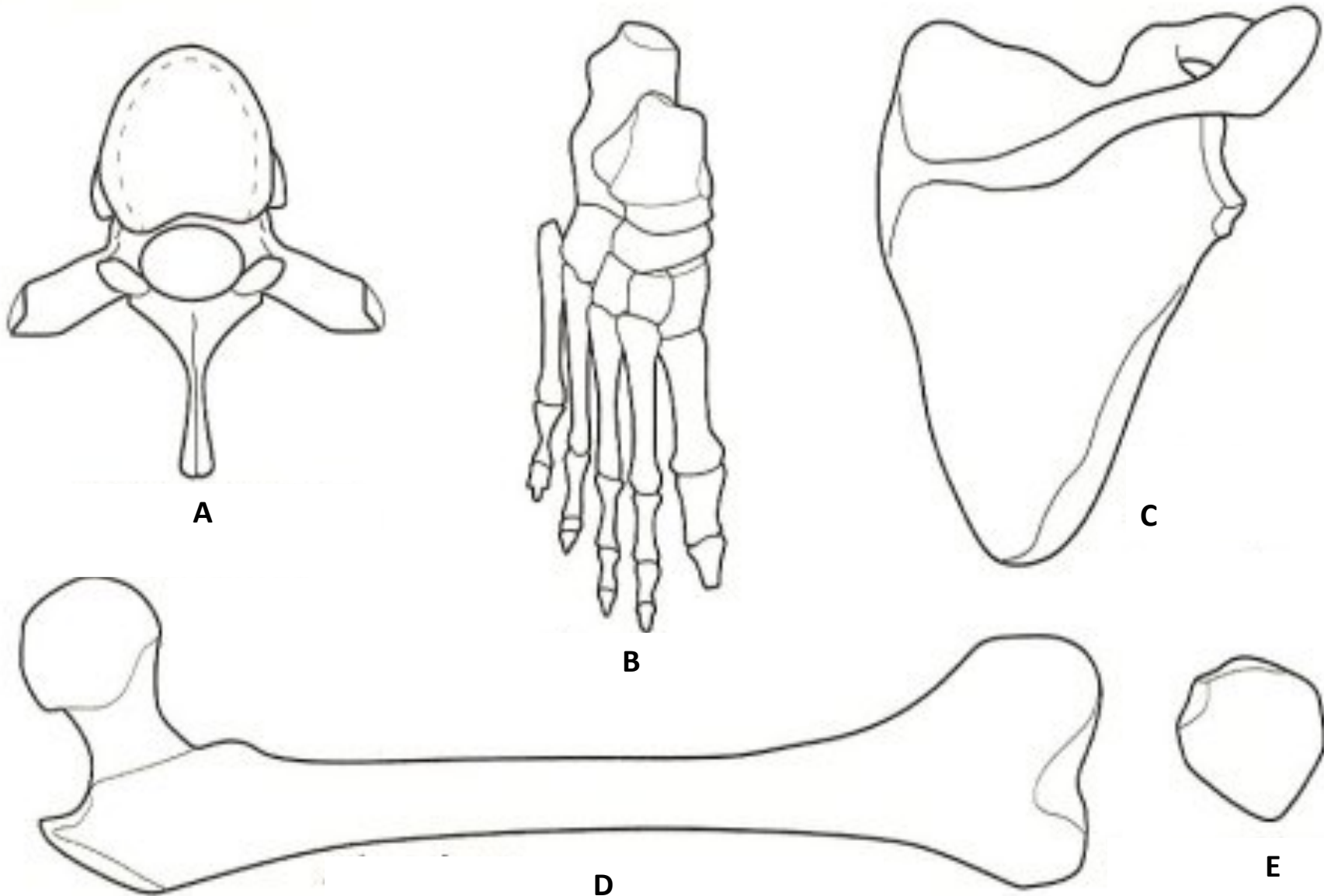
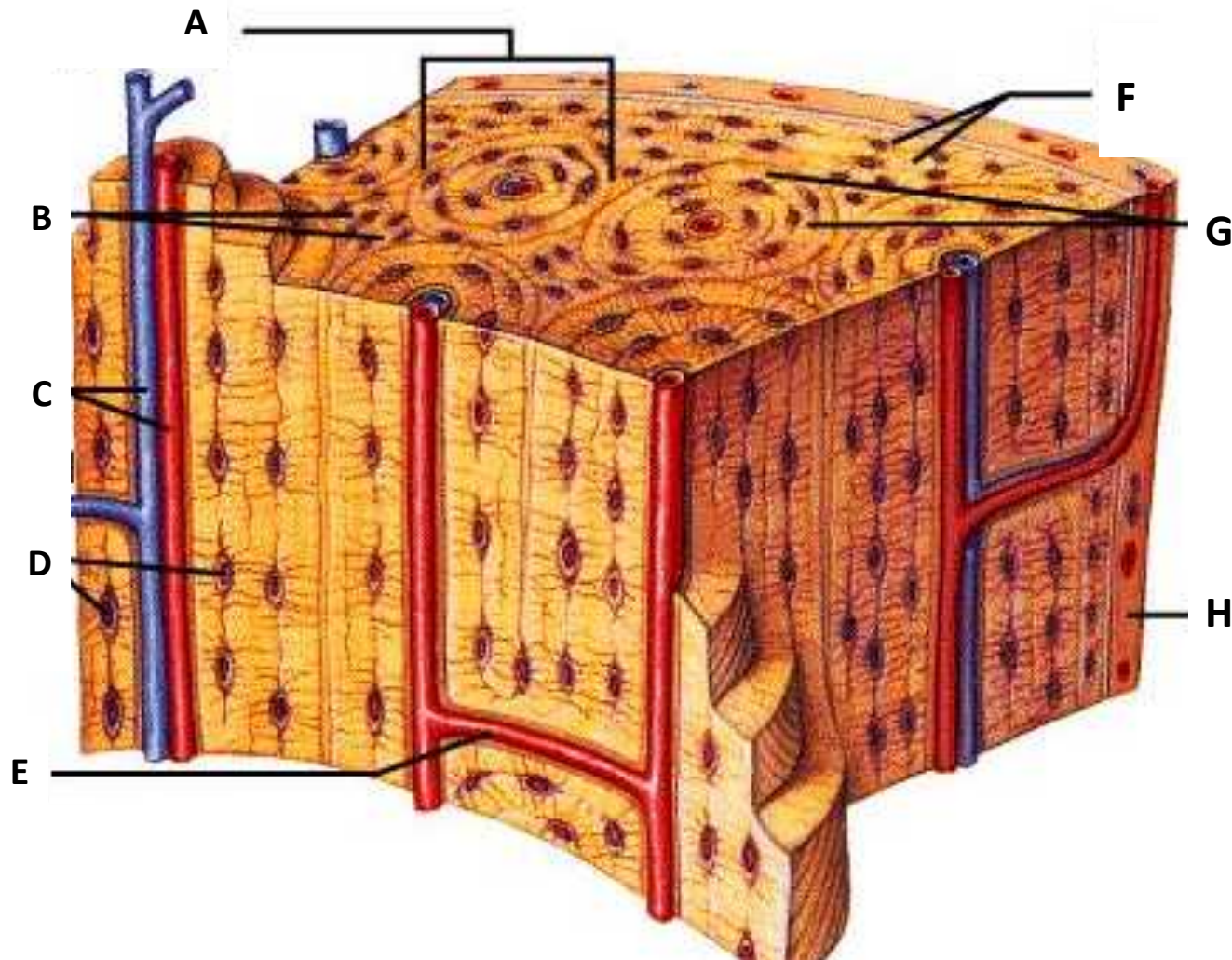


