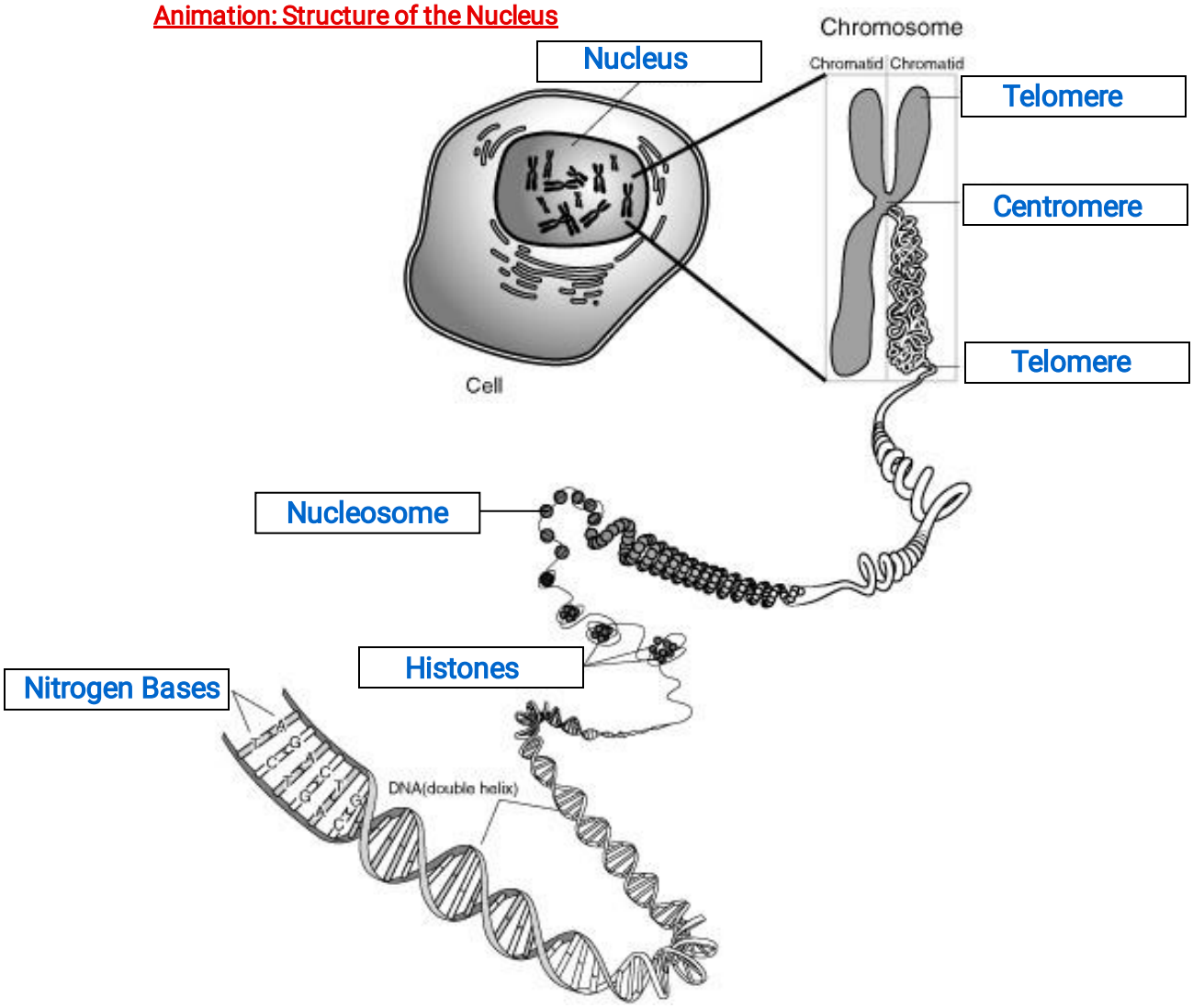
Guided Reading: Chapter 16

Part I. DNA as the Genetic Material (Video: Molecular Visualization of DNA Wrapping)

Animation: Structure of the Nucleus



(p.287)**1.** What are the two chemical components of chromosomes?

The two chemical components of chromosomes are DNA and proteins.

(p.287) **2.** Why did researchers originally think that protein was the genetic material?

