What is PCR

By Nanjing_NFLS

Contribution of archaea

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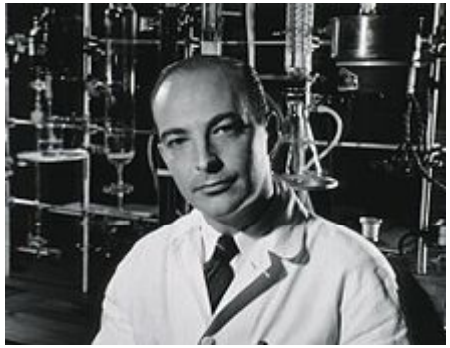
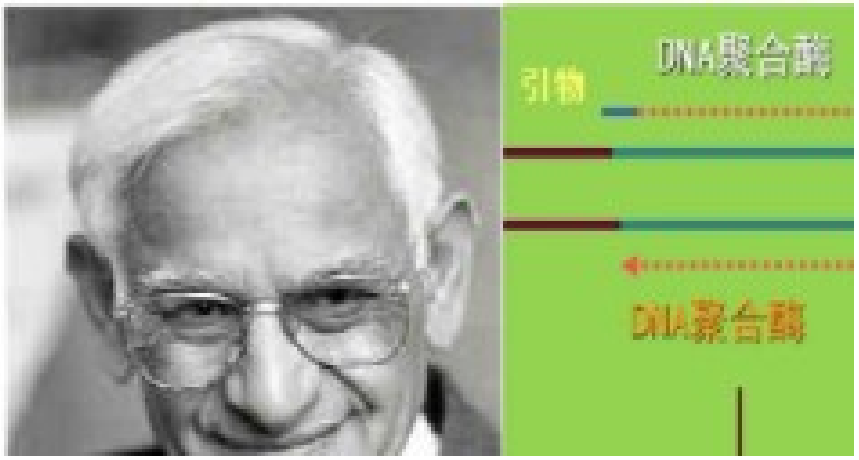
1953 1971 1976 1983 19



Arthur Kornberg



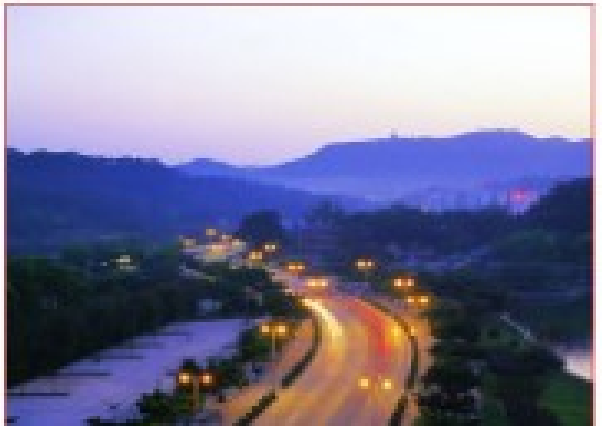
Khorana, MIT Professor

- In 1957, American scientist Arthur Kornberg discovered the first DNA polymerase
- Khorana proposed that DNA can be denatu in vitro, hybridized with suitable primers, extended by polymerase, and the process repeated to clone tRNA genes.
- The idea was long forgotten because sequencing and oligonucleotide synthesis technologies were backward at that time.