# STATION 1: BONE TYPES

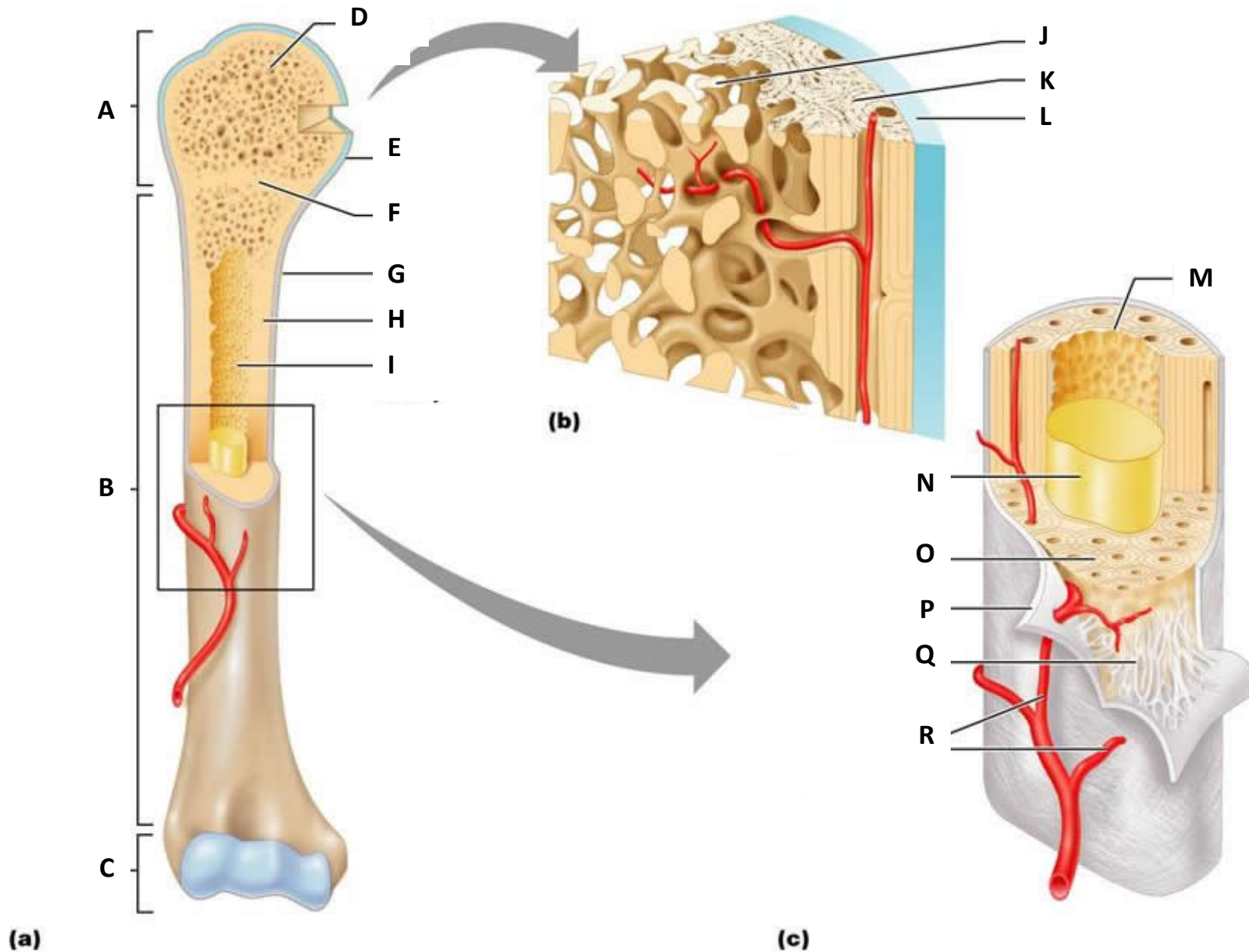


# STATION 1: COMPACT BONE

## Compact Bone

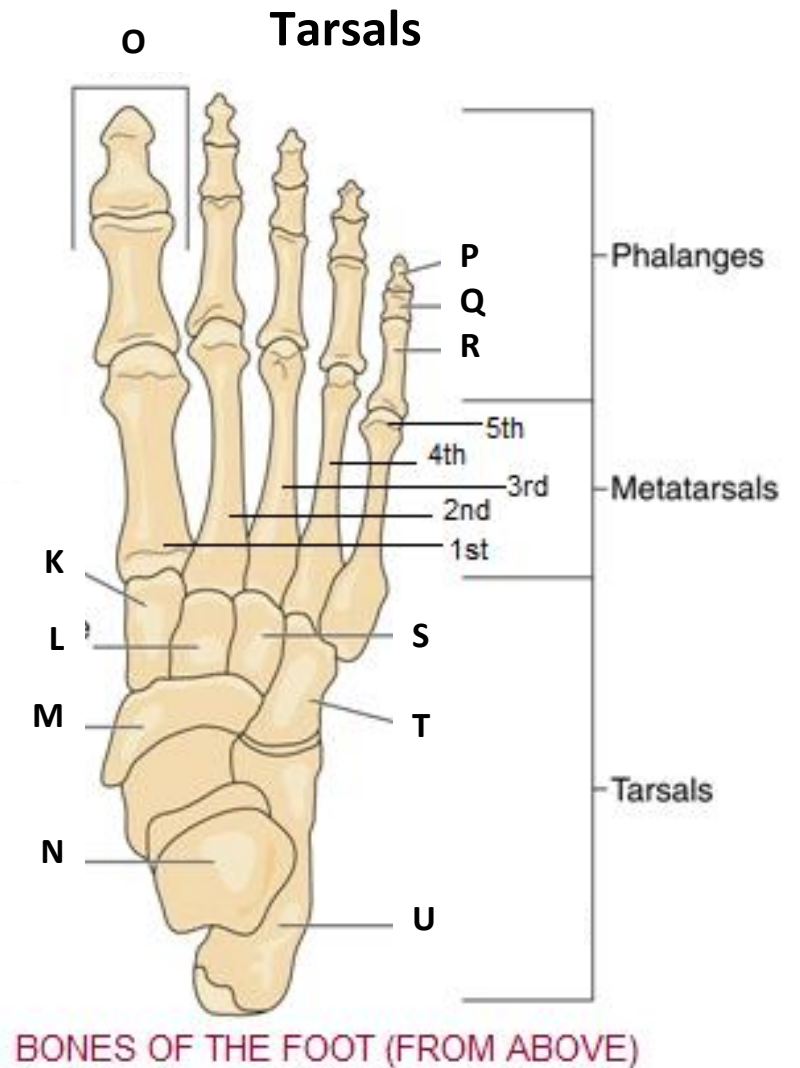
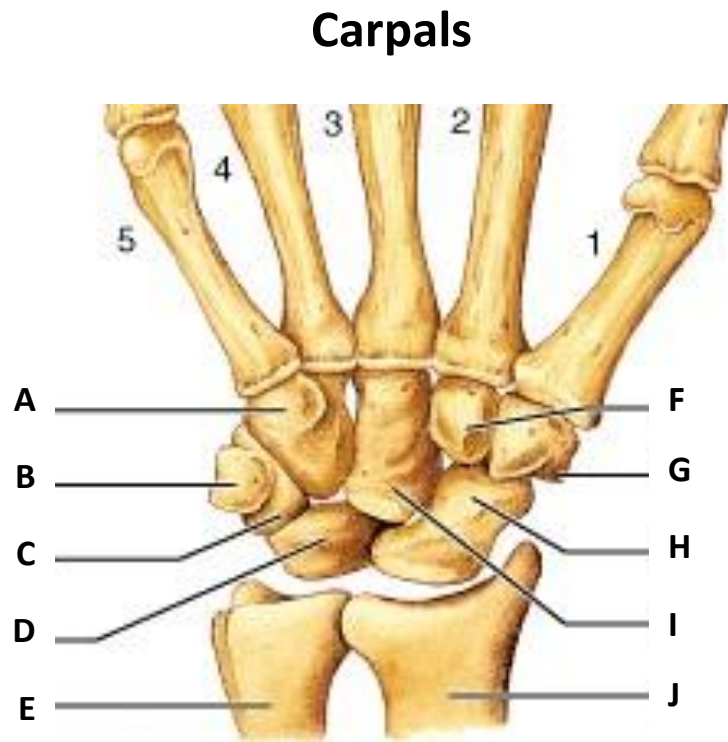


