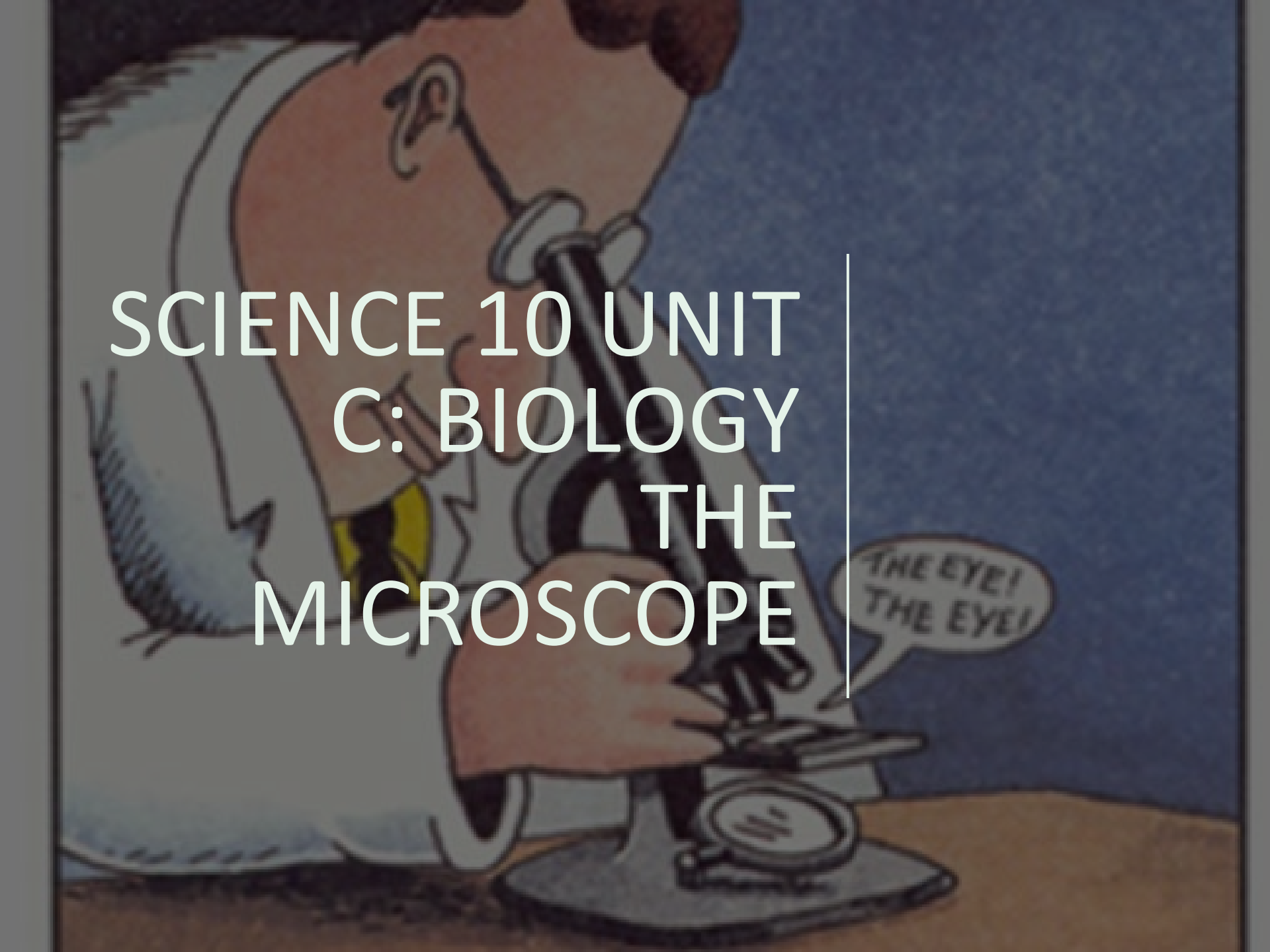
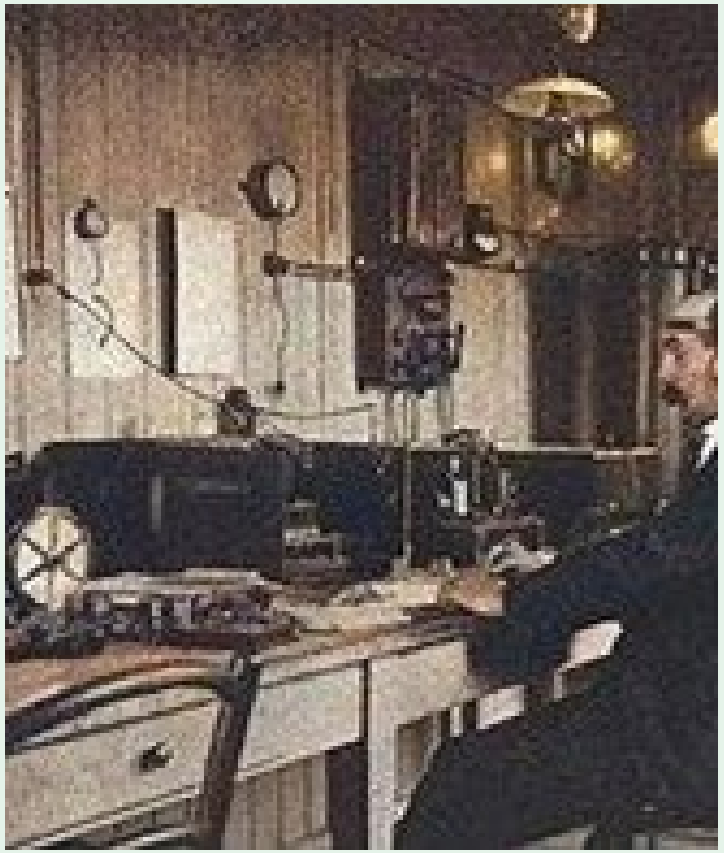
SCIENCE 10 UNIT C: BIOLOGY THE MICROSCOPE