1953 1971 1976 **1983** 19

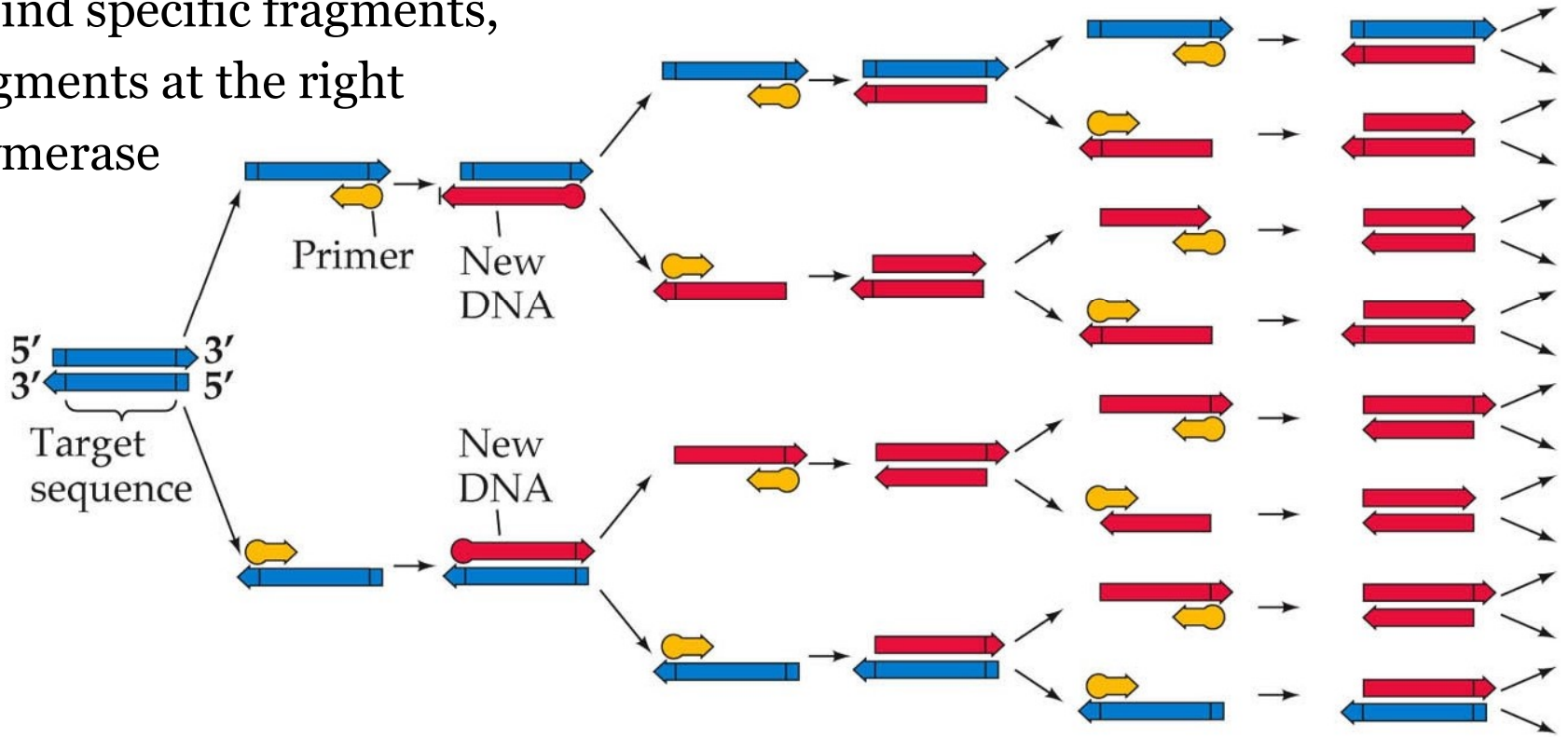
- In 1983, Kary Mullis, a researcher at PE-Cetus, came up with the idea for a "simple and elegant in vitro DNA polymerization reaction" on Route 128 in rural America.

- He named it: the Polymerase Chain Reaction (PCR). In December of that year Mullis used isotope labeling to obtain a 49 bp DNA fragment after 10 cycles.



Principles of PCR

High temperature untwists DNA, cools down to allow primers to bind specific fragments, and extends new fragments at the right temperature for polymerase



After the cycle of the above reactions, the number of DNA increases n-quadratic to 2.

