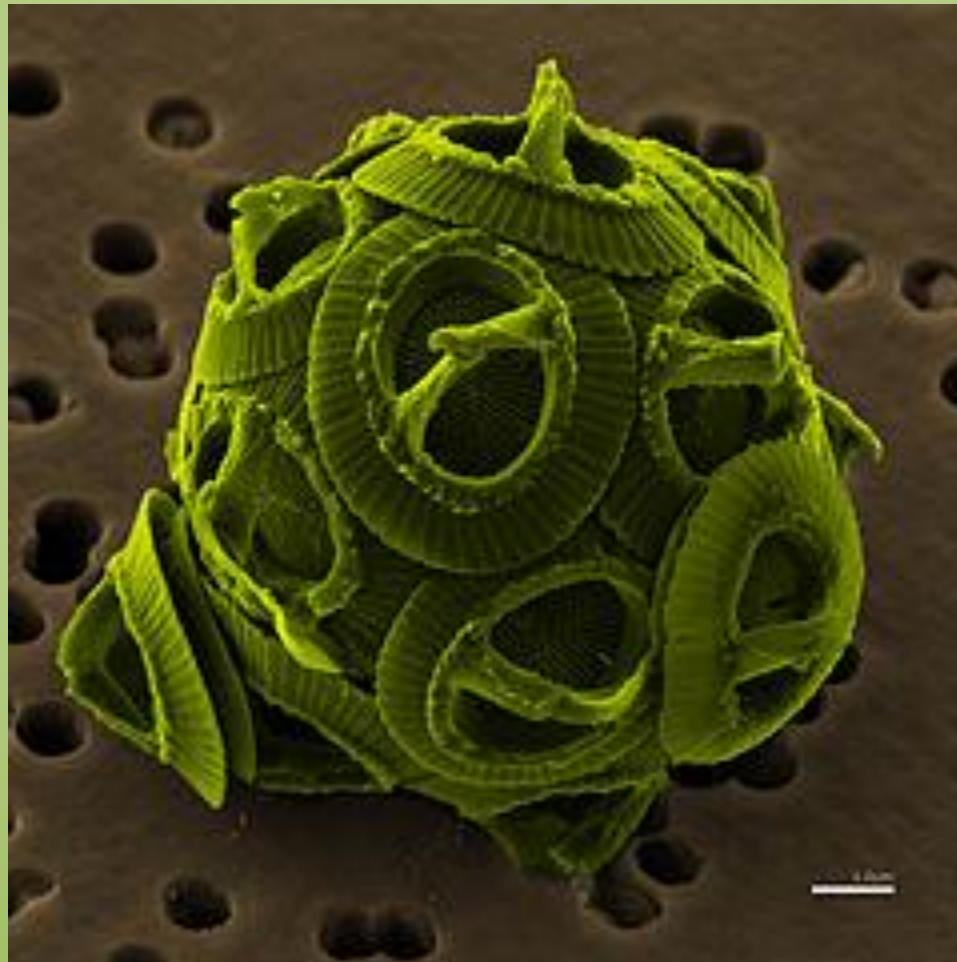


What plant
grows the most
abundantly on
Earth?



Algae: Tiny Plants with Big Energy Potential



Learning Objectives for Today

- What are similarities and differences between biofuels and fossil fuels?
- What are algae? What can biological engineers make out of algae?
- Why is breaking the algal cell wall important for biological engineers?

Biofuels

Chemicals from plants that we can use for energy

What is another source of chemical energy?

How are oil, coal and natural gas different than biofuels?