SCIENCE, TECHNOLOGY, AND SOCIETY (STS)

- Science and technology go hand in hand
- Sometimes, science drives technology
  - Research into electromagnetic radiation led to the radio
- Sometimes, technology drives science
  - **Microscopes**



THE MICROSCOPE

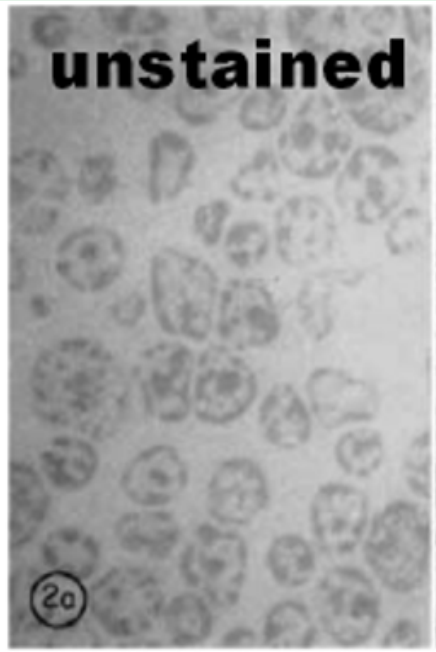
- **Microscopes** are perhaps the strongest example of technology driving science
- Massive impacts on the field of biology
- https://www.youtube.com/watch?v=bjcewKLlb2Y&ab_channel=StatedClearly

