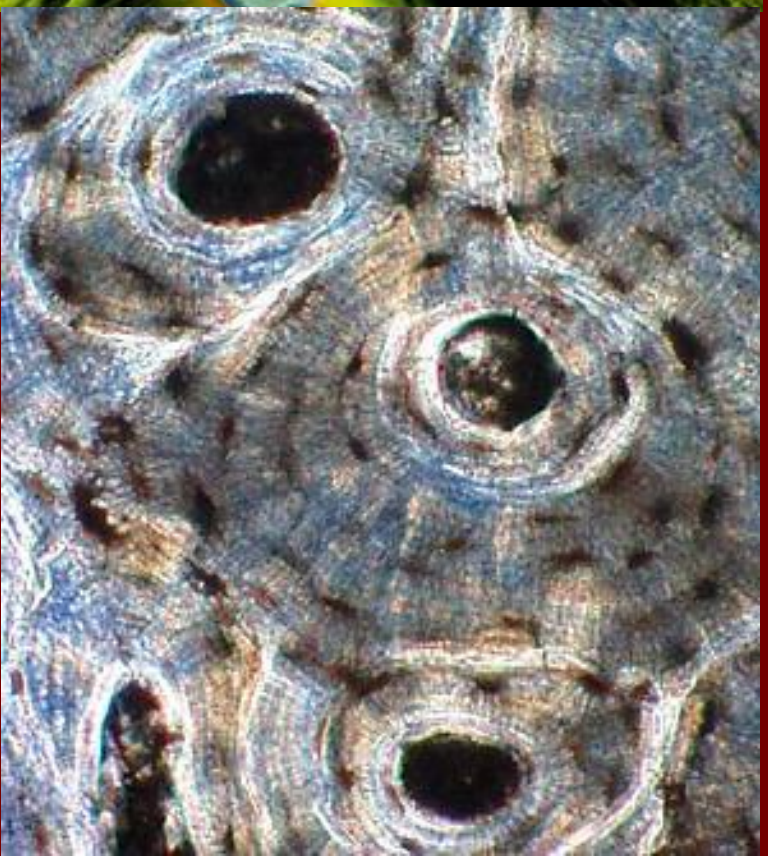
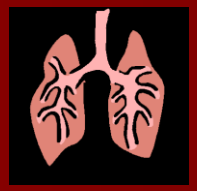
The biology of the skeleton



Bone is more complex than you might think!

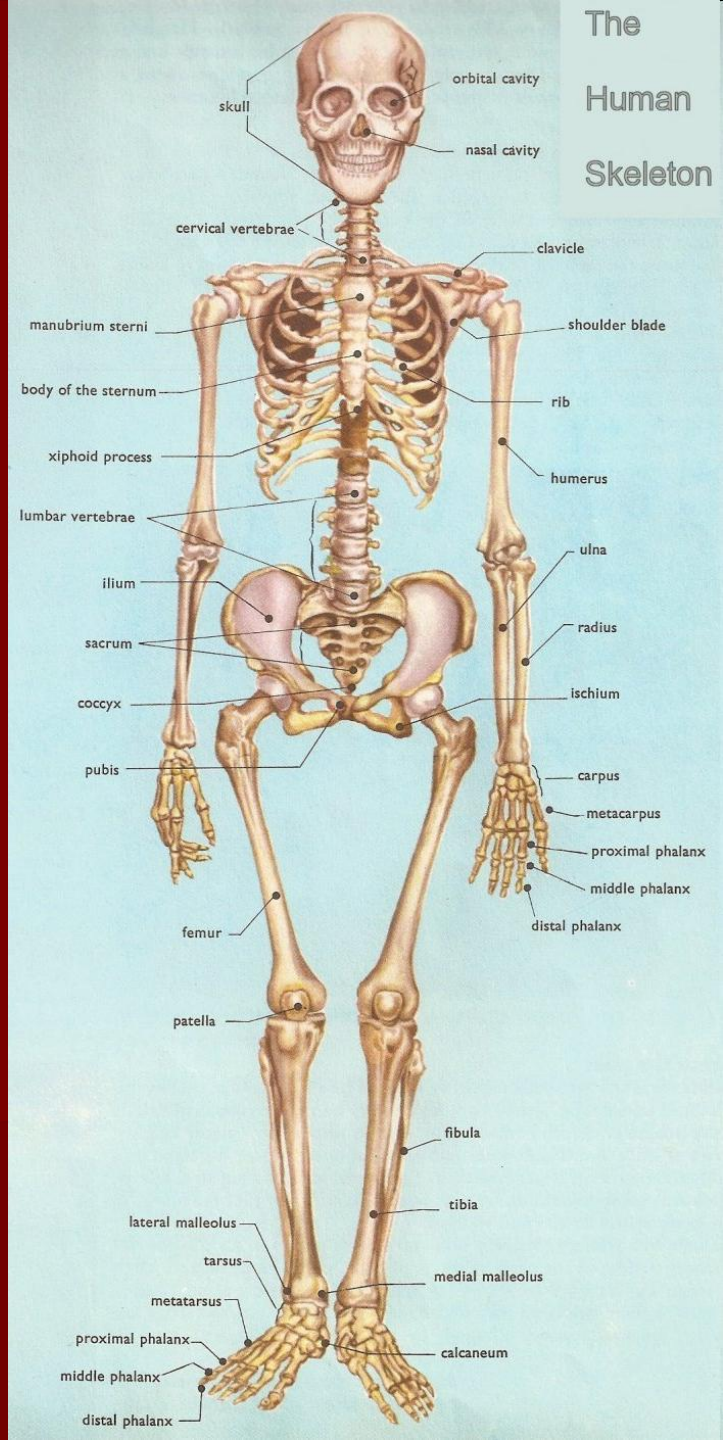
Some of the many functions of bone:

