

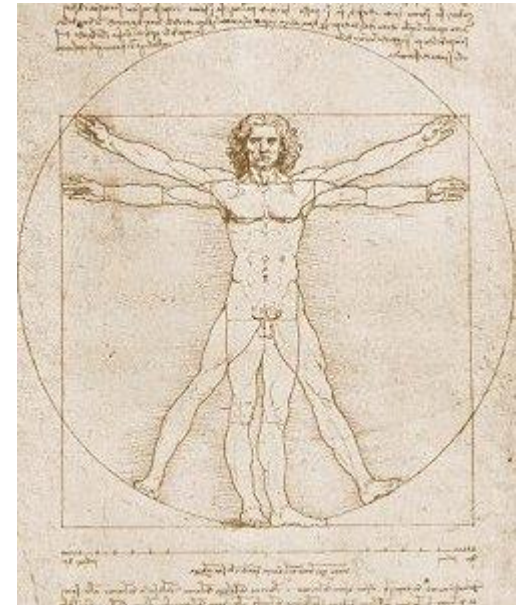
Wybrane zagadnienia BIOMECHANIKI

Marek Matyjewski



Zagadnienia

- ◆ Biomechanika kręgosłupa
- ◆ Zagrożenia mechaniczne
ryzyko - zagrożenie
zmniejszanie zagrożeń
zagrożenia w zderzeniach
- ◆ Podstawy Ergonomii
- ◆ Implanty



BIOMECHANIKA KRĘGOSŁUPA





Biomechanika

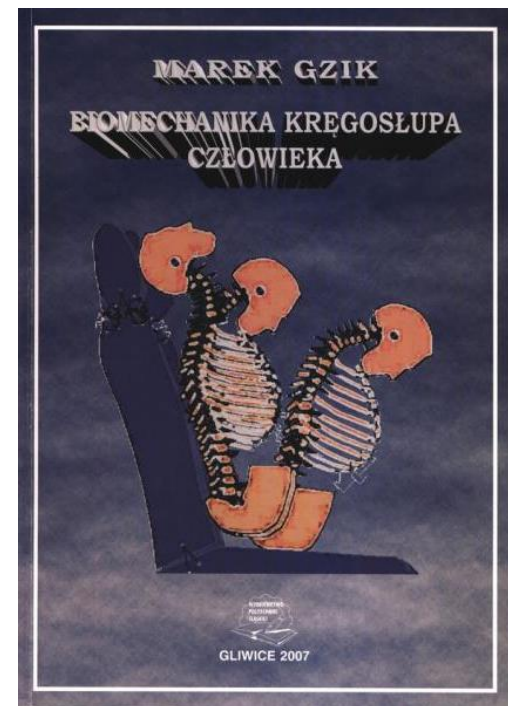
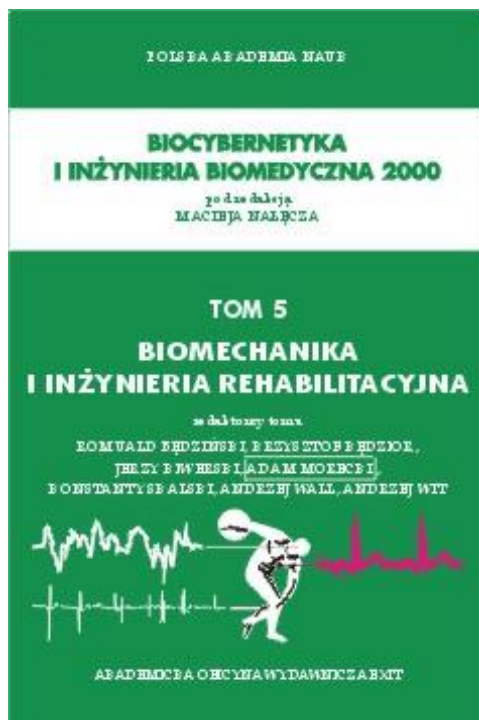
Biomechanika jest nauką o ruchu oraz związanych z nim obciążeniach i ich skutkach, mechanizmach ruch ten wywołujących, ze szczególnym uwzględnieniem człowieka i zwierząt.

Nauka ta opiera swoje podstawy na mechanice z jednej, biologii i medycynie natomiast - z drugiej strony.





Literatura





Biomechanika i inżynieria rehabilitacyjna Tom 5

- ◆ Biomechanika Ogólna
- ◆ Biomechanika Medyczna
- ◆ Biomechanika Sportu
- ◆ Biomechanika Pracy, Układy Człowiek-Maszyna
- ◆ Biomechanika Inżynierska, Ortopedyczna i Rehabilitacyjna



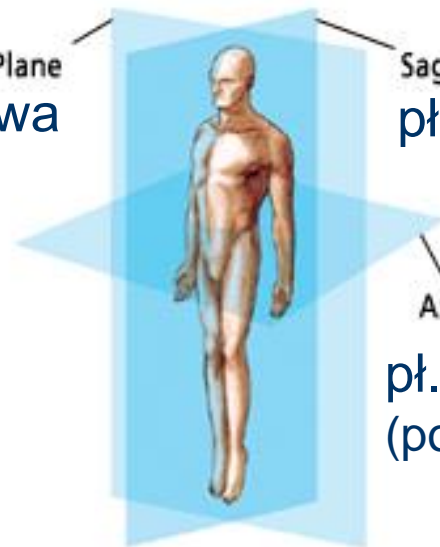
Funkcje kręgosłupa



Płaszczyzny anatomiczne

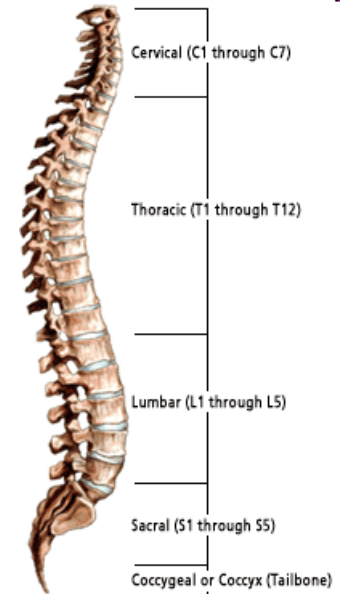


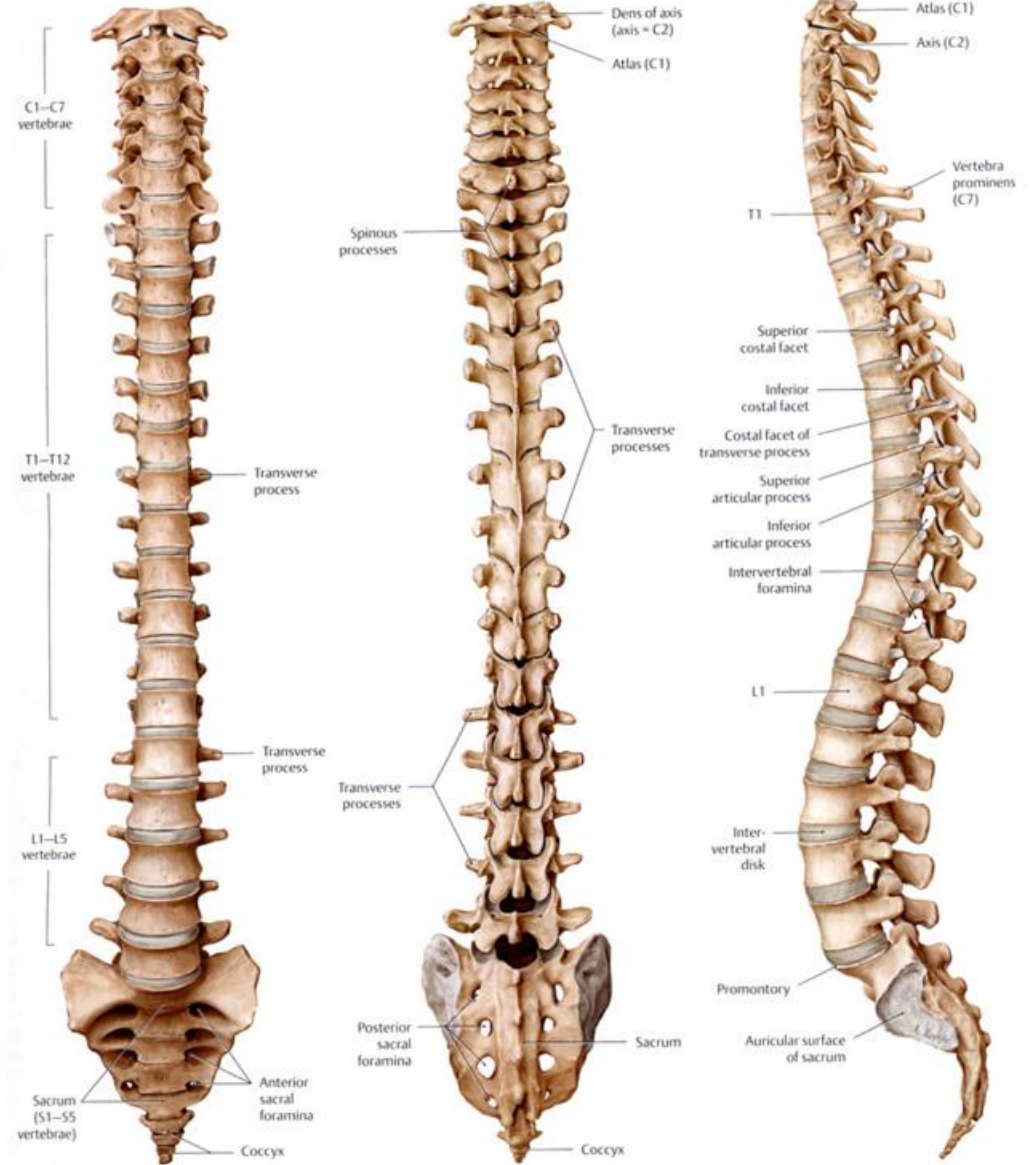
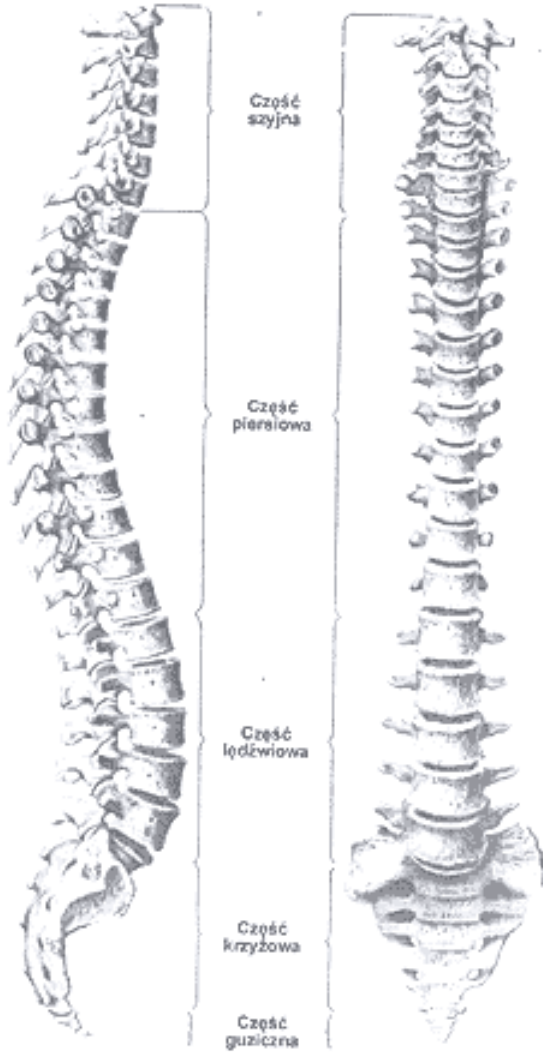
Coronal Plane
pł. czołowa



Sagittal Plane
pł. strzałkowa

Axial Plane
pł. pozioma
(poprzeczna)

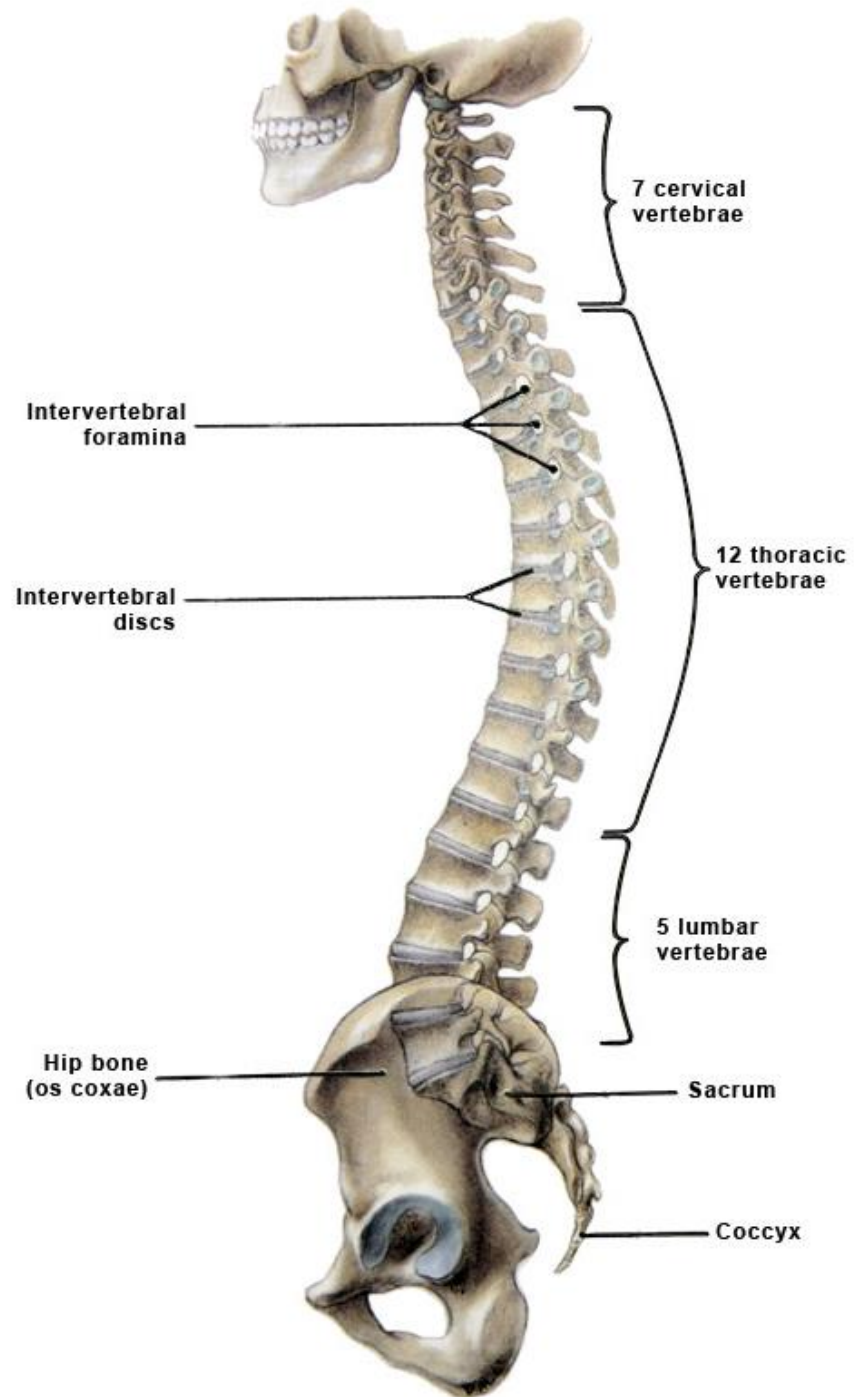
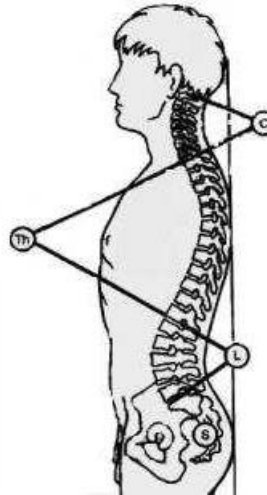