# STATION 1: LONG BONE STRUCTURE



<http://classes.midlandstech.edu/carterp/Courses/bio210/chap06/Slide3.JPG>

# STATION 1: CARPALS AND TARSAALS

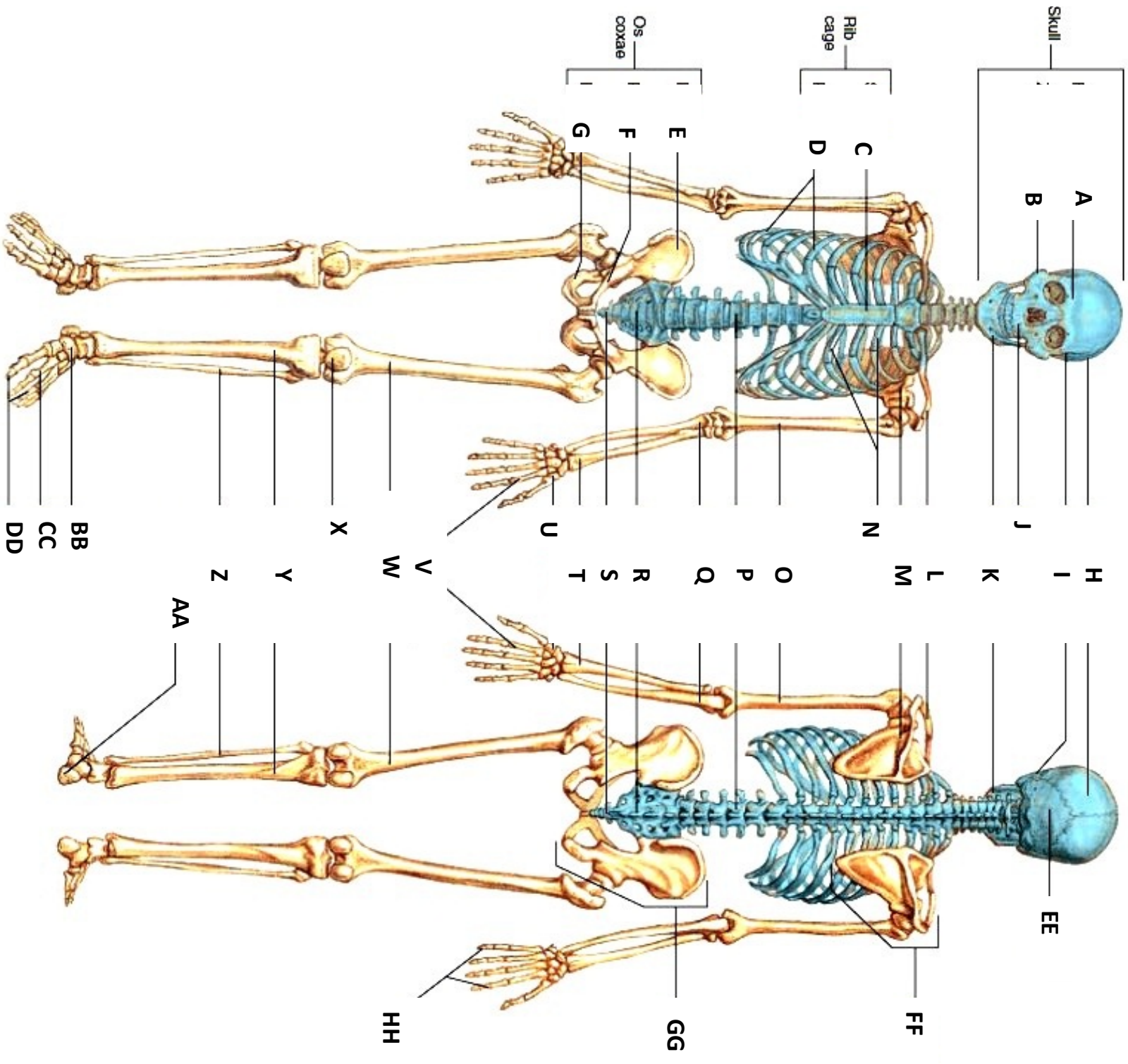


[http://www.joint-pain-expert.net/images/foot\\_bones\\_dorsal3.jpg](http://www.joint-pain-expert.net/images/foot_bones_dorsal3.jpg)

<http://classconnection.s3.amazonaws.com/50/flashcards/669050/jpg/carpals1320510905151.jpg>



