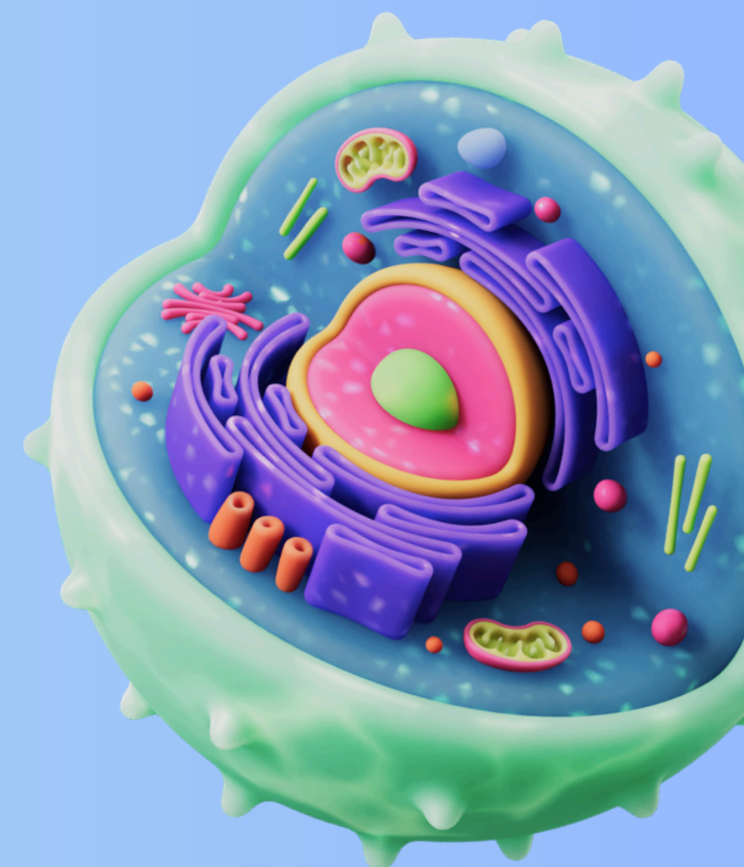


CELL-EBRATING SCIENTIFIC COLLABORATION:

HOW SCIENCE BUILDS ON SCIENCE USING ENDOSYMBIOSIS THEORY

Kierra Schopp, Sept. 17th, 2026

Scientific explanations are developed through observation, experiments, reasoning, and interpretation. As scientists conduct research, they contribute new findings that build upon existing knowledge to advance scientific understanding. Therefore, researchers must communicate their findings and remain open to fresh ideas and perspectives, allowing scientific knowledge to continually evolve. If researchers never shared their findings, then advancements in science would be repetitive, disconnected, and myopic, leading to large gaps in discovery.



The Evolution of Endosymbiosis Theory

The theory that chloroplasts and mitochondria were once free-living prokaryotic, that were engulfed by a proto-eukaryotic cell such that both organisms were benefitted. The mitochondria is the result of the engulfment of an aerobic-respiring alphaproteobacteria, while the chloroplast is the result of the engulfment of a photosynthetic cyanobacteria. The proto-eukaryotic cell offered a stable, protective environment for the prokaryotic cells, and the prokaryotic cells offered resources such as ATP, protection from ROS, and oxygenic photosynthesis.

1. ROBERT HOOKE

- first to observe plant "cells" with a compound microscope.
- 1665.

2. MATTIAS SCHLEIDEN

- hypothesized that cells of plant tissue were the basic monomers of floral life.
- 1838

3. THEODOR SCHWANN

- observed cells in animal tissues.
- predicted that cells are the basic unit of all living matter based off Schleiden.
- 1839

4. ANDREAS SCHIMPER

- observed independent reproduction of the chloroplasts via binary fission.
- 1883

5. KONSTANTIN MERESCHOWSKI

- predicted that chloroplasts were previously photosynthetic bacterium living symbiotically with the eukaryotic cell, based their on independent reproduction.
- 1905
- worked with Paul Portier

6. IVAN WALLIN

- experimentally compared the similarities of the mitochondria and chloroplast based on physiology, organelle staining, & microscopic appearance.
- 1922
- results supported Mereschowski's hypothesis in addition to the mitochondria's symbiosis.

7. LYNN MARGULIS

- hypothesized that mitochondria, tubules, and chloroplasts were the result of endosymbiosis between a proto-eukaryota and ancient prokaryotes.
- used many different forms of evidence.
- 1967
- theory was criticized by scientific community.

8. MICHAEL GREY, W. F. DOOLITTLE, & OTHERS

- used advancements in technology to gather more scientific evidence in support of Lynn's endosymbiosis theory using DNA sequencing.
- the theory was accepted with the additional evidence (excluding the tubules) by the scientific community.
- early 1980s.

With each new observation, prediction, experiment, and even criticism made by different scientists across time and space, the endosymbiosis theory was slowly pieced together. Today, the theory is accepted as part of the evolutionary history resulting in the eukaryotic cells currently observed, which has acted as the basis for many additional scientific discoveries. The timeline of the endosymbiotic theory acceptance proves that science builds from the curiosity, evidence, and collaboration of scientists to uncover the truth behind how the world works. Every one of these scientists were knowledgeable on previous observations, questioned the topic further, utilized their resources, and shared their discoveries so the next scientist could do the same and continue learning. From small plant cells to universal evolution. Small observations compiled into huge discoveries.

Can you name any additional key researchers/discoveries that contributed to this theory? How does it connect to endosymbiosis theory and the work before it?

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