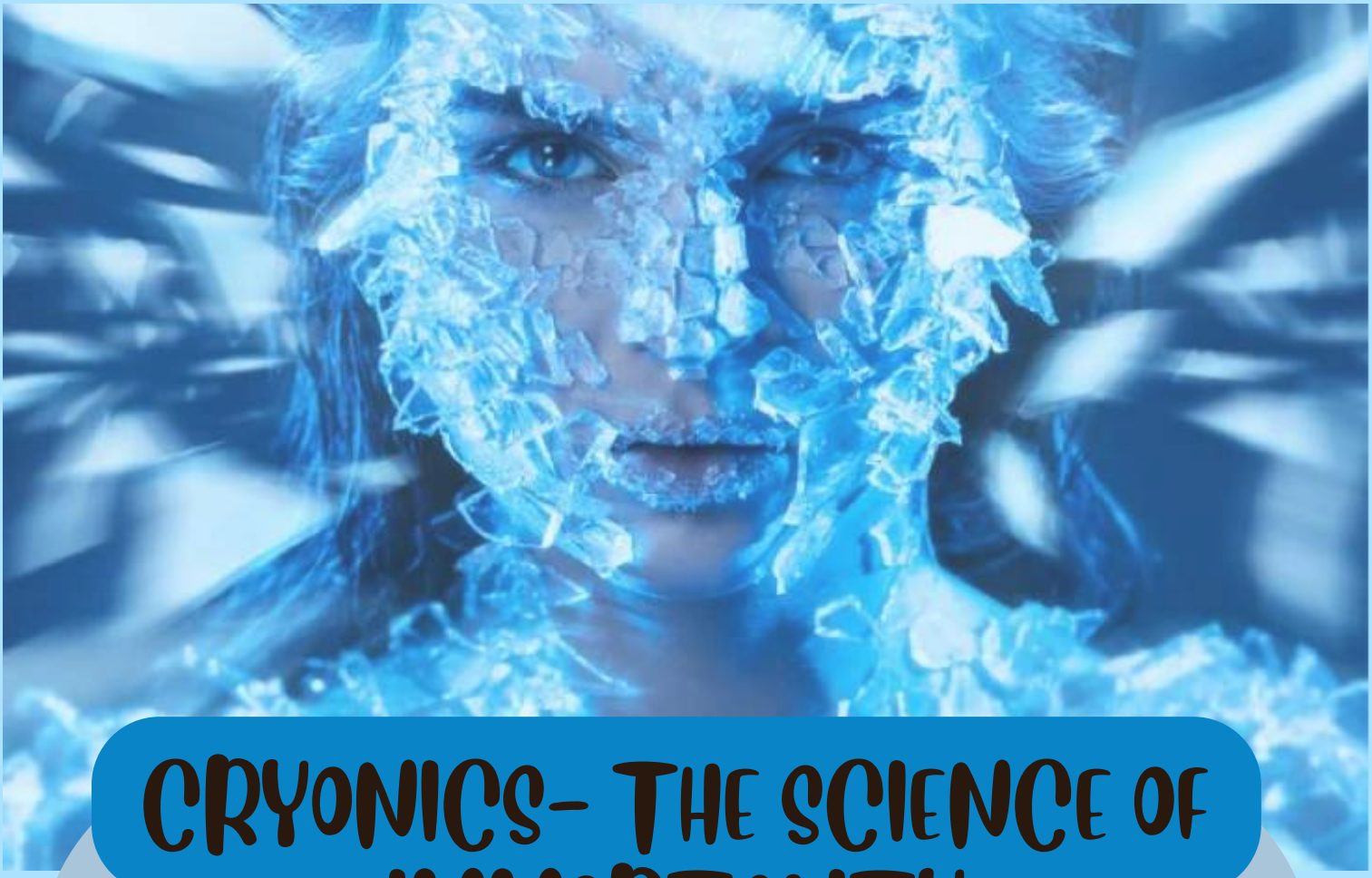
ANAT. VOL2; ISSUE 8 SEP 2023

# FACTA ANATOMICA



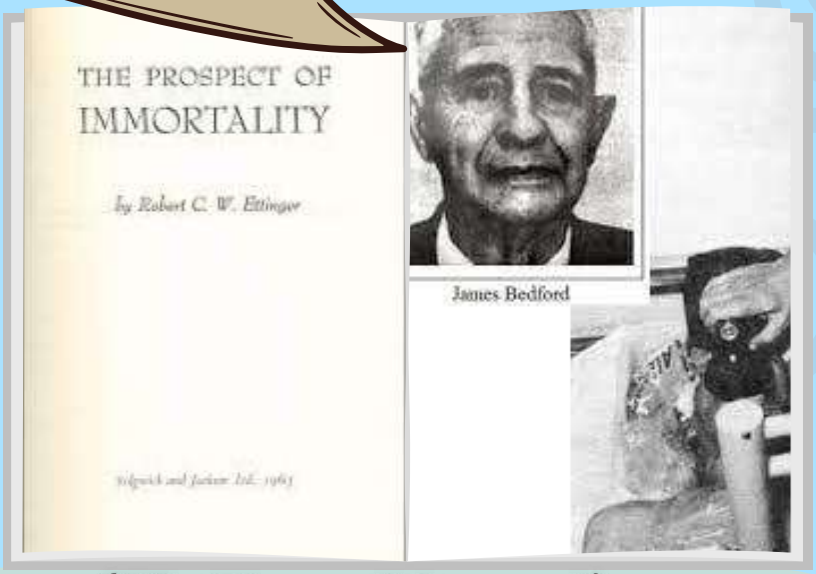
## CRYONICS- THE SCIENCE OF IMMORTALITY

Cryonics is the practice of preserving human or animal bodies at very low temperatures (usually at -196 °C or -320.8 °F ), with the hope of restoring them to life in the future.

Cryonics is based on the assumption that future technologies will be able to repair the damage caused by freezing, aging, and diseases, and revive the preserved individuals.