Biological engineers

People who apply their knowledge about living things to solve problems

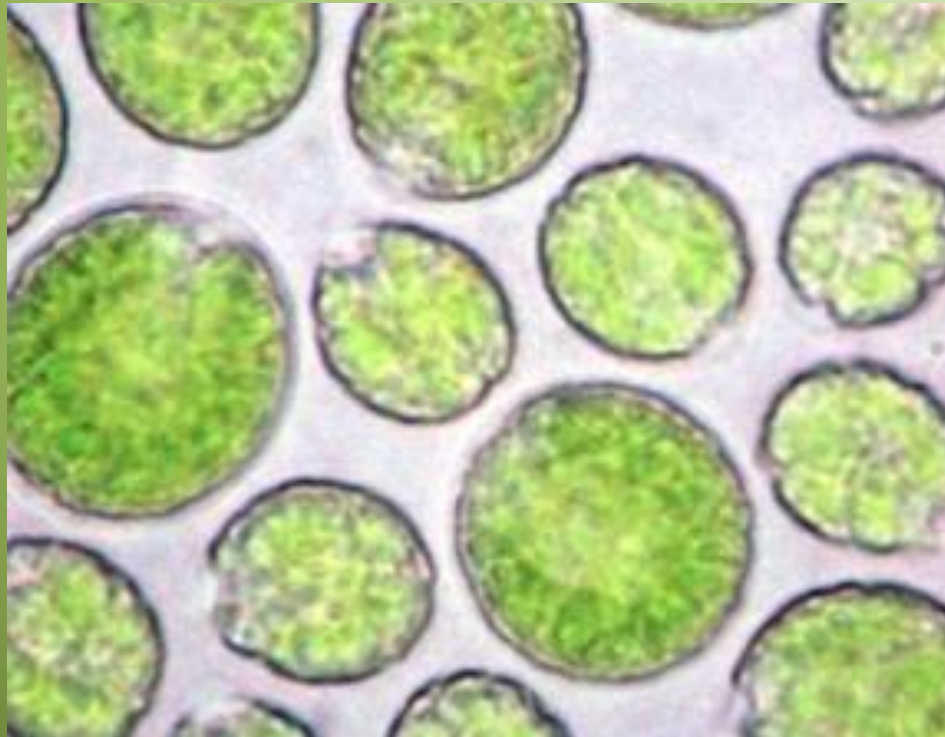
Biological engineers work with farmers, doctors and scientists

Describe a problem that biological engineers might be able to help you with...



Algae are Super Plants

Algae are one type of teeny tiny plant that you can find growing in lakes, ponds and swimming pools

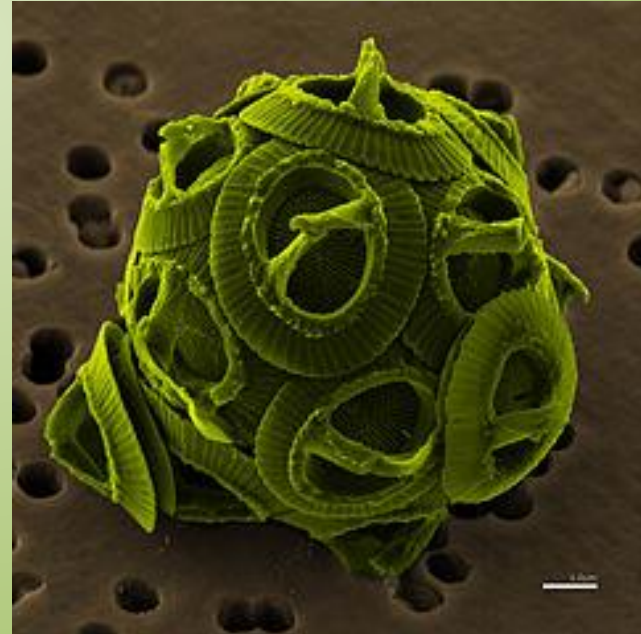


Algae

Very small plants

Live in water in many places
around the world

They grow fast



Algae grow “like weeds”

The types of algae that many engineers use grow twice their size in a day! That’s fast.

Compared to human growth, it would be like:



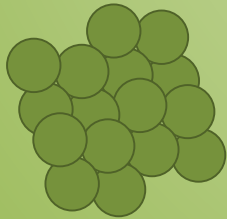
On Monday, you weigh 50 pounds



By Tuesday, you weigh 100 pounds.



