

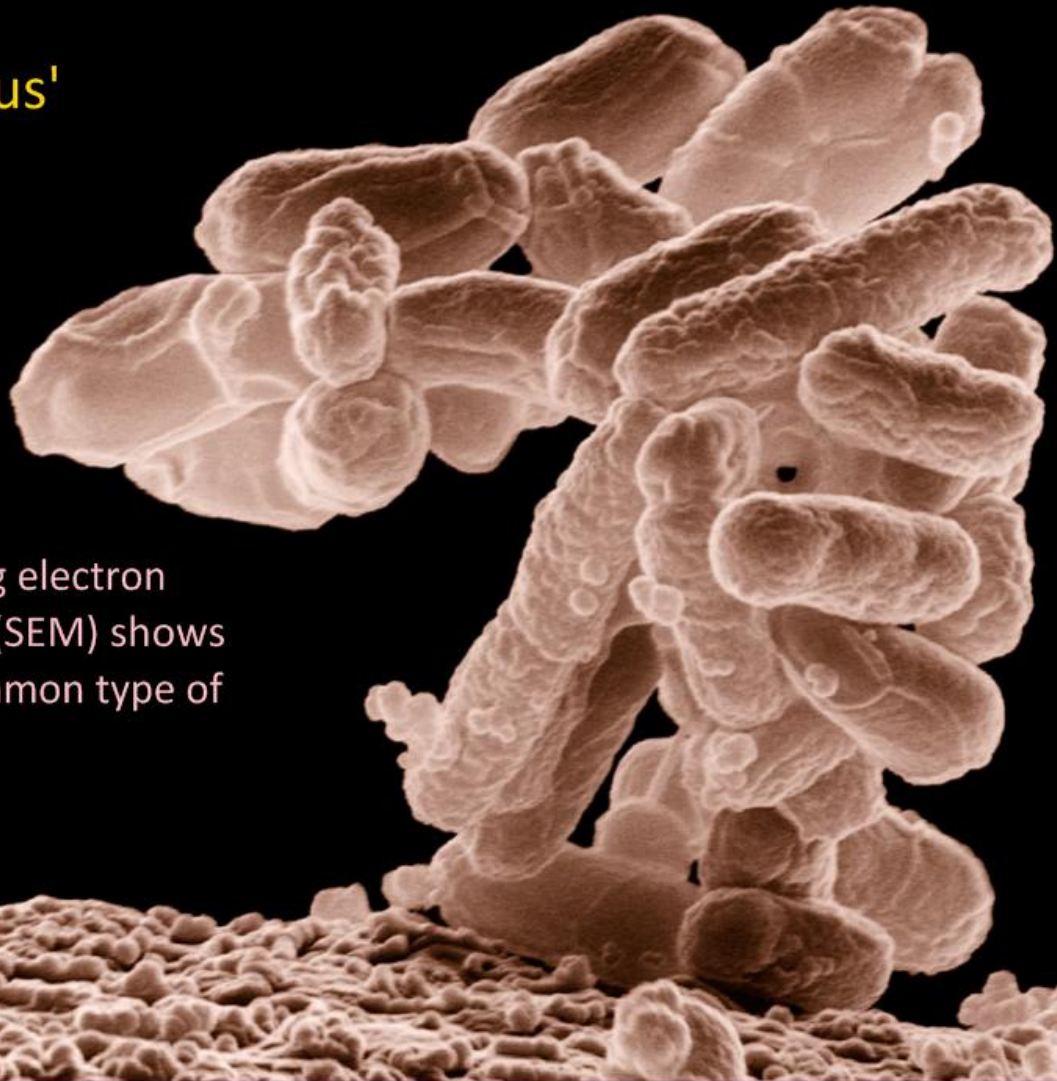
Prokaryotes

Stephen Taylor

Bandung International School

Prokaryotes are smaller than eukaryotes and came first in terms of evolution.

'before'
'nucleus'



This scanning electron micrograph (SEM) shows E. coli, a common type of bacteria.