Essentially, the concept of cryonics is to 'buy time' until technology catches up and is able to fully repair and restore the human body.

# HISTORY




-Robert Ettinger ("The Father of Cryonics") introduced the concept of cryonics in 1962 with the publication of his book, "The Prospect of Immortality."

-Cryopreservation was applied to human cells beginning in 1954 with frozen sperm, which was thawed and used to inseminate three women.

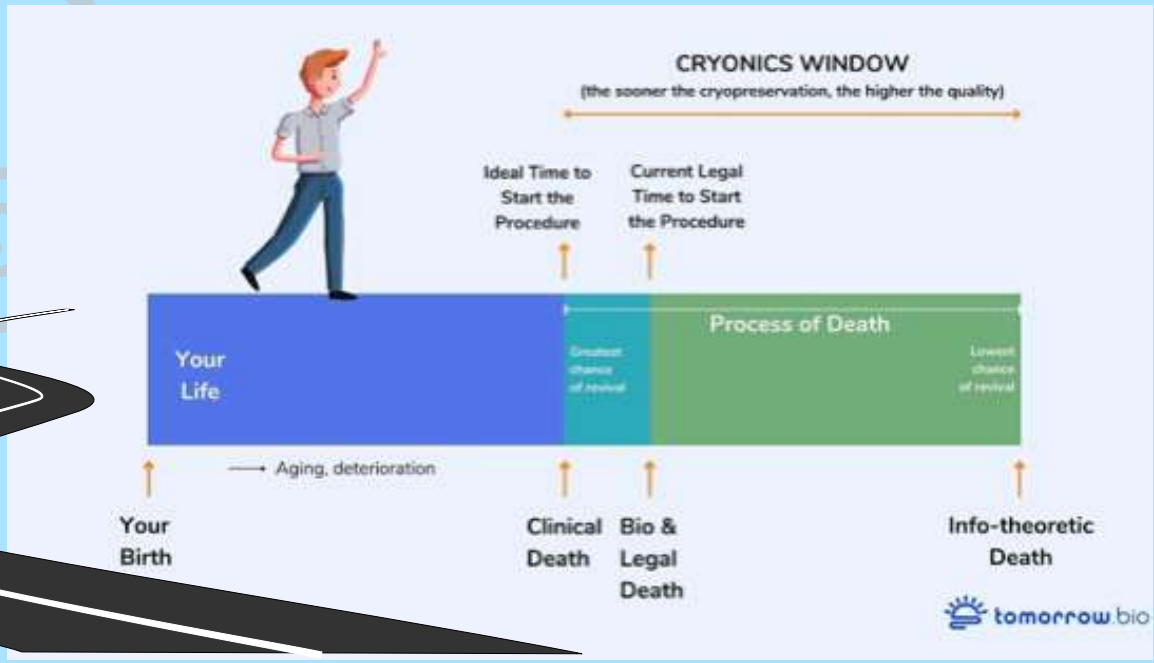
-The first body to be cryopreserved and then frozen with the hope of future revival was that of James Bedford, on January 12, 1967.

