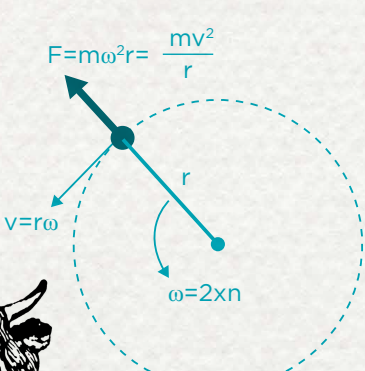


# EVOLUTION OF THE LABORATORY CENTRIFUGE

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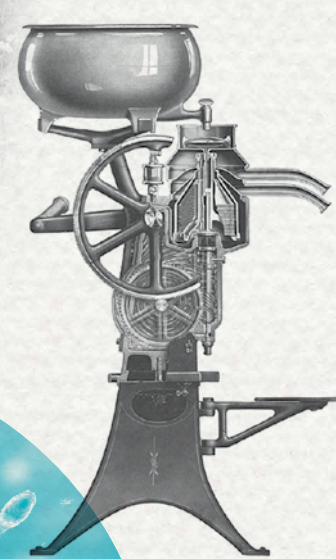


## 1864

Antonin Prandtl developed and commercialized the first dairy centrifuge for separating cream from milk.

## 1879

Gustaf de Laval, a Swedish engineer and inventor, demonstrates the first continuous centrifugal separator, leading to the widespread commercialization of the technology for the first time.



# 1860



Christiaan Huygens

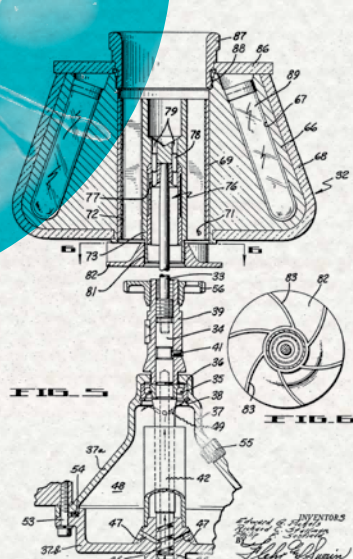
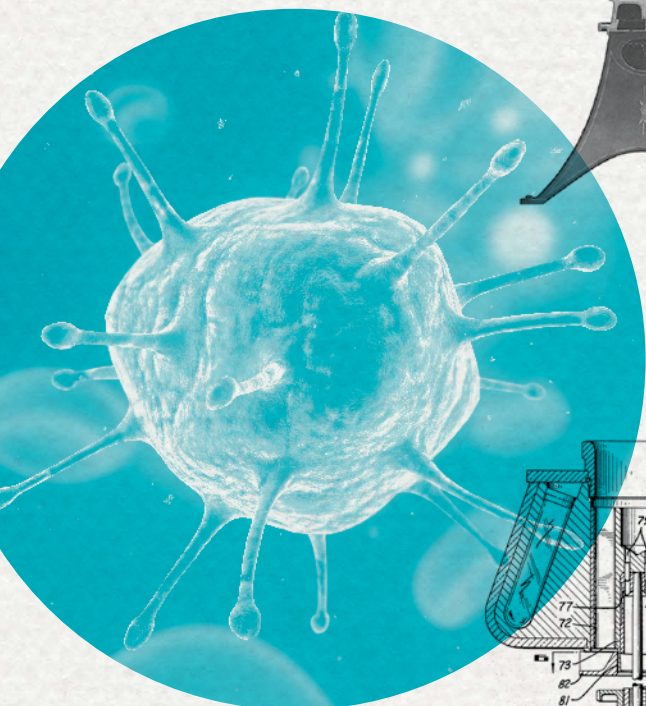


Friedrich Miescher



Gustaf de Laval

# 1900



Theodor Svedberg

## 1930

Émile Henriot developed a centrifuge able to achieve high rotational speeds by means of a bearingless top, driven and supported by compressed air. This transitioned the ultracentrifuge out of the realm of a purely analytical instrument and into sample preparation.



## 1949

Spinco introduces the Model L, the first preparative ultracentrifuge to reach a speed of 40,000 rpm, and marking a change in the fortunes of Spinco.

## 1930s

Edward Pickels and Johannes Bauer together build the first high-speed vacuum centrifuge suitable for the study of filterable viruses. Later, Pickels went on to develop the more convenient, electrically driven ultracentrifuge.

## 1946

Edward Pickels cofounded Spinco (Specialized Instruments Corp.) in Belmont, California, and marketed an ultracentrifuge based on his design. However, sales of the technology remained low and Spinco nearly went bankrupt in the early years.