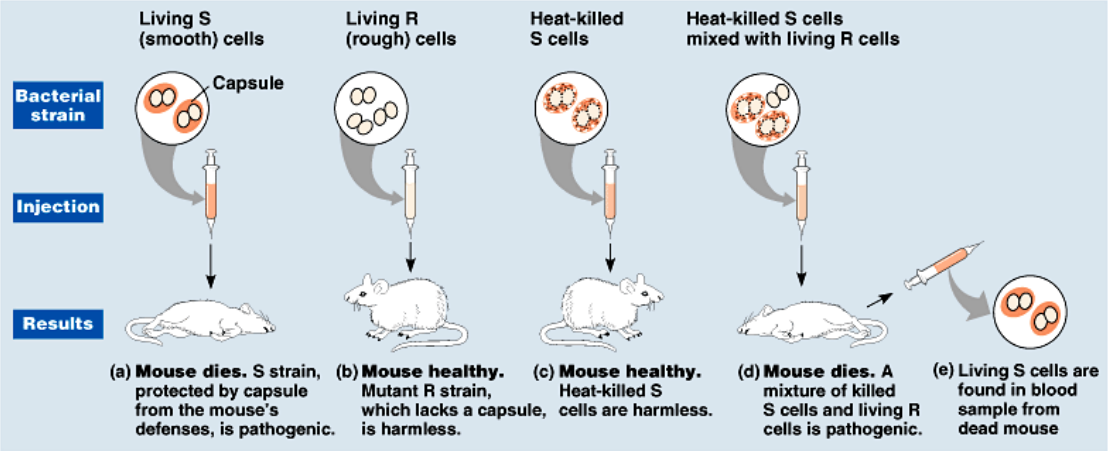
Researchers originally thought that protein was the genetic material since biochemists had already identified them as a class of macromolecules with heterogeneity and specificity, essential requirements for the heredity material. Moreover, little was known about nucleic acids, whose physical and chemical properties seemed far to uniform to account for the multitude of specific inherited traits exhibited by every organism.

They forgot to KEEP IT SIMPLE!!!

(p.288)**3.** Distinguish between the virulent and nonvirulent strains of *Streptococcus pneumoniae* studied by *Frederick Griffith*.

The virulent strain of Streptococcus pneumoniae studied by Frederick Griffith had a protective SMOOTH capsule surrounding it (S-strain) while the nonvirulent (R-strain) did not.

(p.288)**4.** Use this figure to summarize the experiment in which Griffith and Avery became aware that hereditary information could be transmitted from one organism to another. (Animation)



Purpose: To see if a harmless form of bacteria can be changed or transformed into a more deadly form.

Hypothesis: IF the remains of the heat-killed pathogenic (*deadly*) bacteria *Streptococcus pneumonia* are mixed with harmless bacteria, THEN some of the harmless bacteria will be changed into pathogenic bacteria by some "external agent."

Independent Variable: Virulence of Bacteria **Dependent Variable**: Mouse

Conclusion: A chemical agent "transformed" the harmless bacteria.

(p.288)**5.** Define *transformation* and what did Oswald Avery determine to be the *transforming agent*?

Transformation is a change in the genotype (*genetic makeup*) and phenotype (*physical makeup*) of an organism due to the assimilation (the taking in) of external DNA by a cell. Oswald Avery determines that the transforming agent was DNA.

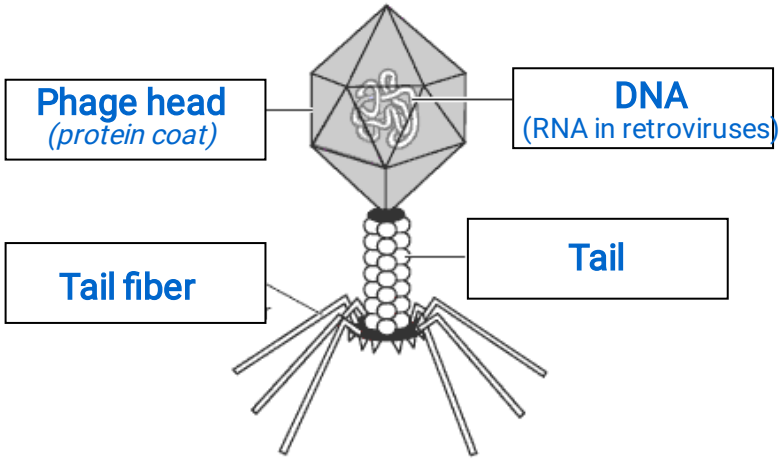
(p.288)**6.** What is a bacteriophage? (Bacteriophage 3D)

A bacteriophage (*phage*) is a virus that infects bacteria.