-As of 2014, about 250 corpses have been cryogenically preserved in the U.S., and around 1,500 people have signed up to have their remains preserved.

-As of 2016, four facilities exist in the world to retain cryopreserved bodies: three in the U.S. and one in Russia.

-As of now, about 500 people have been cryopreserved all over the world, and 2,000 people have made arrangements for their future cryopreservation.

# Legal vs Total death




- Legal death is often defined by the irreversible cessation of vital functions, which typically include:
  - Cardiovascular Function: The heart stops beating and cannot be restarted.
  - Respiratory Function: Breathing ceases and cannot be restarted.
  - Brain Function: Irreversible cessation of brain activity, as indicated by flat electroencephalogram (EEG) readings.
- Biological Death (Total Death): Biological death, also known as total death, refers to the irreversible cessation of all physiological functions that sustain an organism's life. This includes not only the cessation of heartbeat and breathing but also the complete loss of brain activity and cellular function.
- Unlike legal death, biological death is concerned with the actual state of the body and its biological functions, rather than the legal and administrative processes associated with declaring someone dead.

# PROCEDURE

1

When a person legally dies, cryonics organizations are notified, and the body is prepared for preservation. The body is cooled to a temperature where metabolic processes virtually stop.

**Stabilization:**

2

***Cryoprotectants*** are introduced to the body to replace water in the cells, preventing ice formation. This process, known as ***vitrification***, is meant to prevent cellular damage during freezing

**Perfusion and Vitrification**

3

The body is gradually cooled to very low temperatures, typically using liquid nitrogen, to the point where all metabolic activity halts.

