How Molecular Biology came about?

- Microscopic biology began in 1665
- Robert Hooke (1635-1703) discovered organisms are made up of cells
- Matthias Schleiden (1804-1881) and Theodor Schwann (1810-1882) further expanded the study of cells in 1830s

- Robert Hooke

- Matthias Schleiden

- Theodor Schwann

Major events in the history of Molecular Biology 1800 - 1870

- **1865** Gregor Mendel discover the basic rules of heredity of garden pea.
  - An individual organism has two alternative heredity units for a given trait (dominant trait v.s. recessive trait)

Mendel: The Father of Genetics

- **1869** Johann Friedrich Miescher discovered DNA and named it nuclein.

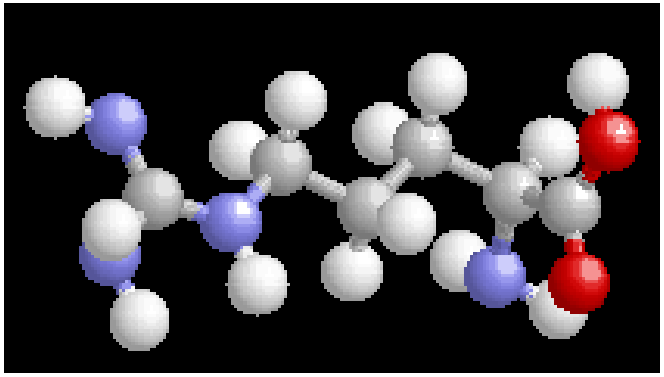
Johann Miescher

Major events in the history of Molecular Biology 1880 - 1900

- **1881** Edward Zacharias showed chromosomes are composed of nuclein.

- **1899** Richard Altmann renamed nuclein to nucleic acid.

- **By 1900**, chemical structures of all 20 amino acids had
- been identified

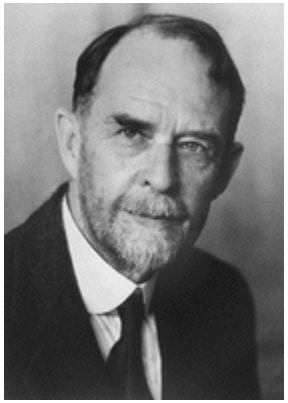


Major events in the history of Molecular Biology 1900-1911

- **1902** - Emil Hermann Fischer wins Nobel prize: showed amino acids are linked and form proteins
  - Postulated: protein properties are defined by amino acid composition and arrangement, which we nowadays know as fact

Emil Fischer

- **1911 –** Thomas Hunt Morgan discovers genes on chromosomes are the discrete units of heredity

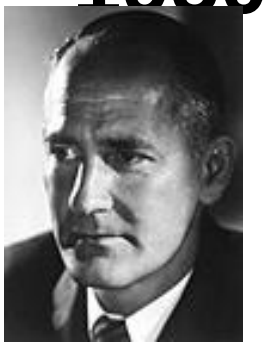


Thomas Morgan

- **1911** Pheobus Aaron Theodore Lerene discovers RNA

Major events in the history of Molecular Biology 1940 - 1950

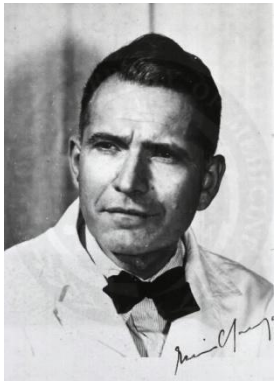
- **1941 –** George Beadle and Edward Tatum identify that genes make proteins



George Beadle

Edward Tatum

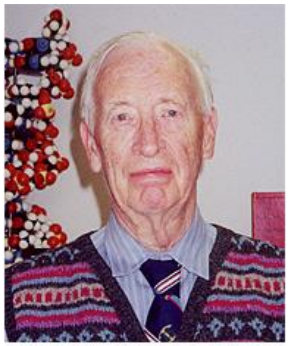
- **1950 –** Edwin Chargaff find Cytosine complements Guanine and Adenine complements Thymine