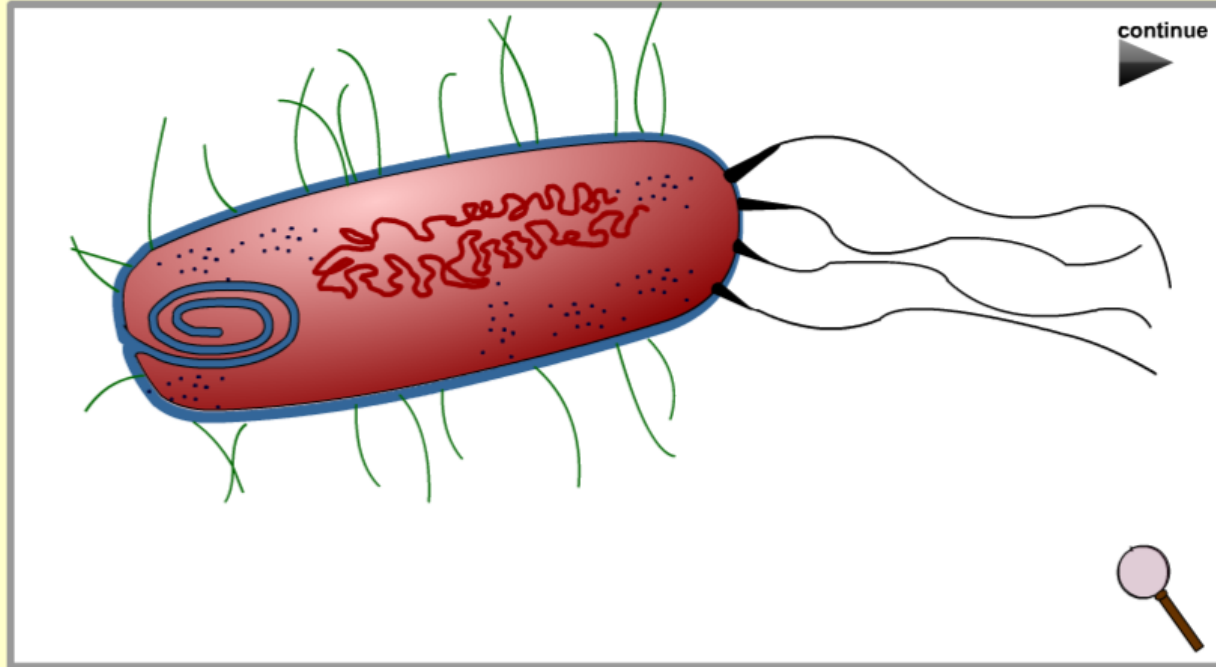
1 μm

http://commons.wikimedia.org/wiki/Image:E_coli_at_10000x,_original.jpg

Try out this tutorial on cell structure:

Cell Structure

Prokaryotic Cell



This is a typical prokaryotic cell. Notice the significant structural and internal elements. Point the cursor over the different components to learn their names and functions. To see a closeup of the internal crowding of a cell press the "Zoom in!" button.

Introduction

Prokaryotic Cell

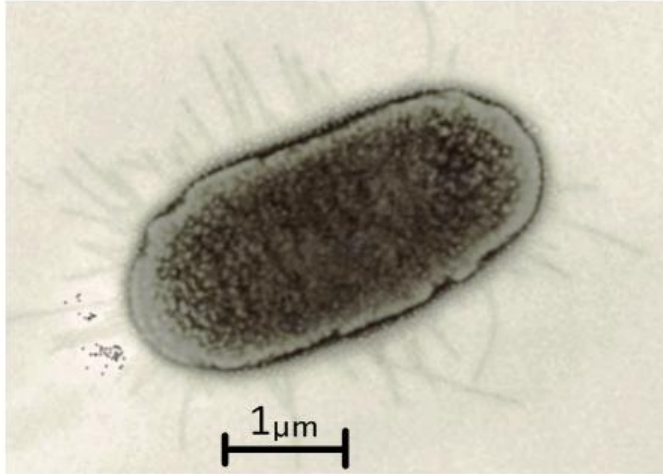
Animal Cell

Plant Cell

Construct A Cell

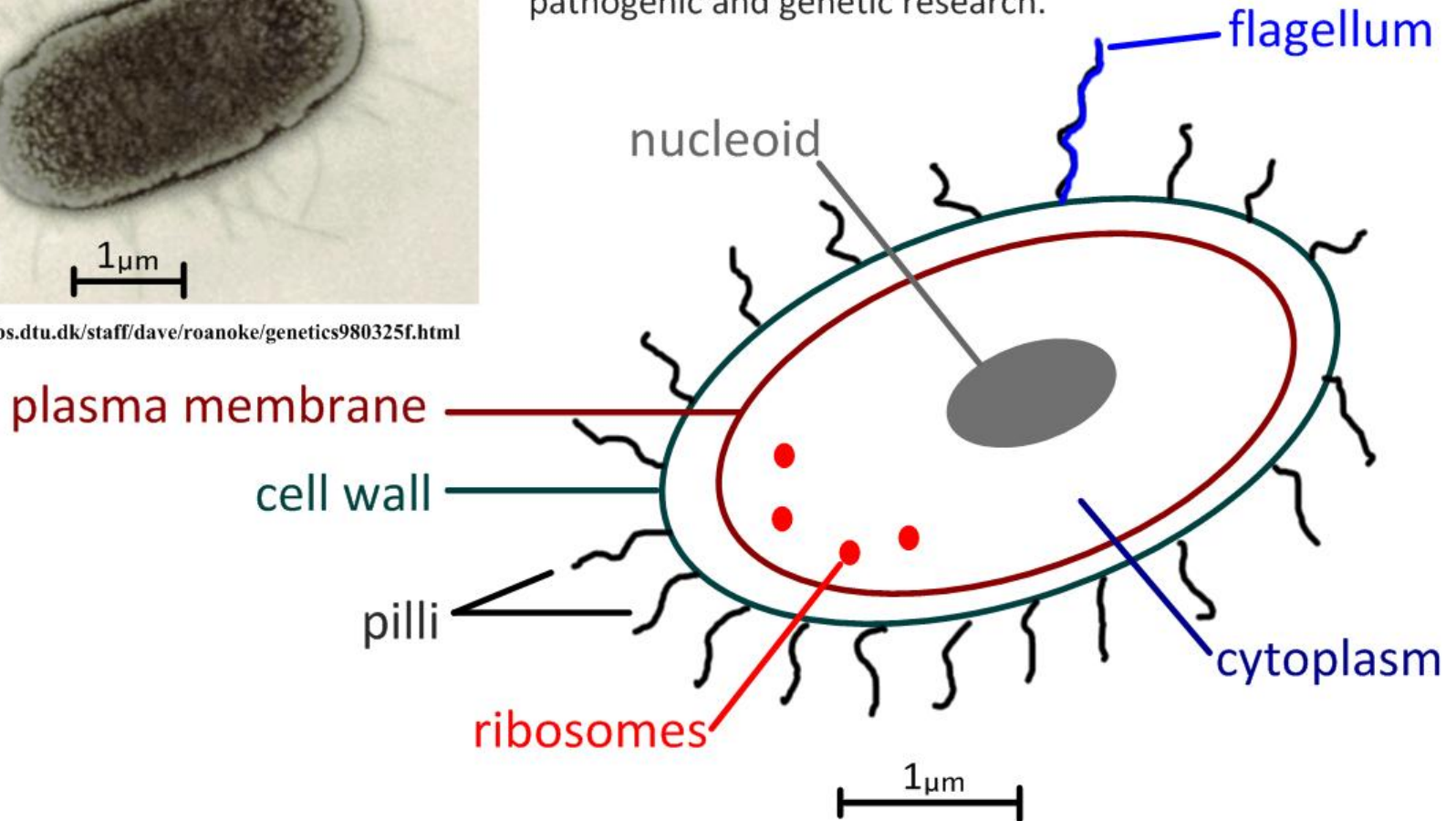
http://www.wiley.com/legacy/college/boyer/0470003790/animations/cell_structure/cell_structure.swf