-Protection of organs 

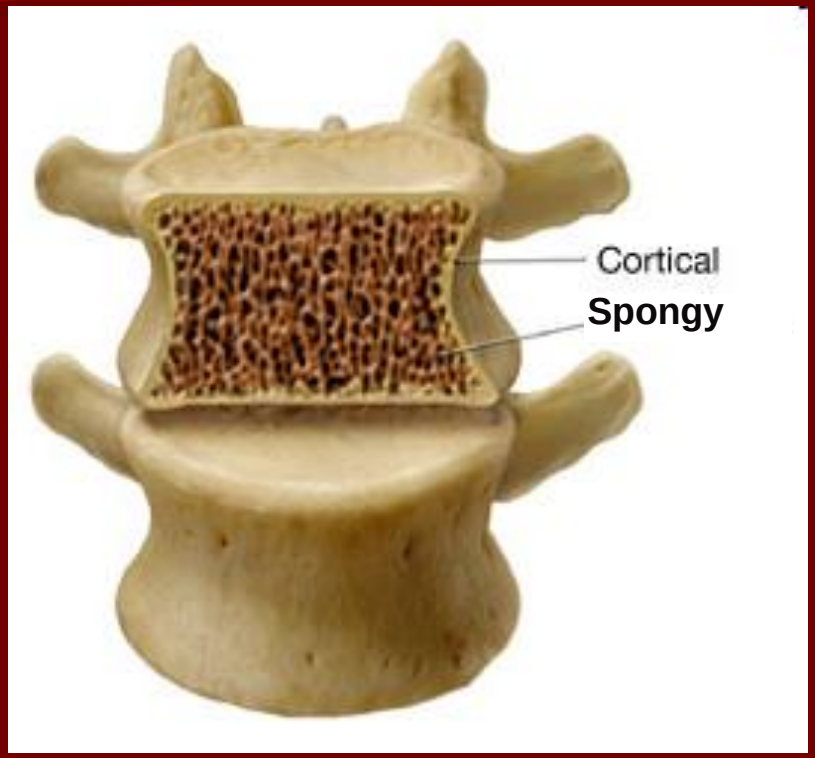
-Mineral storage 

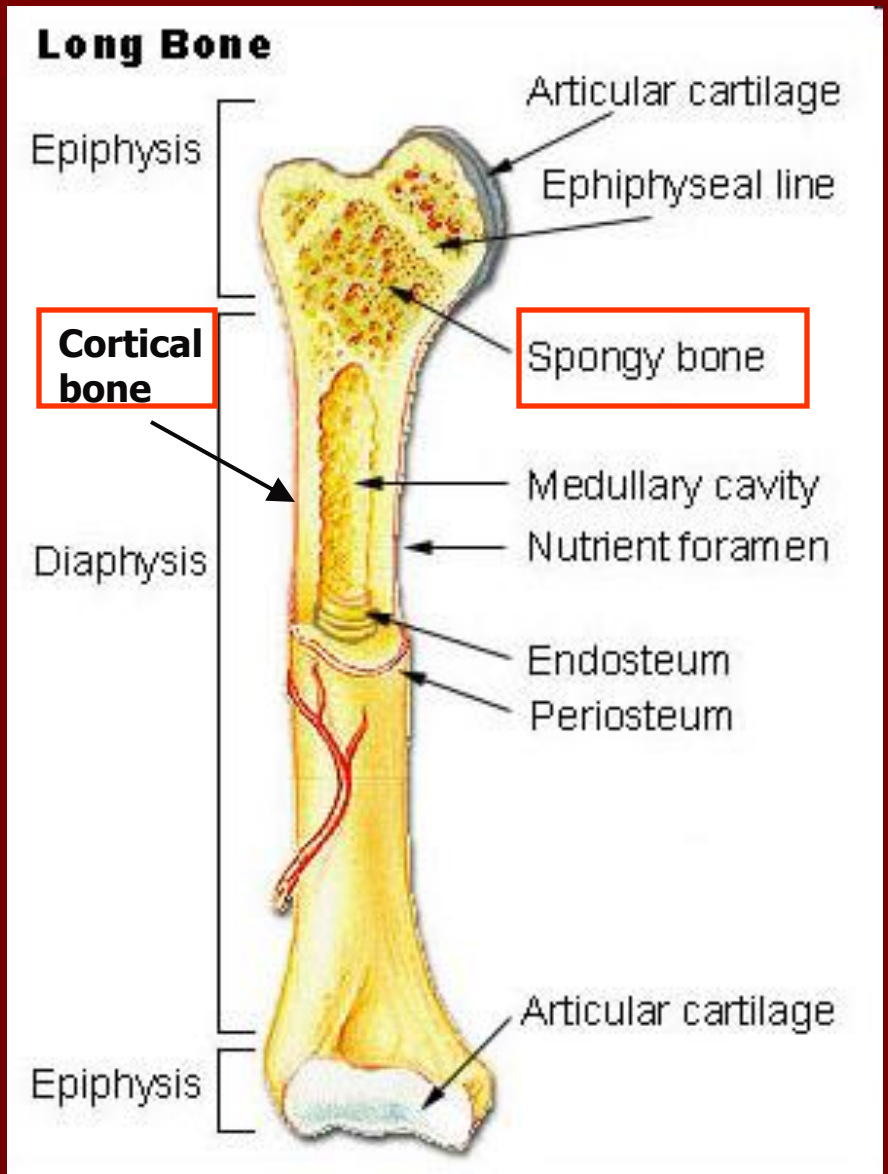
-Making red and white blood cells 

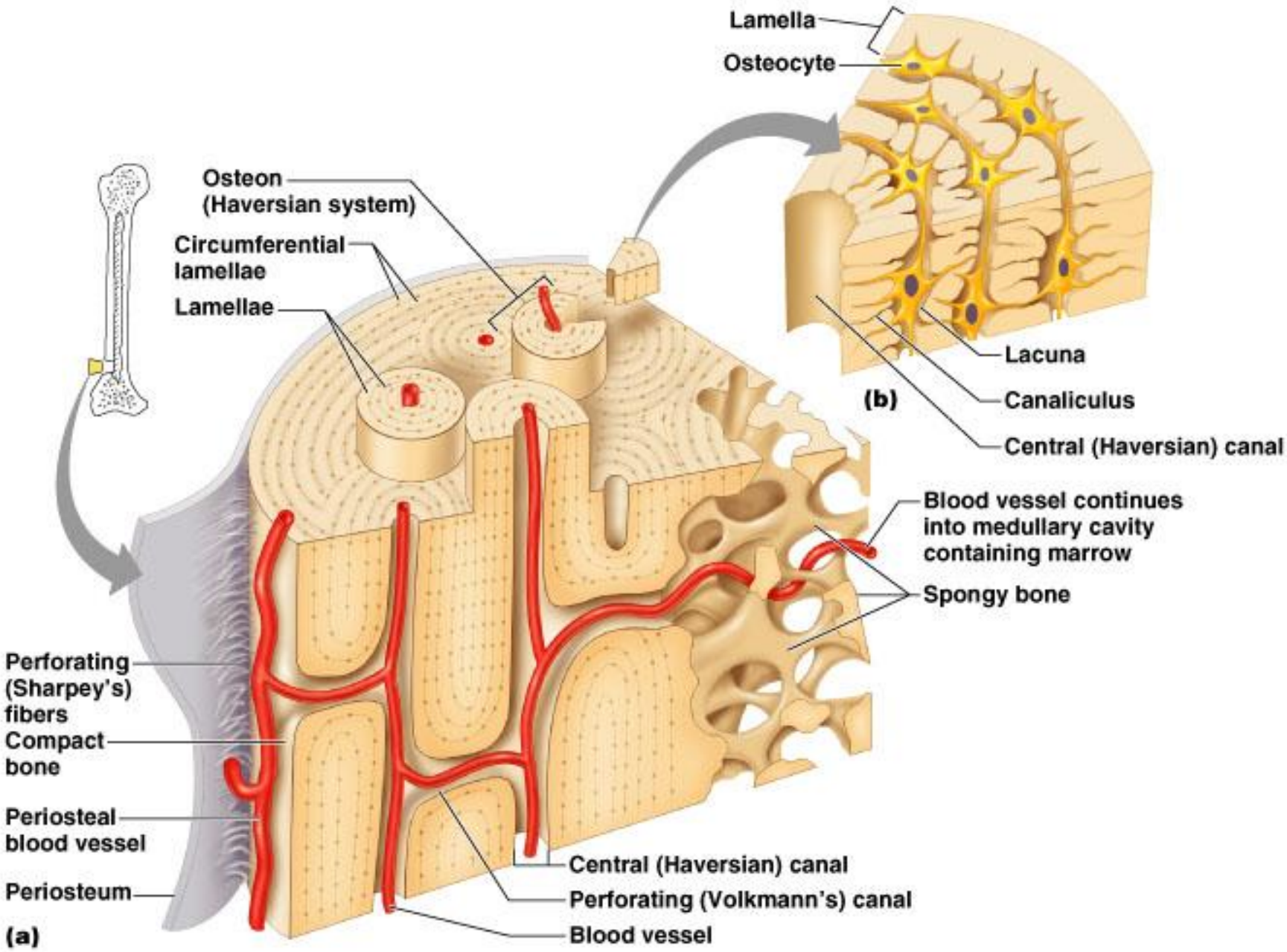
-MOVEMENT! 



What kinds of bone are there?






Lamella
Osteocyte
