

Use the following information to answer the following questions about your organism:

**Is your organism a prokaryote or a eukaryote?**

**If it is a prokaryote, is it in the bacteria or archaea group?**

**What is this organism's metabolism?**

**Where does it get its carbon?**

**Where does it get its energy?**

**Where do you most likely find this organism?** (you may need to use the internet for this question)

Be prepared to provide your answer to the class.

All materials with answers will be posted on blackboard and this material will be on the exam.

**SUMMARY TABLE 29.1** Characteristics of Bacteria, Archaea, and Eukarya

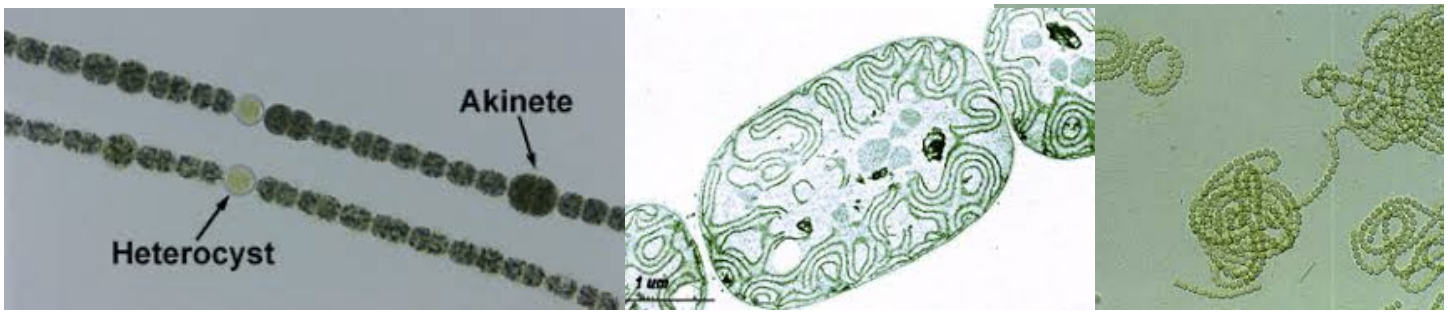
	Bacteria	Archaea	Eukarya
DNA enclosed by a nuclear envelope? (see Chapter 7)	No	No	Yes
Circular chromosome present?	Yes (but linear in some species)	Yes	No (linear)
Organelles enclosed by membranes present? (see Chapter 7)	No	No	Yes
Rotating flagella present? (see Chapter 7)	Yes	Yes	No (flagella and cilia undulate)
Multicellular species?	No (with some exceptions)	No	Yes
Plasma membrane lipids composed of glycerol bonded to unbranched fatty acids by ester linkages? (see Chapter 6)	Yes	No (branched lipids bonded by ether linkages)	Yes
Cell walls, when present, contain peptidoglycan? (see Chapter 5)	Yes	No	No
RNA polymerase composed of >10 subunits?	No (only 5 subunits)	Yes	Yes
Translation initiated with methionine? (see Chapter 17)	No (initiated with <i>N</i> -formylmethionine; <i>f</i> -met)	Yes	Yes

Contains histone proteins  
yes

yes No

**SUMMARY TABLE 29.3** Six General Methods for Obtaining Energy and Carbon–Carbon Bonds

Source of C–C Bonds (for synthesis of complex organic compounds)			
Source of Energy (for synthesis of ATP)		<b>Autotrophs:</b> self-synthesized from CO <sub>2</sub> , CH <sub>4</sub> , or other simple molecules	<b>Heterotrophs:</b> from molecules produced by other organisms
	<b>Phototrophs:</b> from sunlight	photoautotrophs	photoheterotrophs
	<b>Chemoorganotrophs:</b> from organic molecules	chemoorganoautotrophs	chemoorganoheterotrophs
	<b>Chemolithotrophs:</b> from inorganic molecules	chemolitho[auto]trophs	chemolithotrophic heterotrophs



# ANABENA

No membrane bound organelles, including the photosynthetic mechanism (no chloroplasts)

