FACULTY OF ENGINEERING &TECHNOLOGY
DEPARTMENT OF BIOTECHNOLOGY

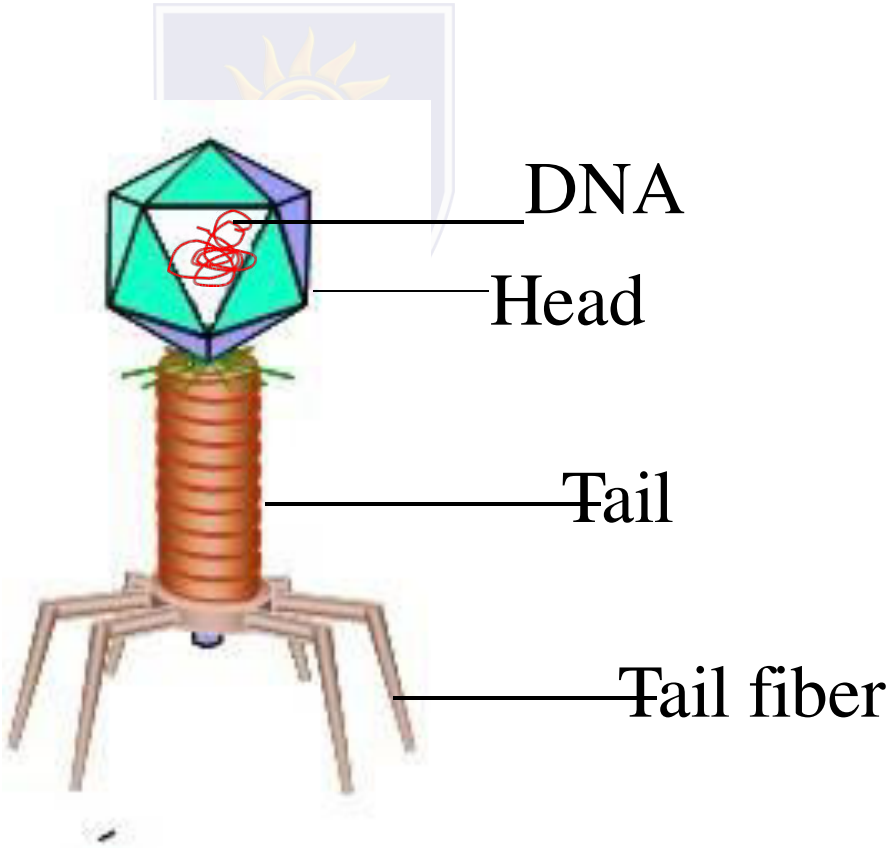
Hershey- Chase Experiments:

- In 1952 Alfred Hershey and Martha Chase used bacteriophage (virus) T_2 to show that DNA is the genetic material. Most of the phage structure is protein, with DNA contained inside the protein sheath of its

"head."