**Cooling**

4

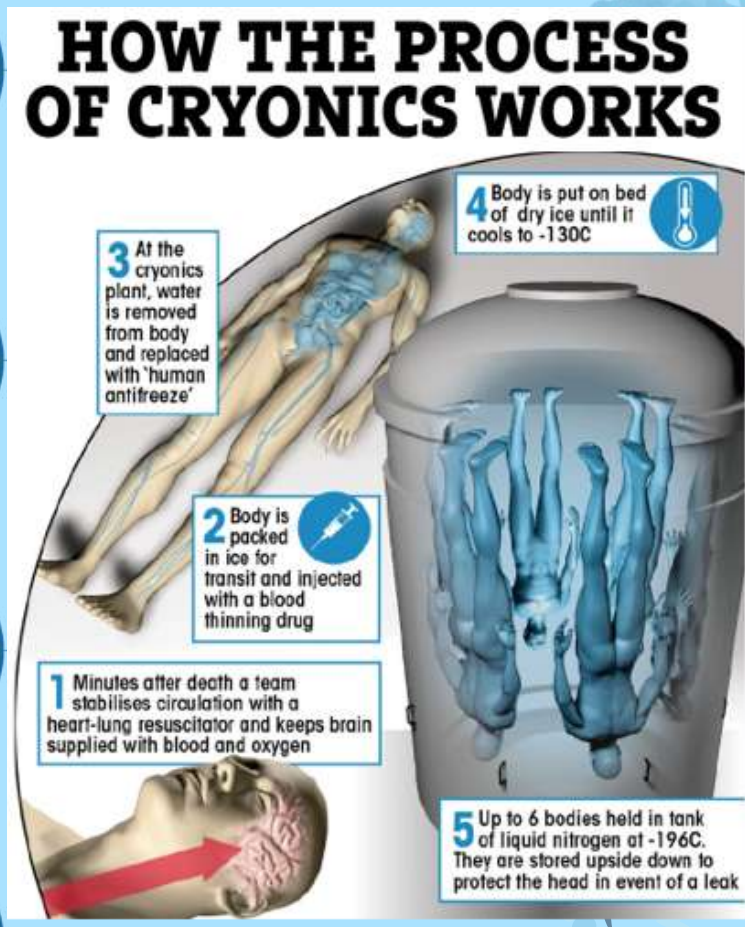
The cooled body is stored in a specialized container, usually a cryostat, which keeps it at the ultra-low temperature necessary for preservation

