Robert Hooke and the Discovery of Cells

Class 9 Biology · Chapter: The Fundamental Unit of Life
🎬 **Video explanation (PrayogX reel):** https://www.instagram.com/reel/DfCxXiyAIyQ/

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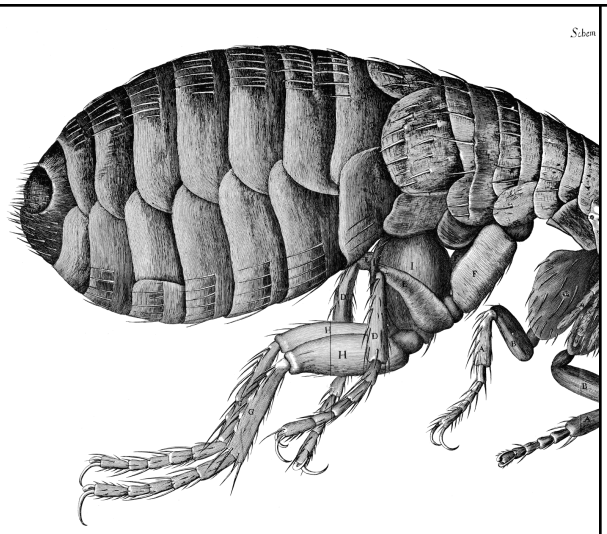
1. The man behind the word "cell"

Robert Hooke (1635–1703) was an English scientist who, in **1665**, looked at a thin slice of cork under his microscope and named the tiny boxes he saw **"cells"**. Strangely, **no authentic portrait of Hooke survives**; the faces you see online are modern reconstructions. What survives is his work: the book **Micrographia**.

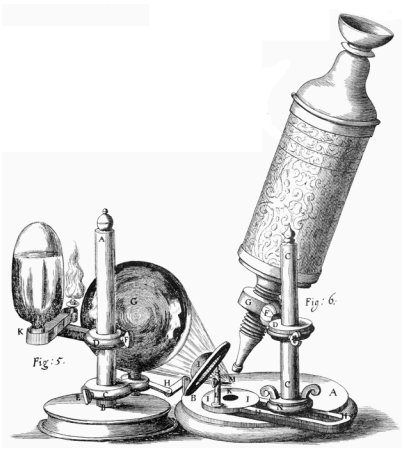
2. Key definitions

Term	Meaning
Cell	The basic structural and functional unit of life. From the Latin *cella*, "a small room".
Micrographia	Hooke's book (1665) of large, detailed drawings of things seen through a microscope (a flea, a louse, cork, a fly's eye).
Compound microscope	A microscope with two or more lenses (objective and eyepiece) that together magnify an object.
Cork	The bark of the cork oak tree; made of **dead** cells with only their walls left.
Magnification	How many times larger the image is than the object: image size ÷ actual size.

3. Micrographia (1665)



Hooke's flea, drawn as big as a fold-out page

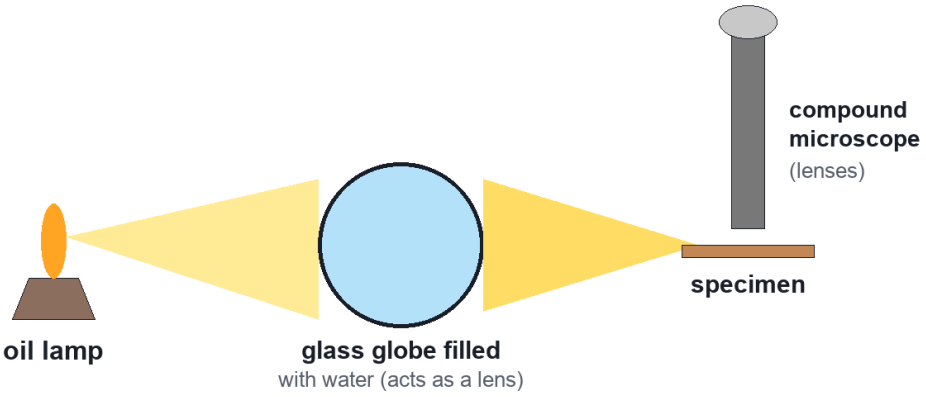


Hooke's microscope

- Published in January **1665** by the Royal Society of London; the first major book on microscopy.
- Its huge, beautiful engravings (the flea, the louse) amazed readers and made the "invisible world" visible.
- It contains **Observation XVIII**: the cork slice and the first use of the word "cell" for these structures.