The ultrastructure of *E. coli* as an example of a prokaryote



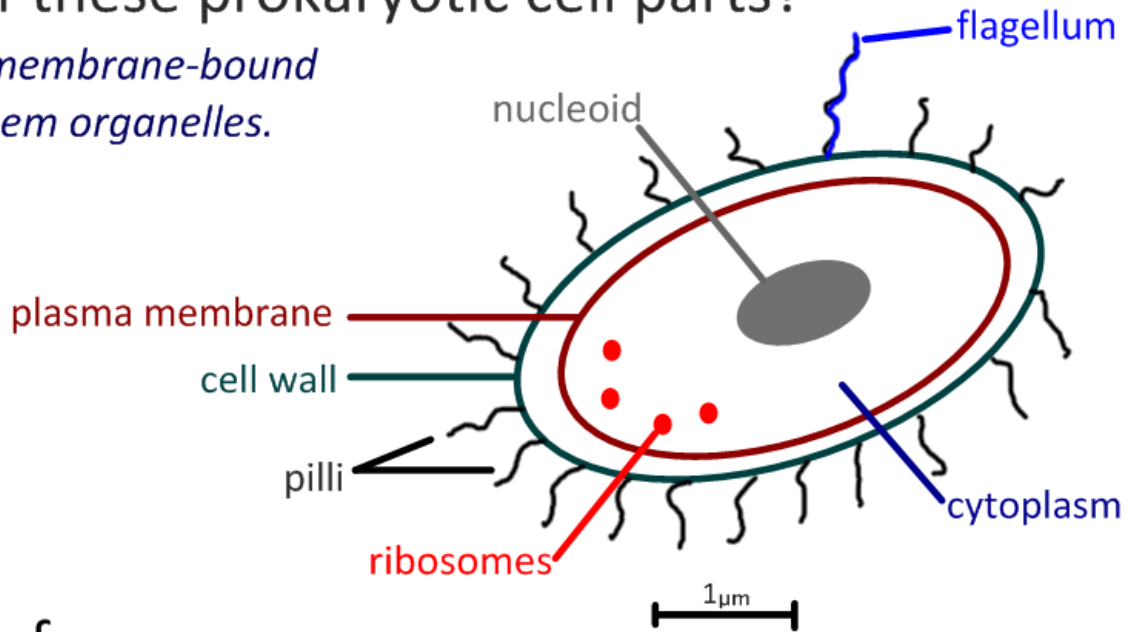
E. coli is the classic 'model' microbe, used in many kinds of pathogenic and genetic research.

<http://www.cbs.dtu.dk/staff/dave/roanoke/genetics980325f.html>



What are the functions of these prokaryotic cell parts?

Remember, these cell parts are not membrane-bound as in a eukaryote, so we don't call them organelles.



