METHODS OF DNA REPLICATION

Mrs. ANITA KANNAGI
Associate Professor
PG & Research Centre of Zoology
III UG Zoology (SF)

DNA replication

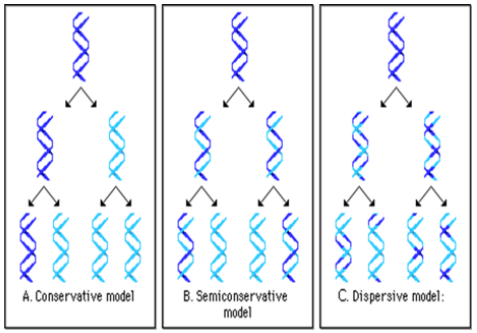
- The process by which a DNA molecule makes its identical copies
- takes place in S-phase of interphase.

Three possible methods of DNA replication

1. Dispersive method
2. Conservative method and
3. Semi-conservative method.

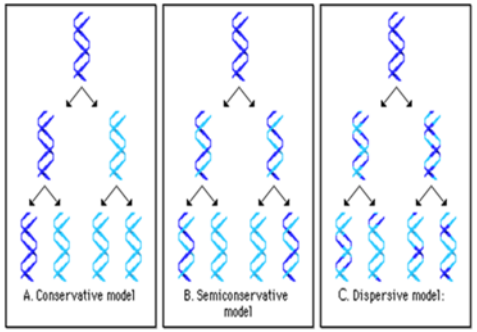
1. Dispersive Replication:

- the two strands of parental DNA break at several points
- resulting in several pieces of DNA.
- Each piece replicates and are reunited randomly
- The new DNA molecules are hybrid which have old and new DNA in patches.
- This method of DNA replication is not accepted, because such replication could not be proved experimentally.



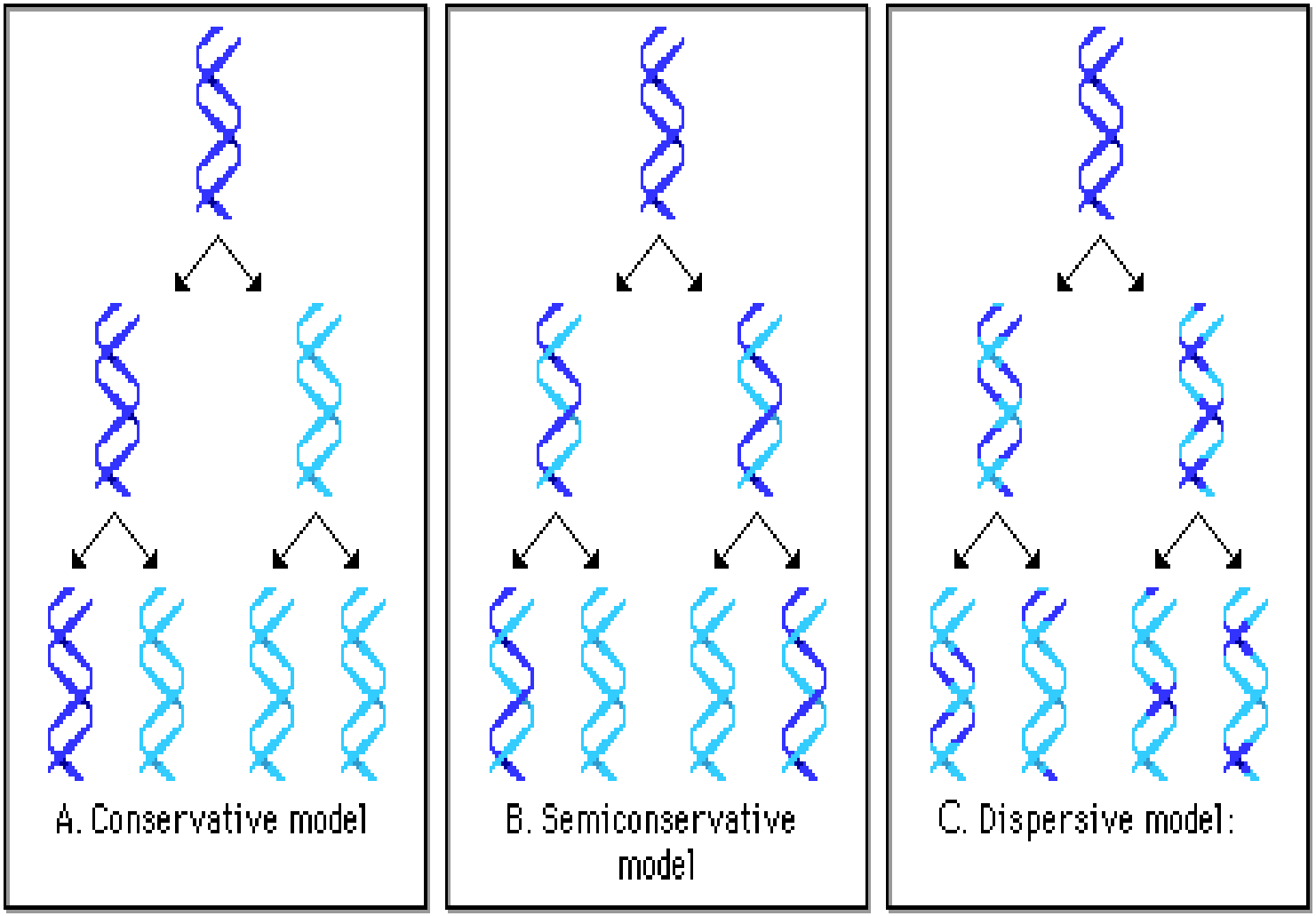
2. Conservative Replication:

- In this method, two DNA molecules are formed.
- One molecule has both parental strands and
- the other strand has both newly synthesized strands.
- This method is also not accepted as there is no experimental proof in support of this model.



3. Semi-conservative Replication:

- proposed by Watson and Crick
- both the strands of parental DNA separate from one another
- Each parental strand synthesizes a new strand.
- each of the two resulting DNA molecules has one parental and one new strand
- This method of DNA replication is universally accepted
- several evidences in support of semi-conservative method


A. Conservative model
B. Semiconservative model
C. Dispersive model:

MESELSON AND STAHL EXPERIMENT

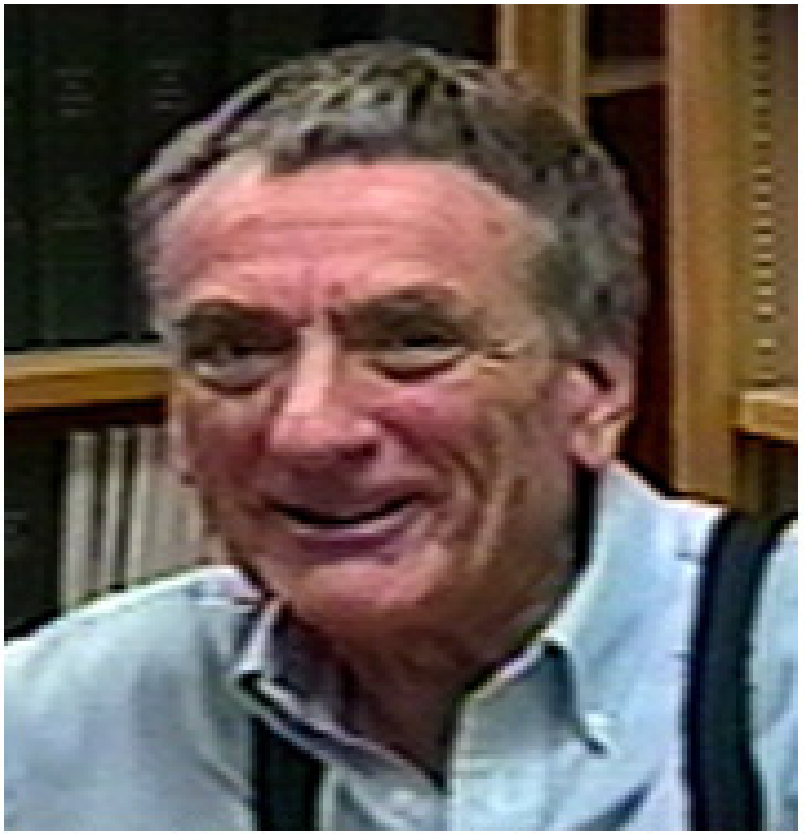
Meselson and Stahl (1958) cond experiment with E. coli.

MATTHEW STANLEY MESELSON (

- Born in Colorado
- studied chemistry at the University of Chicago
- Worked at the California Institute of Technology

FRANKLIN WILLIAM STAHL

- Born in Boston.
- Received a B.A. from Harvard University in 1951.
- Work in the University of Rochester after graduate



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- In 1954, Meselson met Franklin Stahl
- In 1958, they proved that DNA was replicated in a semi-conservative way.

- The **Meselson-Stahl experiment** was an experiment to prove that DNA replication was semiconservative.
- Nitrogen is a major constituent of DNA, the genetic material of all cells.
- It is commonly found in the ^{14}N isotope, but it can also be found in the heavier ^{15}N isotope.