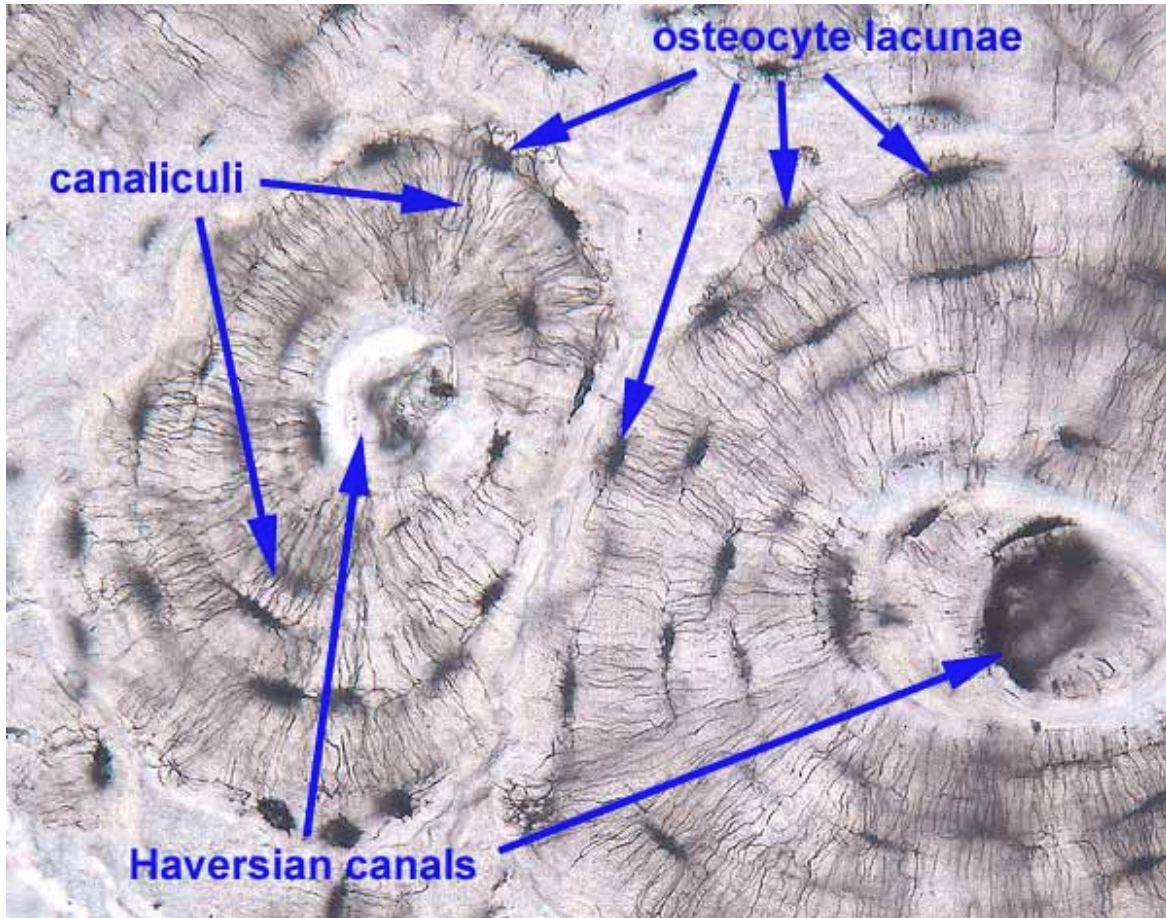
# STATION 1: THE SKELETON



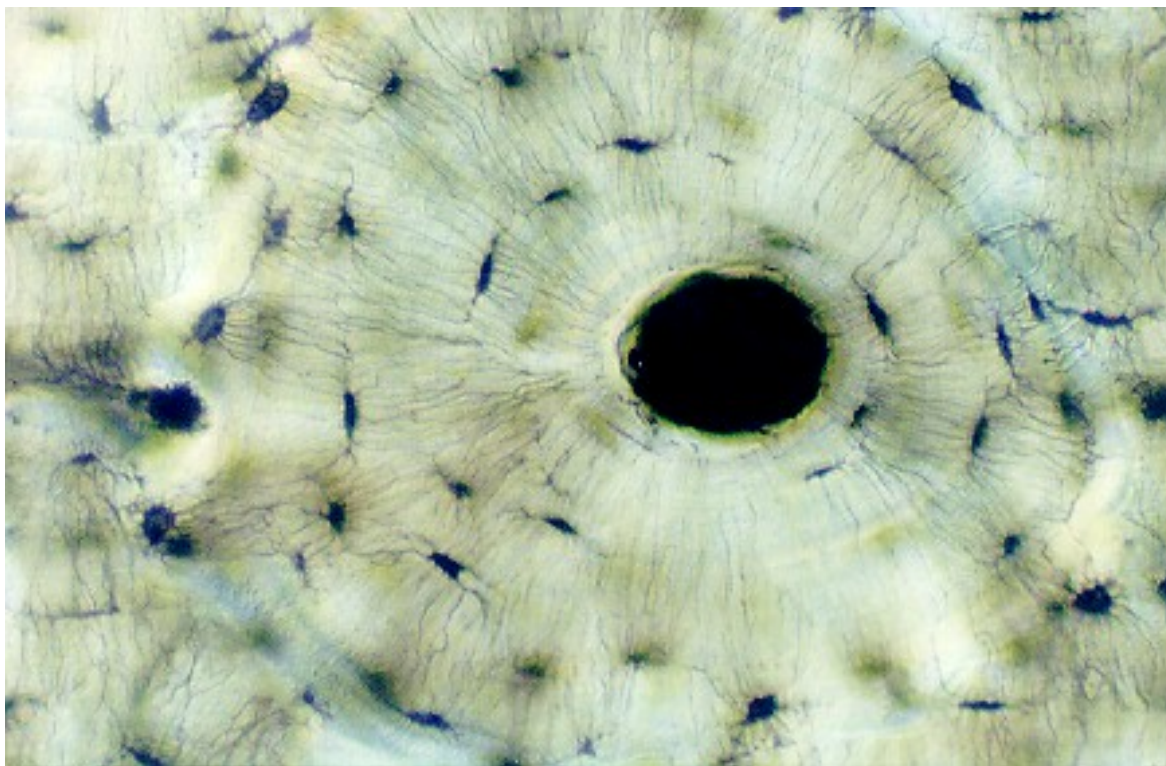


# STATION 3: COMPACT BONE

**A**



**B**



<http://www.siumed.edu/~dking2/ssb/images/NM036b.jpg>  
<http://legacy.owensboro.kctcs.edu/gcaplan/anat/histology/bone4.jpg>