Krzywizny kręgosłupa

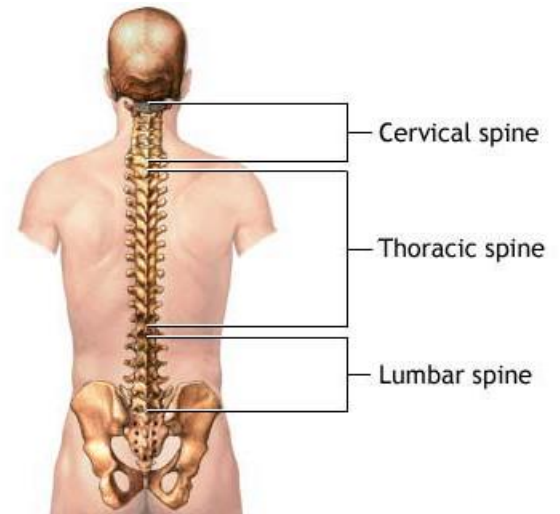
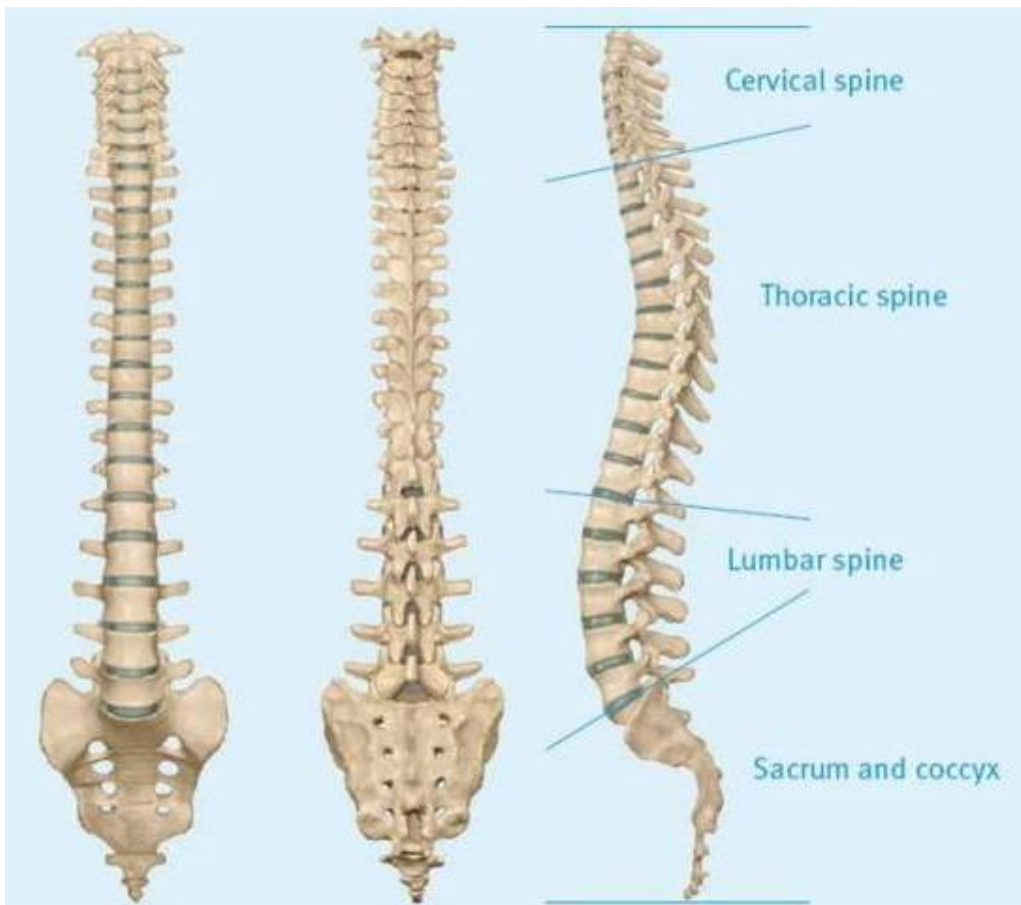


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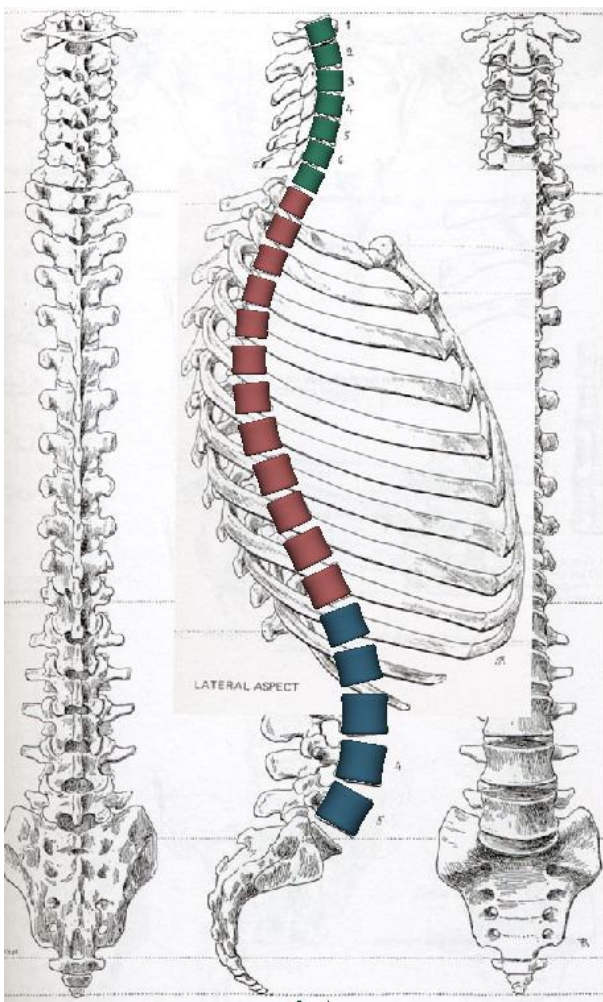


Cztery odcinki kręgosłupa





Liczba kręgów



7 kręgów szyjnych

C1 ÷ C7

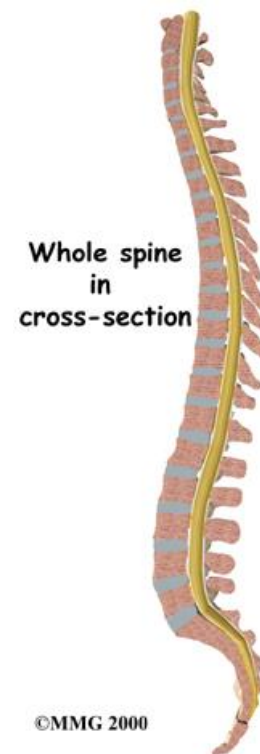
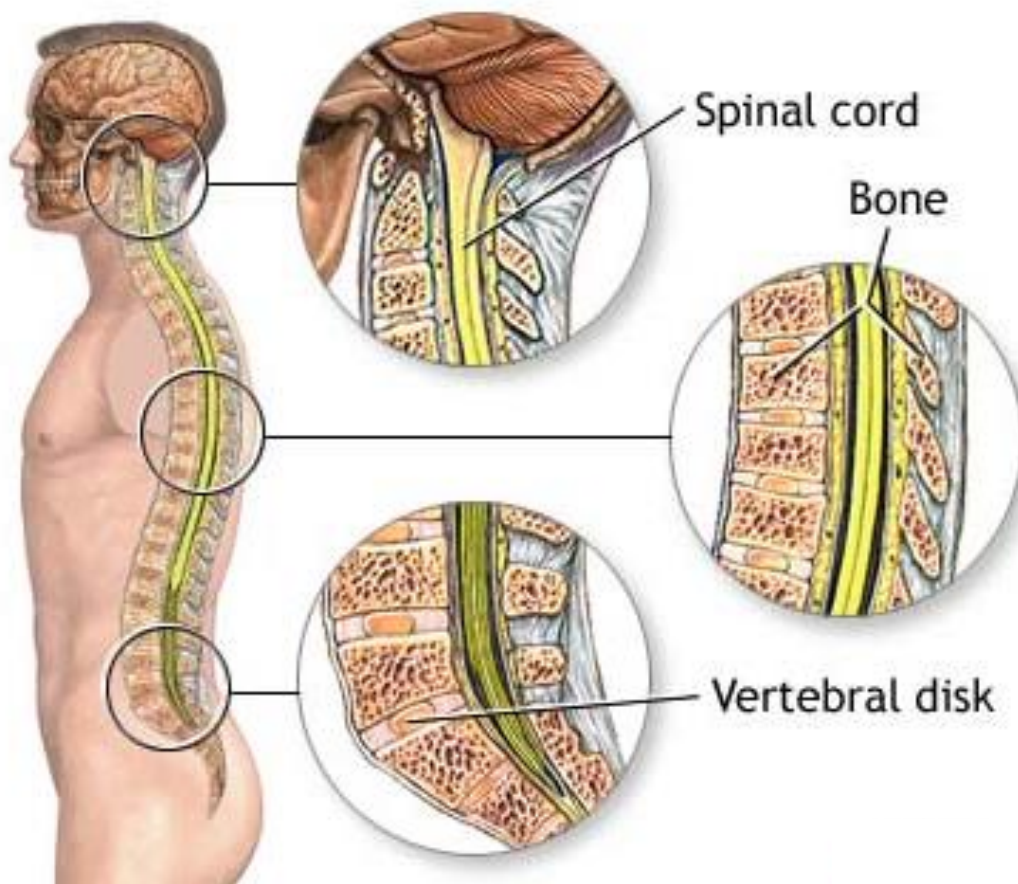
12 kręgów piersiowych

Th1 ÷ Th12

5 kręgów lędźwiowych

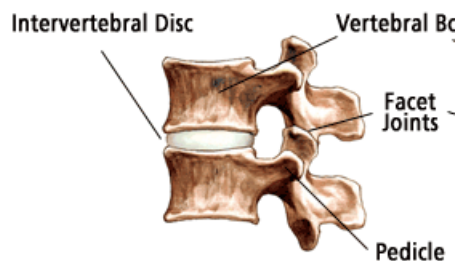
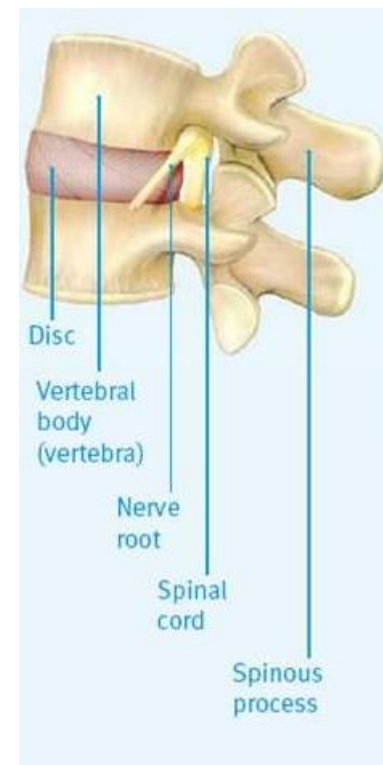
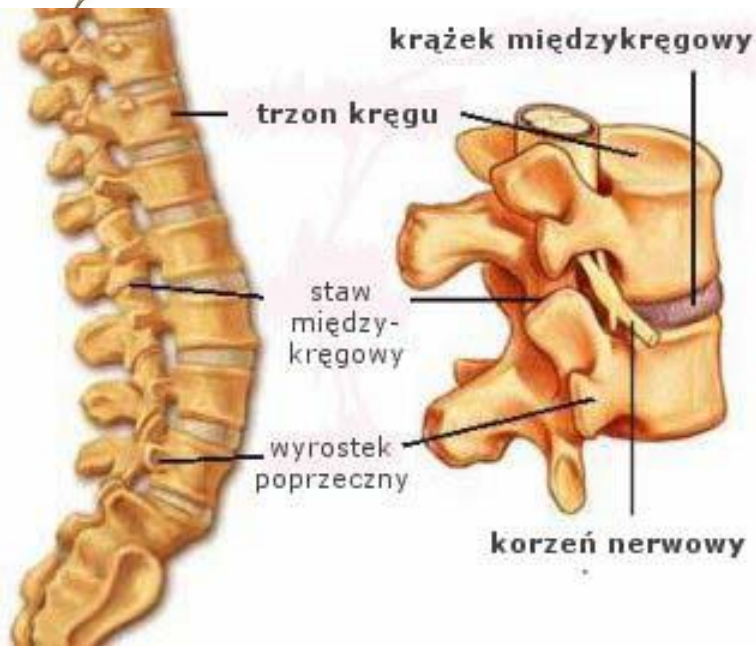
L1 ÷ L5