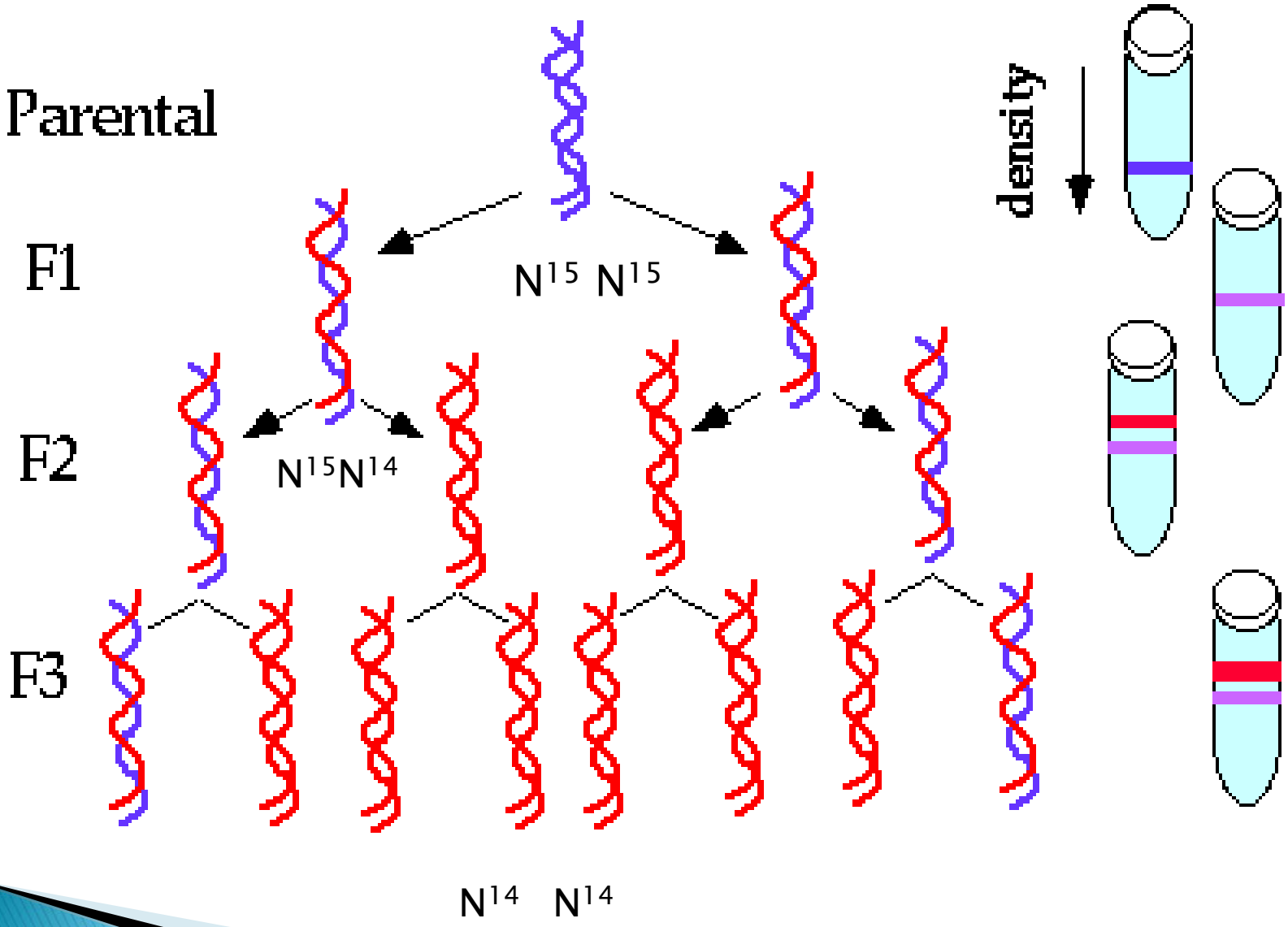
- Meselson and Stahl (1958) conducted their experiment with E. coli.
- grown on culture medium containing heavy isotope of Nitrogen (N^{15}) for 14 generations. (one generation is completed in about 30 minutes)
- to replace the normal nitrogen (N^{14}) of E. coli with heavy nitrogen.
- The normal nitrogen (N^{14}) is lighter than N^{15} nitrogen).

- DNA. After 14 generations of multiplication in N^{15} medium, the E. coli was transferred to normal N^{14} medium
- and allowed to grow there for one generation.
- Now DNA is analysed for radioactivity.
- It was found to have exactly an intermediate density
- This supported the idea of semiconservative replication.

- The DNA was intermediate in density because it had an all ^{15}N DNA strand and ^{14}N DNA strand.

- ^{15}N strand was one of the original strands in the original cell.

- ^{14}N strand was a newly synthesized strand.


Parental
F1
F2
F3
N^{15} N^{15}
$N^{15}N^{14}$
N^{14} N^{14}
density

- After two generations, half the DNA was with intermediate density and half with light bands

- which further confirms semi- conservative mode of DNA replication.

- After third generation 3/4 DNA was found with normal N^{14} and 1/4 with hybrid nitrogen [$N^{14}N^{15}$]

Thus this experiment proves that semi conservative method takes place during DNA replication.