## 1954

Beckman Instruments purchases Spinco and begins to improve the design of centrifuges, many of which are still in use today.

## 1955

Sorvall introduces floor standing unit with refrigeration.

## 1962

Netheler & Hinz Medizintechnik, a company based in Hamburg, Germany, and known today as Eppendorf, developed the first microcentrifuge for laboratory use.



Arnold Orville Beckman

# 2000

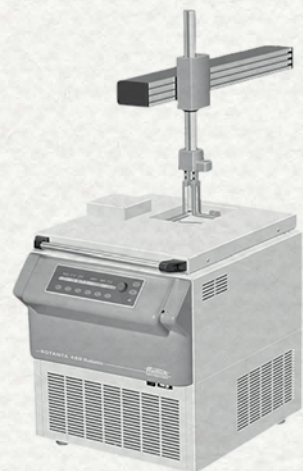
## 1976

The world's first microprocessor controlled centrifuge was launched atACHEMA by Hettich. This innovation was considered ahead of its time, and arrived many years before this technology became standard.



The first robotic centrifuge is introduced by Hettich – this centrifuge offered PC control and adjustable rotor positioning.

## 1900s



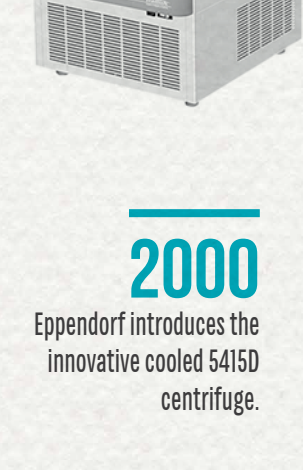
## 2000

Eppendorf introduces the innovative cooled 5415D centrifuge.



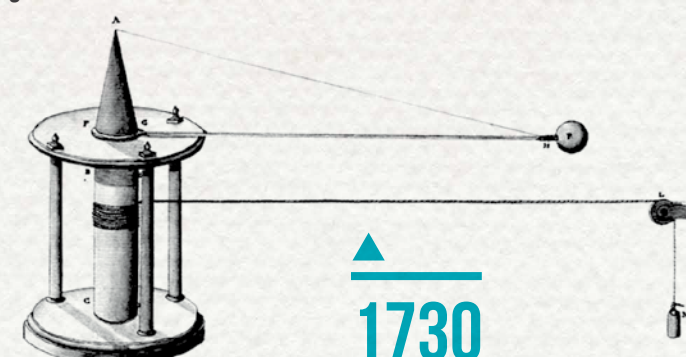
## 2010s

Advances in ergonomics and safety continue including easy and secure rotor attachment, instant rotor identification, and self-opening doors.



## 1659

Christiaan Huygens coins the term "centrifugal force" in his 1659 *De Vi Centrifuga*. Huygens also discovered Saturn's moon Titan, invented the pendulum clock, and pioneered work on games of chance.

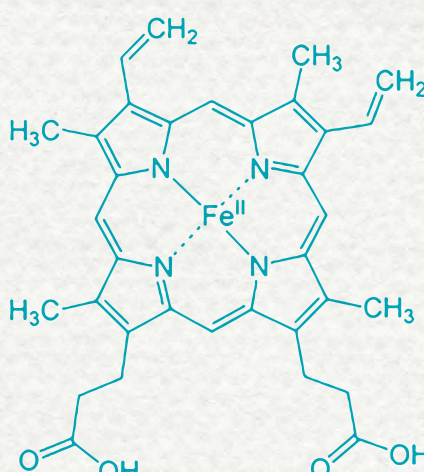
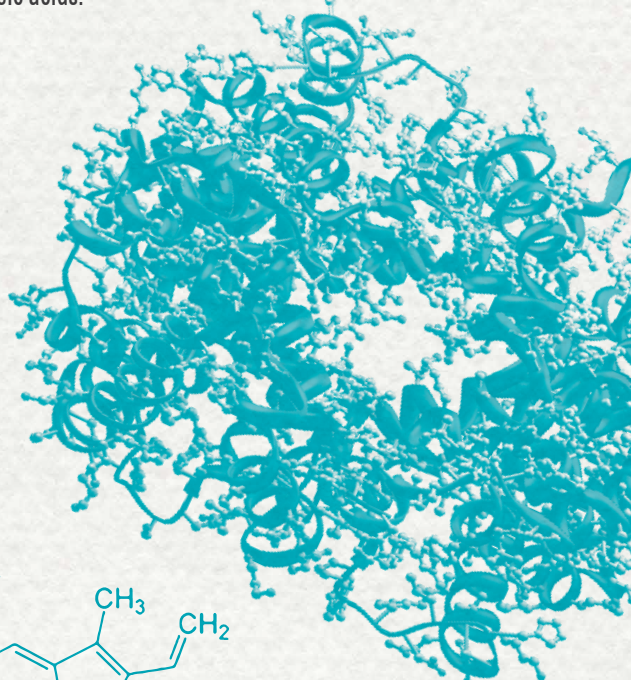
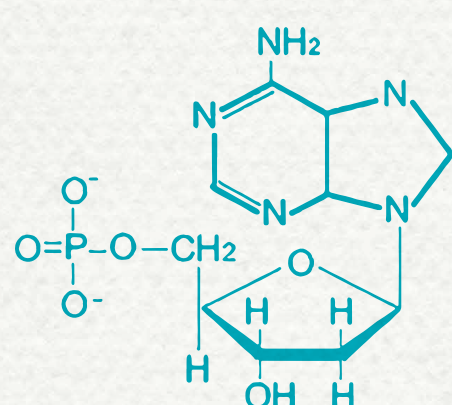