Osteon
(Haversian system)
Circumferential
lamellae
Lamellae
Lacuna
Canaliculus
(b)
Central (Haversian) canal
Blood vessel continues
into medullary cavity
containing marrow
Spongy bone
Perforating
(Sharpey's)
fibers
Compact
bone
Periosteal
blood vessel
Periosteum
(a)
Central (Haversian) canal
Perforating (Volkmann's) canal
Blood vessel

What is bone made of?

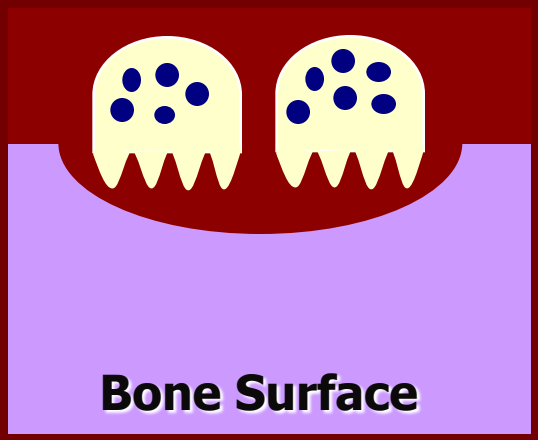
- Mineral (calcium phosphate)
- Organic molecules (like type I collagen)
- **CELLS**
  - **Osteoblasts**
  - **Osteoclasts**
  - **Osteocytes**