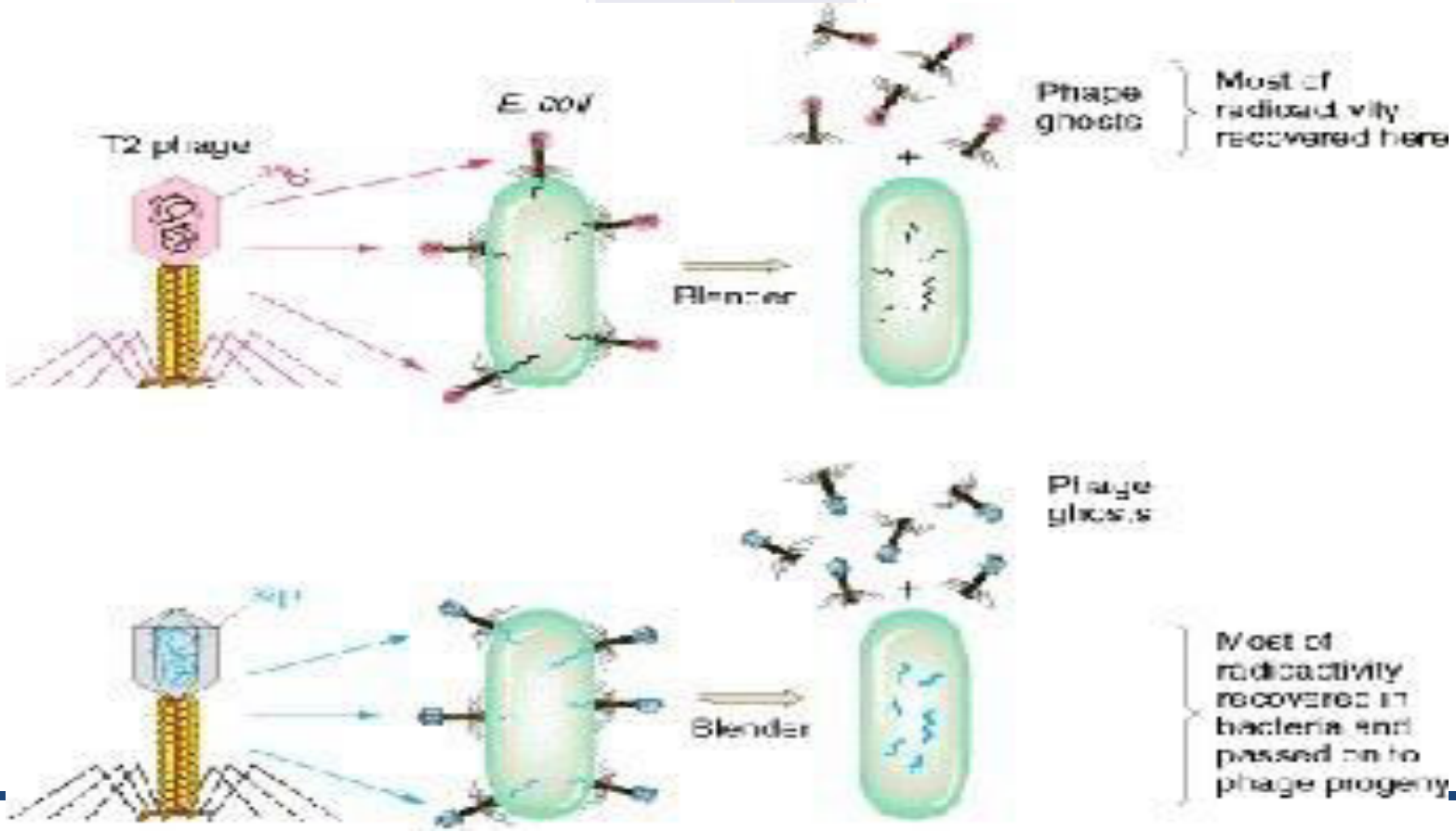
- They reasoned that phage infection must entail the introduction (injection) into the bacterium of the specific information that dictates viral reproduction.
- Hershey and Chase incorporated the radioisotope of phosphorus (^{32}P) into phage DNA and that of sulfur (^{35}S) into the proteins of a separate phage culture. P is not found in proteins but is an integral part of DNA; S is present in proteins but never in DNA.

Bacteriophage



- When the ^{32}P-labelled phages were used, most of the radioactivity ended up inside the bacterial cells, indicating that the phage DNA entered the cells. ^{32}P can also be recovered from phage progeny.
- When the ^{35}S-labelled phages were used, most of the radioactive material ended up in the phage ghosts, indicating that the phage protein never entered the bacterial cell.
- They concluded that DNA is the hereditary material; the phage proteins are mere structural packaging that is discarded after delivering the viral DNA to the bacterial cell.

The Hershey-Chase experiment, which demonstrated that the genetic material of phage is DNA, not



Support for the hypothesis that DNA is the genetic material

1. Experiments have shown that DNA is located almost exclusively in the nucleus of eukaryotic cells, only in cell locations where chromosomes, the carrier of genetic information, are present.

1. Cytochemical analysis demonstrated that the amount of DNA per diploid cell in a given organism is constant from one cell type to another.The amount of DNA in haploid germ cells (sperm and egg) was shown to be half the amount of DNA in diploid cells. This relates directly to the inheritance patterns of genes.

3. Comparative studies indicated that different organisms have different amount of DNA. The amount of DNA per cell is in proportion to the complexity of the cell. The higher the organism in the evolutionary scale, the greater the content of DNA per cell. This is expected as different organisms differ in their complexity and therefore have different numbers of chromosomes and genes.
4. DNA is metabolically stable, meaning that it is not rapidly degraded like many other cellular molecules. Furthermore, the amount of DNA per cell in a given species of higher organism remains fairly constant, unaffected by changes in the environment or nutrition. This stability would be expected for the genetic material.

5. There is a direct correlation between the absorption of ultraviolet light by DNA and the rate of mutation. The rate of mutation is highest at the wavelength of maximum absorption, suggesting that DNA is the hereditary material and when irradiated undergoes chemical changes which cause mutations.
6. DNA is capable of accurate replication. This mechanism ensures the faithful copying of the genetic information at each cell division, thus genetic information can be passed unchanged from one generation to the next.
7. DNA codes for all the instructions for making proteins, the macromolecules needed for the cell