Przekrój w płaszczyźnie strzałkowej



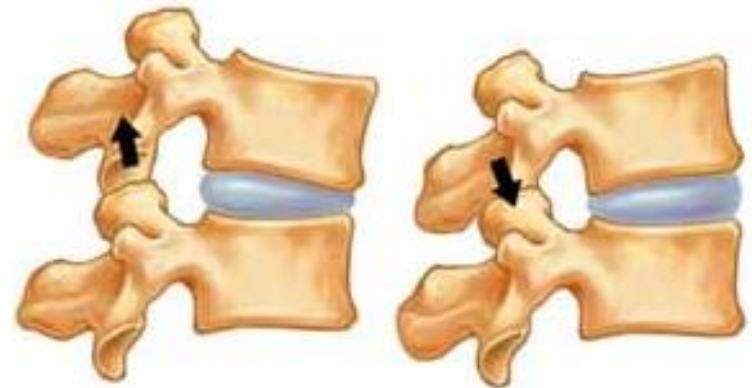
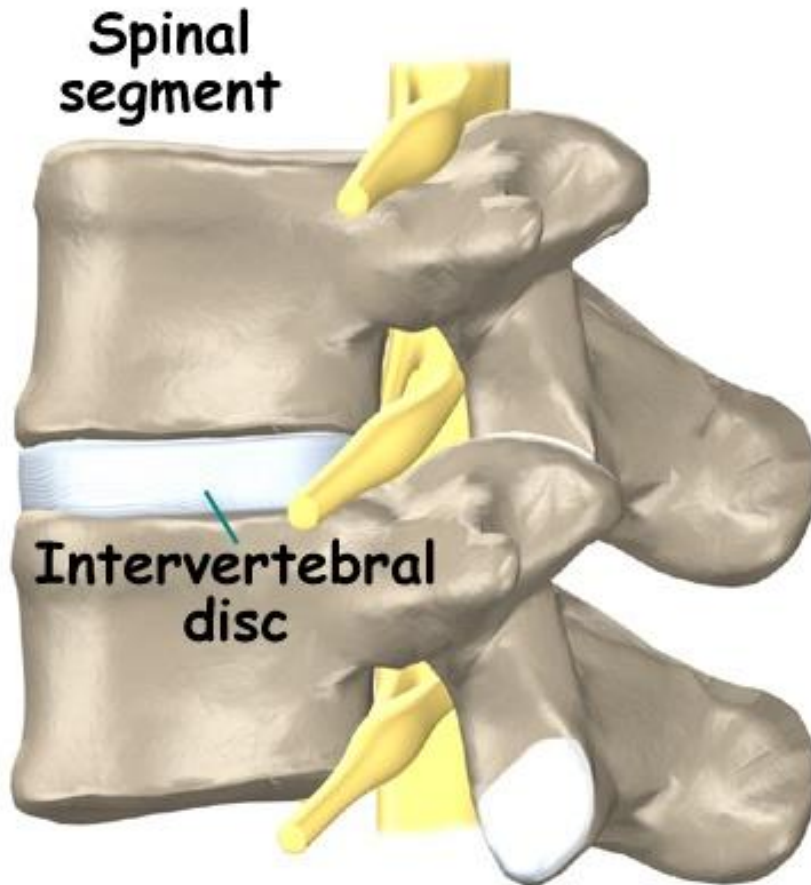


Segment ruchowy kręgosłupa



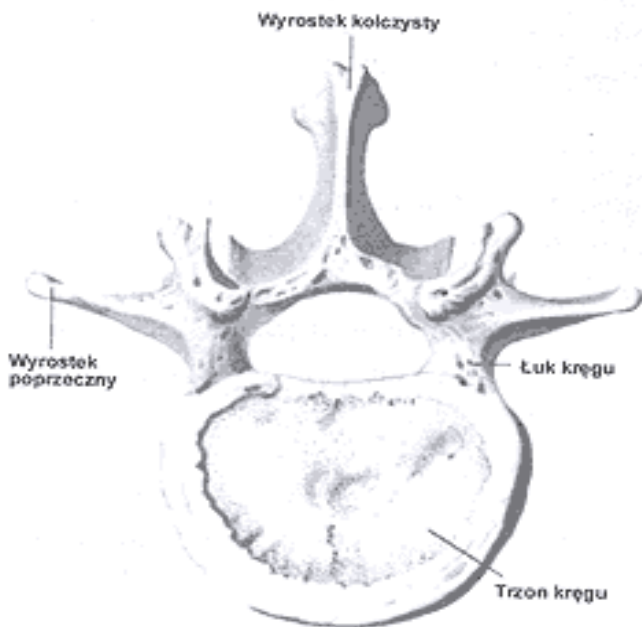
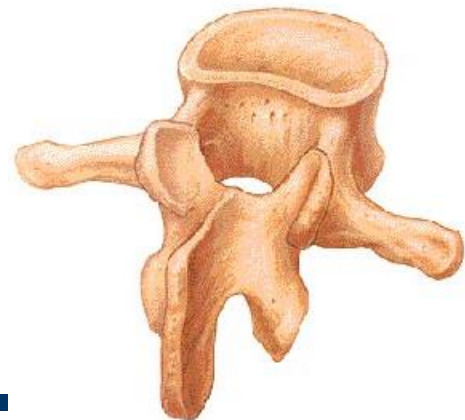


Segment ruchowy kręgosłupa





Budowa kręgu



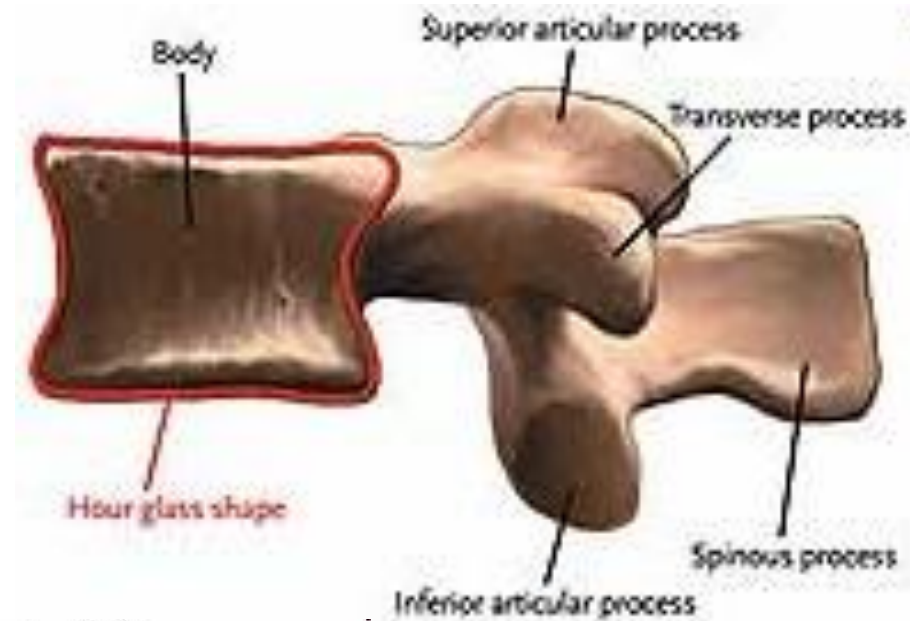
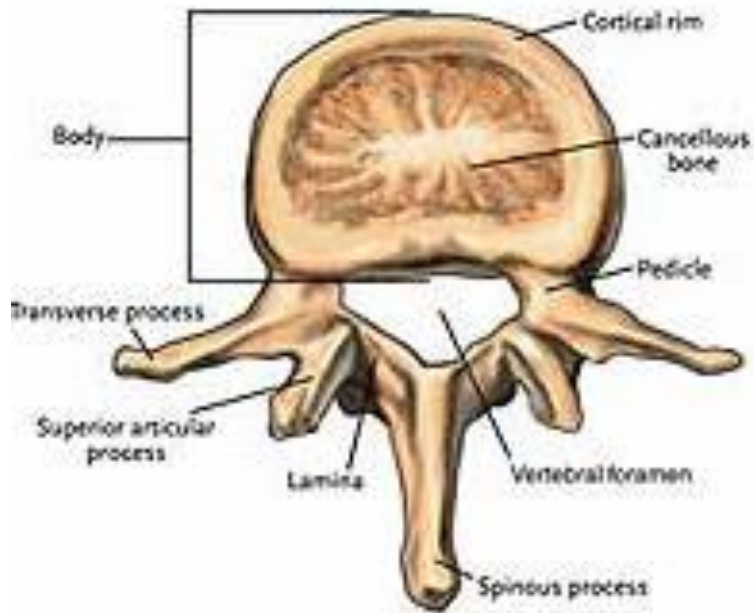
Widok kręgu z góry



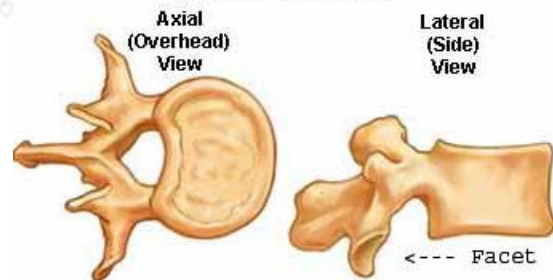
Widok kręgu z boku



Budowa kręgu



Lumbar Vertebrae

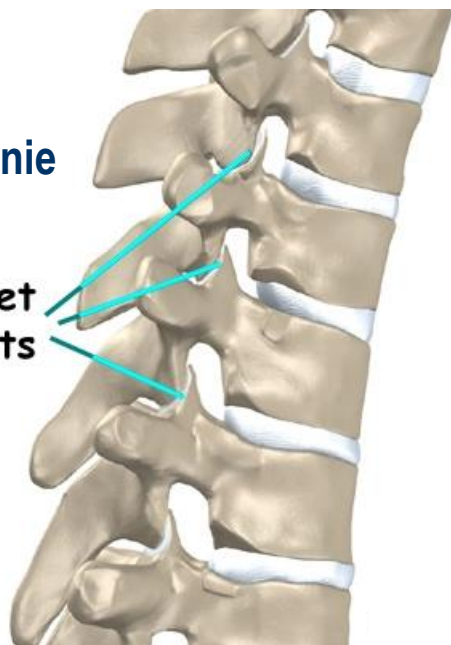




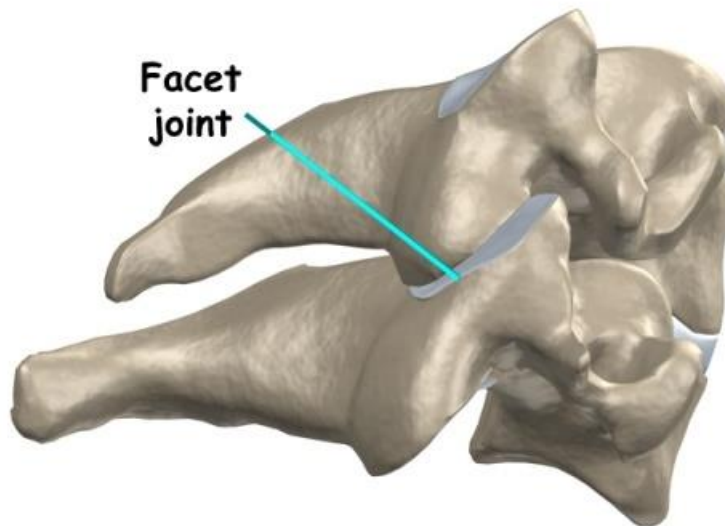
Stawy międzykręgowe

Powierzchnie stawowe

Facet joints

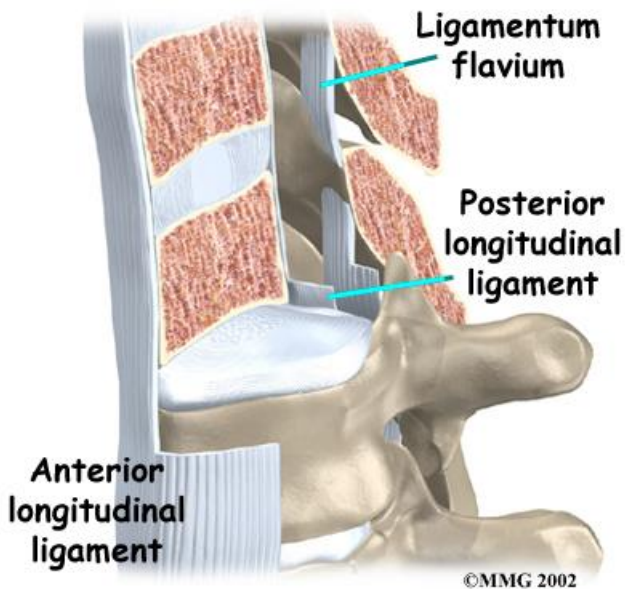


Facet joint





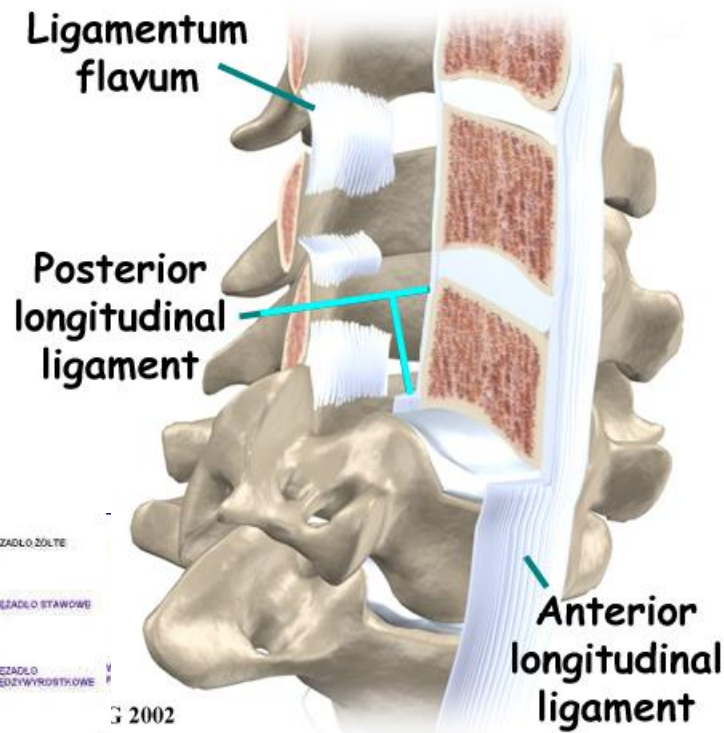
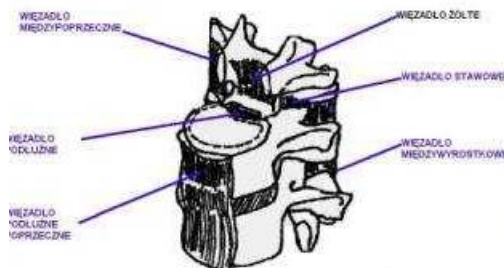
Więzadła



