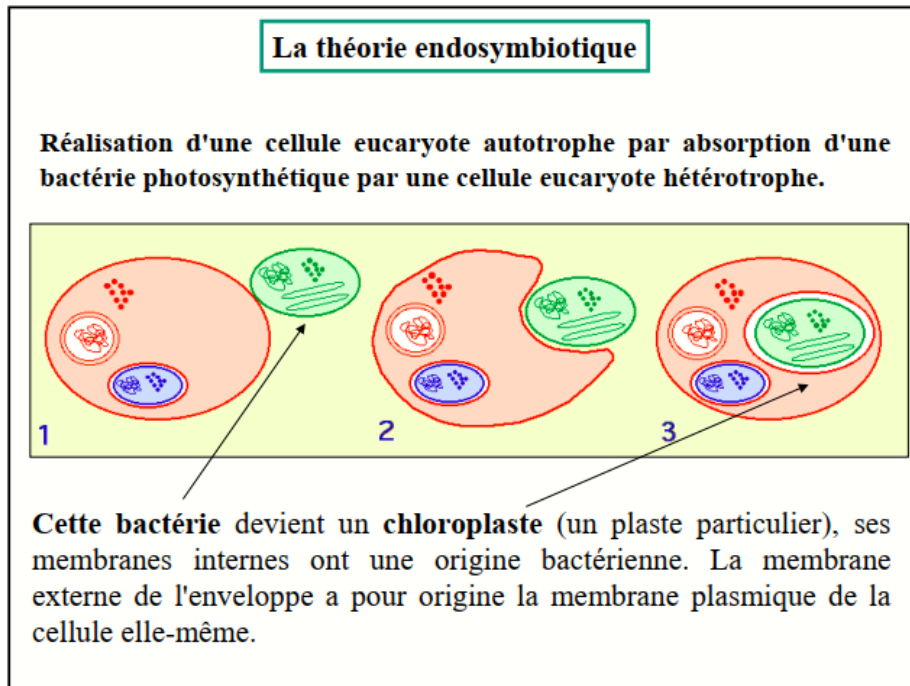


Plastids

1. Introduction

Plastids are organelles found in plant and algal cells. They have a double membrane and their own circular DNA. They perform essential functions such as photosynthesis, storage, and pigmentation of plant organs.

2. Origin



Plastids originated from an ancient endosymbiosis between a eukaryotic cell and a photosynthetic cyanobacterium.

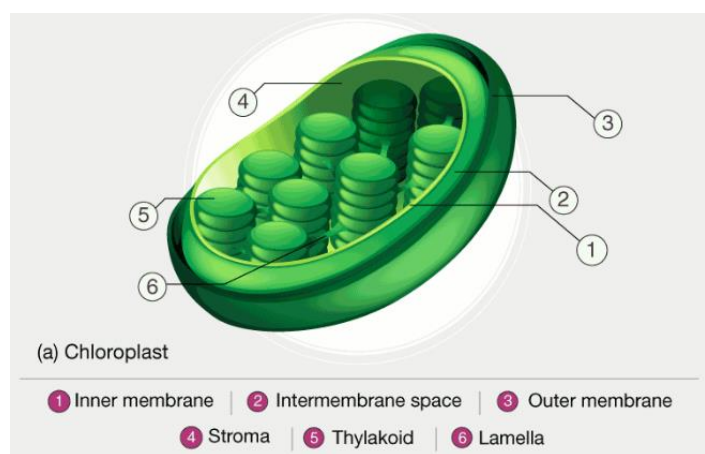
Evidence includes:

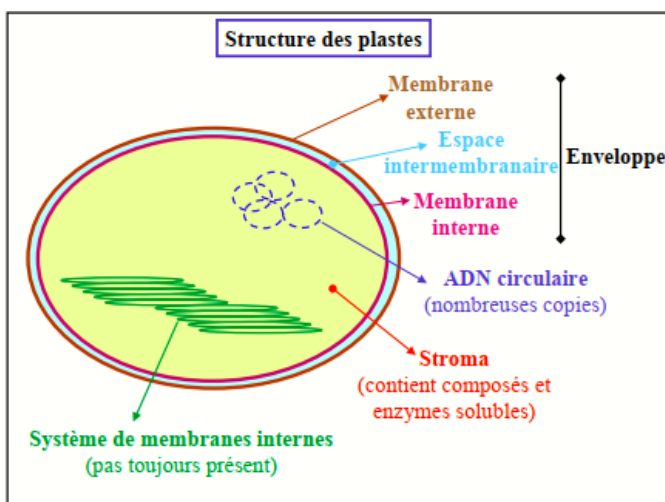
- Circular DNA
- Ribosomes similar to bacterial ones
- Division independent of the nucleus
- Two membranes of different origins

3. Structure

All plastids share the following features:

