REVOLUTIONARY DISCOVERIES

GOLDBIO®

1928 Antibiotics

Alexander Fleming wasn't setting out to revolutionize biology when he discovered something in *Penicillium* mold spores was able to kill *staphylococcal* bacteria. Fleming was just trying to prevent deadly infections.

1951 HeLa Cells

The cancer cells taken from Henrietta Lacks before she died became a benchmark in cancer research. This first immortal cell line allowed the creation of Salk's first polio vaccine. Since its discovery, there have been over 11,000 patents created involving the HeLa cells.

1956 DNA Polymerase

Arthur Kornberg and his lab forever changed the world of molecular biology with the discovery of DNA polymerase from *E. coli* cells. In one instant, scientists were now finally capable of synthesizing new DNA sequences onto an existing DNA strand.

1970 Restriction Enzymes

Hamilton Smith and associates discovered the more popular type II restriction enzymes that cleave at their site of recognition. And Daniel Nathans showed that by cleaving in those places, they could separate the fragments via gel electrophoresis in order to map the DNA.

1983 PCR

Few discoveries have revolutionized their fields as much as polymerase chain reactions (PCR). Likewise, PCR owes its own revolution to the previously discovered thermally stable DNA polymerase. PCR may be the single most indispensable technique used in modern biology.

1990 Gene Therapy

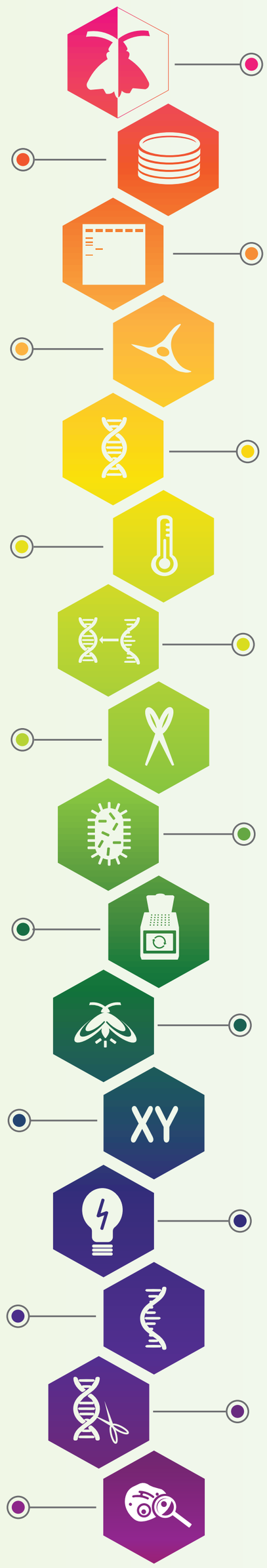
Gene therapy had been seen as science fiction for most of the 20th century, but by 1990, William French Anderson was given permission by the NIH to conduct a clinical trial for a patient with a severe immune system deficiency. Cancer gene therapy trials were approved by 1992.

1998 RNAi

Craig Mellows and Andrew Fire published their work documenting the intentional silencing of genes in *C. elegans* via a new process called RNA interference (RNAi) The use of RNAi has become critical in the development of gene expression and suppression.

2013 Single-Cell Analysis

Named Nature's 2013 Method of the Year, single-cell analysis and sequencing technologies of single-cell RNA and DNA recently exploded, advancing cell heterogeneity research. This breakthrough provides insights into rare cells, cancer mutations, microenvironment interplay, etc.



1800s Inheritance & Evolution

By now, the stories of Charles Darwin's finches and Gregor Mendel's peas have become common lore. But their long reaching conclusions helped to spur the explosion in the area of inheritance and evolution for the last 170 years.

1931 Gel Electrophoresis

It is just as remarkable to realize that electrophoresis, as we know it, was discovered in 1931 by Arne Tiselius and even earlier work was done in the early 1800s that provided the groundwork for the Tiselius Apparatus to differentiate between proteins.

1952 - 1953 The Structure of DNA

Like the discovery of inheritance and evolution, the discovery of the structure DNA is well known; starting with the Rosalind Franklin's first image of the double helix in 1952 and then subsequently James Watson's and Francis Crick's model of the double helix structure in 1953.

1970 Reverse Transcriptase

Reverse transcriptase was independently discovered by both Howard Temin and David Baltimore in 1970. As a revolutionary tool, RT allowed scientists to synthesize cDNA from RNA, bridging the gaps in knowledge of the character and sequence of RNA by use in PCR.

1970 *E. Coli* Transformation

E. coli was being utilized as a model organism in microbiology and other biological fields for most of the 20th century, but was considered intractable to transforming until Morton Mandel and Akiko Higa were able to induce it to take up DNA with the use of calcium chloride.

1986 Bioluminescent Markers

In 1955, Osamu Shimomura was the first to crystallize luciferin from ostracods. But it wasn't until 1985, when firefly luciferase was first cloned, that the doors to bioluminescence research would really open. By 1986, it was being utilized as a gene marker in tobacco and Arabidopsis.

1992 Fluorescent Protein Markers

Douglas Prasher utilized GFP and reported its genetic sequence in 1992, which allowed it to be expressed in *E. coli* in 1994 and later in *C. elegans*. The use of bioluminescent and fluorescent markers have let us visualize the mysteries of the cell and protein-protein interactions.

2012 CRISPR - Cas9

The magnificence of CRISPR as a gene editing tool came about when Jennifer Doudna and Emmanuelle Charpentier reengineered the Cas9 endonuclease and showed that the new system could be programmed to target any DNA sequence for cleavage.

Gold Biotechnology® | Article by Chris Menne
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www.goldbio.com | (800) 248-7609 Designed & Printed November, 2020