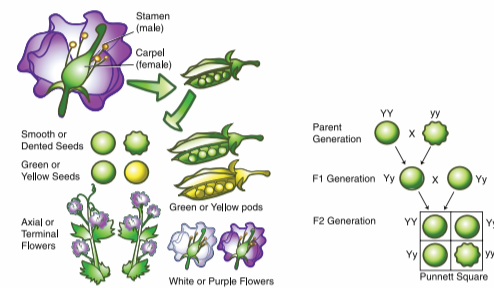


Gene: An Evolving Concept

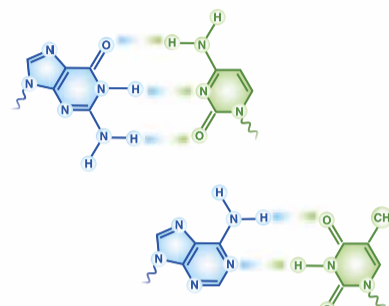


Gregor Mendel



The laws of inheritance were described.

1865 1869



The nucleic acids were isolated and studied by Friedrich Miescher.

The rediscovery of Mendel's work by Carl Correns, Erich von Tschermak-Seysenegg, and Hugo De Vries prompted the foundation of **genetics**.

1900

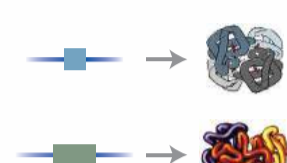


Thomas Morgan



Studies in *Drosophila melanogaster* suggest a **linear model of genes** on chromosomes, like 'beads on a string.'

1910



One gene, one enzyme; Then **one gene, one protein**.

Artificial **transmutation of the gene** by X-ray was reported by Hermann Müller.

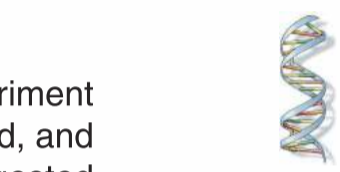
1927



Francis Crick James Watson

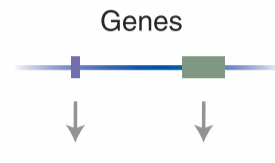
The DNase experiment by Avery, MacLeod, and McCarty suggested **transformation is induced by DNA**.

1941



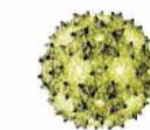
The **DNA double helix** structure was solved.

1944



The **'Central Dogma'** of molecular biology was proposed by Francis Crick.

1958



The **first sequence** of a gene, *COAT_BPMS2*, was determined.

1972

```

AGCCGTATAA
ATGATCTGGTTL
TACCCCTATTTC
CTTTCTACAGCCA
TACTGGTTGTTTT
TTGTCTCTGG
    
```

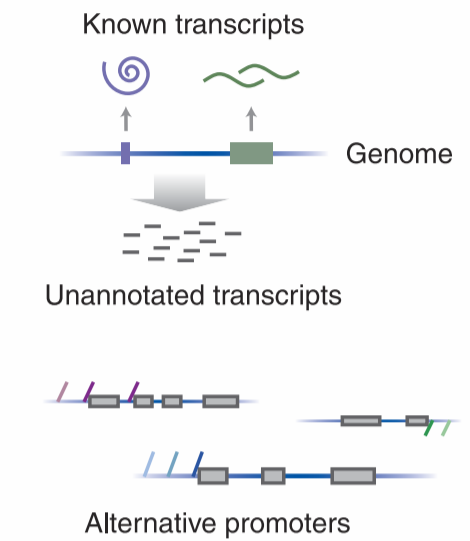
GENSCAN, a computer program for **gene structure prediction**, became available.

1994

The drafts of the **human genome sequence** were published.

1997

2001



The ENCODE Project highlighted the **complexity** of gene transcription and regulation.

2007

Gene as a discrete heredity unit

Gene as a distinct locus

Gene as a physical molecule

Gene as a protein blueprint

Gene as transcribed code

Gene as ORF sequence pattern

Gene as annotated genomic entity

Gene as ...

ZHENG DONG D. ZHANG, M.M.V.I.L

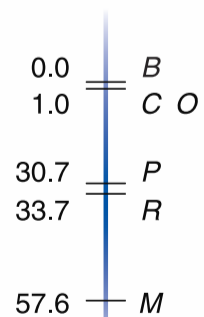
A term invented almost a century ago, 'gene,' with its beguilingly simple orthography, has become a central concept in biology. Given a specific meaning at its coinage, this word has evolved into something complex and elusive over the years, reflecting our ever-expanding knowledge in genetics and in life sciences at large. The stunning discoveries made in the ENCODE Project—like many before that significantly enriched the meaning of this term—are harbingers of another tide of change in our understanding of what a gene is.

The first appearance of the word **'gene,'** derived from the Greek *genesis* or *genos*.



Wilhelm Johannsen

Alfred Sturtevant constructed the **first genetic map**.



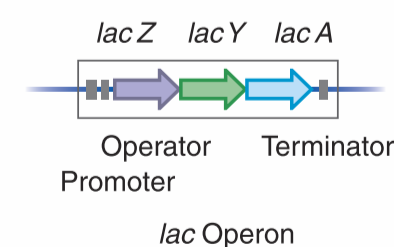
Griffith's experiment demonstrating type-switching in *pneumococcus* suggested a **transforming principle**.



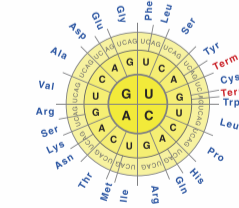
Alfred Hershey Martha Chase

Hershey and Chase determined that **DNA is the genetic material**.

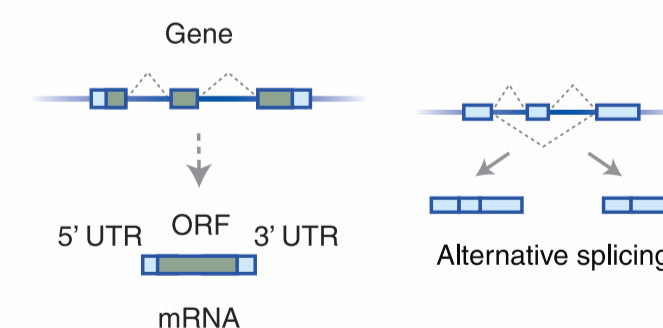
The **operon**, described by François Jacob and Jacques Monod, demonstrated **transcriptional control**.



The **genetic code** was deciphered by Marshall Nirenberg, Har Gobind Khorana, and others.



Introns and the mechanism of **RNA splicing** were discovered by Phillip Sharp and Richard Roberts demonstrating 'split gene structure.'



The **ENCODE Project** was launched.



The pilot phase of the ENCODE Project was finished. New gene models are proposed.