## 1730

Military engineer Benjamin Robins develops a whirling apparatus to determine drag.

## 1869

Friedrich Miescher was the first to adopt a crude centrifuge for laboratory application, using it to isolate a cell organelle. This process led to the discovery of an important class of biological constituents, later to be known as nucleic acids.



Theodor Svedberg, a Swedish colloid chemist, develops the first ultracentrifuge. Capable of achieving 900,000 x g, Svedberg used his centrifuge to determine the molecular weight and subunit structure of highly complex proteins such as hemoglobin.



## 1920 1930

Albert Claude and James Potter published a landmark paper, "Isolation of Chromatin Threads from the Resting Nucleus of Leukemic Cells". This paper outlined a series of centrifugation steps in which either the supernatant or the sediment was collected until chromatin threads were retrieved from the final sediment.

## 1926

Svedberg receives a Nobel Prize for the invention of the ultracentrifuge and his work in colloid chemistry.

## 1930s

Martin Behrens developed centrifugation techniques using density gradients of nonaqueous solvents for the separation of nuclei. His approach to tissue fractionation aimed to isolate one or more identifiable components from disrupted cells that could be physically and chemically characterized.

## 1942

## 1950

Myron K. Brakke, while working at the Brooklyn Botanic Garden developed density gradient centrifugation, a tool that allowed for the purification of virus particles and ushered in a new era of virology and molecular biology research.

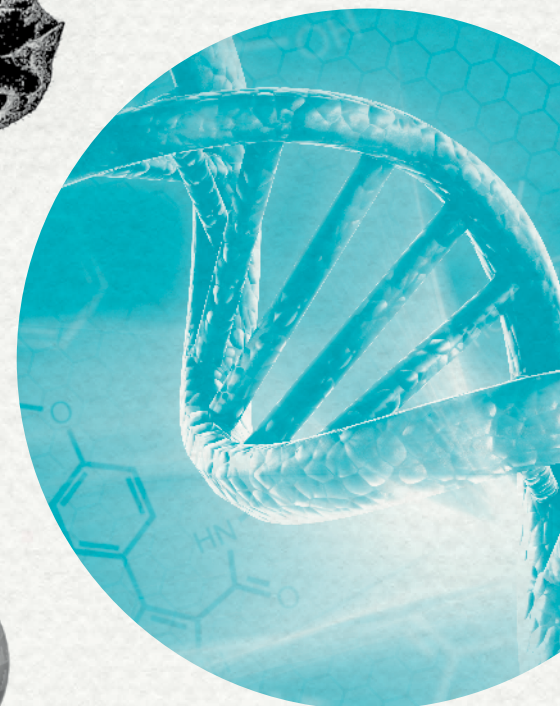
## 1940s

Ivan Sorvall started Sorvall in the 1940's, and invented the Superspeed tabletop unit, an open tripod tabletop unit.



## 1958

Matthew Meselson and J.F. Stahl centrifuged DNA, giving evidence for Watson & Crick's proposed mechanism of DNA replication.



## 1900s

Advances in materials science see the widespread adoption of carbon fiber rotors which allow for acceleration using unmatched g-forces without compromising sample capacity or risk of metal fatigue.



## 2000s

This period see the expansion of personal centrifuges such as the MiniSpin and MyFuge. Economical and convenient, they drive a new market trend toward centrifuges ideal for quick spin downs of microtubes and PCR tubes.



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