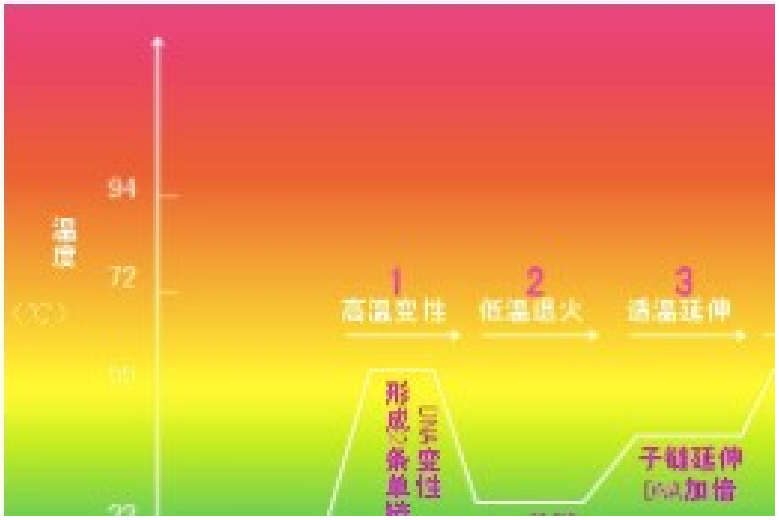
Initial PCR

1953 1971 1976 1985 1986 1988 1989

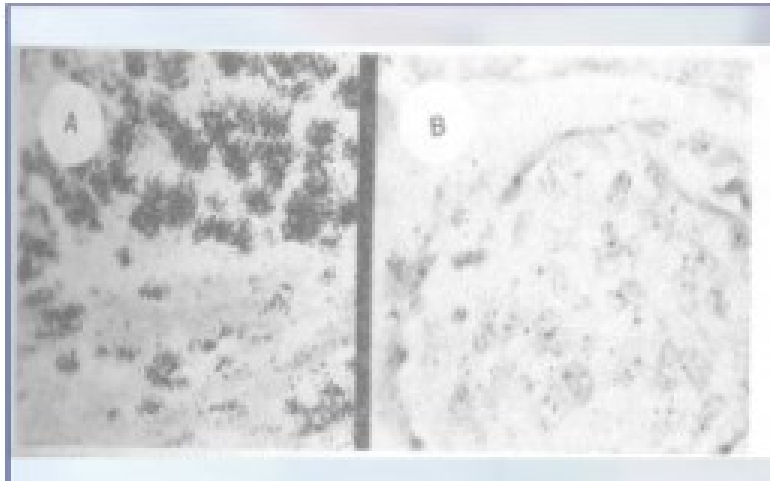
- The technology was officially born in 1985. Initially, Mullis used E. coli DNA polymerase. Because the enzyme is not heat resistant, the enzyme needed to be re-enriched for each cycle.
- The initial PCR was performed in three water baths that underwent 94 degrees of denaturation, 55 degrees of annealing and 37 degrees of DNA polymerization. It was performed manually and timed with a stopwatch.

10 years of explosions（1983-1993）

- Patent for PCR filed October 25, 1985, granted July 28, 1987 (Patent No. 4,683,202), with Mullis as first inventor
- In 1986, PE-Cetus discovered and purified Taq, a heat-resistant DNA polymerase suitable for PCR.
- 1987, PE-Cetus introduces PCR automated thermocycler
- In 1989, Science magazine listed PCR as one of the top ten major scientific inventions, likening 1989 to the year of the PCR explosion.



1986，mullis在冷泉港实验室报告pcr技术



T

1983 1985 1986 1988 1989 19 1

- In 1976, Chinese-American scientist Chia-Yun Chi isolated Taq DNA polymerase from the heat-resistant archaea Thermus aquaticus.

- Introduced automated PCR in 1987.
- In 1989, a more efficient and stable rTaq polymerase was introduced, with a working temperature of 72° C. In 1987, automated PCR was introduced.
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1989 1990 1991 1992 **1993** 1996

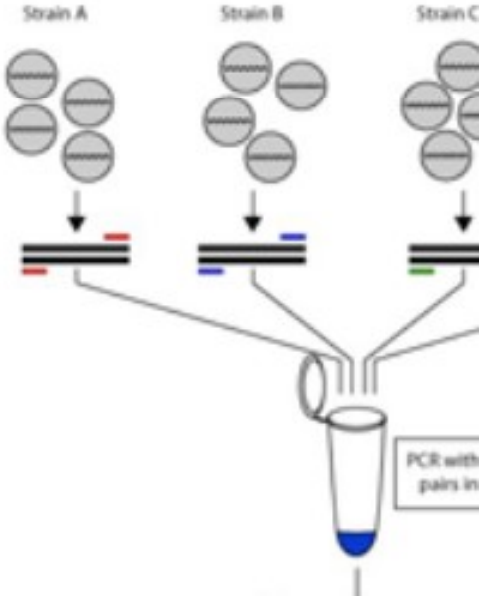
Nobel prize

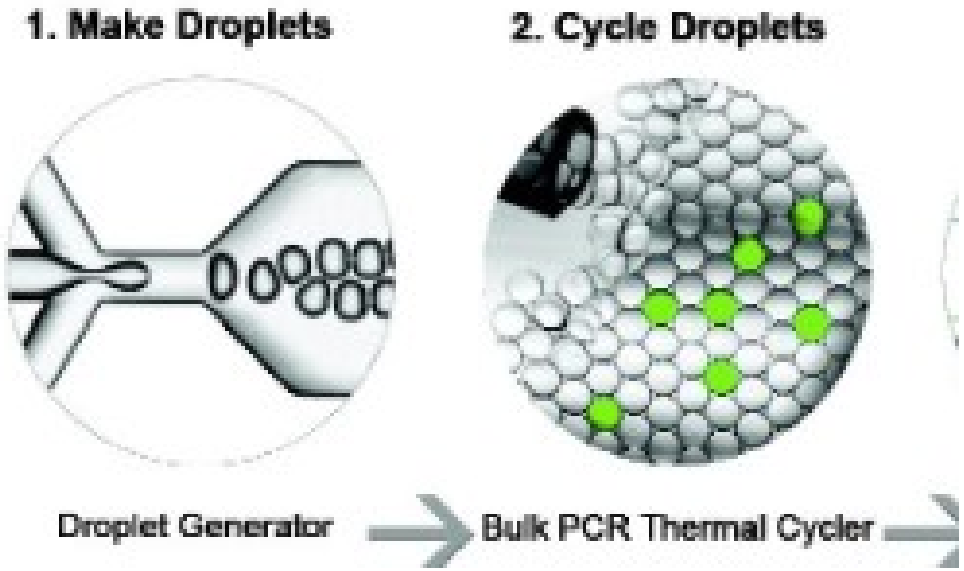
- Mullis wins Nobel Prize in Chemistry for invention of PCR reaction
- The golden age of PCR has since begun.

The Revolution

Current PCR

- PCR instruments have become miniaturized and high-throughput
- Various new PCR methods are developed





Overview of PCR Cloning