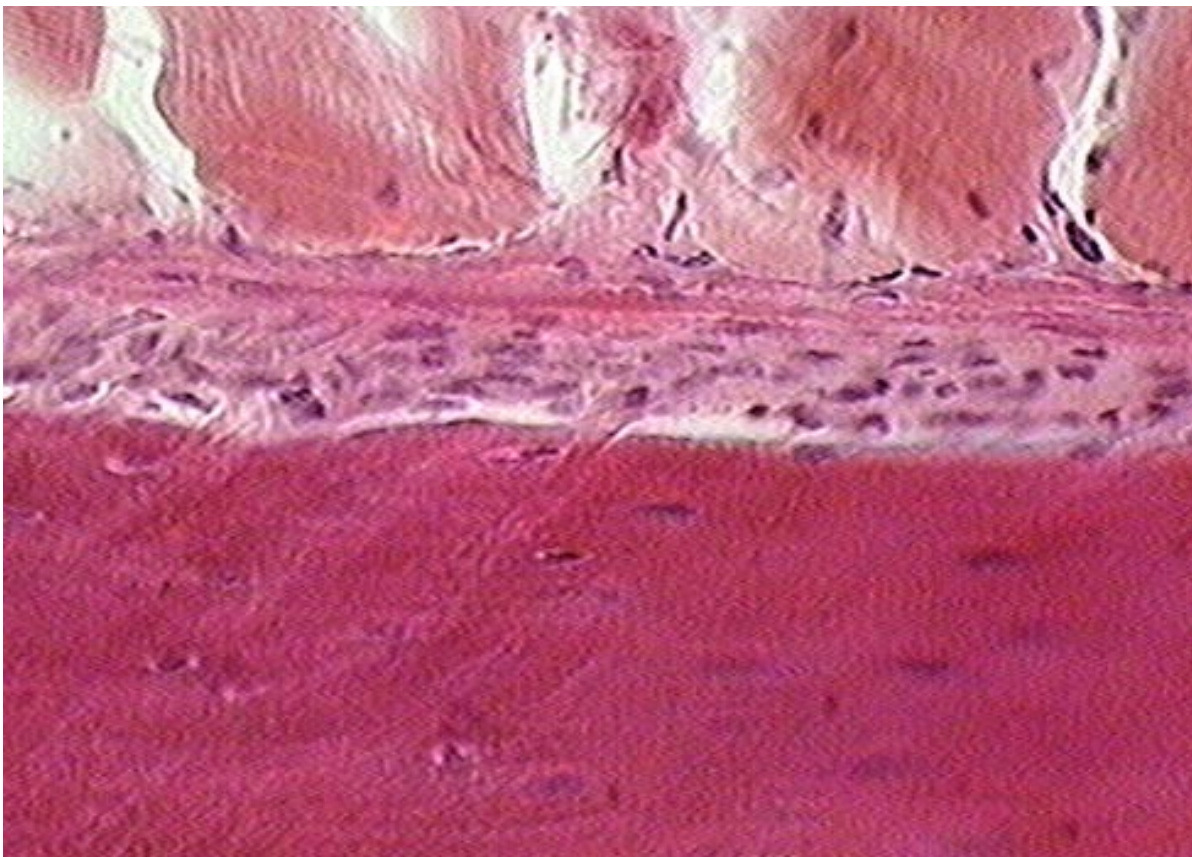


# STATION 3: PERIOSTEUM

**A**



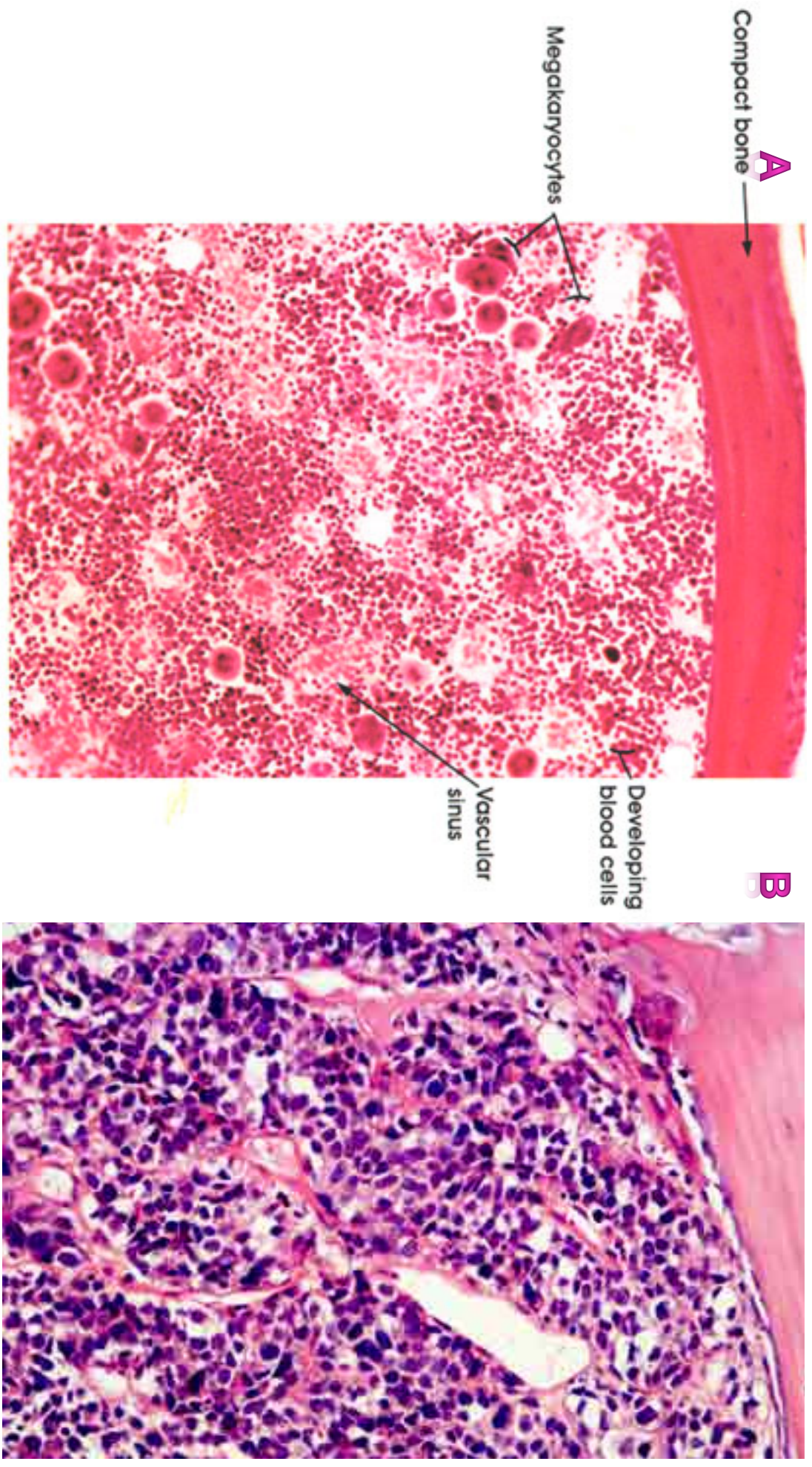
**B**



<http://www.lab.anhb.uwa.edu.au/mb140/corepages/bone/images/pos20he.jpg>  
<https://casweb.ou.edu/pbell/histology/Images/Slides/Bone/15.periost.sharpeys.40.2.jpg>



# STATION 3: RED BONE MARROW

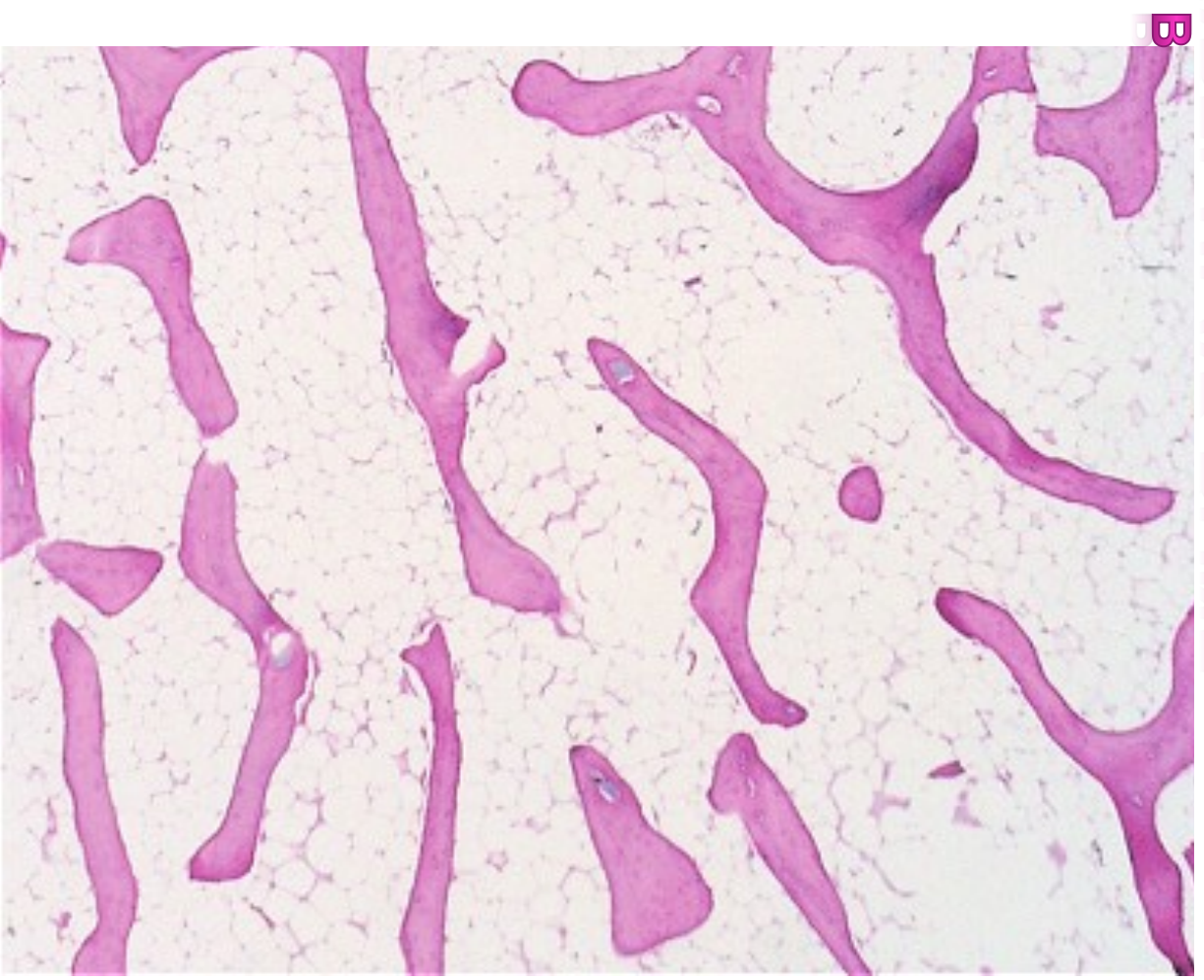


<http://www.anatomyatlases.org/MicroscopicAnatomy/Images/Plate56.jpg>

[http://www.pathology-student.com/image-files/bone\\_metastasesw.jpg](http://www.pathology-student.com/image-files/bone_metastasesw.jpg)