Bone cells

- "Osteo" means "bone" in Greek
- Bone cells are responsible for forming and remodeling your skeleton

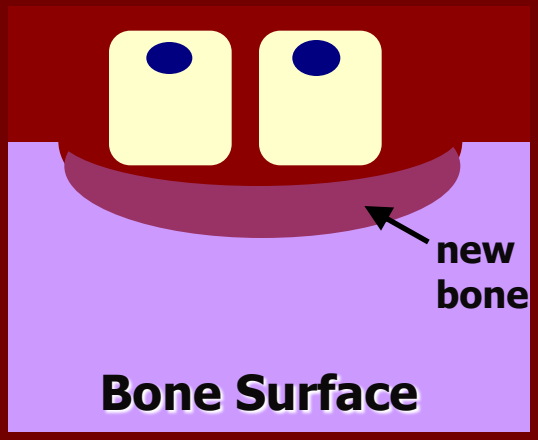
Osteoclasts

Bone eating cells



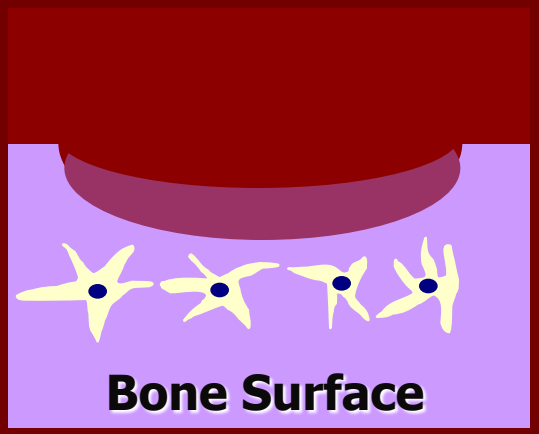
Osteoblasts

Bone forming cells



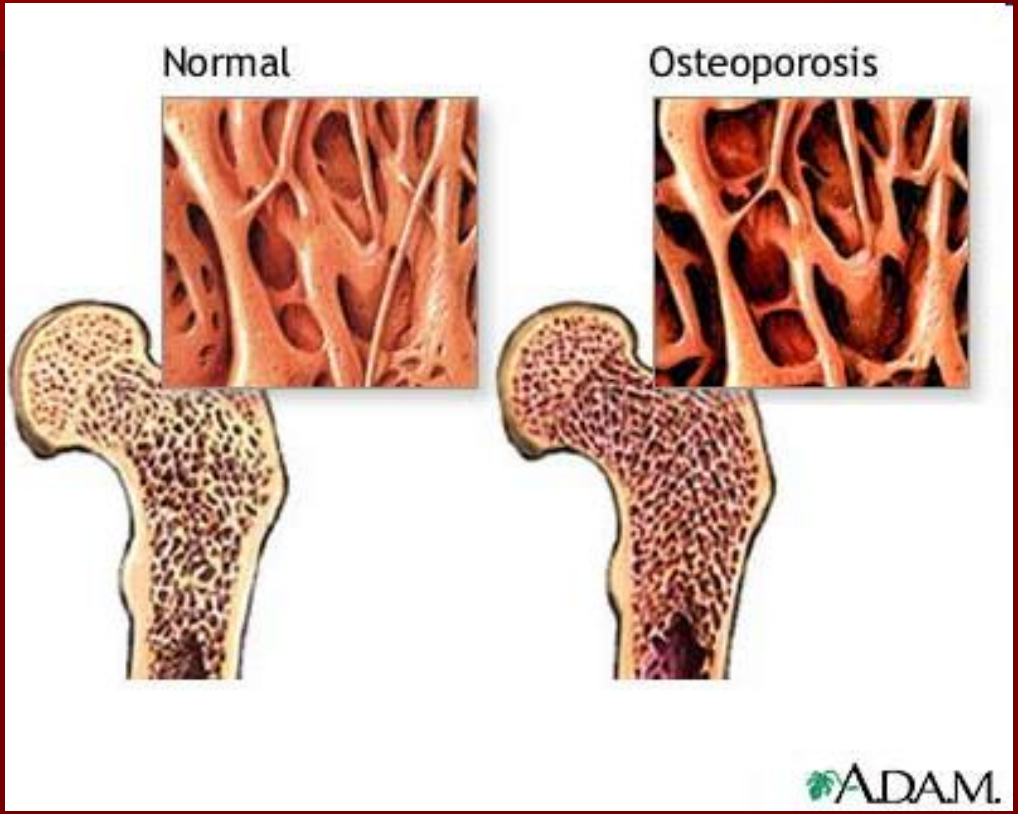
Osteocytes

Osteoblasts that became trapped in the newly made bone.



Your bones require MECHANICAL LOAD to stay strong

What happens when your bones AREN'T strong?