**Photo-**

**Prokaryote**

Heterocysts change gaseous  $N_2$  into biologically available nitrogen

Gets its carbon from  $CO_2$  during photosynthesis

**Autotroph**

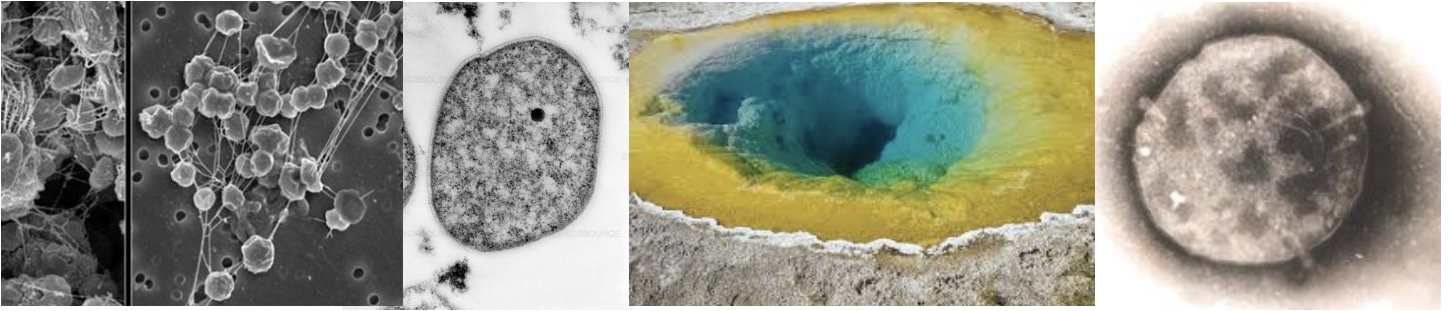
Some species native to Iowa

**Ponds & wetlands**

Anabena does not generally produce histone proteins

**Bacteria**





# CRENARCHAEOTA

Name is Greek for “old spring quality” because the first strains were isolated from sulfur vents. These strains oxidize ammonia ( $\text{NH}_3$ ) or sulfur compounds for energy.

Chemolitho

Can live at the highest temperatures of all known organisms

Hotsprings

All groups of Crenarchaeota have circular DNA and most have histone proteins

Prokaryote  
Archaea

Crenarchaeota do not photosynthesize

Heterotroph







# HELIOBACTERIA

Are gram+, meaning their cell walls contain peptidoglycan

Prokaryote Bacteria

Require organic carbon sources

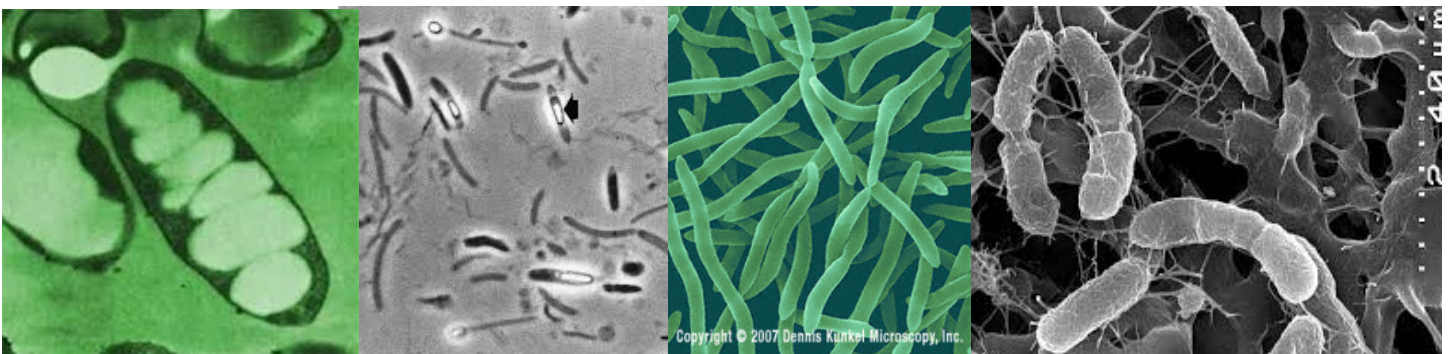
Heterotroph

Its photosynthetic apparatus is disabled by  $O_2$ , therefore it is an obligate anaerobe.