Więzadło żółte

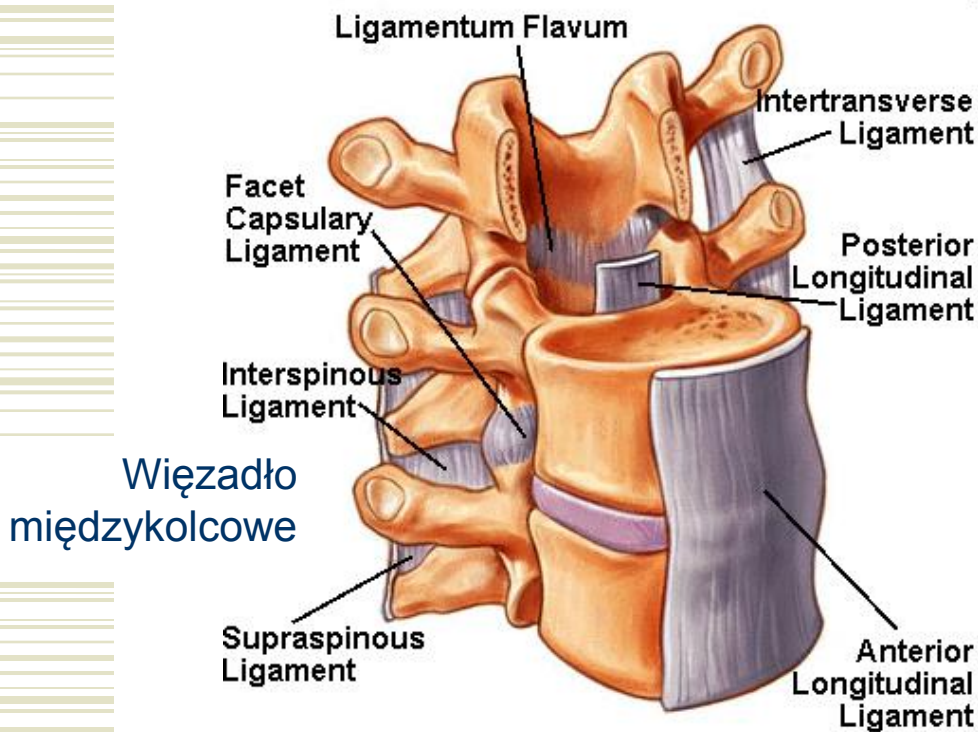
Więzadło podłużne tylne

Więzadło podłużne przednie



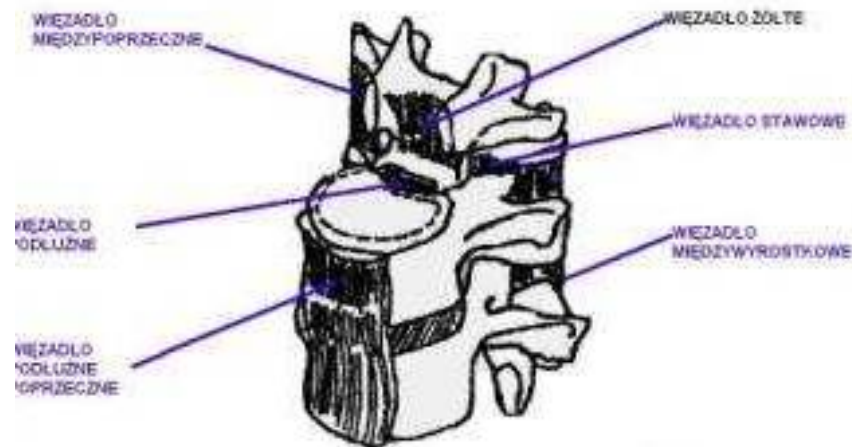


Więzadła



Więzadło międzykolcowe

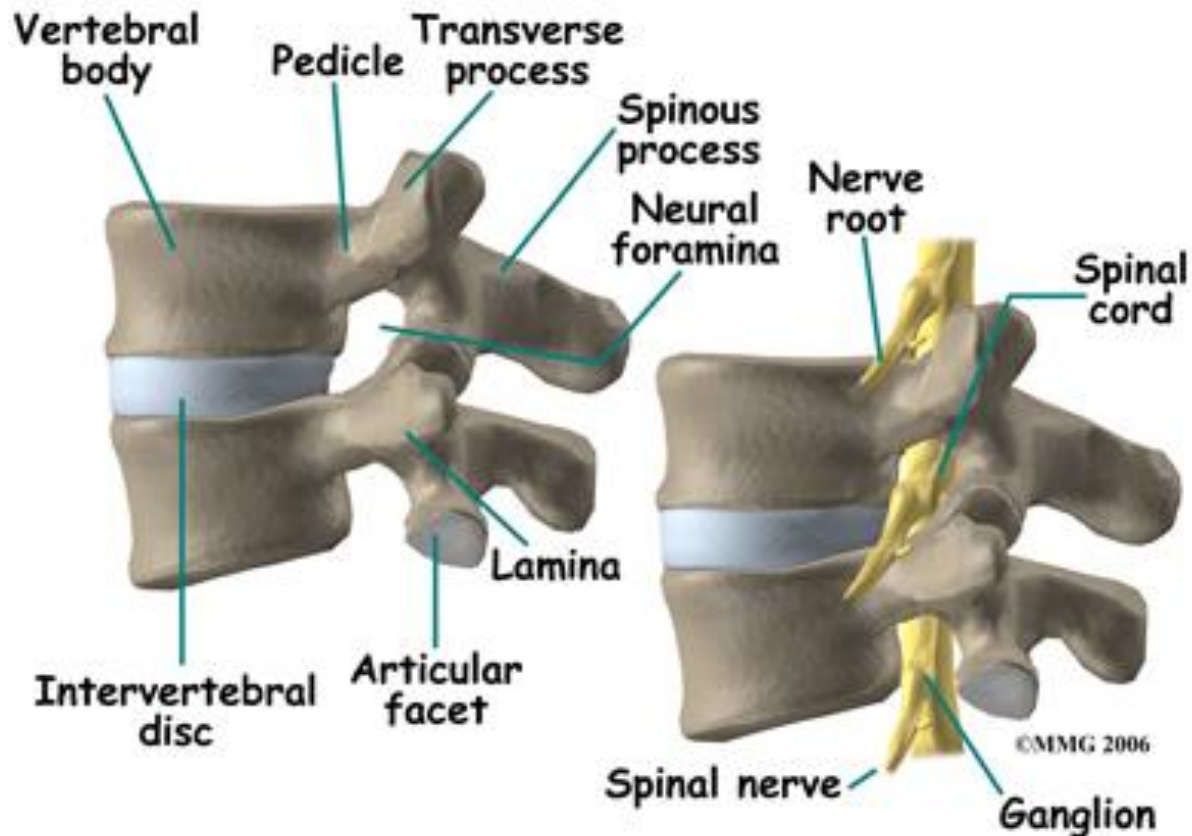
Więzadło nadkolcowe





Wyrostki stawowe

Side View, Lumbar Vertebra





Różnice w budowie kręgów

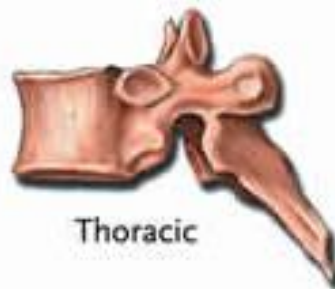
szyjny

piersiowy

lędźwiowy



Cervical



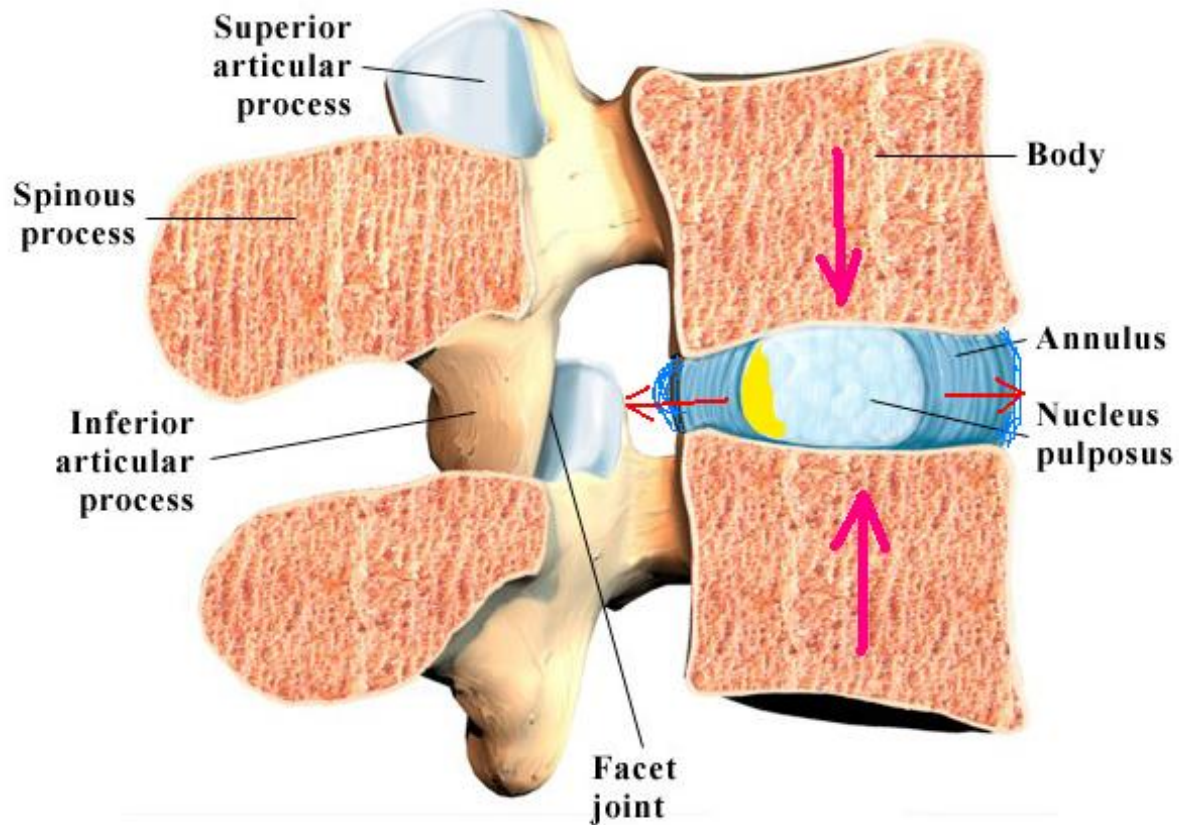
Thoracic



Lumbar



Krażek międzykręgowy





Krażek międzykręgowy

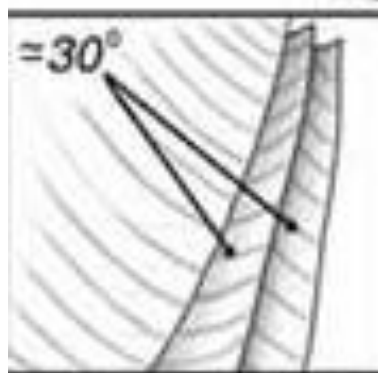
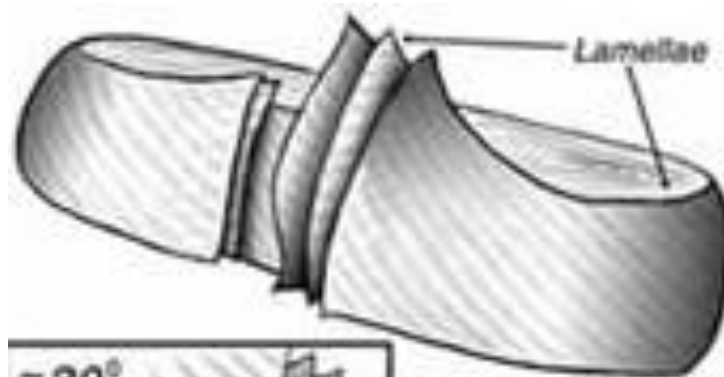
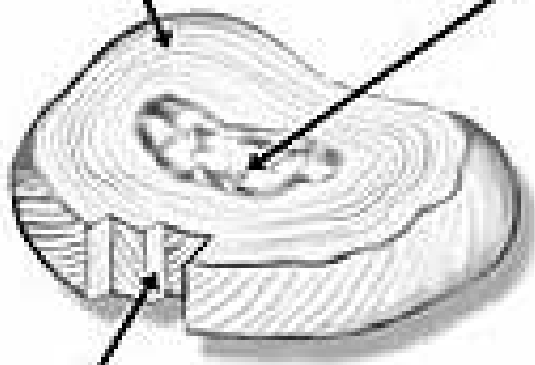
Pierścień włóknisty