- Osteoclasts are doing more work than osteoblasts!
- The osteoclasts are breaking down more bone than osteoblasts are making.

Bone resorption > Bone formation

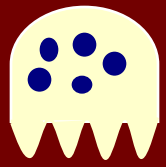
BONE LOSS!!!

How can we FIX osteoporosis?

Bone resorption > Bone Formation

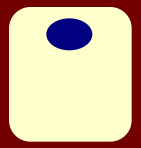
↑

BONE LOSS → Osteoporosis!



osteoclast

Bone resorption < Bone Formation



osteoblast

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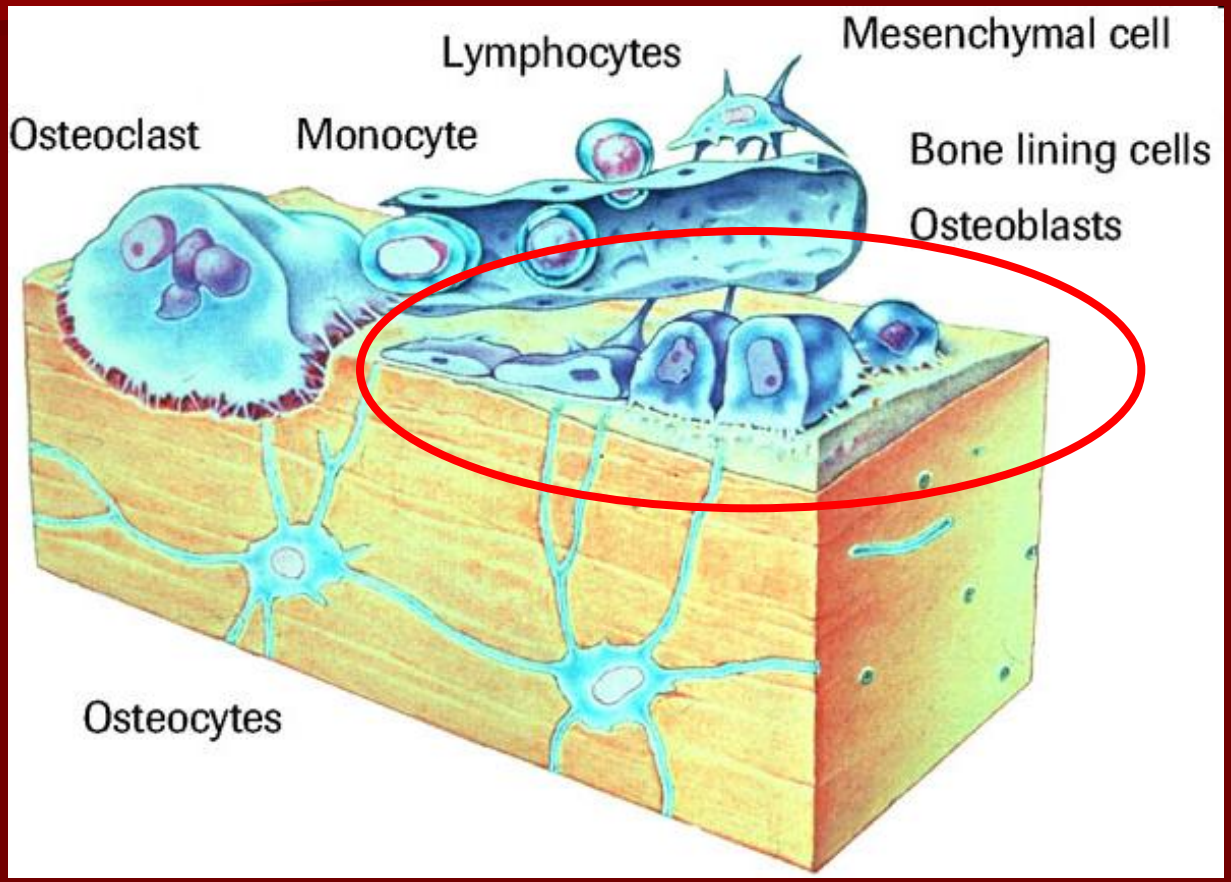
BONE GAIN