Photo-

Fixes nitrogen in rice agriculture

Wet soil





# HUMAN (*Homo sapiens*)

Each cell contains a nucleus and mitochondria

Eukaryote

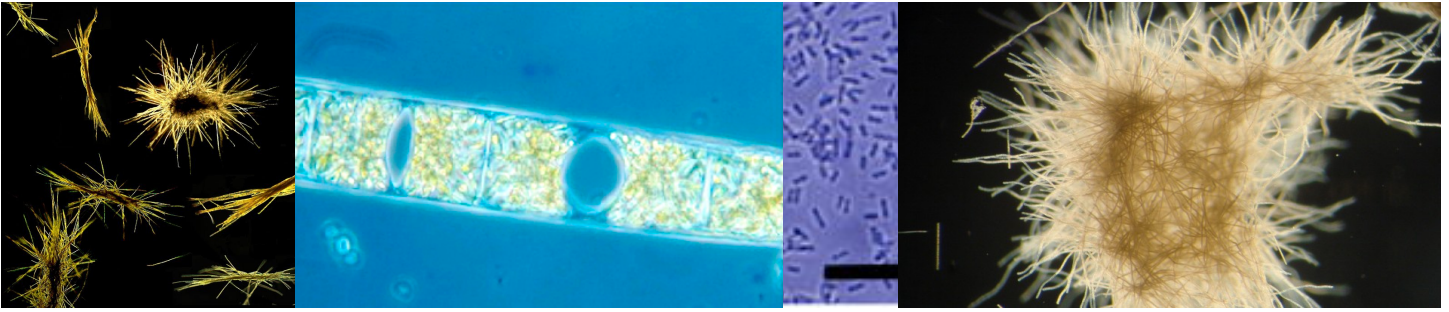
Energy and carbon are derived from eating other organisms

Chemoorgano- Heterotroph

Have colonized every terrestrial ecosystem type on Earth

Most places





# DIAZOTROPH

Lacks a nucleus **Prokaryote**

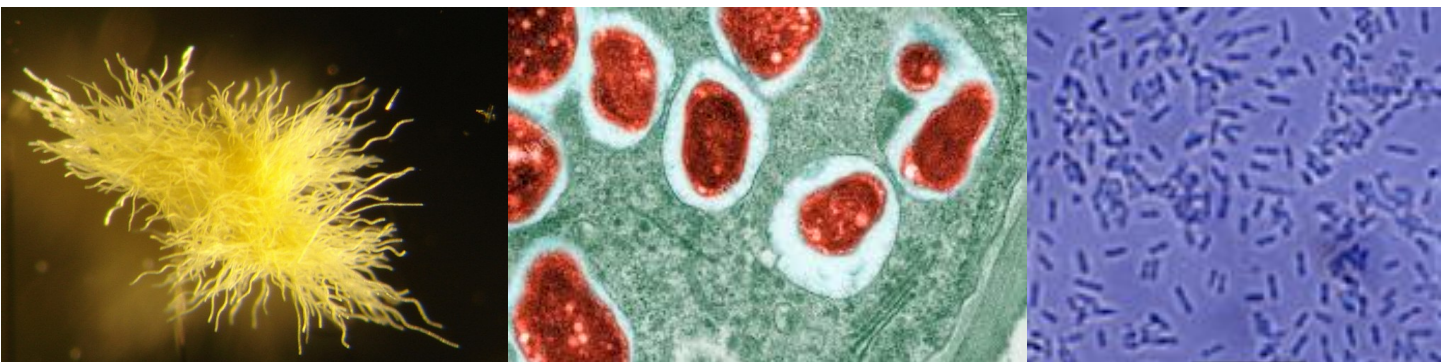
Uses carbon from the atmosphere  
**Autotroph**

Uses root exudates (simple carbon compounds) for energy

**Soil** **Chemoorgano-**

It is unclear if it is a bacteria or archaean

**Unclear**







# EUGLENA

Contains chloroplasts (organelles that photosynthesize)