**Storage**

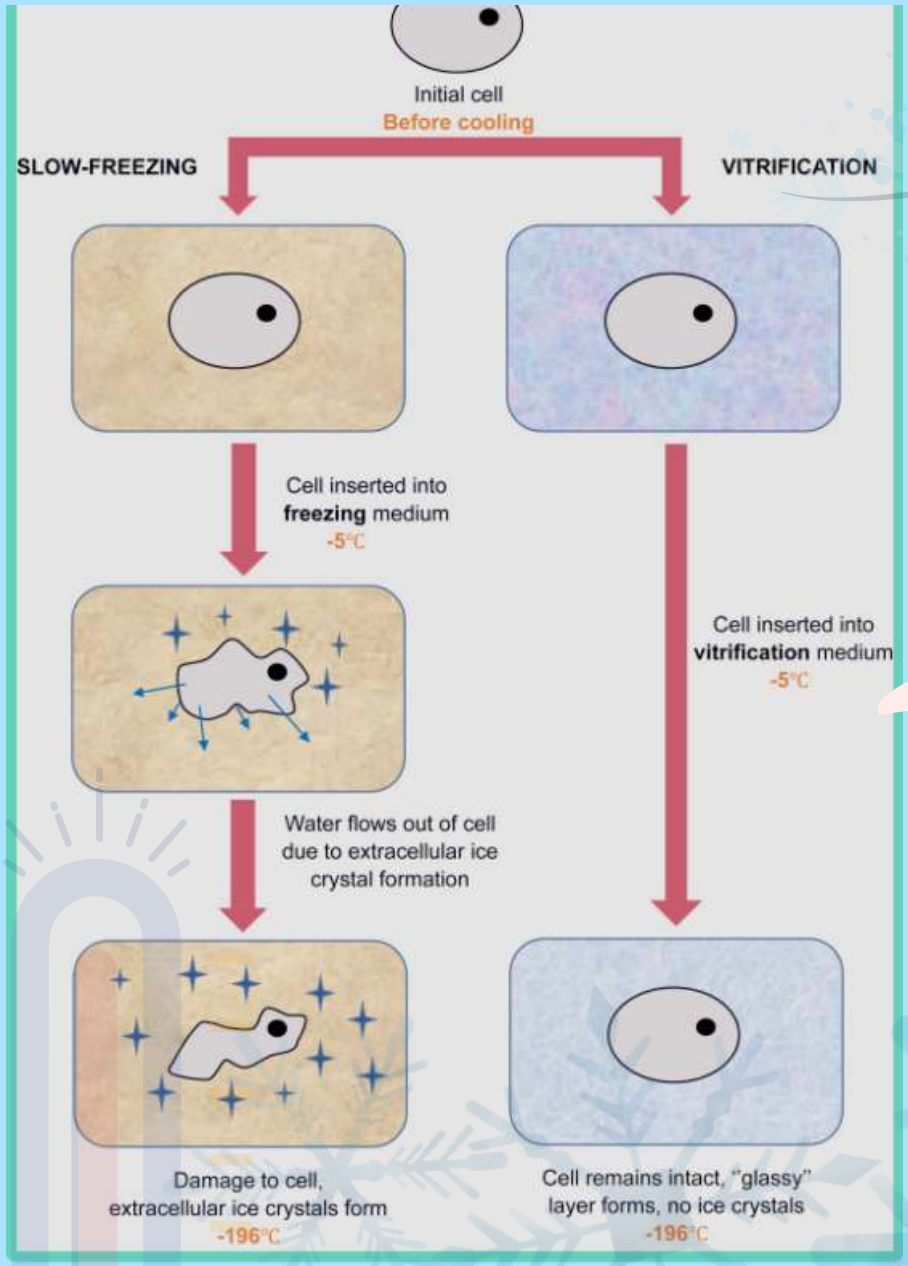
5

The hope is that in the future, medical technology will advance to a point where it's possible to repair the damage caused by the preservation process and the underlying causes of death. This could involve repairing cells, tissues, and even reversing the cryoprotectant process.

**Future Revival**



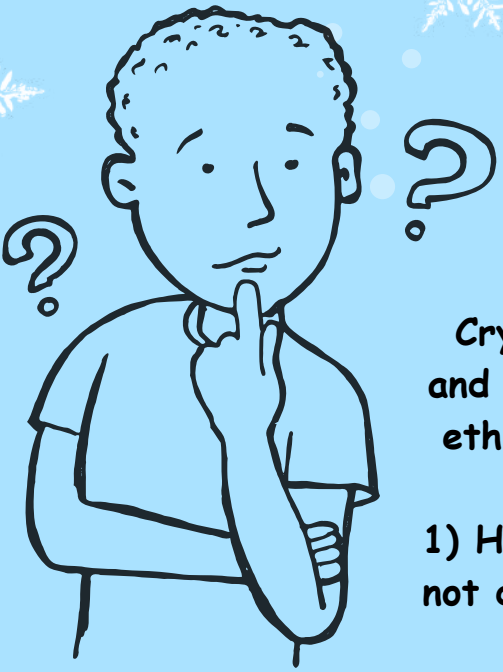
# Freezing vs Vitrification




THE CRYOPROTECTANT TYPICALLY CONSISTS OF NUTRITIONAL SALTS, BUFFERS, OSMOGENS, AND APOPTOSIS INHIBITORS, INGREDIENTS NECESSARY TO PREVENT SWELLING AND SHRINKING OF CELLS BY MAINTAINING ISOTONIC CONCENTRATION OF CELL. ANOTHER KEY FORMULATION OF CRYOPROTECTANT MIXTURE IS NON-PENETRATING CRYOPROTECTANTS WHICH ARE TYPICALLY LARGE MOLECULAR POLYMERS. THESE PLAY A LARGE PART IN THE INHIBITION OF ICE GROWTH AND PREVENTION OF INJURY DUE TO BEING SUBJECTED TO THE EXTREME COLD.

# Laws in India

There are no specific laws in India that directly address the practice of cryonics. Cryonics is a relatively new and niche field, and its legal status can vary from country to country.