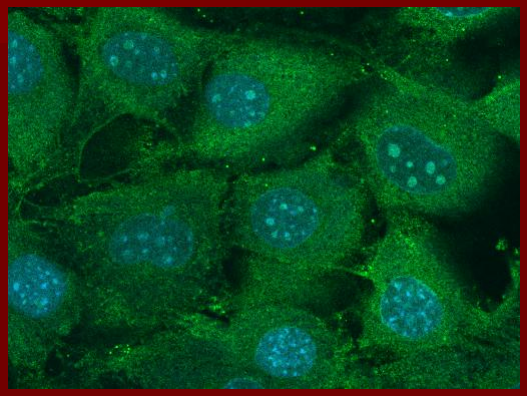
Does the behavior of cells in the bone change depending on what surrounds it?



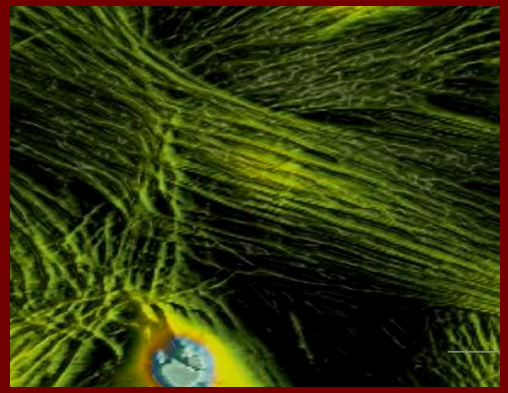
Can we force osteoblasts to make **MORE BONE** by changing the surroundings of the cell?

Techniques I use…

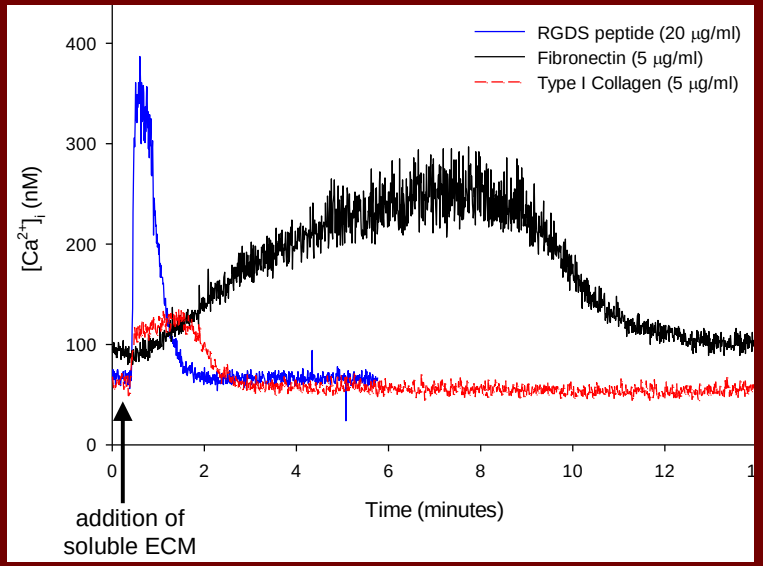
- Cell culture
- Microscopy
  - Atomic Force Microscopy
  - Confocal Microscopy
- Calcium imaging
- Reporter assays



Confocal Microscopy



AFM



Calcium Imaging