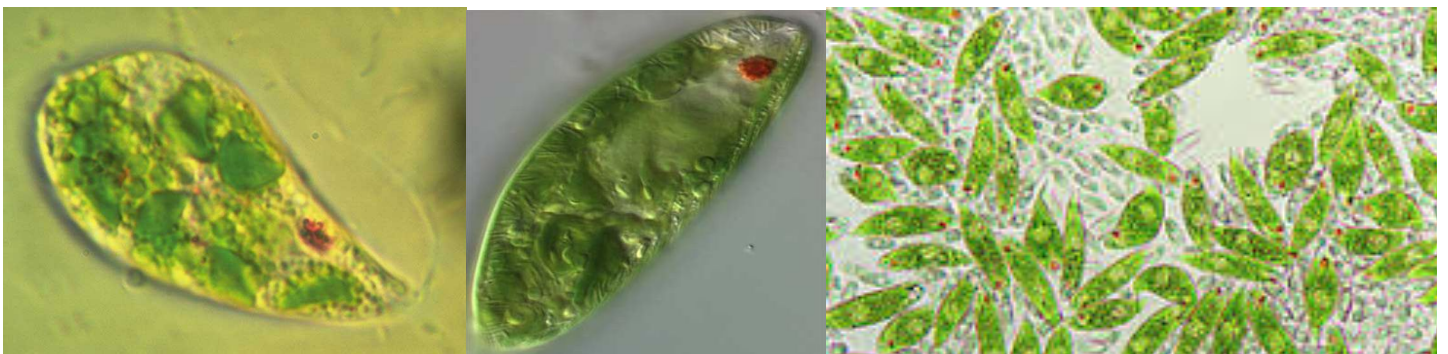
Eukaryote  
Photo-

Undulating flagella help it swim

Pond water

Its breathes  $\text{CO}_2$  dissolved in water

Autotroph





# FIRMICUTES

No nucleus, only a ring of a DNA **Prokaryote**

Although a few Firmicute species can photosynthesize, most consume organic materials for energy

**Organo-**

Many species have gram+ cell walls, which contain peptidoglycan

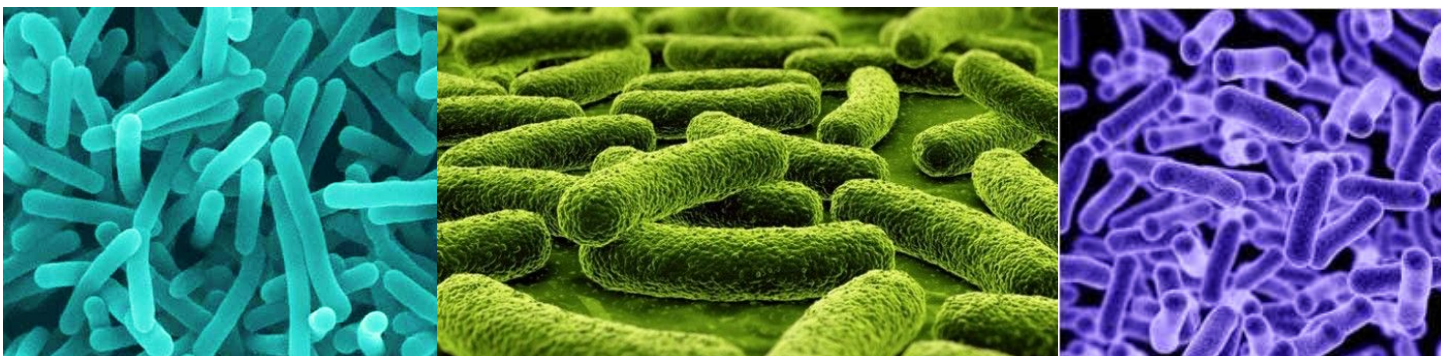
**Bacteria**

These organisms also get their carbon from organic materials

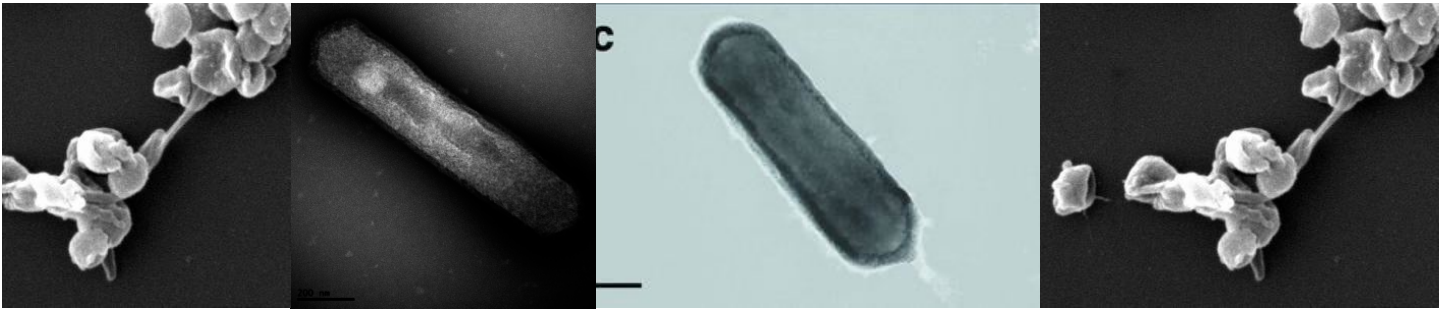
**Heterotroph**

Some species are an important component of our digestive microbiome

**Stomach**







# Thaumarchaeota

One of the most abundant genera on Earth.  
They live in its largest habitat.

The ocean

Oxidize ammonia to fix  $\text{CO}_2$

Litho- Autotroph

Have no membrane-bound organelles

Prokaryote

Have large RNA (>10 subunits)

Archaea