Edwin Chargaff

Major events in the history of Molecular Biology 1950 - 1952

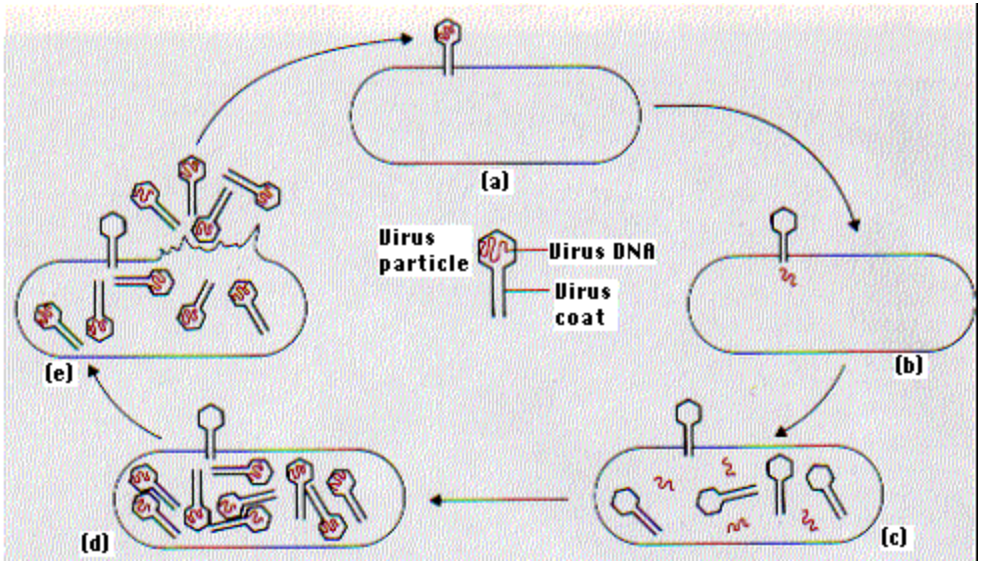
- **1950s** – Mahlon Bush Hoagland first to isolate tRNA



Mahlon Hoagland

- **1952** – Alfred Hershey and Martha Chase make genes from DNA

Hershey Chase Experiment



Major events in the history of Molecular Biology 1952 - 1960

- **1952-1953** James D. Watson and Francis H. C. Crick deduced the double helical structure of DNA

James Watson and Francis Crick

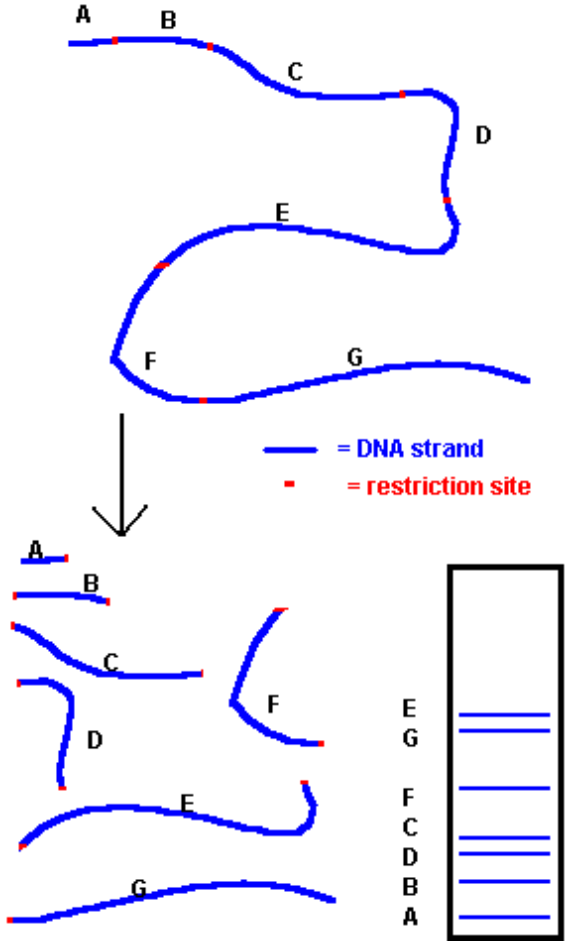
- **1956** George Emil Palade showed the site of enzymes manufacturing in the cytoplasm is made on RNA organelles called ribosomes.

George Emil Palade

Major events in the history of Molecular Biology 1970

- **1970** Howard Temin and David Baltimore independently isolate the first restriction enzyme

- DNA can be cut into reproducible pieces with site-specific endonuclease called restriction enzymes;
  - the pieces can be linked to bacterial vectors and introduced into bacterial hosts. (gene cloning or recombinant DNA technology)



Major events in the history of Molecular Biology 1970- 1977

- **1977** Phillip Sharp and Richard Roberts demonstrated that pre-mRNA is processed by the excision of introns and exons are spliced together.

- Joan Steitz determined that the 5’ end of snRNA is partially complementary to the consensus sequence of 5’ splice junctions.