# STATION 3: TRABECULAR BONE

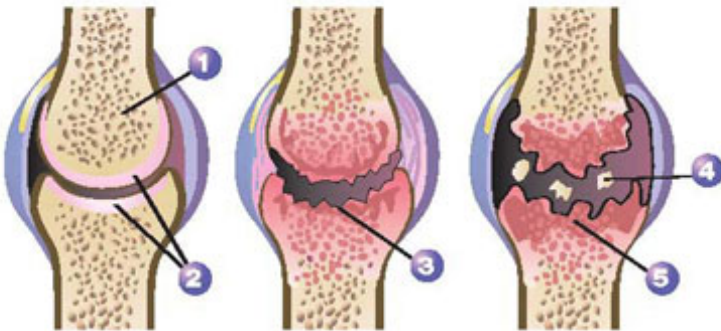


# Station 5: Osteoarthritis

Protective cartilage at ends of bones wears down

Causes & Risk Factors	Symptoms	Treatment Options
<ul style="list-style-type: none"> <li>• Older age</li> <li>• More common in females</li> <li>• Bone deformities</li> <li>• Joint injuries</li> <li>• Obesity</li> <li>• Repetitive joint stress</li> <li>• Sedentary lifestyle</li> <li>• Related bone disease</li> </ul>	<ul style="list-style-type: none"> <li>• Tenderness</li> <li>• Pain</li> <li>• Stiffness</li> <li>• Grating sensation</li> <li>• Bone spurs</li> <li>• Loss of flexibility</li> </ul>	<ul style="list-style-type: none"> <li>• Over-the-counter medication</li> <li>• Prescriptions</li> <li>• Physical therapy</li> <li>• Splints and/or braces</li> <li>• Cortisone injections</li> <li>• Surgery</li> </ul>

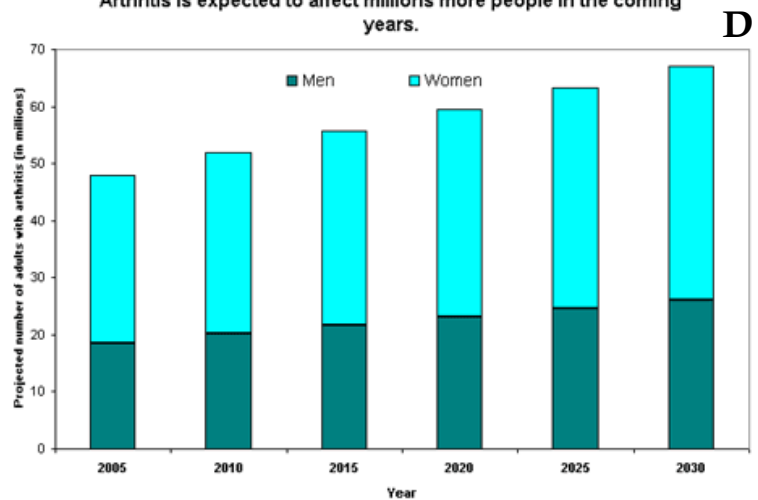
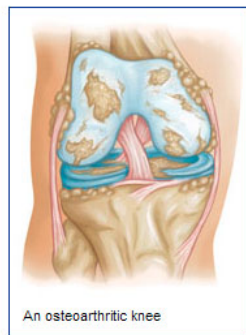
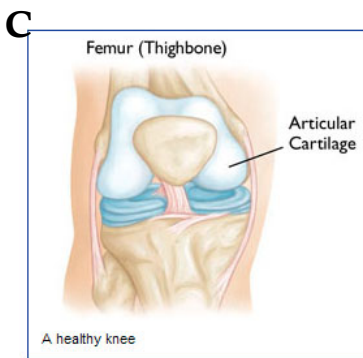
## A Evolution of Osteoarthritis



1. Bone
2. Cartilage
3. Thinning of cartilage
4. Cartilage remnants
5. Destruction of cartilage



Arthritis is expected to affect millions more people in the coming years.



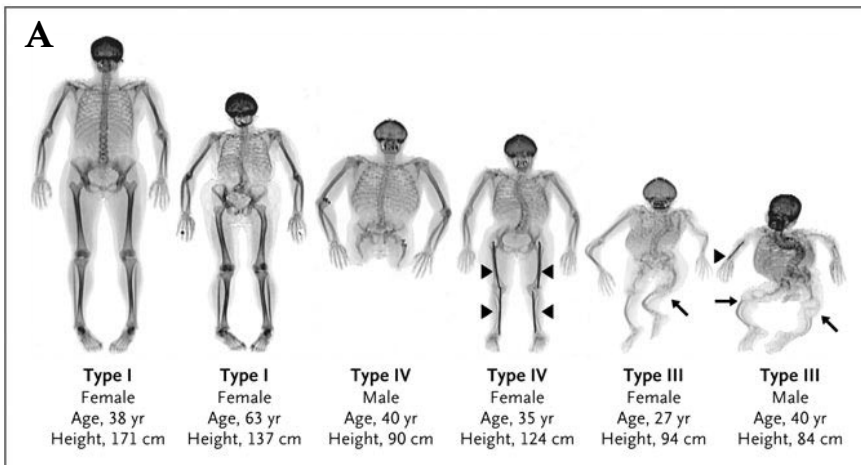
- A. <http://drjaygoldstein.com/wp-content/uploads/2012/12/osteoarthritis.jpg>  
 B. [http://www.cedars-sinai.edu/Patients/Health-Conditions/Images/354023\\_Osteoarthritis\\_.jpg](http://www.cedars-sinai.edu/Patients/Health-Conditions/Images/354023_Osteoarthritis_.jpg)  
 C. [http://orthosurg.ucsf.edu/wp-content/uploads/2011/08/knee\\_osteoarthritis.jpg](http://orthosurg.ucsf.edu/wp-content/uploads/2011/08/knee_osteoarthritis.jpg)  
 D. [http://www.cdc.gov/arthritis/images/nhis\\_figure1.gif](http://www.cdc.gov/arthritis/images/nhis_figure1.gif)