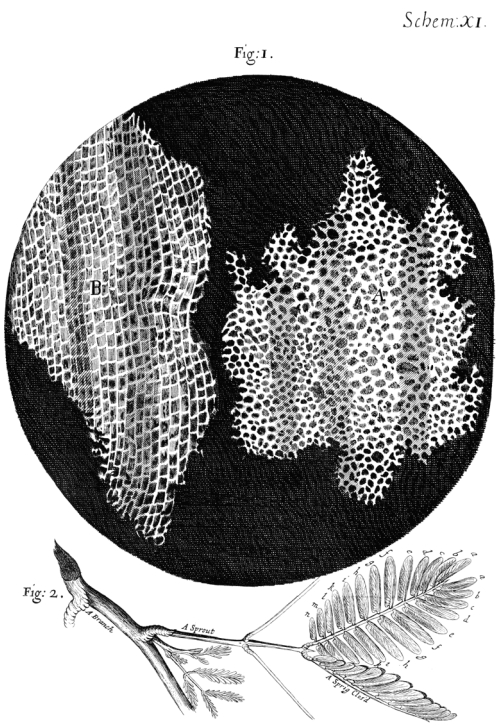
4. How Hooke's microscope worked (step by step)

Hooke's lighting: oil lamp -> water-filled glass globe -> specimen



1. Hooke **designed** his own compound microscope (it was built by the London instrument-maker Christopher Cock).
2. Light was a problem in 1665: no electric bulbs. He used an **oil lamp**.
3. He placed a **glass globe filled with water** between the lamp and the specimen; it worked like a lens and **focused** the light onto the specimen.
4. A further lens concentrated the light further, so the specimen was bright enough to see through the lenses of the microscope.

5. The cork observation: discovery of cells



Hooke's own drawing of cork.
He cut a very thin slice of cork with a sharp penknife and saw that it was full of tiny pores or boxes arranged like a **honeycomb**. They reminded him of small rooms, so he called them **cells**.

Important: cork cells are **dead**. Hooke saw only the empty cell walls, not the living contents (no nucleus, no cytoplasm).

6. Hooke's count: how many cells in a cubic inch of cork?

Hooke's estimate: cells in one cubic inch of cork

Along a line	In a square inch	In a cubic inch
~60 cells in 1/18 inch	1,080 x 1,080	1,080 x 1,080 x 1,080
60 x 18 = 1,080 per inch	**= 1,166,400**	**= 1,259,712,000**

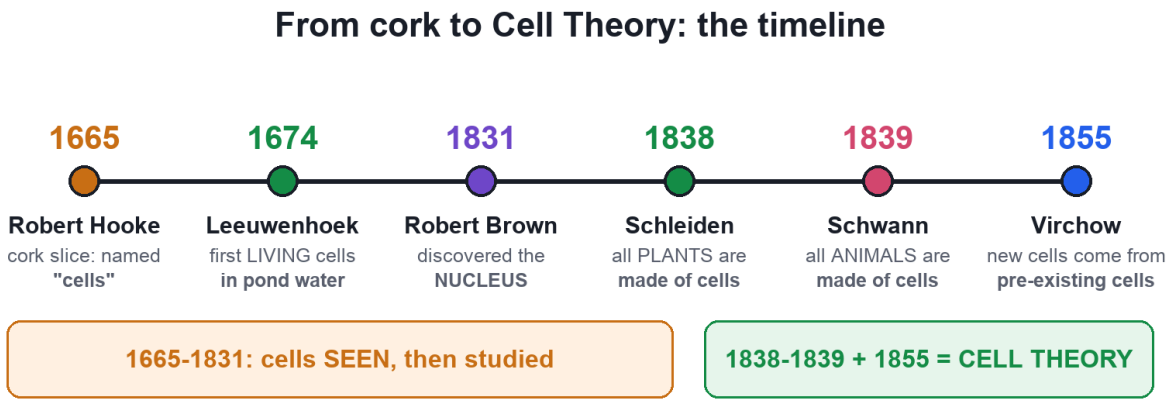
about 126 crore (1.26 billion) cells in one cubic inch!