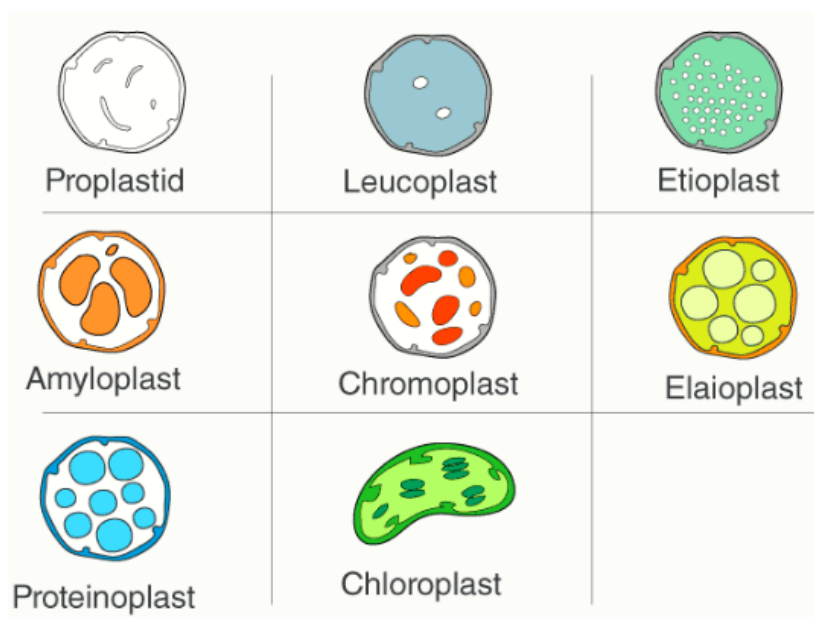
- A double-membrane envelope
- A stroma containing enzymes
- Plastid DNA and ribosomes
- Sometimes an internal thylakoid system (chloroplasts)





4. Types of Plastids

There are different types of plastids with their specialized functions. Among them, a few are mainly classified based on the presence or absence of the Biological pigments and their stages of development.



4.1 Proplasts

Proplastids are immature plastids found in meristems. They can differentiate into chloroplasts, chromoplasts, or leucoplasts.

4.2. Leucoplasts

Leucoplasts are non-pigmented plastids mainly involved in storage:

- Amyloplasts: starch
- Elaioplasts: lipids
- Proteinoplasts: proteins

4.3. Amyloplasts

Amyloplasts contain starch grains and are abundant in storage organs such as roots, tubers, and seeds.

4.4. Chromoplasts

Chromoplasts are rich in carotenoids, pigments responsible for the yellow, orange, and red colors of flowers, fruits, and certain roots.

4.5. Etioplasts

Etioplasts appear in the absence of light. They contain a chlorophyll precursor (protochlorophyllide) and a pro-lamellar body. Under light, they develop into chloroplasts.

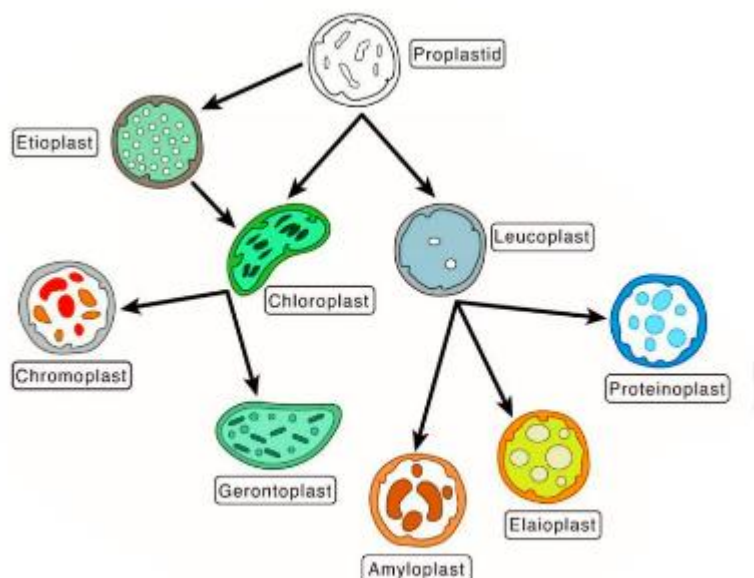
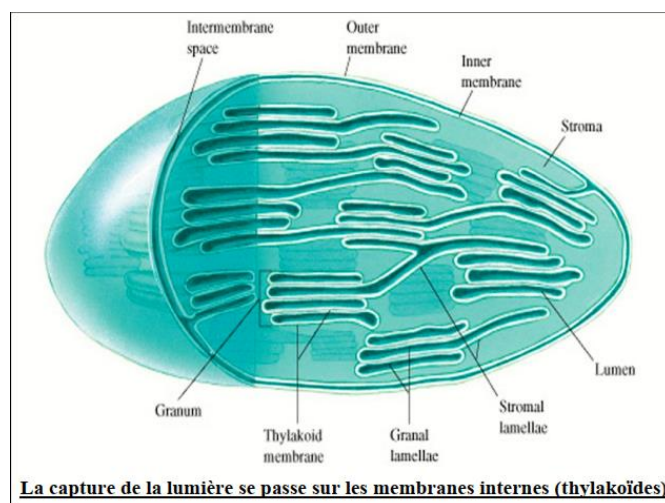
4.6. Chloroplasts

Chloroplasts are the plastids responsible for photosynthesis.

Structure:

- Thylakoids (grana)
- Stroma
- Pigments: chlorophylls and carotenoids

They convert light energy into chemical energy (sugars).



5. Photosynthesis

Photosynthesis occurs in two phases:

1. **Light-dependent reactions** (thylakoids): production of ATP, NADPH, and O_2

2. **Dark reactions / Calvin cycle** (stroma): sugar synthesis

6. ADN plastidial

Chloroplast DNA:

- Is circular
- Contains ~120 genes
- Exists in multiple copies
- Encodes some photosynthesis and translation proteins

7. Inheritance of Plastids

In most plants, plastids are inherited **maternally**, limiting transmission through pollen. A gene of interest can be inserted into the chloroplast genome, allowing:

- High expression levels
- Enhanced biosafety