Movement

Protein synthesis

Attachment, DNA transfer

Protective coating, can be Gram-positive or Gram-negative

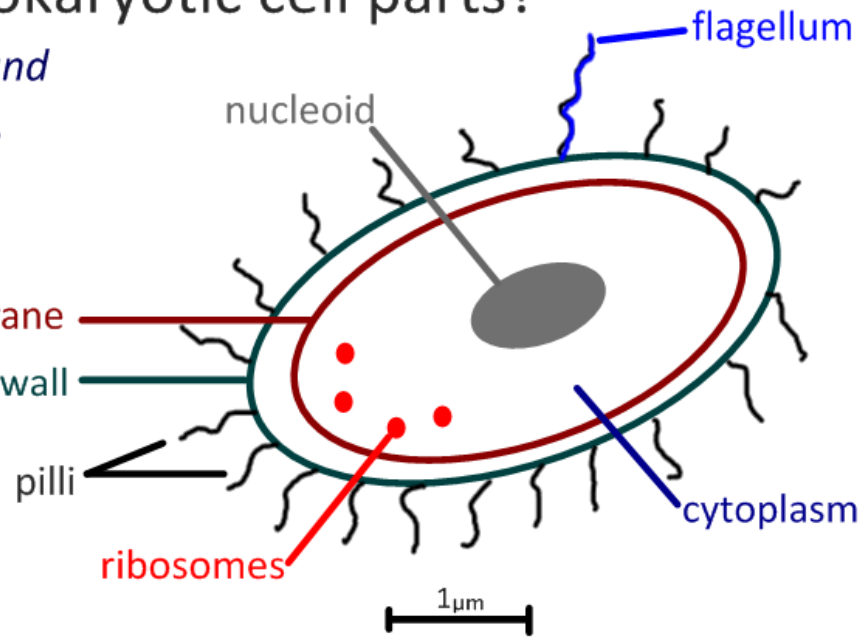
Contains enzymes for metabolism

Region containing closed-loop DNA

Controls entry and exit of substances

What are the functions of these prokaryotic cell parts?

Remember, these cell parts are not membrane-bound as in a eukaryote, so we don't call them organelles.



Movement **flagellum**

Protein synthesis **ribosomes**

Attachment, DNA transfer **pili**

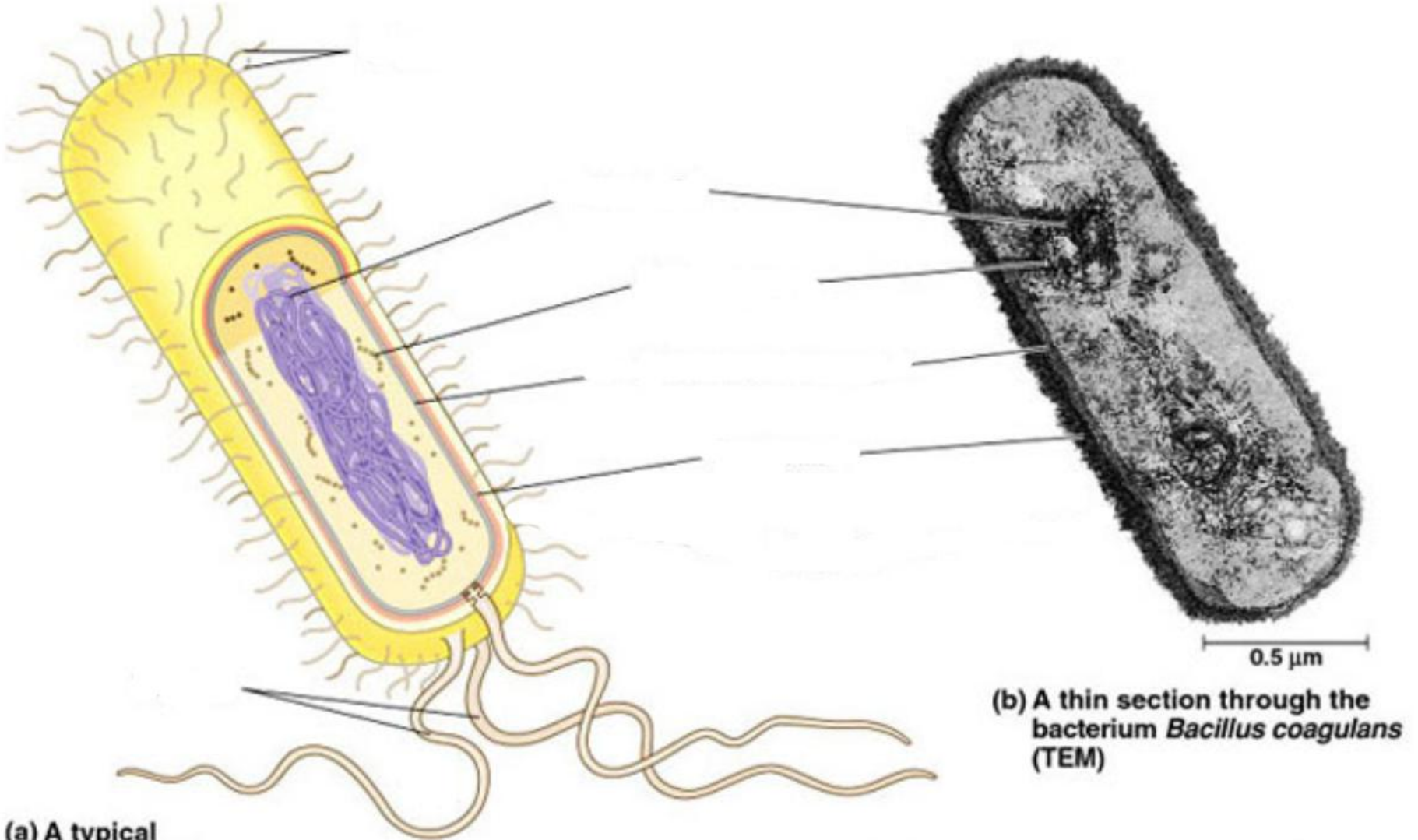
Protective coating, can be Gram-positive or Gram-negative **cell wall**

