

## Mpemba effect

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The Mpemba effect has intrigued scientists for decades.



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### **About Mpemba effect:**

- The Mpemba effect, named after Tanzanian student **Erasto Mpemba in 1969**, defies intuition as it reveals that **hot water can freeze faster than cold water under similar conditions**.
- **Aristotle, Francis Bacon, and René Descartes** had noticed similar effects centuries ago, but it gained scientific attention after Mpemba highlighted it in 1969.
- Despite early observations, researchers have recently conducted **numerous experiments** to delve into the causes of this intriguing phenomenon.

### **Proposed Explanations:**

#### **Microbubbles and Convection:**

- **Microbubbles left suspended in boiled water** may **promote convection**, transferring heat faster as the water cools.
  - **Convection is enhanced** in warmer water due to its **lower density**.

#### **Evaporation and Heat Transfer:**

- **Warmer water evaporates more**, and evaporation is inherently **endothermic** (absorbing heat), contributing to **faster heat loss**.
  - It is similar to how **sweat cools the skin**.
- **Accelerated heat transfer** in warmer water aids the freezing process.

#### **Frost as an Insulator:**

- **Presence of frost in cold water** may act as an **insulator**, slowing the loss of heat and influencing freezing time.

### Chemical Factors:

- The presence of compounds like calcium carbonate, **precipitated by boiling** and then **dissolving**.
  - Dissolved compounds can **act as impurities**, affecting the freezing point

### Complex Interplay of Mechanisms:

- The Mpemba effect continues to captivate scientists due to its intricate interplay of physical mechanisms.
- **Researchers are yet to reach a consensus on a single explanation**, indicating the complexity of factors involved.