Annulus Fibrosus

Jądro miazdżyste

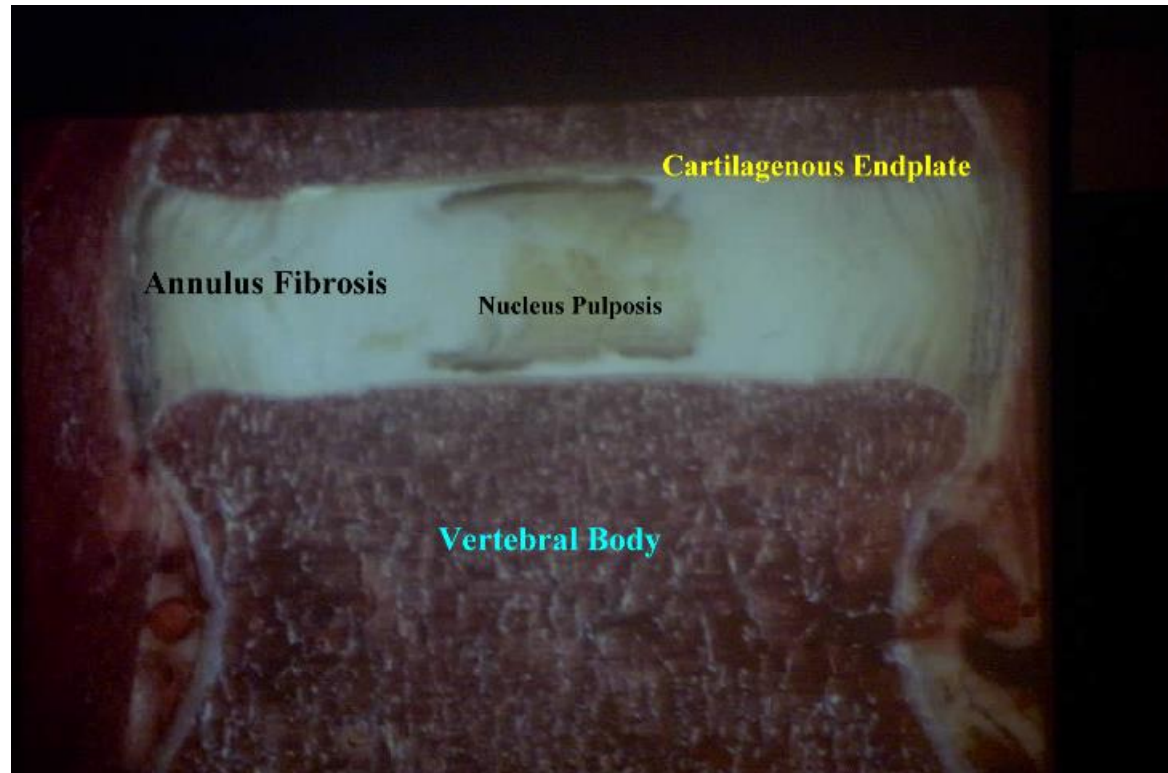
Nucleus Pulposus

Lamellae



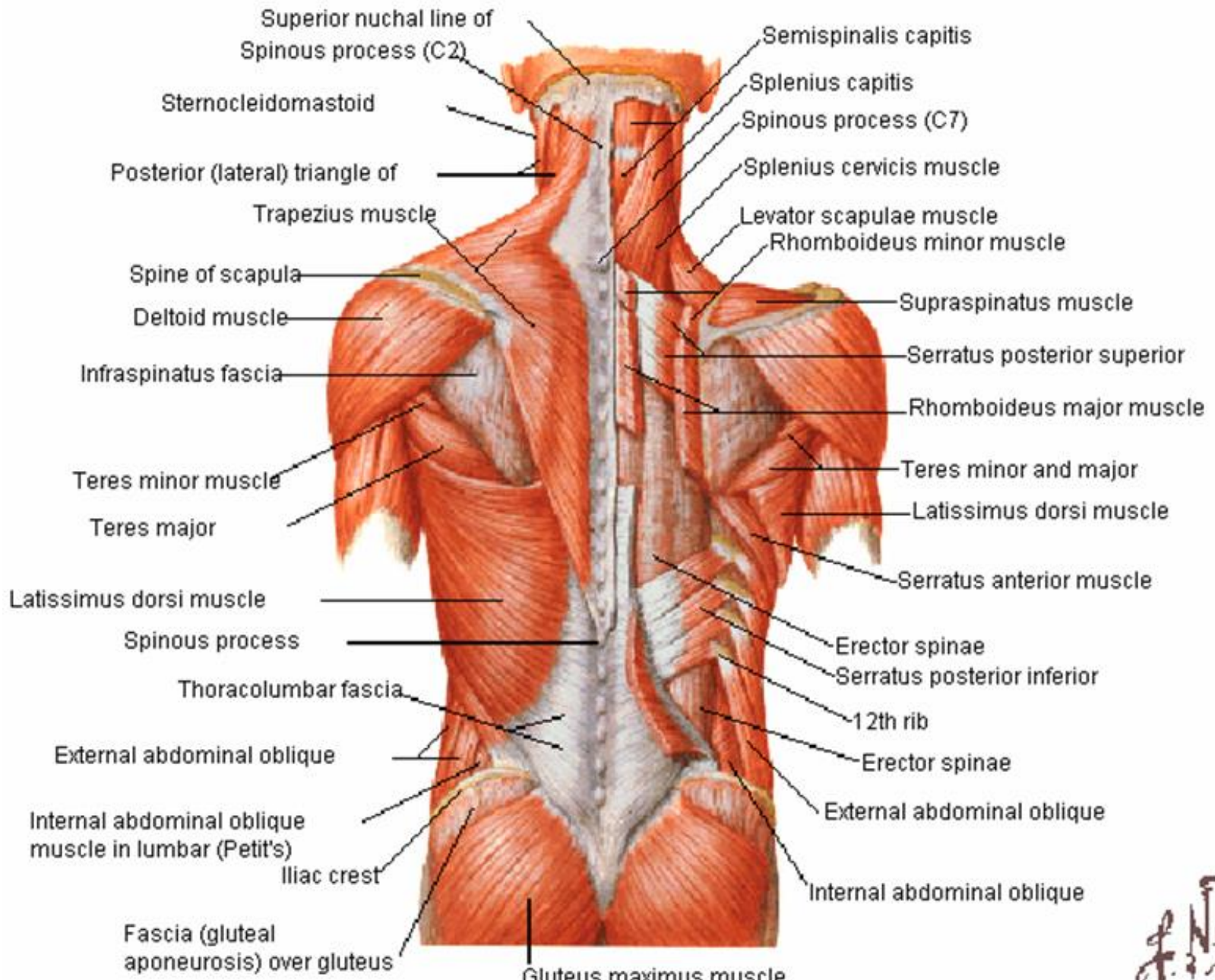


Krażek międzykręgowy



Muscles of Back

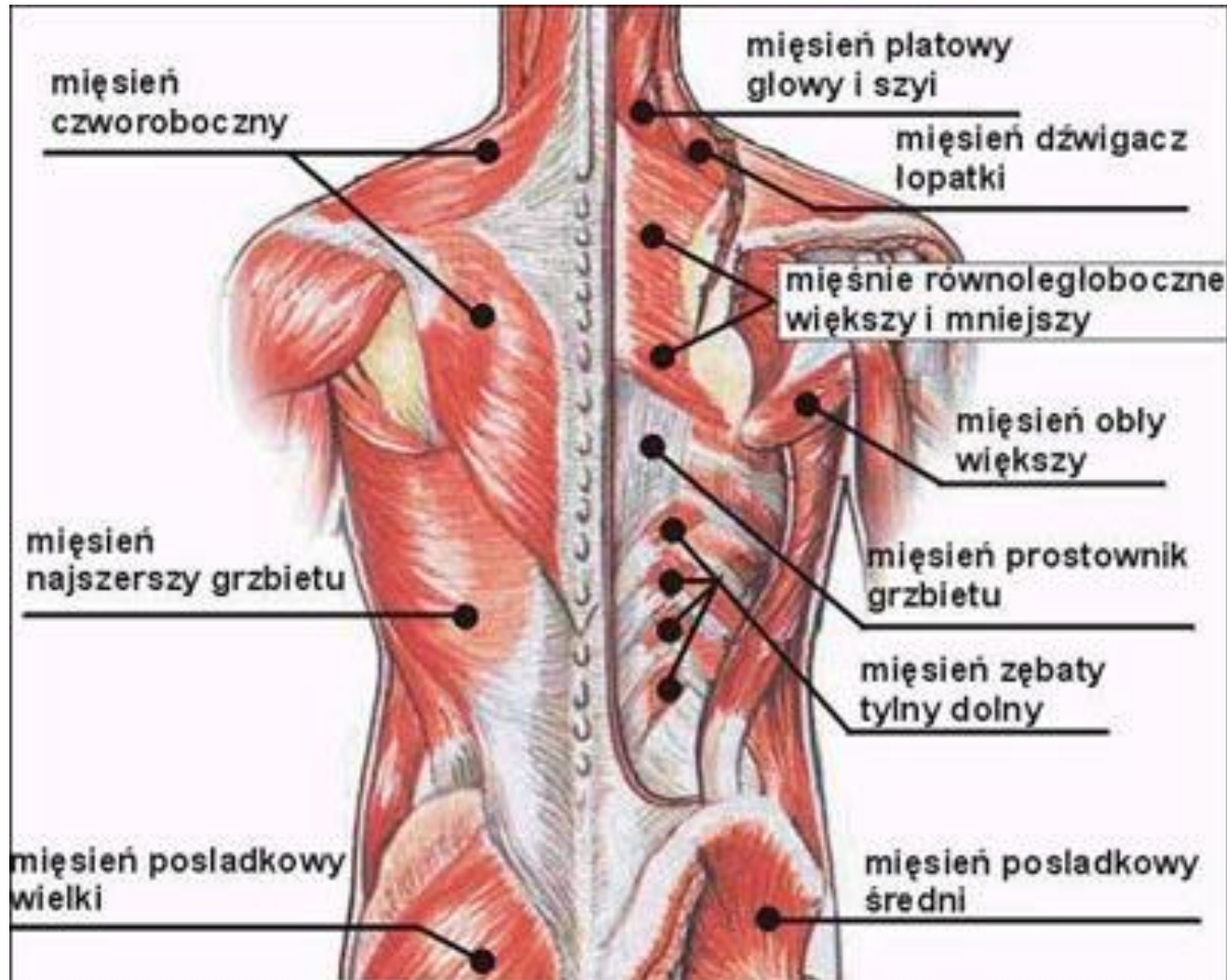
Superficial Layers



F. J. Natter
M.D.

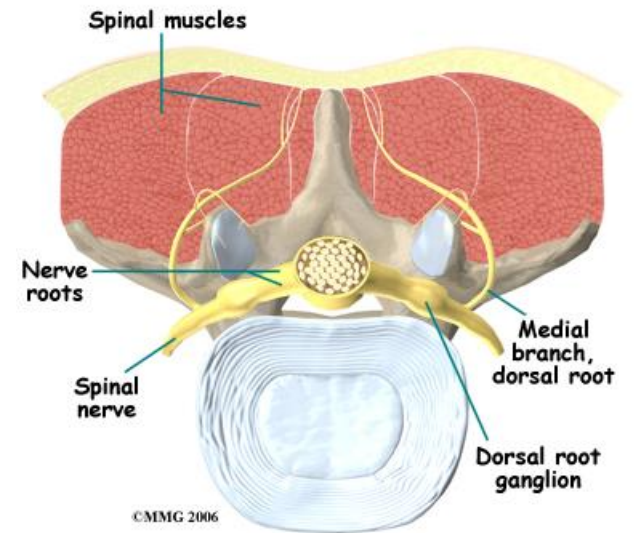
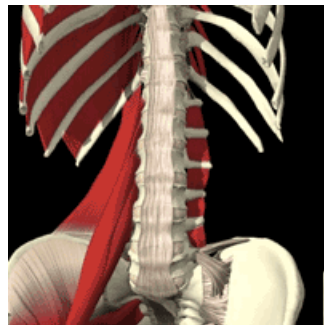
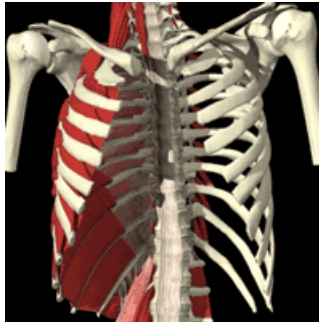


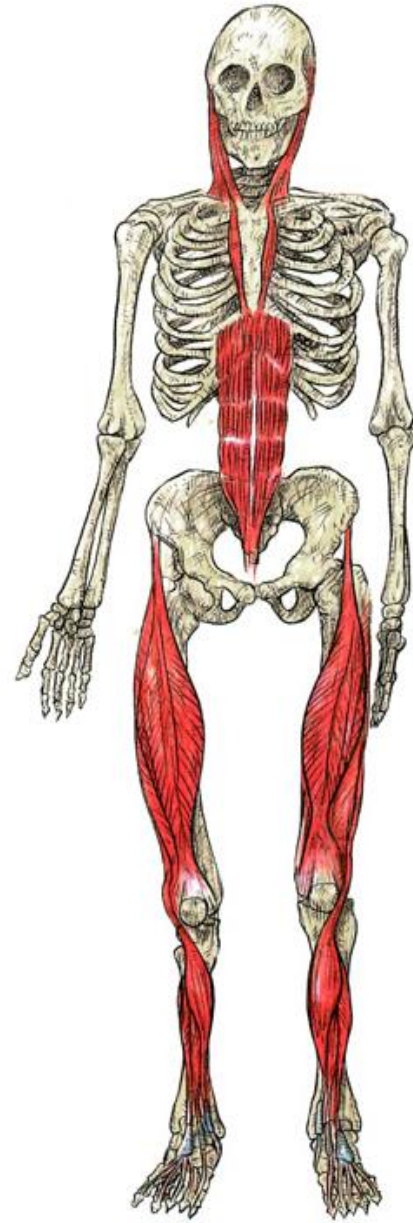
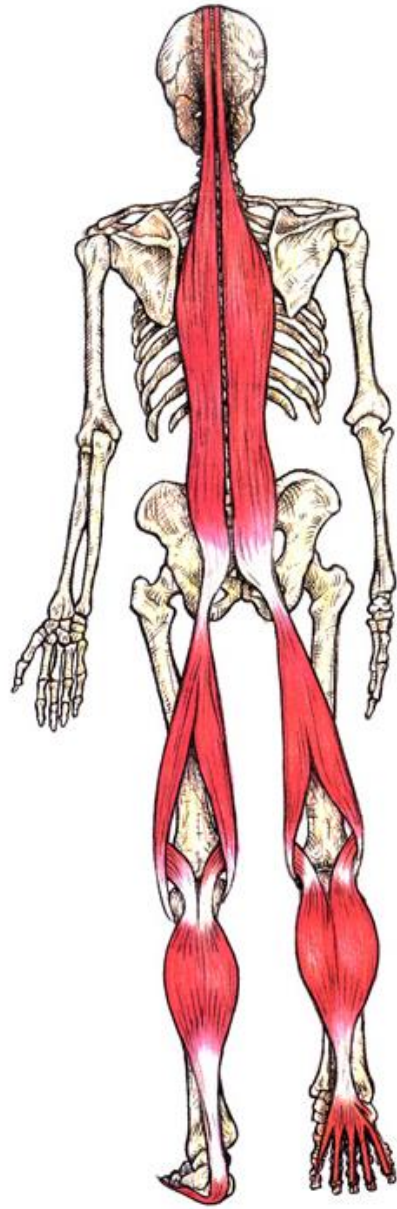
Mięśnie pleców





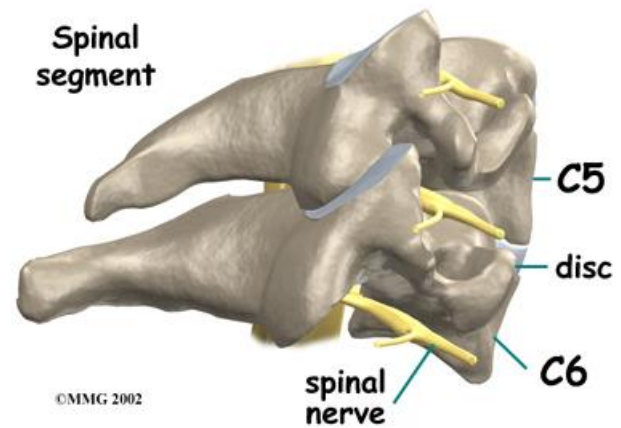
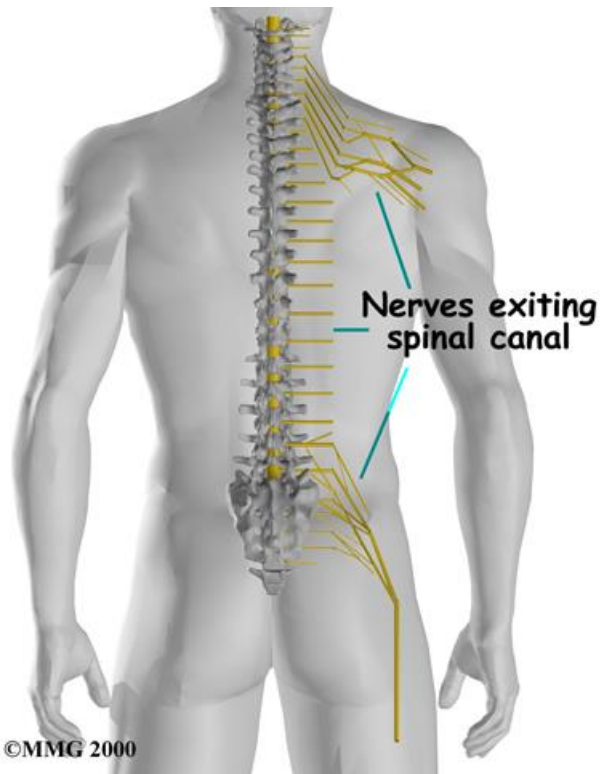
Mięśnie