Contains enzymes for metabolism **cytoplasm**

Region containing closed-loop DNA **nucleoid**

Controls entry and exit of substances **plasma membrane**

Which structures can you identify in this electron micrograph?

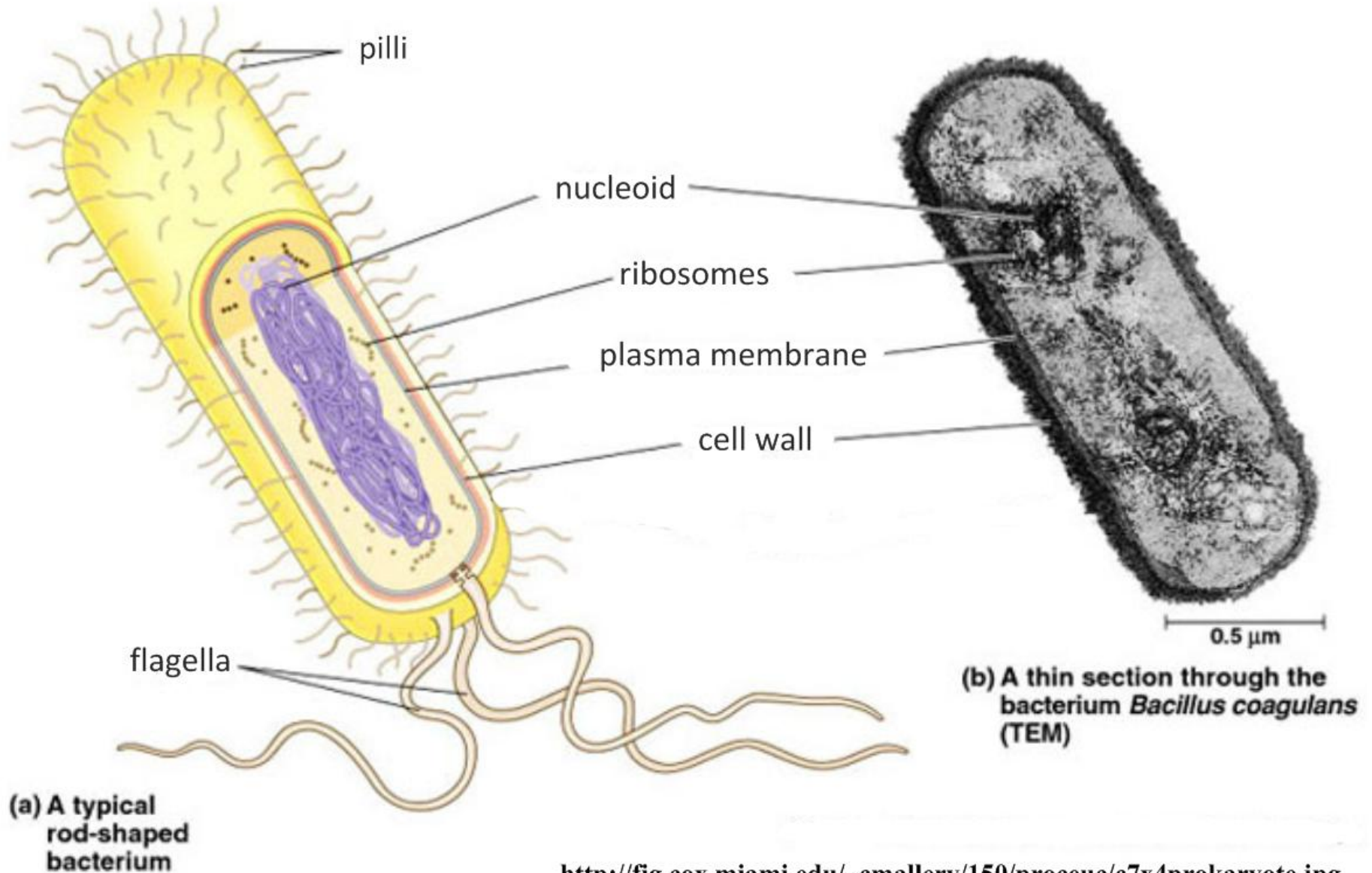


(a) A typical rod-shaped bacterium

(b) A thin section through the bacterium *Bacillus coagulans* (TEM)

<http://fig.cox.miami.edu/~cmallery/150/proceuc/c7x4prokaryote.jpg>

Which structures can you identify in this electron micrograph?