How much would you weigh on Wednesday?



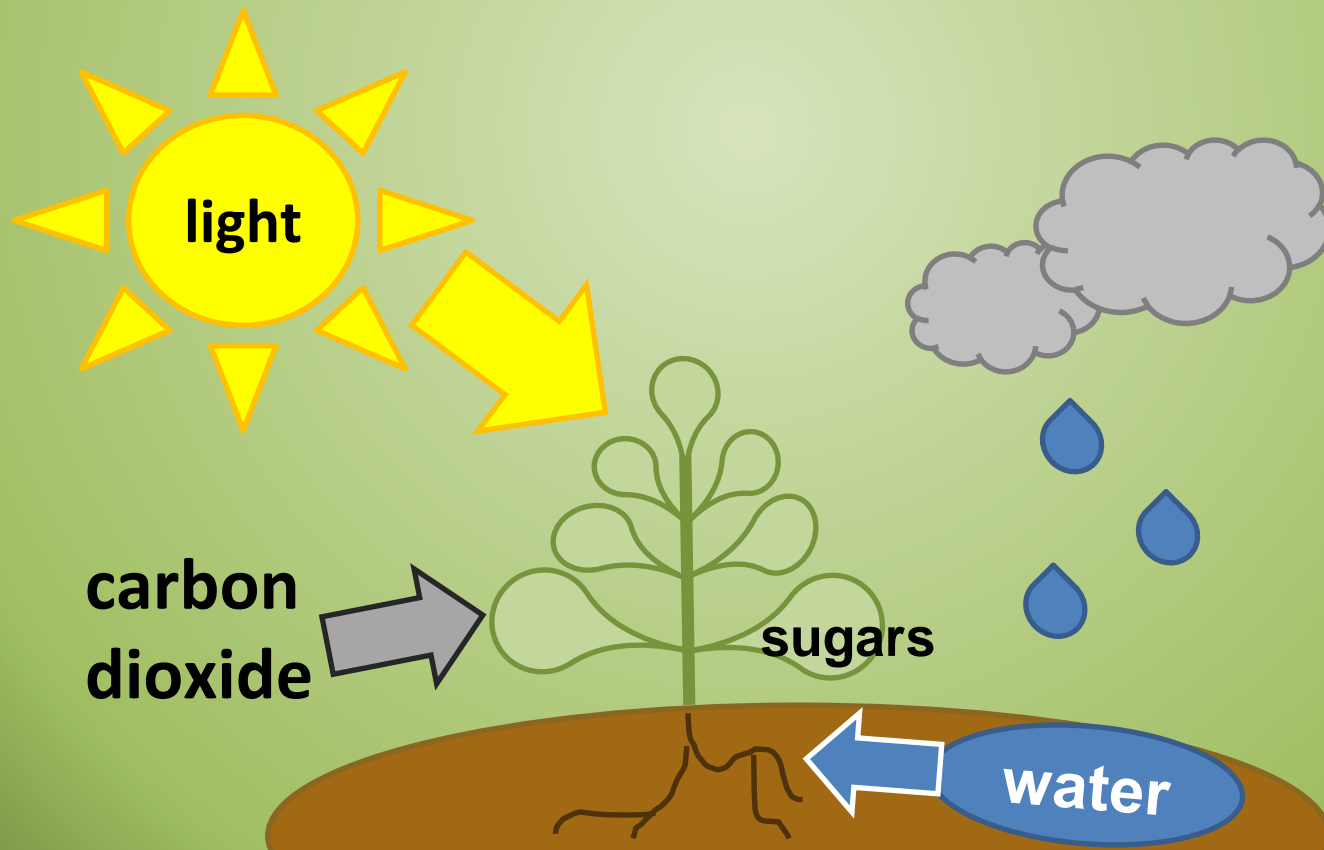
By Friday, you would weigh 800 pounds!

From where does the alga growth come?