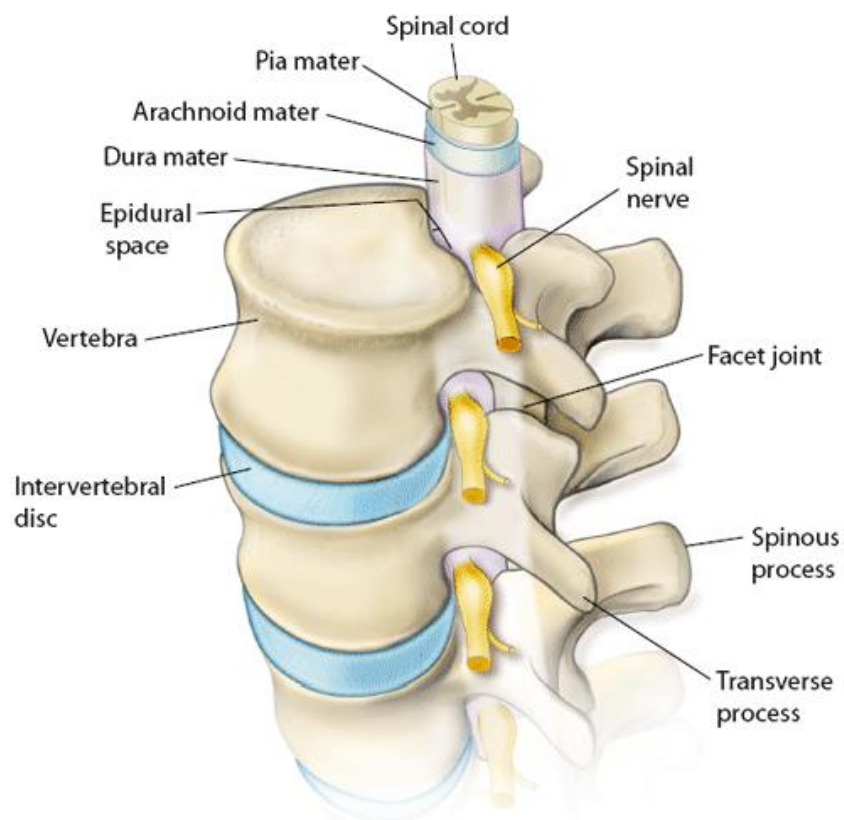


Układ nerwowy



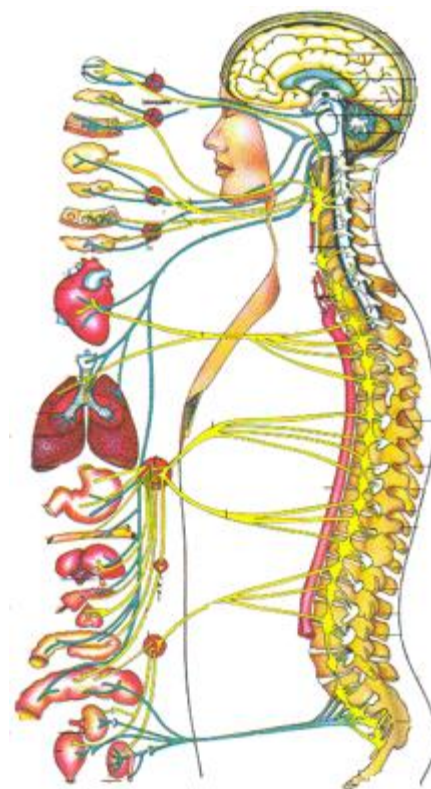


Rdzeń kręgowy, korzenie nerwów



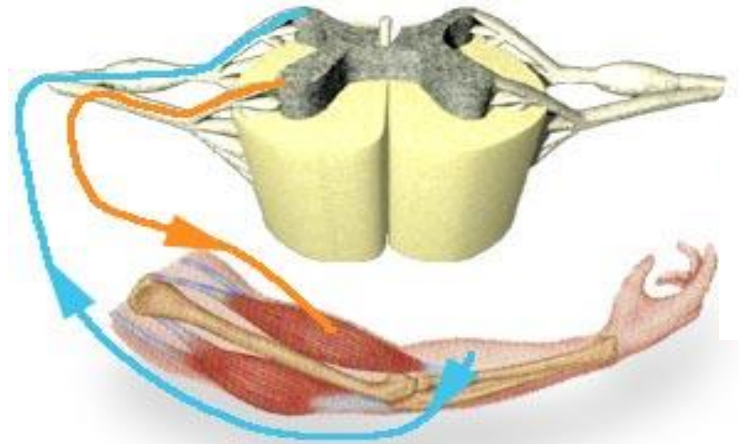
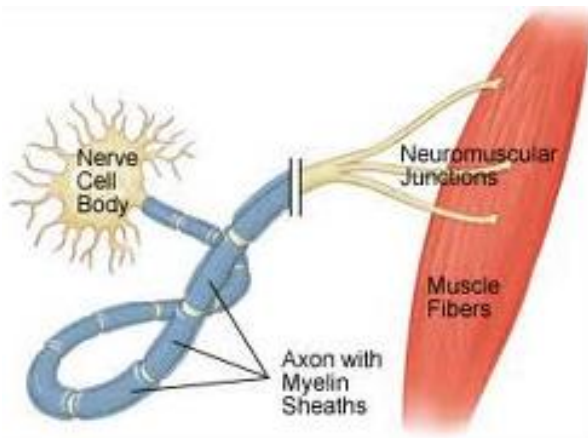


Układ nerwowy

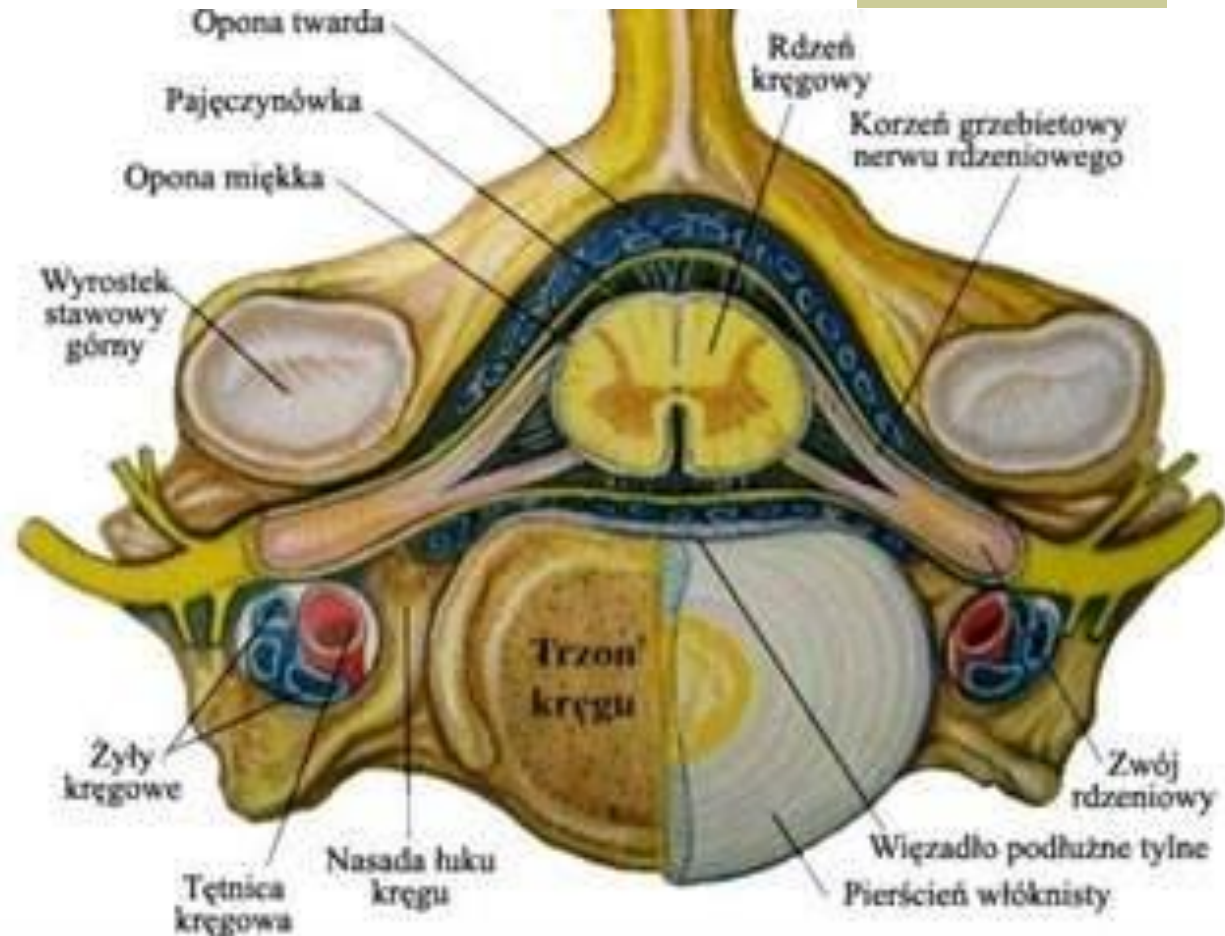
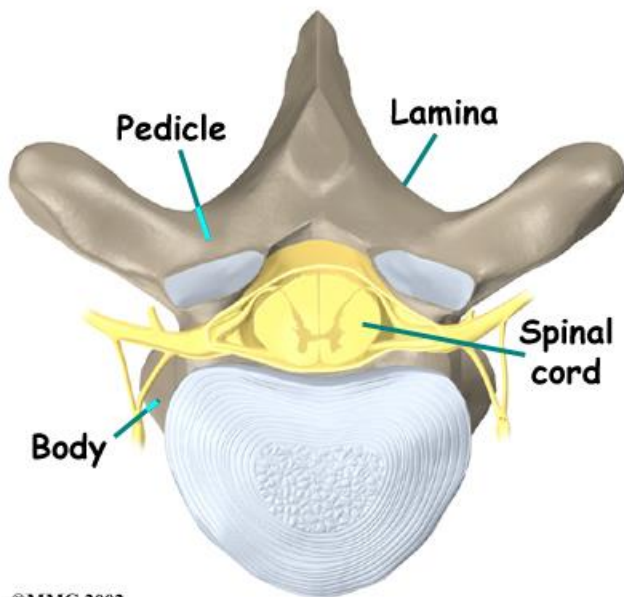




Sterowanie mięśniami



Przekrój poziomy



Odcinek szyjny



Cervical Spine

©MMG 2000



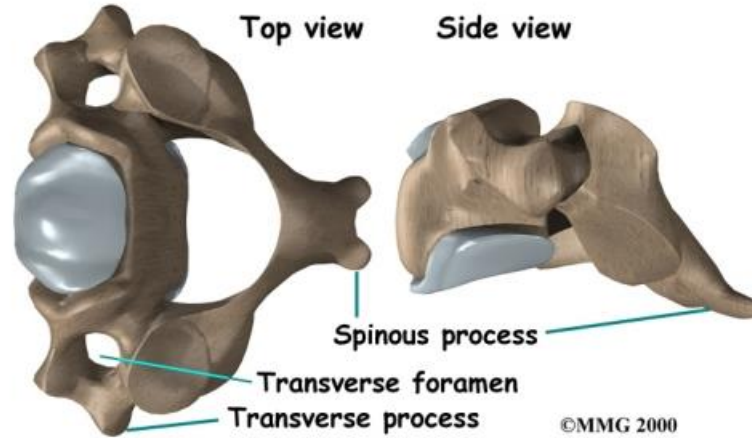
C1

C7

Third cervical vertebra

Top view

Side view



Spinous process

Transverse foramen

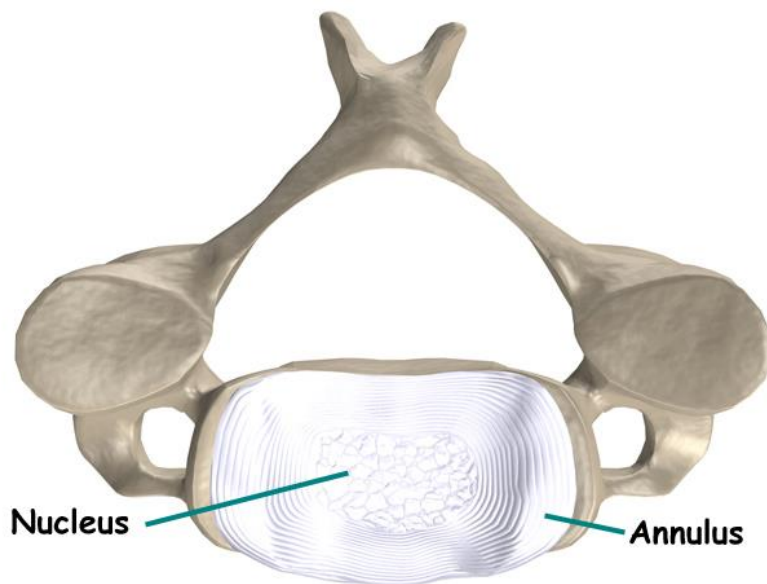
Transverse process

©MMG 2000





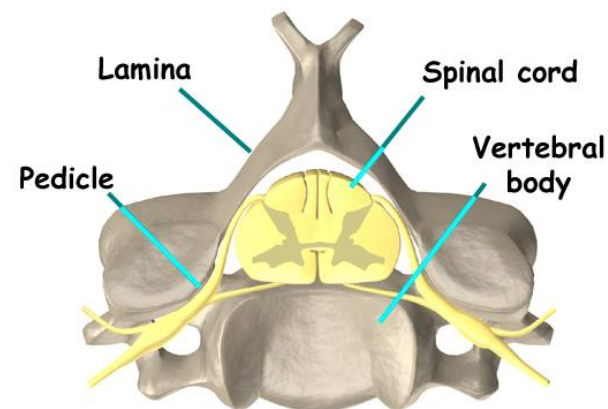
Kręgi szyjne



Nucleus

Annulus

Intervertebral disc



Lamina

Spinal cord

Pedicle

Vertebral body

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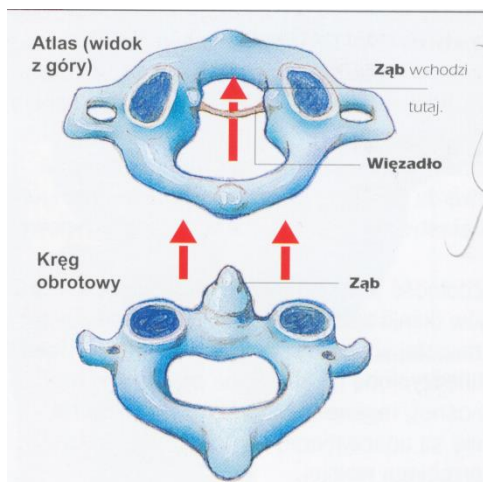
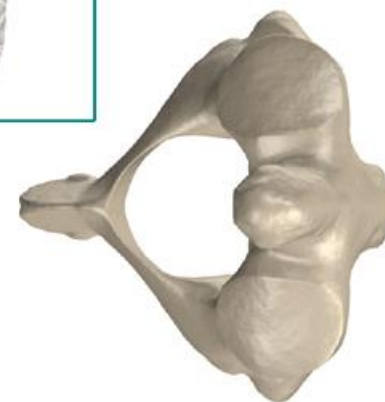
C1 i C2