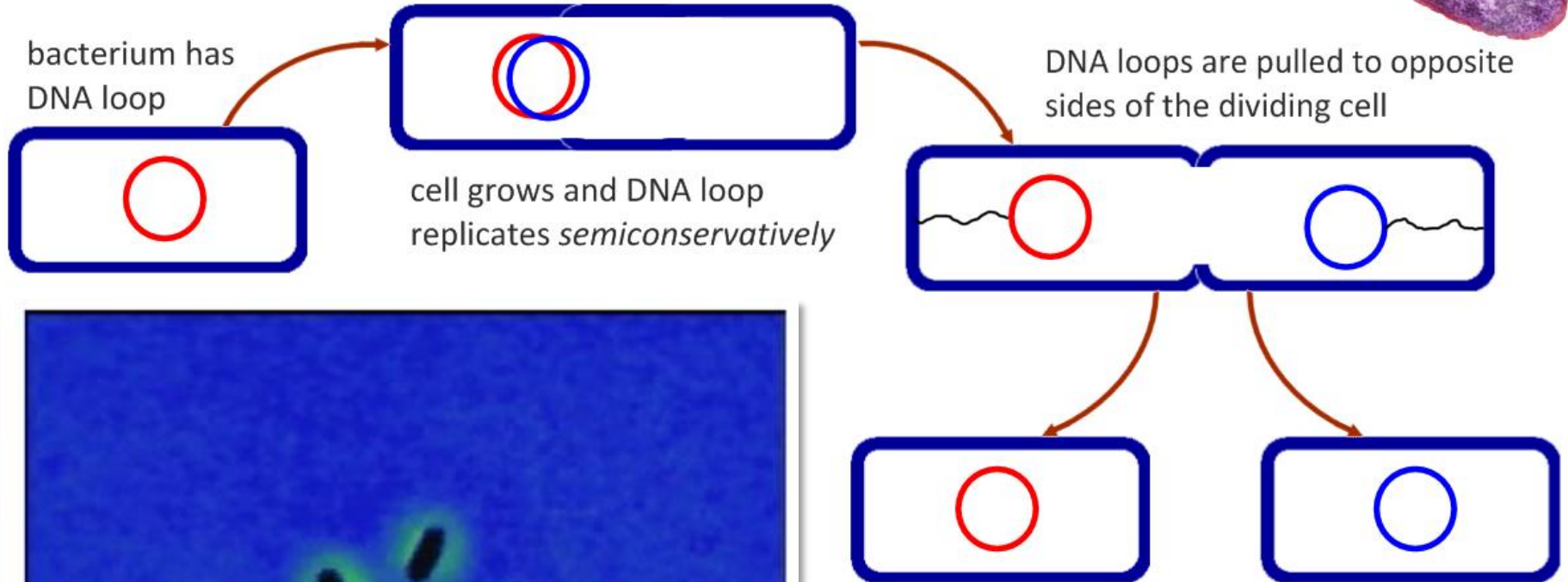


<http://fig.cox.miami.edu/~cmallery/150/proceuc/c7x4prokaryote.jpg>

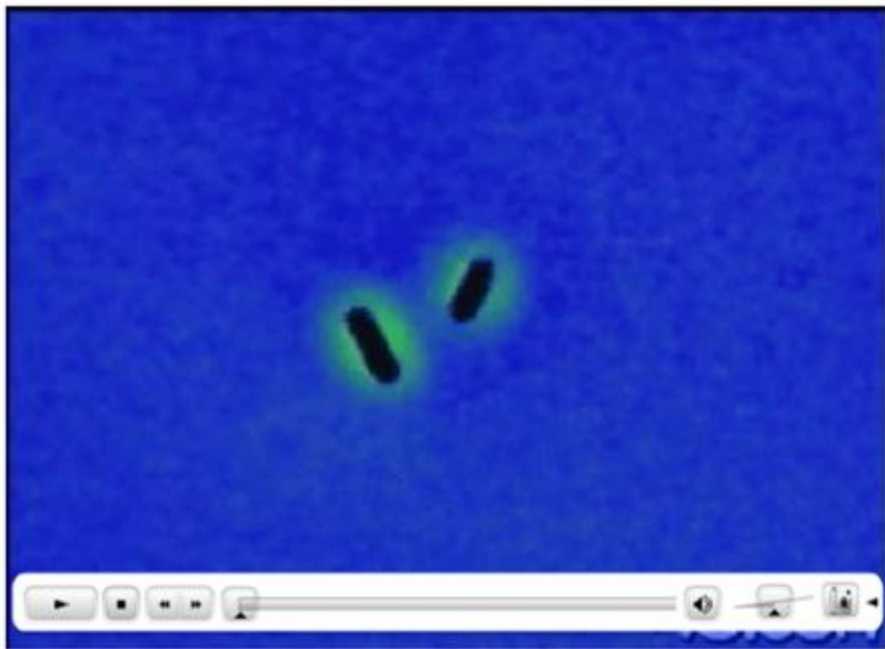
Prokaryotes reproduce by binary fission:

'two' 'splitting'

(This is much simpler than mitosis in eukaryotes)



The new cells are called **daughter cells**. They are **clones** because they contain identical sets of DNA.