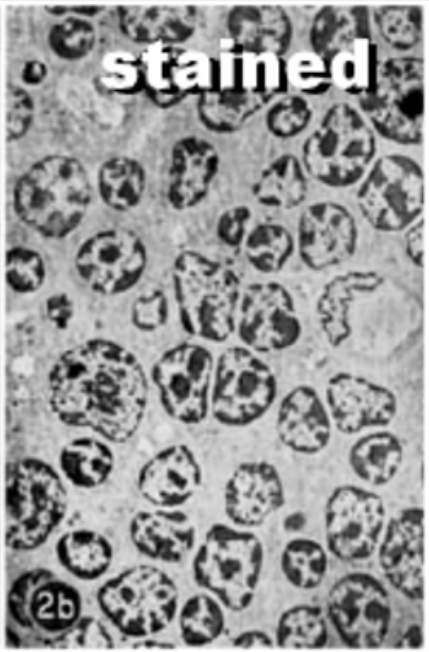
THE MICROSCOPE

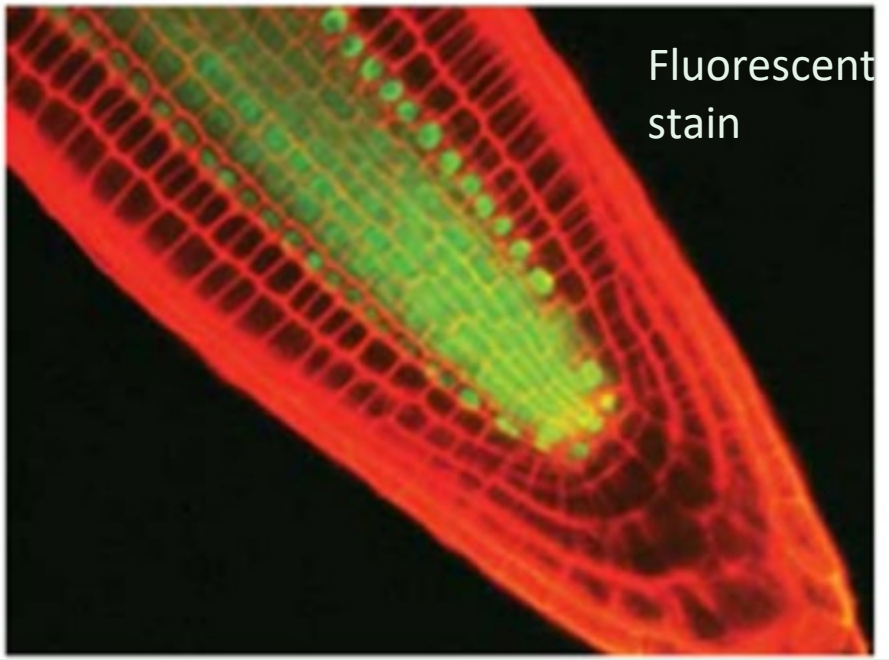
- Three things affect microscope imaging
- **Magnification**
  - How much larger is the image
- **Contrast**
  - Is it high enough to distinguish
- **Resolution**
  - Ability to distinguish between two nearby structures

THE MICROSCOPE

- We can increase contrast using a **stain**







VAN LEEUWENHOEK'S MICROSCOPE

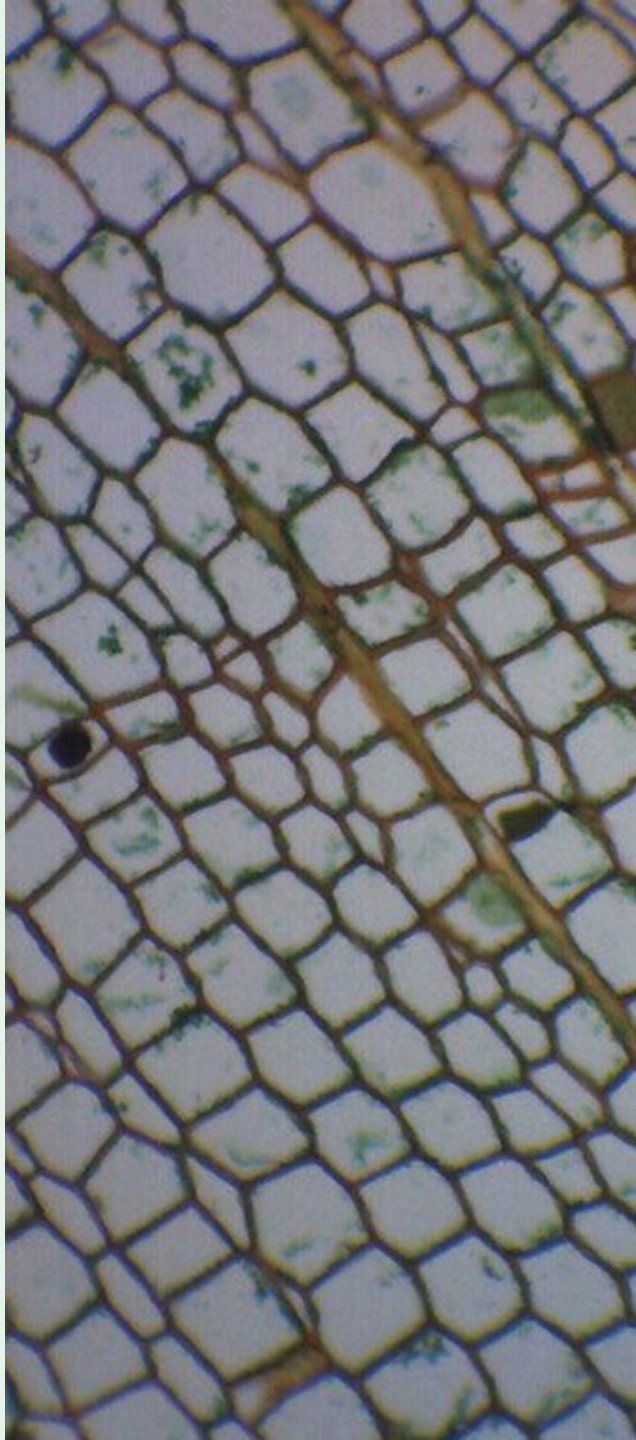
- A **simple** microscope, had only **one** lens
  - Like a magnifying glass
- Observed bacteria, yeast, and other microbes as a hobby
- Kept careful records, helped science