(p.377)**7.** What are restriction endonucleases or restriction enzymes? (1979 Nobel Prize)

Restriction endonucleases or restriction enzymes are enzymes that protect bacteria against intruding DNA from other organisms, such as phages or other bacteria cells.

(p.289)**8.** Label the *head, tail sheath, tail fiber,* and *DNA* of the diagram of a bacteriophage below,



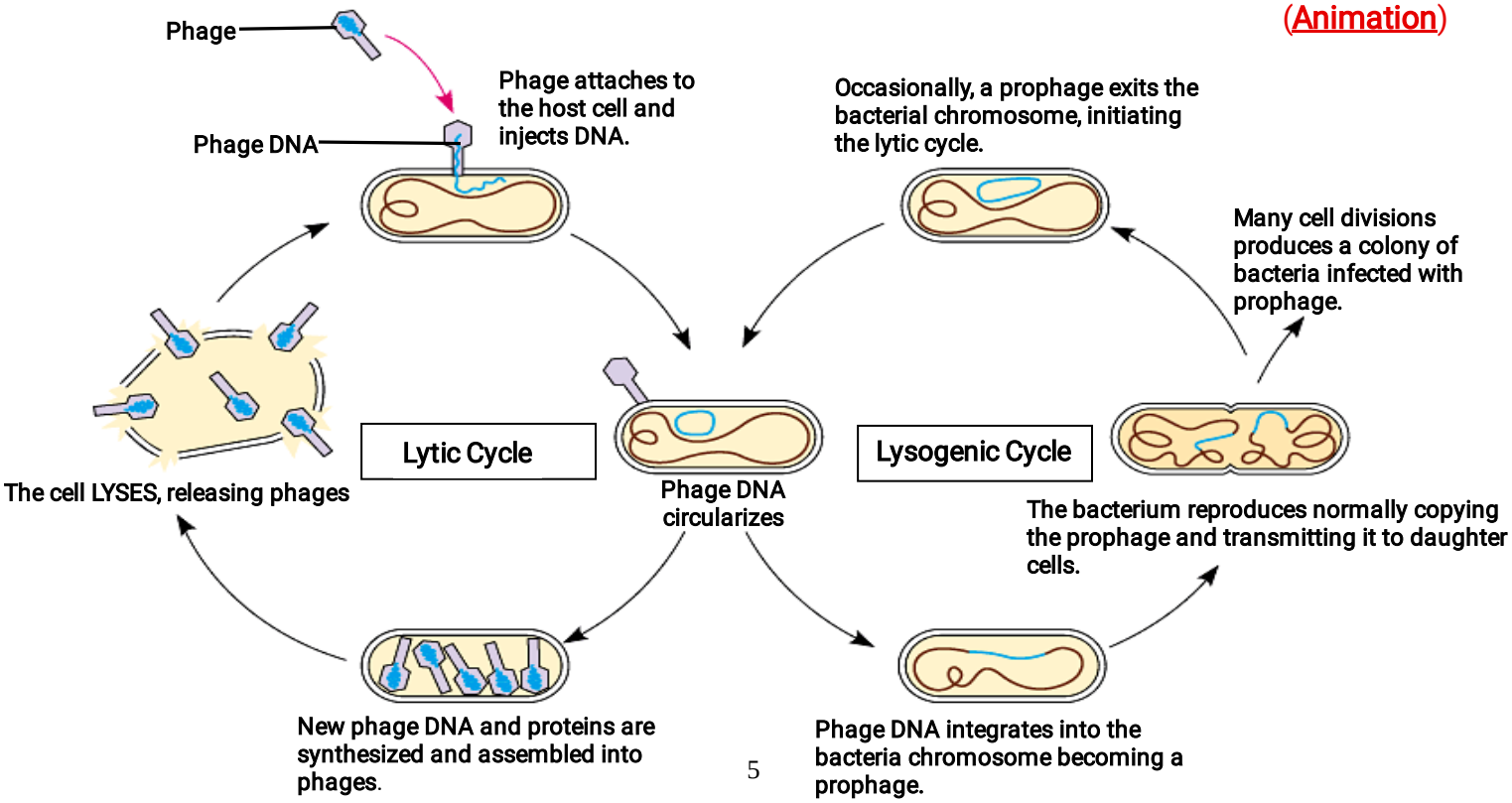
(p.331)**9.** How does a bacteriophage destroy a bacterial cell? (***Look ahead Fig. 18.3***)

A bacteriophage destroys a bacterial cell by by injecting its DNA (*RNA retroviruses*) into the host cell where it is used to produce more viruses.