Plants Photosynthesize

Photo = light

Synthesize = to make, usually a chemical



Why do biological engineers use algae for biofuels?

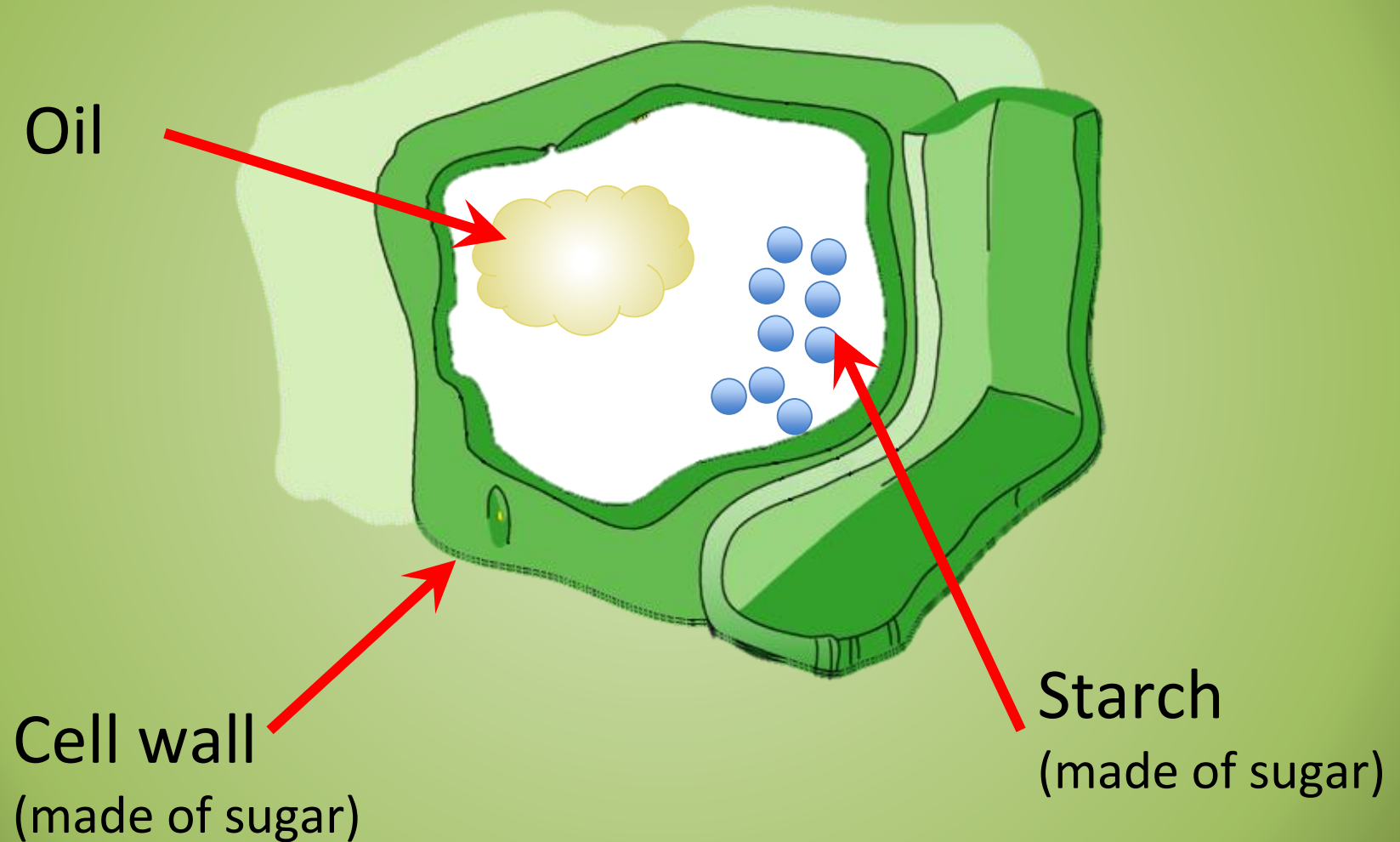
Algae grow very fast

Algae grow in many places around the world

People do not usually eat algae

We can make biofuel from three parts of algal cells

3 Parts of Algae We Make into Fuel



Algae

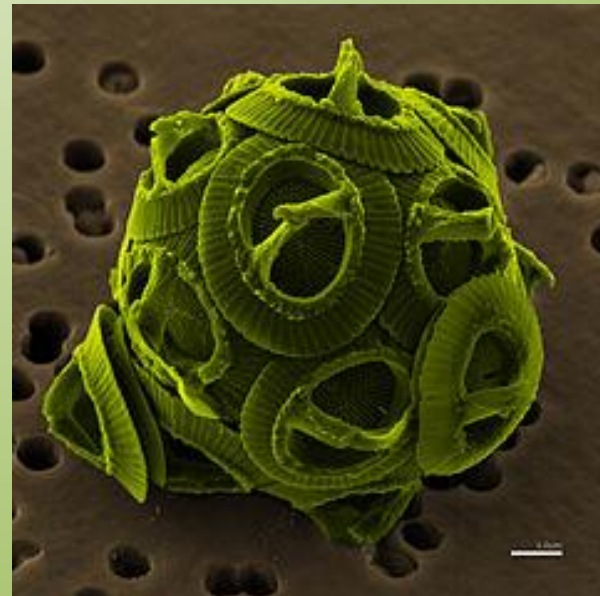
Very small plants

Live in water in many places around the world

They grow fast

People don't usually eat algae

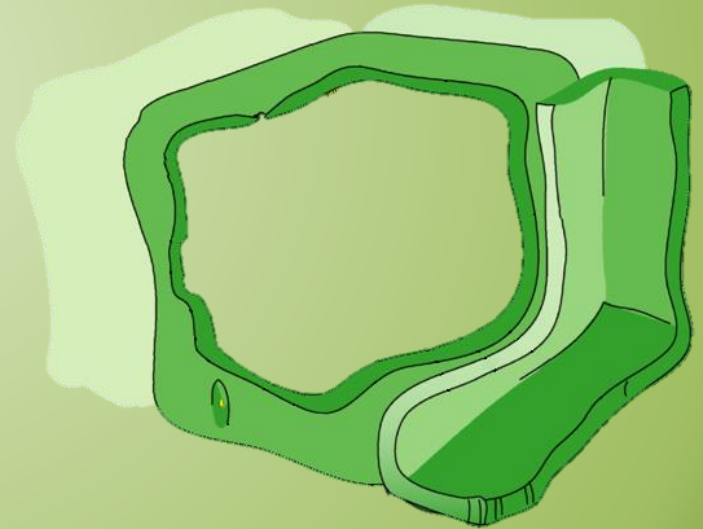
Composed of oil, starch and cell walls



Cell Wall Analogy