FOCUSING WITHOUT LENSES - INUIT

ARTIFACT FROM THE MANITOBA MUSEUM (HBC 98-1349) / PHOTO BY ANDREW WORKMAN

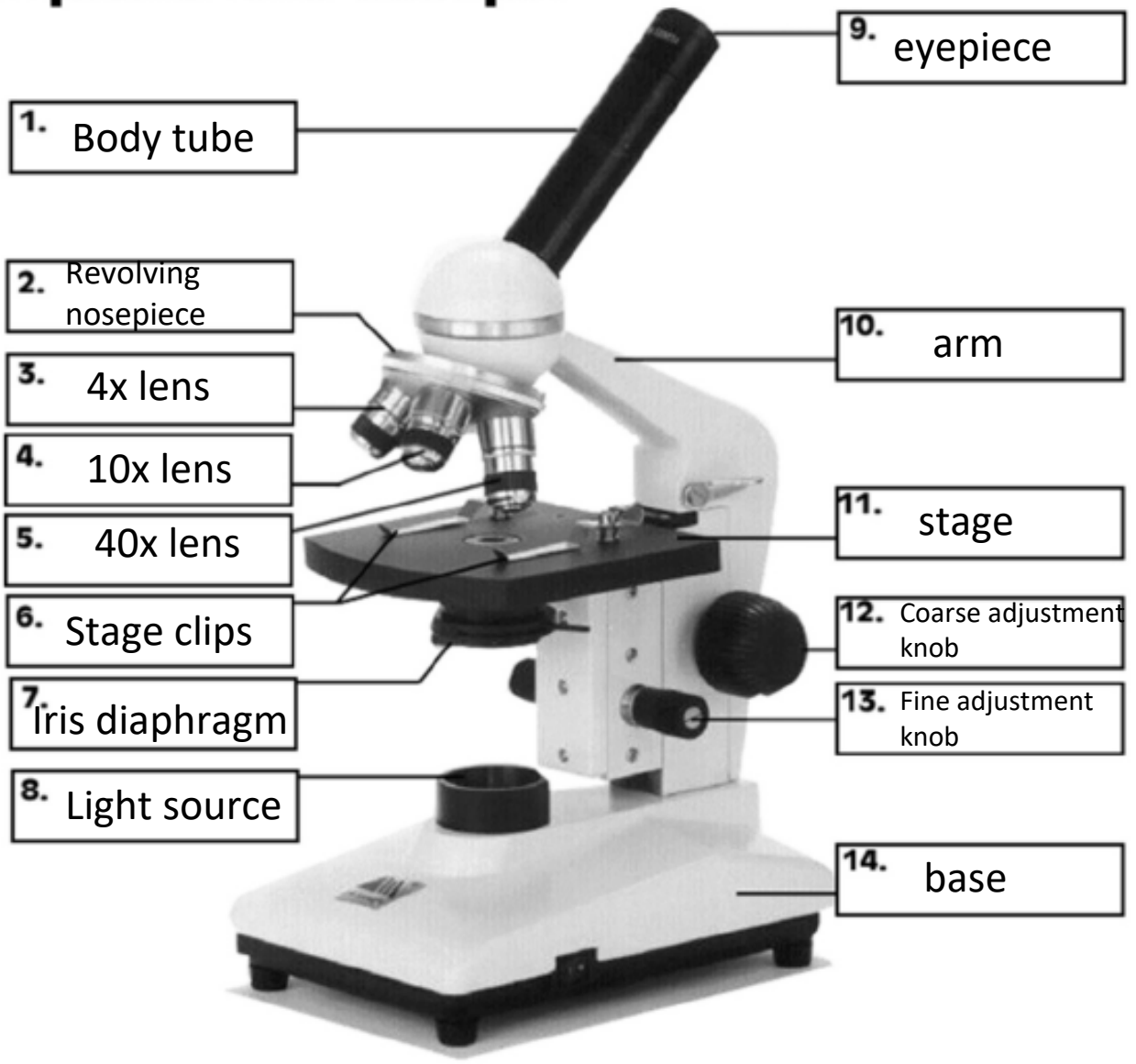
ROBERT HOOKE'S MICROSCOPE

- Built a microscope with two lenses, called a **compound microscope**
- One set of lenses **enlarges** the object
- The other set **magnifies** the image
- Coined the term **cells** while observing cork (see image)



Parts of the Compound Microscope:

3, 4, and 5 are the **Objective Lenses**



MICROSCOPE PARTS EXPLAINED

- Body tube
  - Connects the eyepiece to the microscope
- Revolving nosepiece
  - Switches between objective lenses