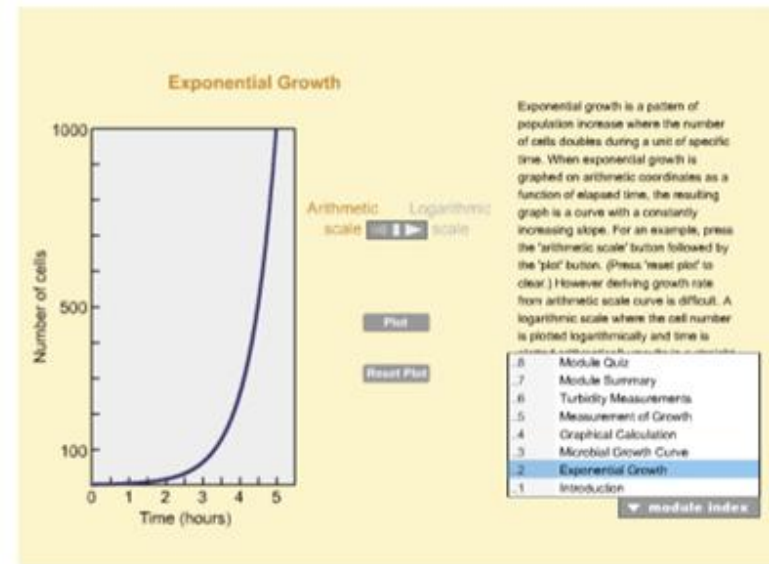
<http://www.youtube.com/watch?v=FcjAsTTN8qU>

Population growth by binary fission will be **exponential**: as time increases, the rate of growth of population increases (until there are no more resources for extra growth)

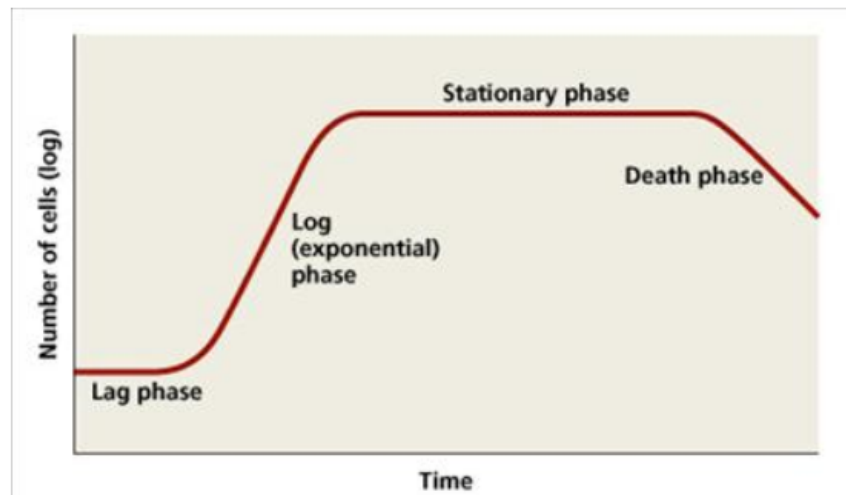
More bacterial cell division:



http://www.youtube.com/watch?v=zi8whUhp4_g



<http://www.umd.umich.edu/casl/natsci/microbio/Micro385/animations/PopGrowth.swf>

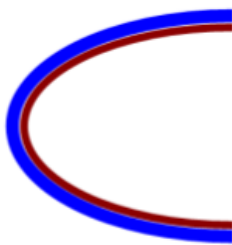


<http://faculty.ircc.edu/faculty/tfischer/micro%20resources.htm>

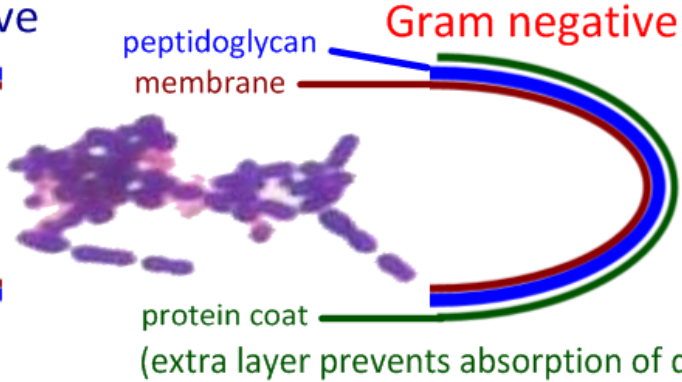
Because it's good to know: *What's gram-staining?*

Bacteria can be classified as either **gram-positive** or **gram-negative**. This refers to their ability to hold a purple stain and is used in culture to identify disease-causing bacteria.