Atlas



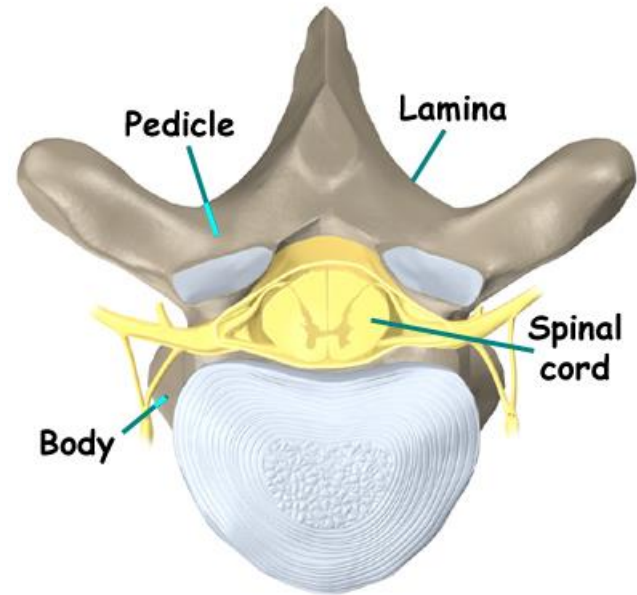
Axis



Odcinek piersiowy

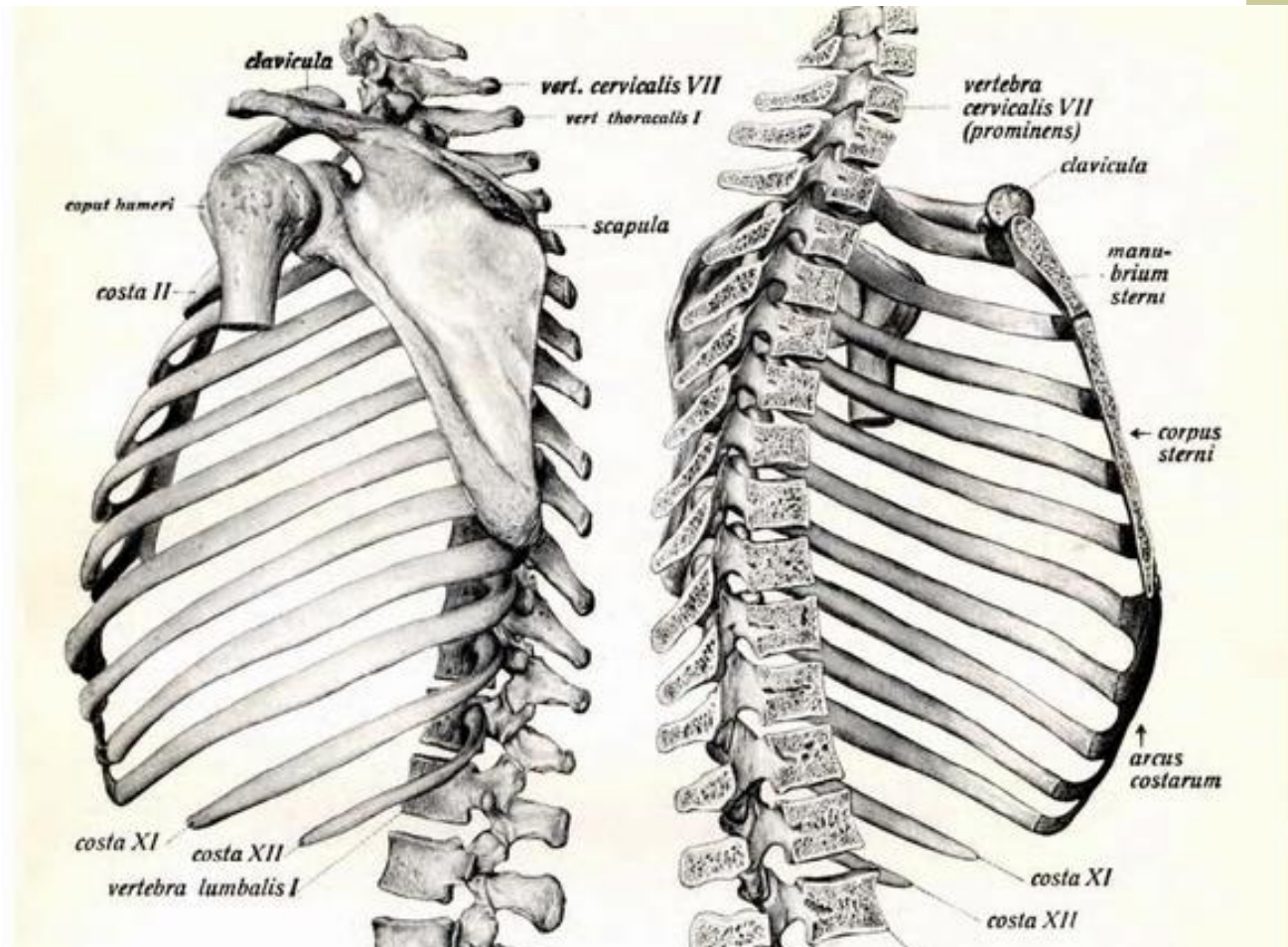


Thoracic
Spine
Anatomy



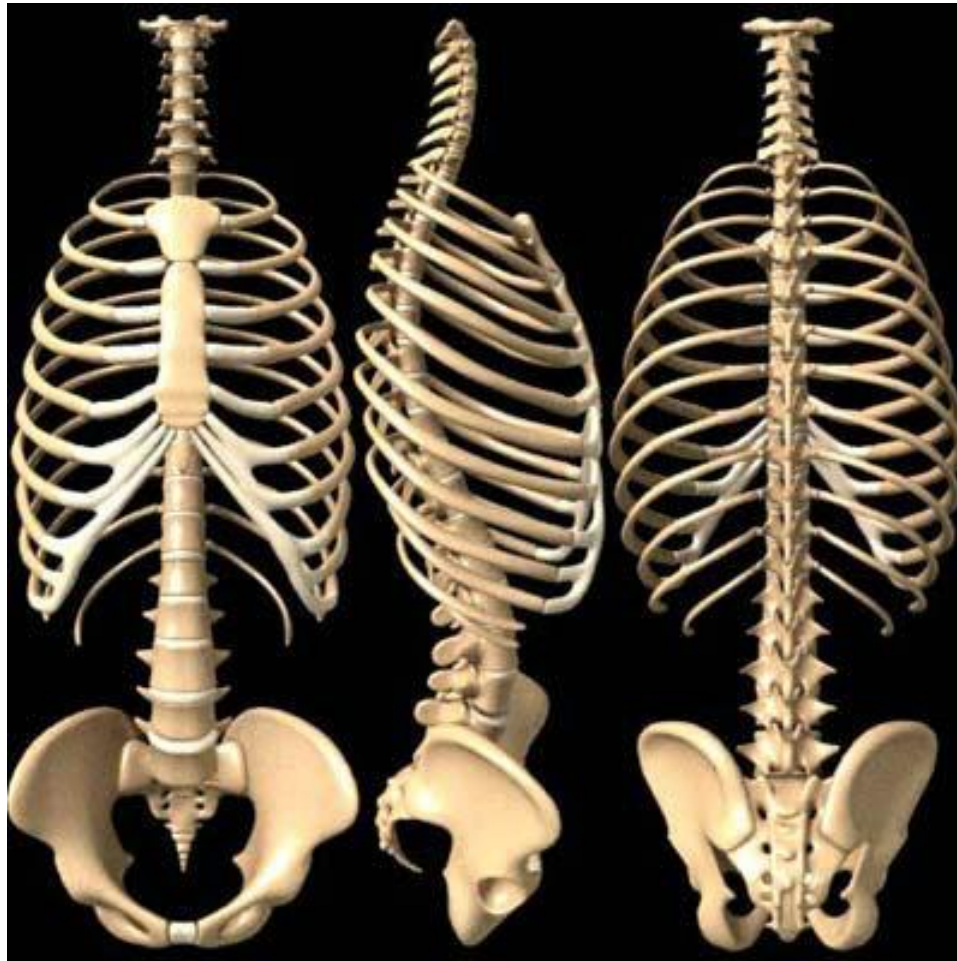


Odcinek piersiowy

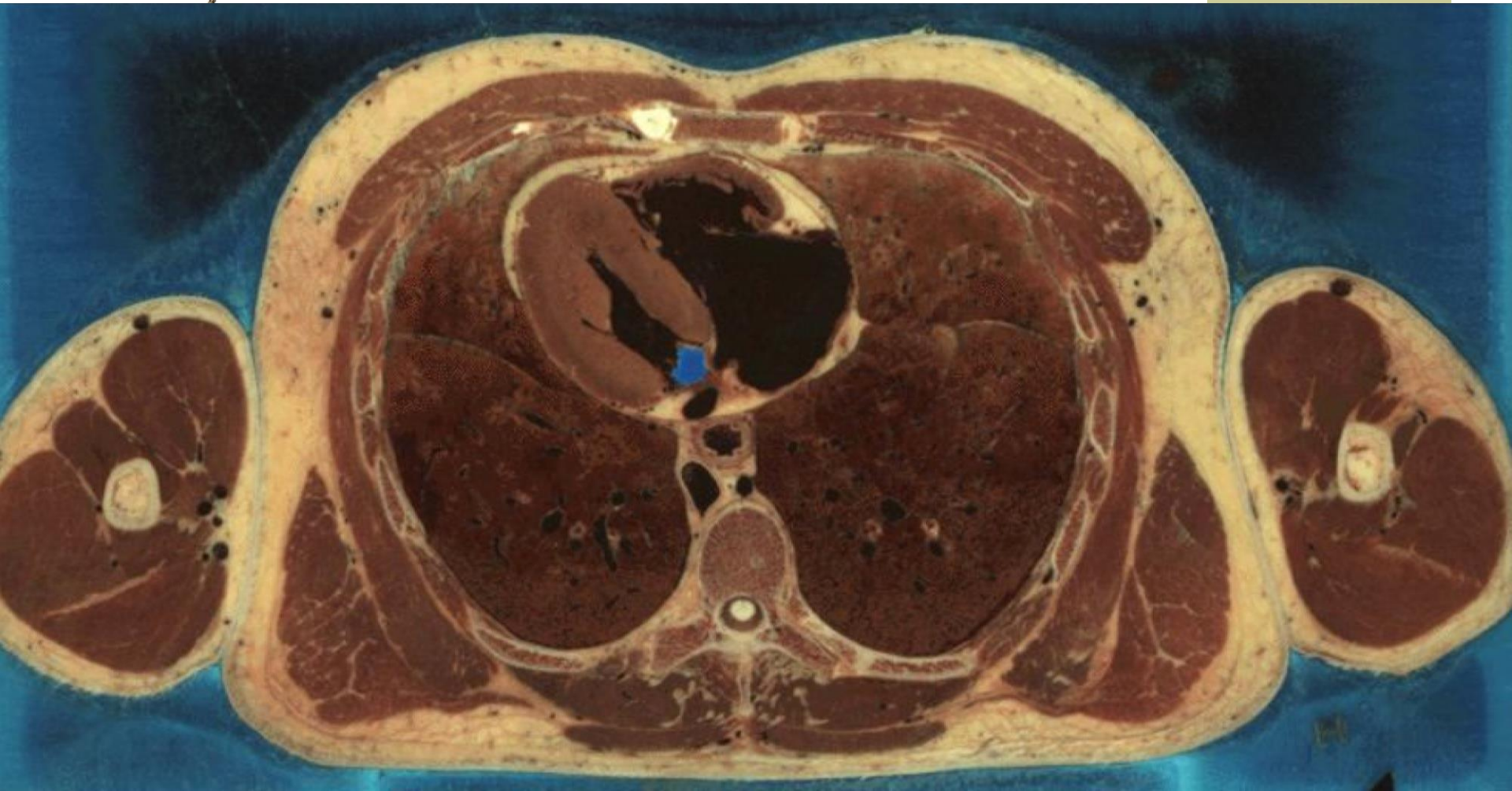




Odcinek piersiowy



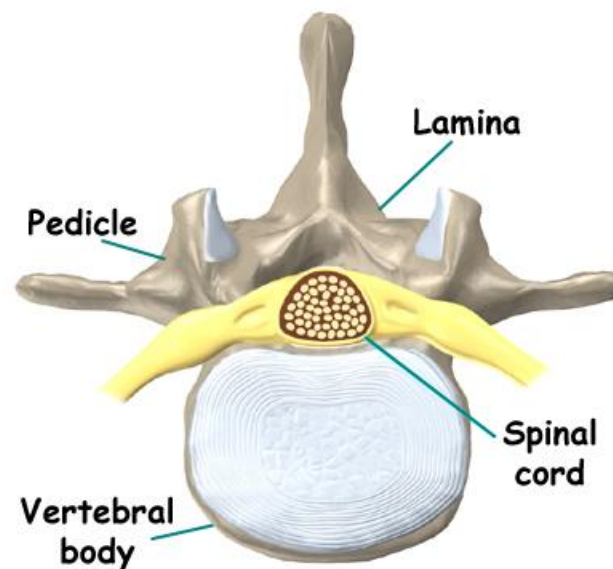
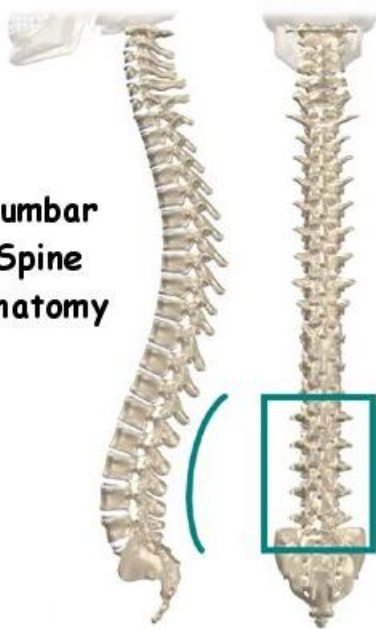
Odcinek piersiowy