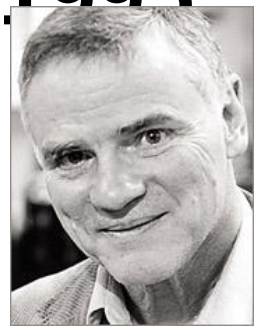
Phillip Sharp

Richard Roberts

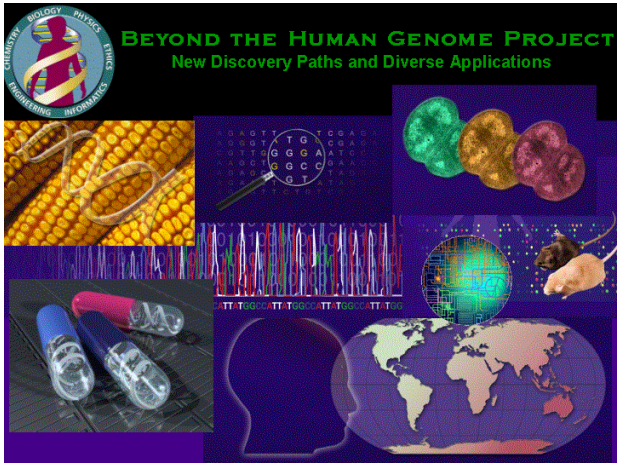
Joan Steitz

Major events in the history of Molecular Biology 1986 - 1995

- **1986** Leroy Hood: Developed automated sequencing mechanism
- **1986** Human Genome Initiative announced
- **1990** The 15 year Human Genome project is launched by congress
- **1995** Moderate-resolution maps of chromosomes 3, 11, 12, and 22 maps published (These maps provide the locations of “markers” on each chromosome to make locating genes easier)



Leroy Hood



Major events in the history of Molecular Biology 1995-1996

- **1995** John Craig Venter: First bactierial genomes sequenced

John Craig Venter

- **1995** Automated fluorescent sequencing instruments and robotic operations

- **1996** First eukaryotic genome-yeast-sequenced

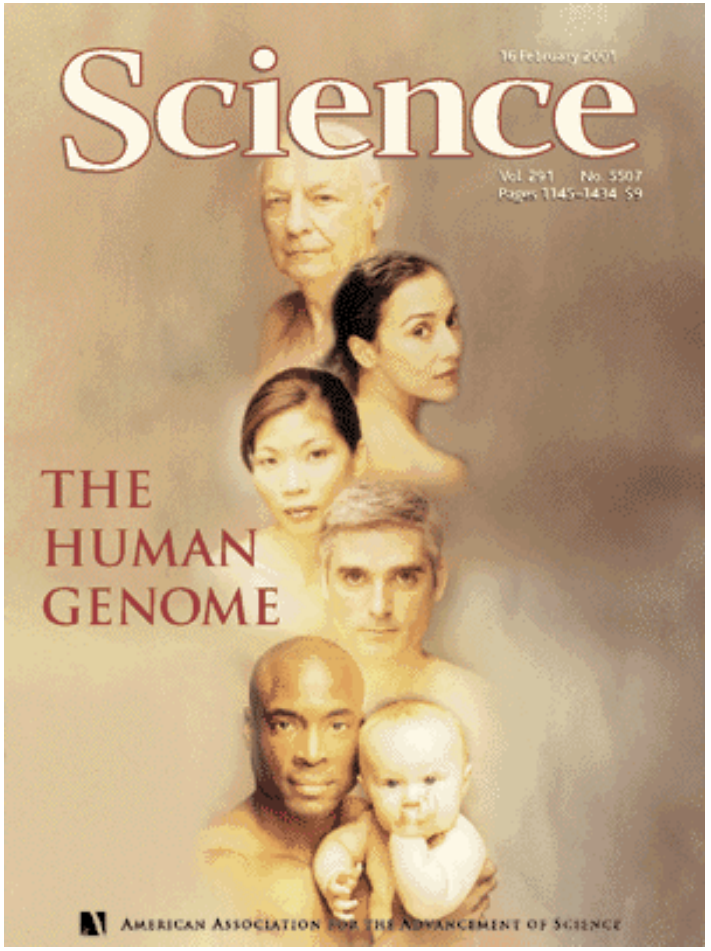
Major events in the history of Molecular Biology 1997 - 1999

- **1997** E. Coli sequenced
- **1998** PerkinsElmer, Inc.. Developed 96-capillary sequencer
- **1998** Complete sequence of the Caenorhabditis elegans genome
- **1999** First human chromosome (number 22) sequenced

Major events in the history of Molecular Biology 2000-2001

- **2000** Complete sequence of the euchromatic portion of the Drosophila melanogaster genome

- **2001** International Human Genome Sequencing:first draft of the sequence of the human genome published



Major events in the history of Molecular Biology 2003- Present

- **April 2003** Human Genome Project Completed. Mouse genome is sequenced.

- **April 2004** Rat genome sequenced.