# Station 5: Osteogenesis Imperfecta

A genetic disorder that causes brittle bones

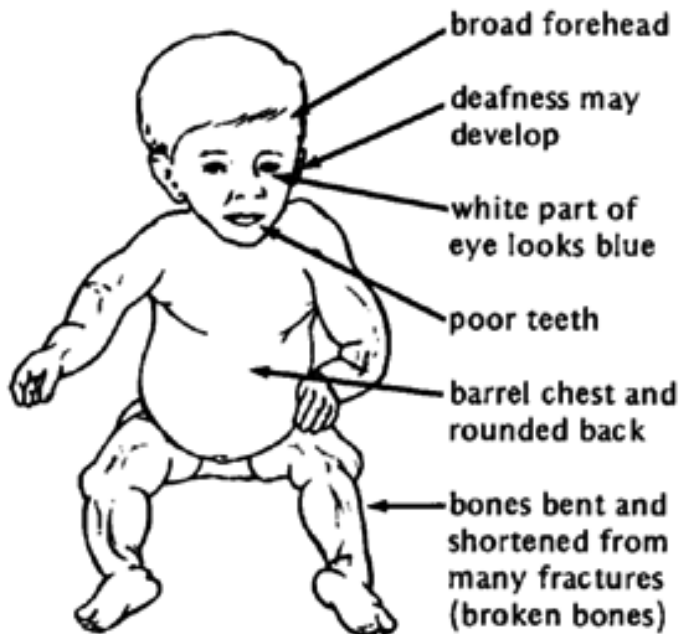
Causes & Risk Factors	Symptoms	Treatment Options
<ul style="list-style-type: none"> <li>• Congenital mutation</li> <li>• Frequent fractures</li> <li>• Bone bowing seen in fetal ultrasound</li> <li>• Easily bruised</li> <li>• deafness</li> </ul>	<ul style="list-style-type: none"> <li>• Easily fractured bones</li> <li>• Blue sclera</li> <li>• Muscle weakness</li> <li>• Hearing loss</li> <li>• Micrognathia</li> <li>• Limb deformity &amp; shortening</li> </ul>	<ul style="list-style-type: none"> <li>• Uncurable</li> <li>• Prescription medication to increase bone density</li> <li>• Improved nutrition</li> <li>• Bone marrow transplant</li> </ul>



3-4. Clinical Heterogeneity and Biochemical Defects in Osteogenesis Imperfecta (OI)

C

## SIGNS OF BRITTLE BONE DISEASE



D

OI type	Clinical features	Inheritance	Biochemical defects
I	Normal stature, little or no deformity, blue sclerae, hearing loss in about 50% of individuals. Dentinogenesis imperfecta is rare and may distinguish a subset	AD	Decreased production of type I procollagen. Substitution for residue other than glycine in triple-helix of $\alpha_1(I)$
II	Lethal in the perinatal period, minimal calvarial mineralization, beaded ribs, compressed femurs, marked long bone deformity, platyspondyly	AD (new mutation) AR (rare)	Rearrangements in the COLA1 and COLA2 genes. Substitutions for glycol residues in the triple-helical domain of the $\alpha_1(I)$ or $\alpha_2(I)$ chain. Small deletion in $\alpha_1(I)$ on the background of a null allele
III	Progressively deforming bones, usually with moderate deformity at birth. Sclerae variable in hue, often lighten with age. Dentinogenesis imperfecta is common, hearing loss is common. Stature very short	AD AR	Point mutations in the $\alpha_1(I)$ or $\alpha_2(I)$ chain. Frameshift mutation that prevents incorporation of pro $\alpha_1(I)$ into molecules (noncollagenous defects)
IV	Normal sclerae, mild to moderate bone deformity, and variable short stature. Dentinogenesis imperfecta is common, and hearing loss occurs in some	AD	Point mutations in the $\alpha_1(I)$ chain. Rarely point mutations in the $\alpha_2(I)$ chain. Small deletions in the $\alpha_1(I)$ chain

AD, autosomal dominant; AR, autosomal recessive.

A. [http://www.nejm.org/na102/home/ACS/publisher/mms/journals/content/nejm/2006/nejm\\_2006.355.issue-26/nejmicm062996/production/images/large/nejmicm062996\\_f1.jpeg](http://www.nejm.org/na102/home/ACS/publisher/mms/journals/content/nejm/2006/nejm_2006.355.issue-26/nejmicm062996/production/images/large/nejmicm062996_f1.jpeg)

B. <http://orthoinfo.aaos.org/figures/A00051F01.jpg>

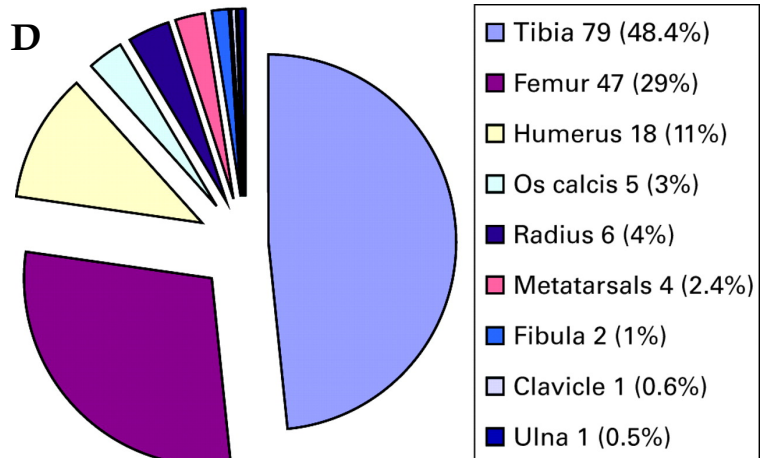
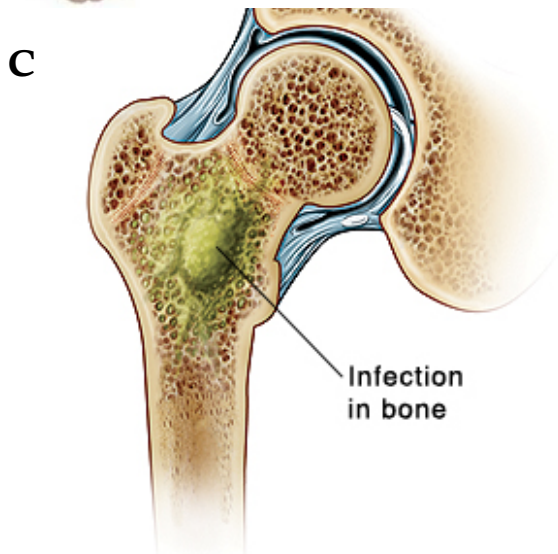
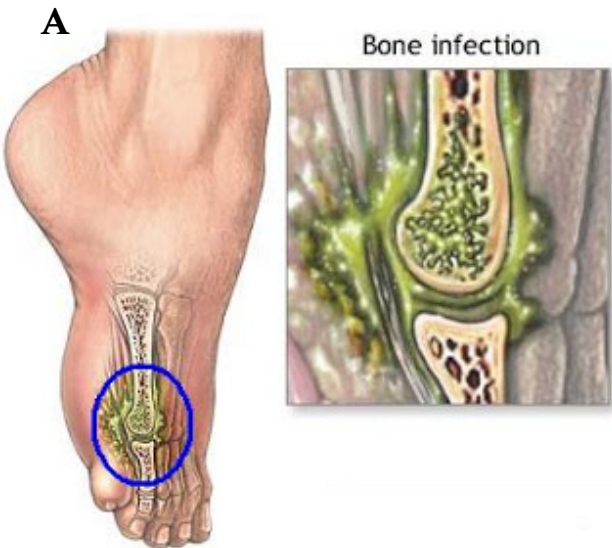
C. <http://www.dinf.ne.jp/doc/english/global/david/dwe002/dwe002g/dwe00215g02.gif>