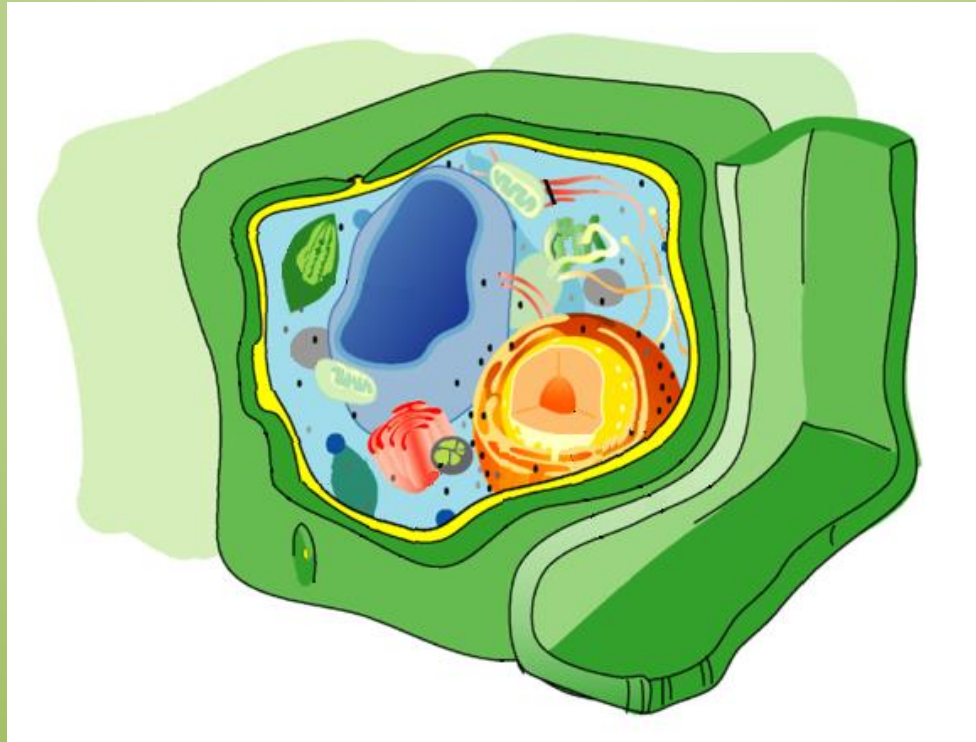
=



Cell wall

A structure made of sugar that surrounds and protects a cell

Cell wall sugars can be used to make more biofuel



Review

- Why are algae good for biofuels?
 - Algae grow very fast
 - Via photosynthesis, algae make sugars and oils
 - Humans do not think algae are tasty, so we can use these oils and sugars to make fuel
- What parts of algae can be made into biofuels?
 - 3 components of algal cells can be made into fuel: **oils, starch** and the **cell wall**.

Review (continued)

- Why do we want to know about the sugars of the cell wall?