(1969 Nobel Prize)

(p.333)**10.** Label the diagram below (***Fig.18.5***) and use it to help explain the two methods of viral replication.

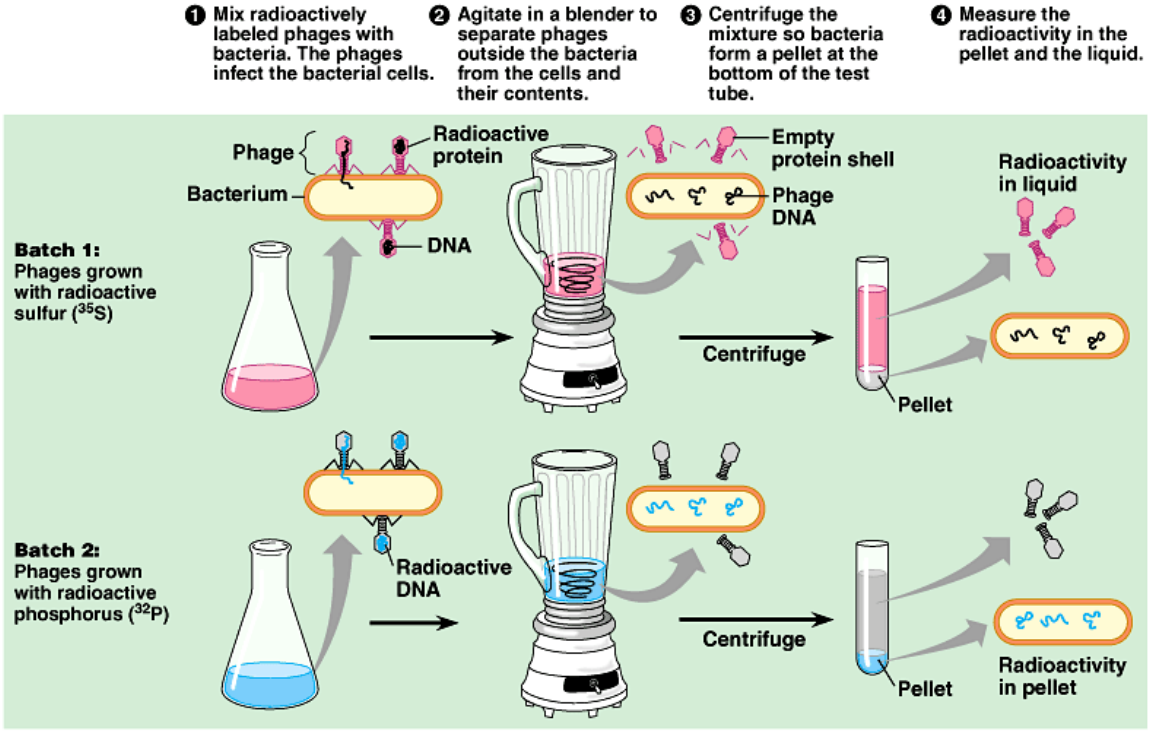
(Animation)



(p.289)**11.** How did Hershey and Chase *label* viral DNA and viral protein so that they could be distinguished?
(Explain why they chose each radioactive tag in light of the chemical composition of DNA and protein.)

Hershey and Chase labeled viral DNA with radioactive phosphorus (^{32}P) because there is no phosphorus in proteins and labeled the viral protein with radioactive sulfur (^{35}S) because there is no sulfur in DNA.

(p.289)**12.** Use this figure to summarize the experiment in which Hershey and Chase became aware that hereditary information could be transmitted between two organisms in an unusual manner. (Animation)



(b) The experiment showed that T2 proteins remain outside the host cell during infection, while T2 DNA enters the cell.

Purpose: To determine which part of a bacteriophage (bacteria-infecting virus) the protein or nucleic acid/DNA responsible for "reprograming" the host bacterial cell.

Hypothesis: IF radioactive phosphorus – ^{32}P used to "tag" the viral DNA is found in the more dense pellet containing E.coli bacteria and the radioactive sulfur – ^{35}S used to "tag" the viral protein coat is found in the less dense liquid, THEN the DNA functions as the bacteriophage's genetic material.

Independent Variable: Virus **Dependent Variable**: Location of ^{32}P / ^{35}S

Conclusion: ^{32}P found in the pellet – DNA is the genetic material!!!!!