D. <http://www.surgeongeneral.gov/library/reports/bonehealth/images/table3-4.gif>

# Station 5: Osteomyelitis

An infection in the bone

Causes & Risk Factors	Symptoms	Treatment Options
<ul style="list-style-type: none"> <li>Primarily <i>staphylococcus</i></li> <li>Bacteria travels from the bloodstream into bone</li> <li>From puncture infection</li> <li>Direct contamination</li> <li>Recent orthopedic surgery</li> <li>Circulatory disorders</li> <li>IV catheterization</li> </ul>	<ul style="list-style-type: none"> <li>Chills</li> <li>Fever</li> <li>Irritability</li> <li>Lethargic</li> <li>Pain at infection site</li> <li>Swelling</li> <li>Heat</li> <li>Redness</li> </ul>	<ul style="list-style-type: none"> <li>Antibiotics</li> <li>Surgical drainage</li> <li>Removal of diseased bone</li> <li>Restore blood flow to bone</li> <li>Amputation</li> <li>Hyperbaric oxygen treatment</li> </ul>



- A. <http://www.yarmouthhyperbaric.com/images/osteomyelitis.jpg>  
 B. [http://4.bp.blogspot.com/\\_1m\\_U2B0Z1C8/ScmFRZg7OqI/AAAAAAAAAu0/wX3Mt7qRBRk/s320/Osteomyelitis\\_foot.jpg](http://4.bp.blogspot.com/_1m_U2B0Z1C8/ScmFRZg7OqI/AAAAAAAAAu0/wX3Mt7qRBRk/s320/Osteomyelitis_foot.jpg)  
 C. <http://blackpoppyimg.files.wordpress.com/2011/01/osteomyelitis.jpg>  
 D. <http://www.bjj.boneandjoint.org.uk/content/92-B/8/1138/F4.large.jpg>



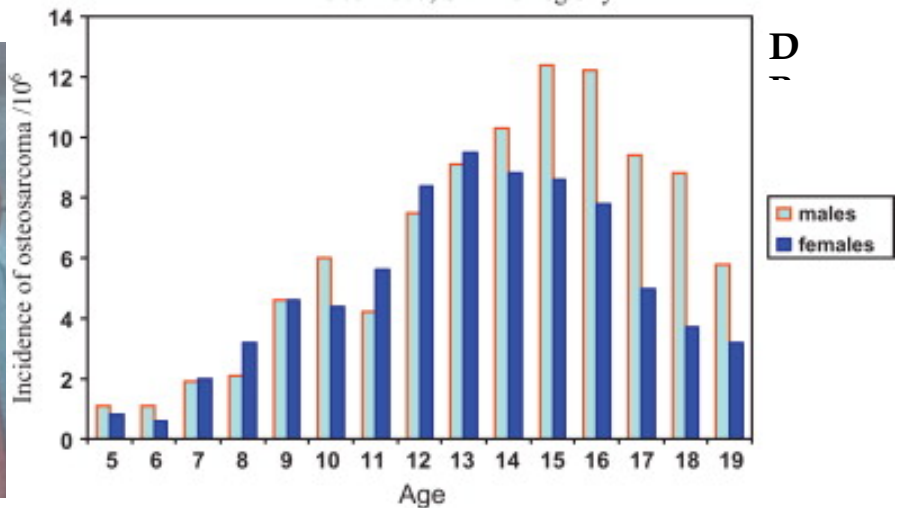
# Station 5: Osteosarcoma

## Malignant bone tumor

Causes & Risk Factors	Symptoms	Treatment Options
<ul style="list-style-type: none"> <li>• Age</li> <li>• Average age of diagnosis is 15 yrs. old</li> <li>• Heredity</li> <li>• Possible linkage to fluoridated water</li> <li>• Radiotherapy for unrelated conditions</li> </ul>	<ul style="list-style-type: none"> <li>• Bone fracture</li> <li>• Bone pain</li> <li>• Limited movement</li> <li>• Tenderness</li> <li>• Swelling</li> <li>• Redness</li> </ul>	<ul style="list-style-type: none"> <li>• Surgery</li> <li>• Chemotherapy</li> <li>• Radiation</li> <li>• Limb amputation</li> </ul>



Age and sex osteosarcoma age-specific incidence rates, cases diagnosed from 1973-2007, SEER 9 registry\*



\* Utah and Hawaii registries were excluded.

- A. <http://www.connectedkansaskids.com/images/osteosarcoma3.JPG>  
 B. <http://impioustdigest.com/osteosarcoma%20.jpg>  
 C. <http://www.physio-pedia.com/images/1/15/Image2.jpg>  
 D. <http://ars.els-cdn.com/content/image/1-s2.0-S1877782111001822-gr1.jpg>

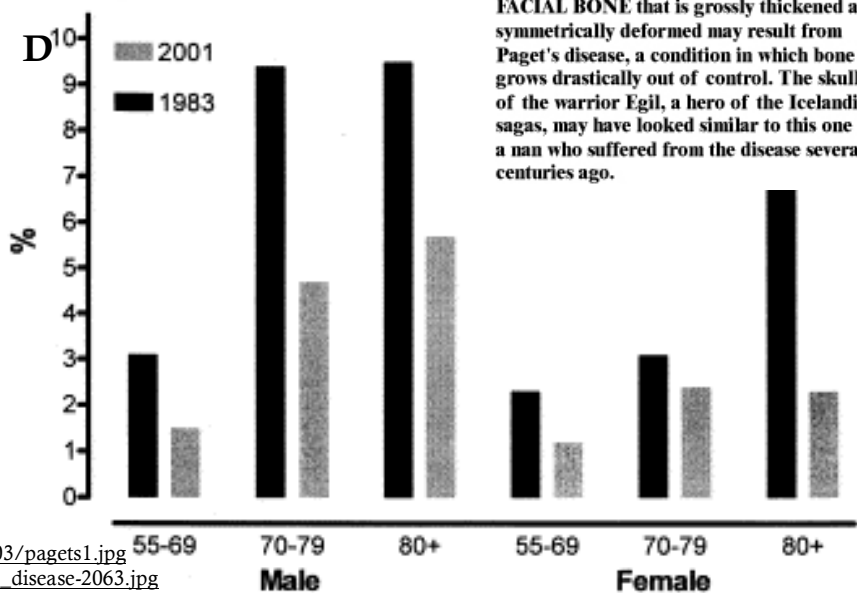
# Station 5: Paget's Disease

Metabolic bone disease affecting the break down and rebuilding of bone

Causes & Risk Factors	Symptoms	Treatment Options
<ul style="list-style-type: none"> <li>Exact cause is unknown</li> <li>Hereditary</li> <li>Possible viral infection</li> <li>Age – over 40</li> <li>Sex – men more common</li> </ul>	<ul style="list-style-type: none"> <li>Bone pain dependent on location</li> <li>Hip pain in pelvis</li> <li>Hearing loss or headaches in skull</li> <li>Tingling &amp; numbness in spine</li> <li>Bone deformity in legs or arms</li> </ul>	<ul style="list-style-type: none"> <li>Medications</li> <li>Surgery</li> <li>Joint replacement</li> <li>Realignment of bones</li> </ul>



**FACIAL BONE** that is grossly thickened and symmetrically deformed may result from Paget's disease, a condition in which bone grows drastically out of control. The skull of the warrior Egil, a hero of the Icelandic sagas, may have looked similar to this one of a man who suffered from the disease several centuries ago.



- A. <http://emedtravel.files.wordpress.com/2012/03/pagets1.jpg>
- B. [http://image.123tagged.com/images/p/pagets\\_disease-2063.jpg](http://image.123tagged.com/images/p/pagets_disease-2063.jpg)
- C. [http://www.viking.ucla.edu/Scientific\\_American/images/scan1.jpg](http://www.viking.ucla.edu/Scientific_American/images/scan1.jpg)
- D. <http://ars.els-cdn.com/content/image/1-s2.0-S8756328202008761-gr1.gif>