Hooke counted about **60 cells** placed end to end in **1/18 of an inch**. So:

- Cells in 1 inch (a line) = 60 × 18 = **1,080**
- Cells in 1 square inch = 1,080 × 1,080 = **1,166,400** (over a million)

- Cells in 1 cubic inch = 1,080 × 1,080 × 1,080 = **1,259,712,000** (about 126 crore, "above twelve hundred millions" in Hooke's words)

7. Where Hooke fits in the story of the cell



Year	Scientist	Contribution
1665	Robert Hooke	Saw cells in cork (dead); named them "cells"; published Micrographia
1674	Leeuwenhoek	First living (free) cells, in pond water
1831	Robert Brown	Discovered the nucleus
1838–39	Schleiden, Schwann	Cell theory: all plants and animals are made of cells
1855	Virchow	All cells arise from pre-existing cells

8. Fun fact: the same Hooke in Physics

This is the same Robert Hooke who gave **Hooke's law** (1678): within the elastic limit, the extension of a spring is proportional to the force applied ($F \propto x$). One scientist, important in both **physics** and **biology**.

9. Solved examples

Solved example 1. If Hooke had counted 50 cells in 1/20 inch, how many cells would there be in one cubic inch?
Solution: Per inch = 50 × 20 = 1,000. Per cubic inch = $1{,}000^3$ = **1,000,000,000** (one billion, 100 crore).
Solved example 2. A cork cell is about 0.03 mm across. In a drawing it is shown 3 mm across. What is the magnification?

Solution: Magnification = image size ÷ actual size = 3 ÷ 0.03 = **100×**.

10. Key takeaways

- 1665: Robert Hooke, **Micrographia**, cork slice, honeycomb-like boxes, named "**cells**" (Latin *cella*, small room).
- He designed his compound microscope and lit specimens with an oil lamp and a water-filled glass globe.
- Cork cells were **dead**: only cell walls were seen.
- His estimate: **1,259,712,000** cells in one cubic inch of cork.
- No authentic portrait of Hooke survives; same Hooke as **Hooke's law**.

Practice questions (CBSE style)

Q1 (MCQ). Robert Hooke observed cells in:
(a) onion peel (b) cork (c) pond water (d) human cheek
Q2 (MCQ). The name of Hooke's 1665 book is:
(a) Principia (b) Origin of Species (c) Micrographia (d) Opticks
Q3 (Short answer, 2 marks). Why did Hooke call the structures he saw "cells"?
Q4 (Short answer, 2 marks). Were the cells seen by Hooke living or dead? Explain.
Q5 (Numerical, 3 marks). Using Hooke's count (60 cells in 1/18 inch), find the number of cells in (a) 1 inch, (b) 1 square inch, (c) 1 cubic inch.
Q6 (Application, 2 marks). Hooke used an oil lamp and a glass globe filled with water. What was the purpose of the globe?
Q7 (Diagram based, 3 marks). Draw what Hooke saw in a thin slice of cork. Label the cell wall and the empty space.
Q8 (Case based, 4 marks). In 1665 a scientist published drawings of a flea as big as a page and of cork showing tiny boxes. He named these boxes cells. Later, Leeuwenhoek saw living cells in pond water.
(a) Name the scientist and the book. (1)
(b) What does the word "cell" mean? (1)
(c) How were Leeuwenhoek's cells different from those in cork? (1)
(d) Name one law in physics named after the same scientist. (1)

Answer key with worked solutions

A1. (b) cork.
A2. (c) Micrographia.
A3. The cork was full of tiny box-like compartments arranged like a honeycomb; they looked like small rooms, and "cell" comes from the Latin *cella*, meaning a small room.
A4. Dead. Cork is the dead bark tissue of the cork oak; its cells have lost their living contents, so Hooke saw only empty cell walls.
A5. (a) 60 × 18 = **1,080**. (b) 1,080 × 1,080 = **1,166,400**. (c) 1,080 × 1,080 × 1,080 =

1,259,712,000.
A6. The water-filled globe acted as a lens: it collected the lamp's light and focused it onto the specimen, making it bright enough to see clearly through the microscope.
A7. Draw many small, closely packed box/hexagon shapes like a honeycomb; label the boundary lines "cell wall" and the inside "empty space (dead cell)" (as in Section 5).
A8. (a) Robert Hooke; Micrographia. (b) A small room (Latin *cella*). (c) Leeuwenhoek's cells were living and free (moving) in pond water; Hooke's cork cells were dead, only walls. (d) Hooke's law (spring extension $\propto$ force).