Gram positive



Gram negative



protein coat
(extra layer prevents absorption of dye)

The Gram Stain:

An Animated Approach

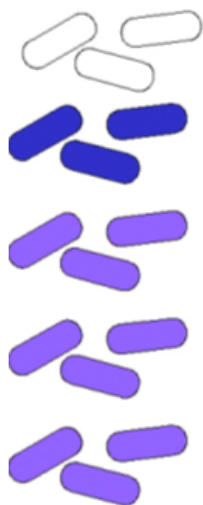
Danny Cavanaugh
Mark G. Keen, Ph.D.
Department of Microbiology
North Carolina State University

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<http://www.microbelibrary.org/microbelibrary/files/ccImages/Articleimages/keen/Gramstainkeen.htm>

Gram Positive



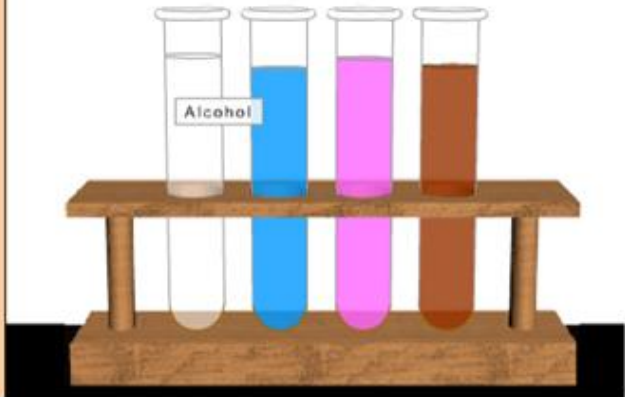
Gram Negative



Fixation
↓
Crystal violet
↓
Iodine treatment
↓
Decolorization
↓
Counter stain safranin

<http://pathmicro.med.sc.edu/fox/gram-st.jpg>

Now have a go at this:



http://vudat.msu.edu/fileadmin/user_upload/vudat/flash/gramstain.swf

[Extend Page](#)

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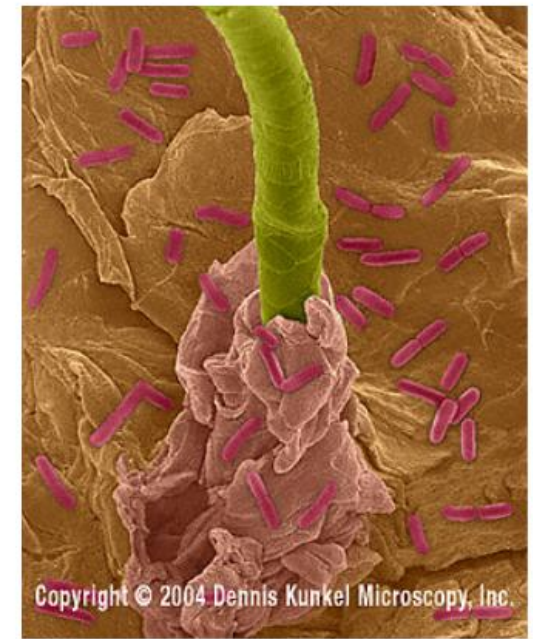
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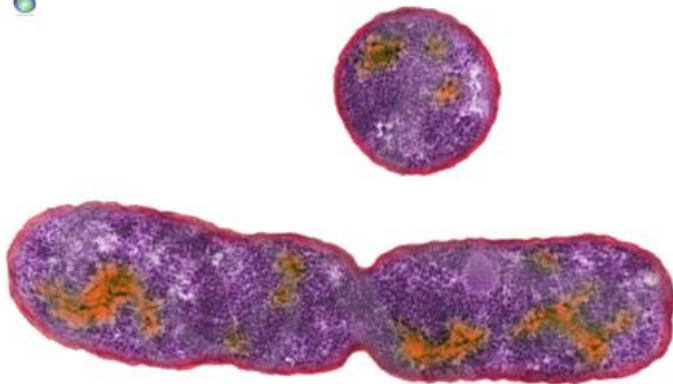
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<http://www.denniskunkel.com/index.php?cPath=3&sort=1a&page=1>

http://www.denniskunkel.com/product_info.php?products_id=946



2μm

<http://www.denniskunkel.com/index.php?cPath=3&sort=1a&page=2>

A bacterium walked into a restaurant.

"I'd like a pizza please," he said.



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"I'm sorry, we're not doing food today," the waiter replied.



"Why not?"

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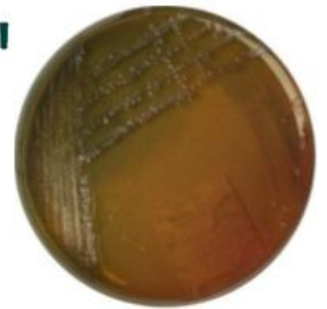


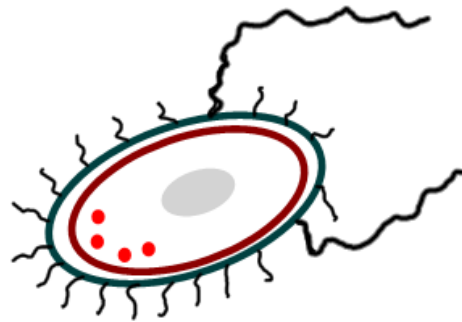
"I'm sorry, we're not doing food today," the waiter replied.



"Why not?"

"We don't have the staph."





for more help and animations visit:

<http://sciencevideos.wordpress.com>