- Objective lenses
  - Magnify the specimen at 4x, 10x, or 40x
- Stage clips
  - Hold the sample slide in place

MICROSCOPE PARTS EXPLAINED

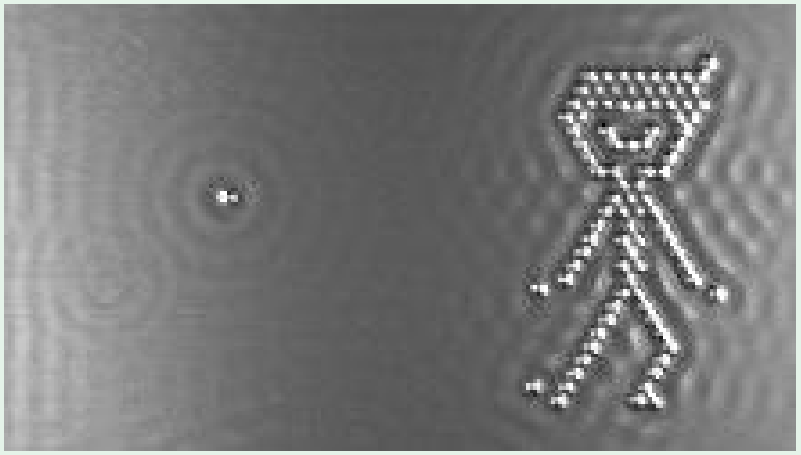
- Iris diaphragm
  - Controls the light level
- Light source
  - Provides the light for the slide
- Eyepiece
  - Look here to view the sample
- Arm
  - Connects the base and the body tube

MICROSCOPE PARTS EXPLAINED

- Stage
  - Flat platform where you place your slides
- Coarse adjustment knob
  - Focuses the lenses on a sample
- Fine adjustment knob
  - Precisely focuses the lenses on a sample
- Base
  - Supports the microscope