# Criticism

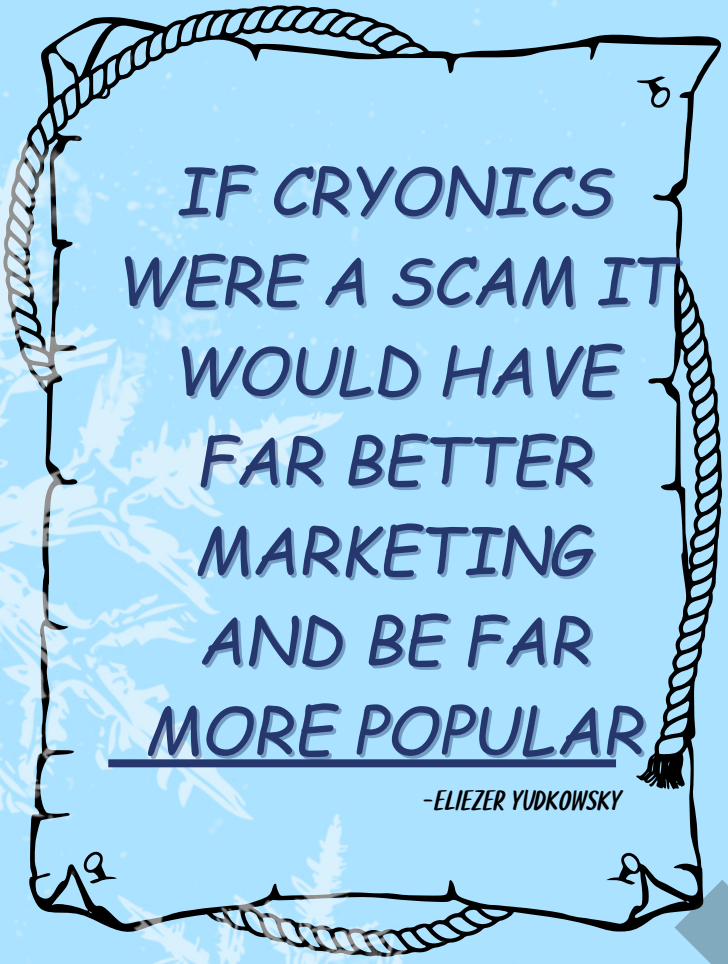
Cryonics is not a proven science, but a speculative and experimental field that faces many technical and ethical challenges. Some of the main questions that cryonics raises are:

1) How can we ensure that the frozen tissues do not deteriorate over time?

2) How can we reverse the freezing process without causing further harm?

3)How can we restore the personality, memories, and identity of the revived individuals?

4)what are the social and legal implications of bringing back people from the past?

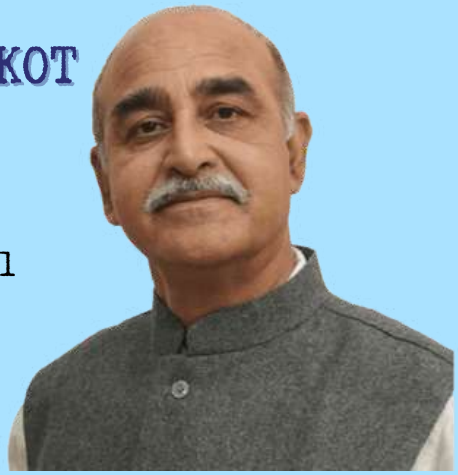



## REFERENCES :


- https://nationalpost.com/feature/cryopreservation-cryonics#:~:text=This%20summer%2C%20a%20University%20of,bodies%20at%20Alcor%20and%20CI.
- https://cryonics.org/
- Dying is the last thing anyone wants to do – so keep cool and carry on". The Guardian. 10 October 2015. Archived from the original on 3 July 2017. Retrieved 21 February 2016.
- https://aggietranscript.ucdavis.edu/human-cryopreservation-an-opportunity-for-rejuvenation/

# MESSAGE FROM EXECUTIVE DIRECTOR

## PROF.DR. (COL.) CDS KATOCH, AIIMS RAJKOT



I heartily congratulate the Department of Anatomy for bringing this informative newsletter on the anatomical explanation of the CRYONICS. My best wishes to the entire team.

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