 - Knowing what types of sugar “LEGO pieces” make up algal cell walls helps us learn how to take them apart without using energy-intensive methods like smashing or melting
 - If we know what sugar “LEGO pieces” we have, we can recycle them into new chemicals

Lesson Extension

Slides 17-20

How do people
grow algae
for biofuels?

Raceway ponds

A way to grow large quantities of algae

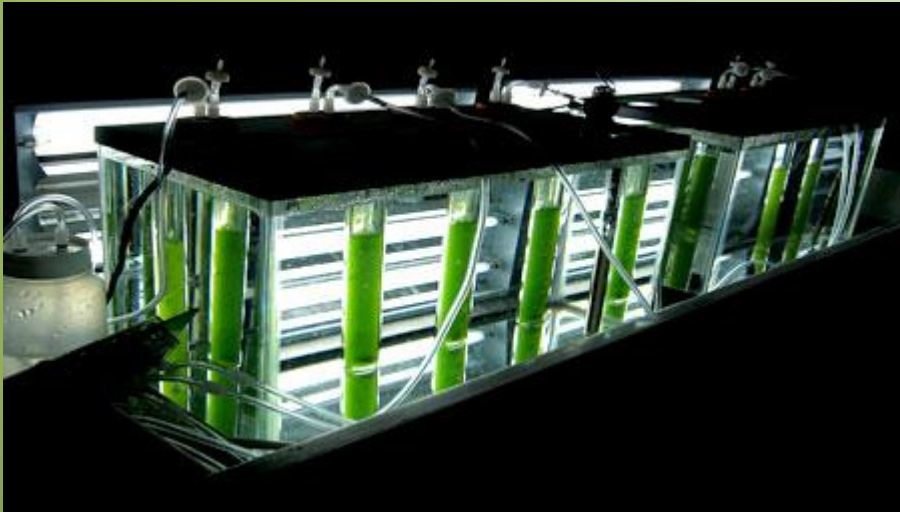
Farmers use raceway ponds



Photobioreactor

A way to grow small to large amounts of algae

Engineers and farmers use photobioreactors



Petri dishes

A way to grow small amounts of algae

Engineers use petri dishes for experiments