ELECTRON MICROSCOPES

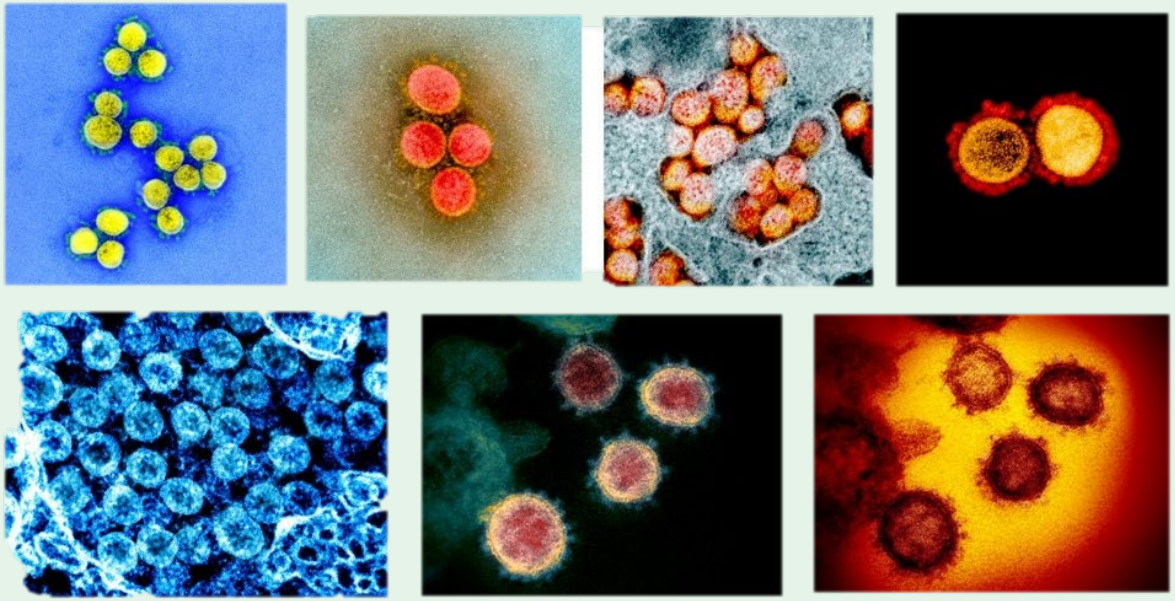
- Invented in the 1930s by Germany, two kinds
- Use **electrons**, which are much **smaller** than photons
- Allows resolution of **smaller** images, like **viruses**
- Viewed on a screen or special image called a **micrograph**



https://www.youtube.com/watch?v=oSCX78-8-q0

TRANSMISSION ELECTRON MICROSCOPE

- Uses thin slices of specimens, like light microscopes
- Can only view dead specimens, like COVID seen below

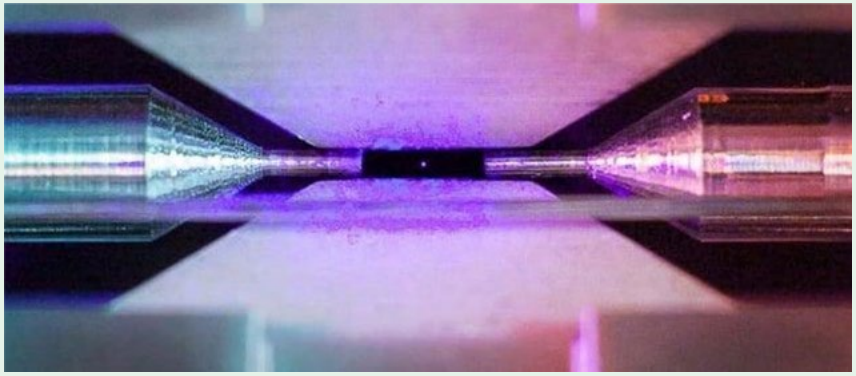


SCANNING ELECTRON MICROSCOPE

- Bounces electrons off surfaces to give 3D images
- Can analyze living specimens
- Who can guess what's in the image below?

THE NEWEST MICROSCOPES

- Confocal Laser Scanning microscopes (**CLSM)**
  - A light microscope, uses lasers to see through thick specimens instead of slices
- **Scanning Tunneling Microscope**
  - Maps surfaces using a metal probe that exchanges electrons with the surface



BONUS MICROSCOPE VIDEOS

- 50 Things Looking Totally Bizarre Under a Microscope
https://www.youtube.com/watch?v=gYnPeHU2wYI

- Top 10 Most Astonishing Electron Microscope Pics In The World
https://www.youtube.com/watch?v=qWmwgY7iHmY