Odcinek lędźwiowy

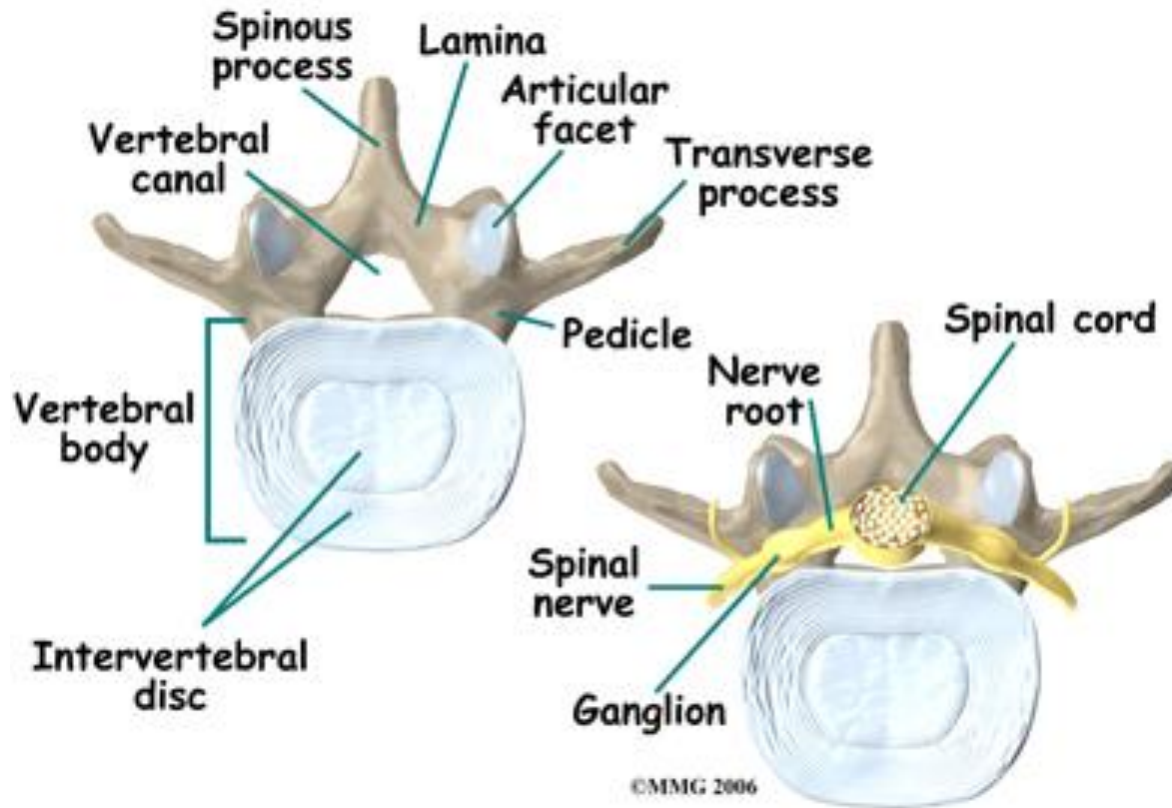
Lumbar Spine Anatomy



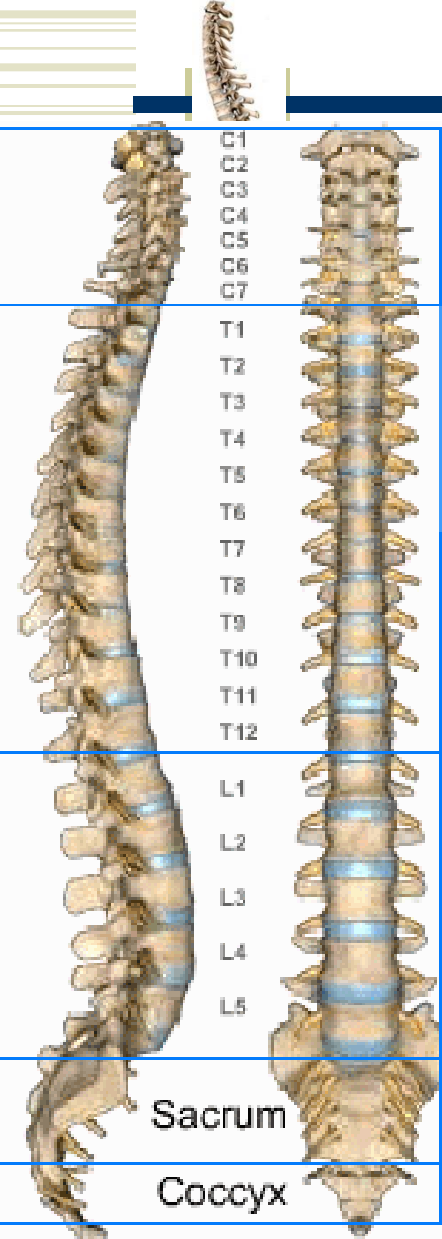


Odcinek lędźwiowy

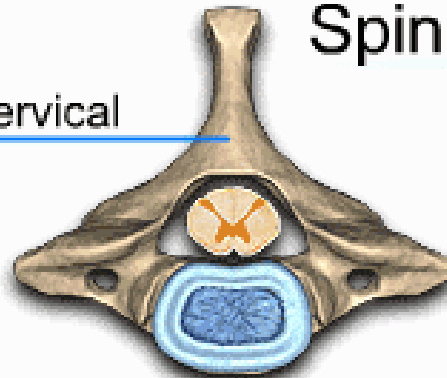
Top View, Lumbar Vertebra



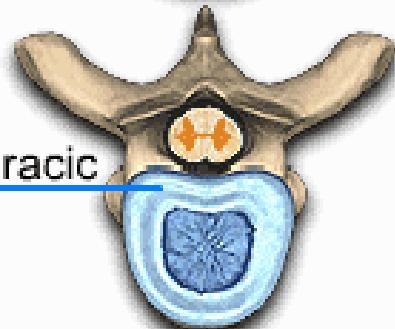
Spine Anatomy



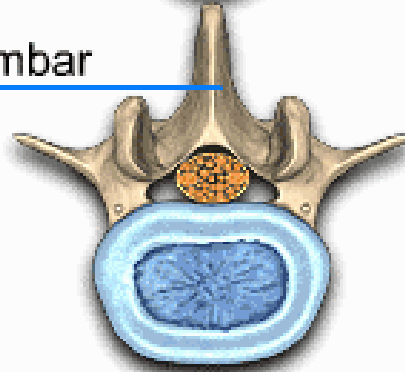
Cervical



Thoracic

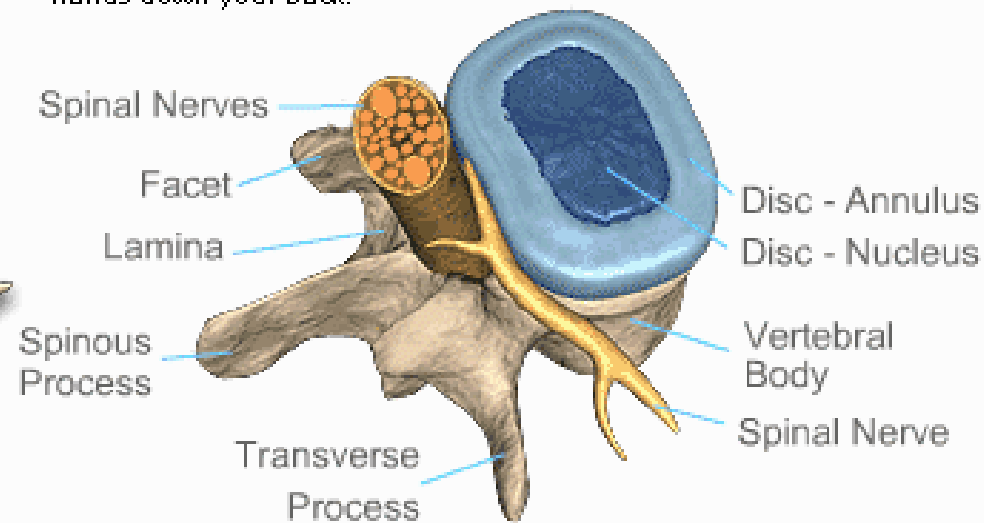


Lumbar



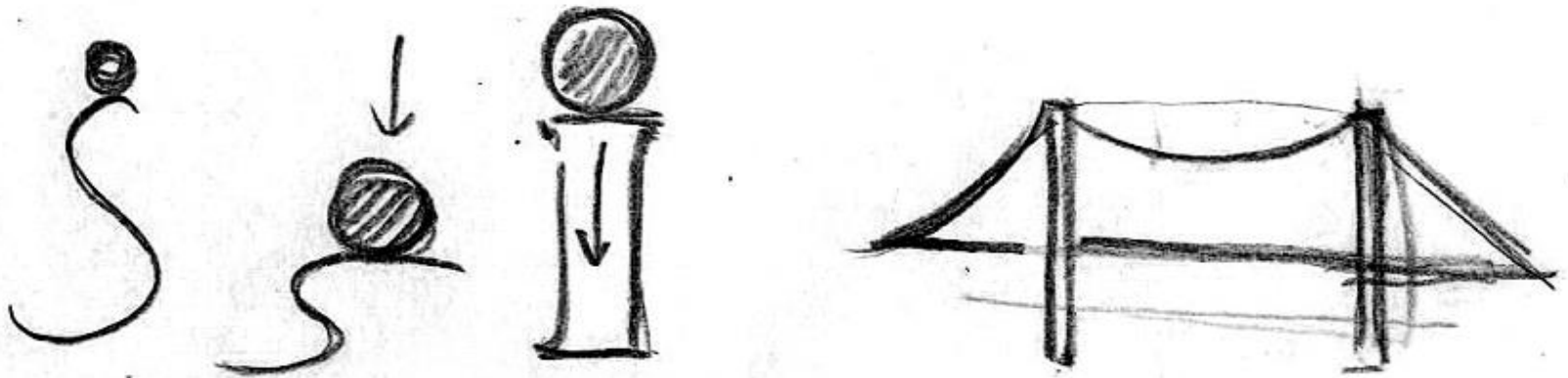
The spinal column begins at the base of the skull and runs down to the coccyx (tailbone). It has three main sections: the cervical (neck), the thoracic (mid-back), and the lumbar (lower back); and the lower section of the spine is composed of the sacrum and coccyx. The function of the spinal column is to provide an upright posture and to protect the spinal cord, which conveys electrical signals from the brain to the arms and legs, allowing movement and sensation. The nerves at the sacrum and coccyx leave the bones and control the bowel and bladder.

Discs, which are made up of the outer annulus and the inner nucleus pulposus, are located between each vertebral body. In the neck region, spinal nerves go into the arms to provide strength and sensation to the arms and hands. In the lumbar region, the nerves join together to form the sciatic nerve, which travels down the legs. The lamina covers the spinal canal, through which the spinal nerve passes and the spinous process is the bone you can feel when running your hands down your back.





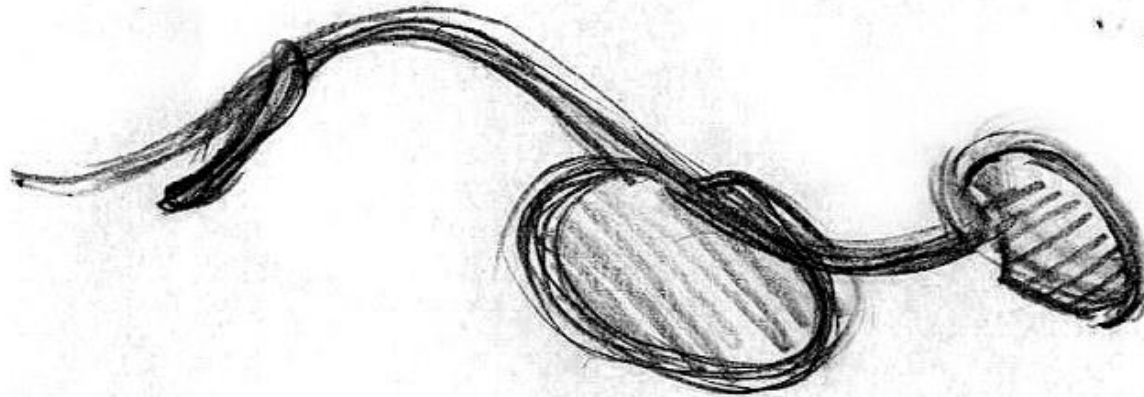
Równowaga pomiędzy przenoszeniem sił a ruchliwością



IT'S HELPFUL TO THINK LIKE AN ENGINEER ABOUT SKELETONS-- WHAT KIND OF SHAPES SUPPORT WEIGHT WELL FOR EXAMPLE. SKELETONS ARE A BALANCE BETWEEN SUPPORT AND FLEXIBILITY, AND DIFFERENT ANIMALS FAVOUR ONE OVER THE OTHER.



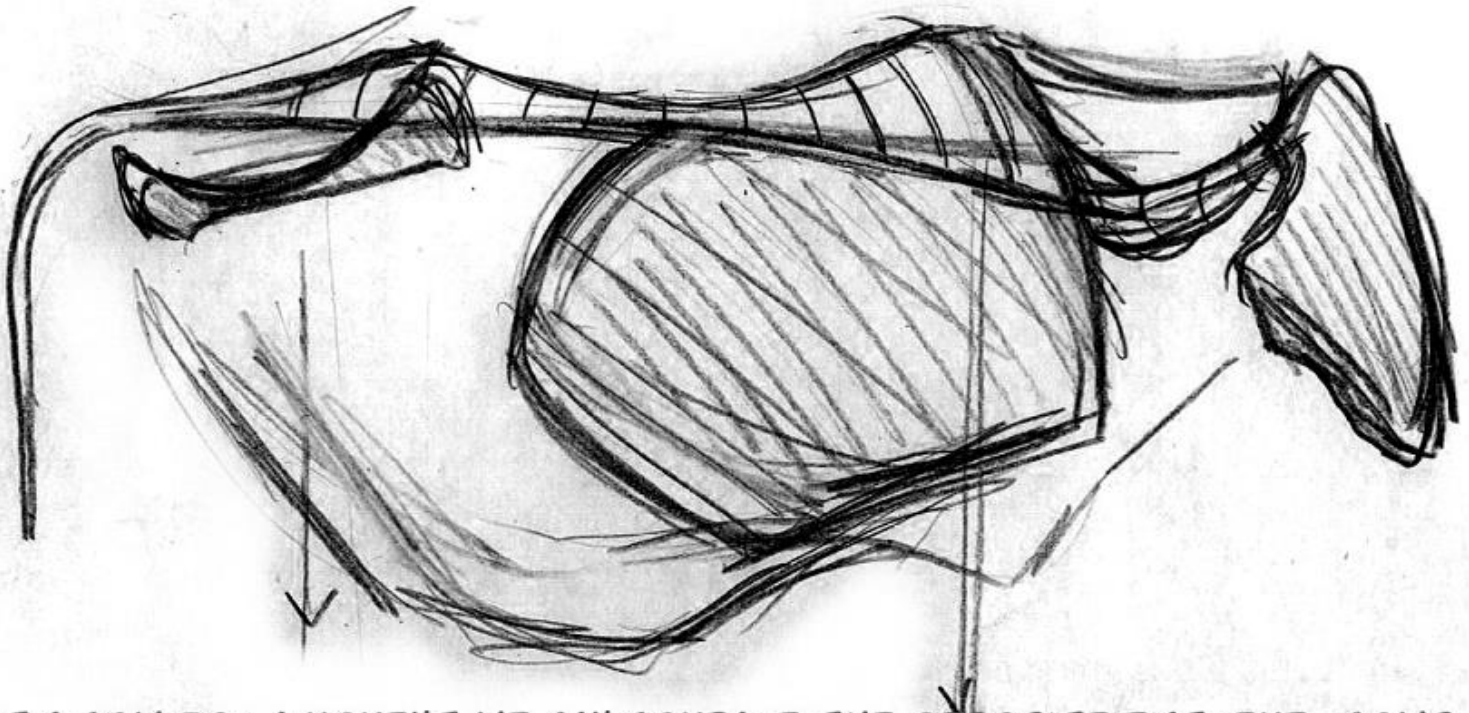
Duża ruchliwość



A CAT IS AN EXTREME IN FAVOUR OF FLEXIBILITY. IT'S A VERY LIGHTWEIGHT ANIMAL-- ITS HEAD IS SMALL BECAUSE IT DOESN'T NEED BIG TEETH (CATS DON'T CHEW BONES LIKE DOGS DO). IT DOESN'T NEED TO SUPPORT A BIG RIBCAGE BECAUSE ITS HEART AND LUNGS ARE VERY SMALL. AS A HUNTER, IT RELIES ON WAITING AND SUDDEN ATTACK SO IT ONLY NEEDS SHORT BURSTS OF ENERGY. DOGS ARE 'ENDURANCE HUNTERS' WHO CAN RUN FOR HOURS, THAT IS WHY THEIR RIBCAGE IS SO MUCH BIGGER-- AND THEY CAN'T CLIMB TREES!



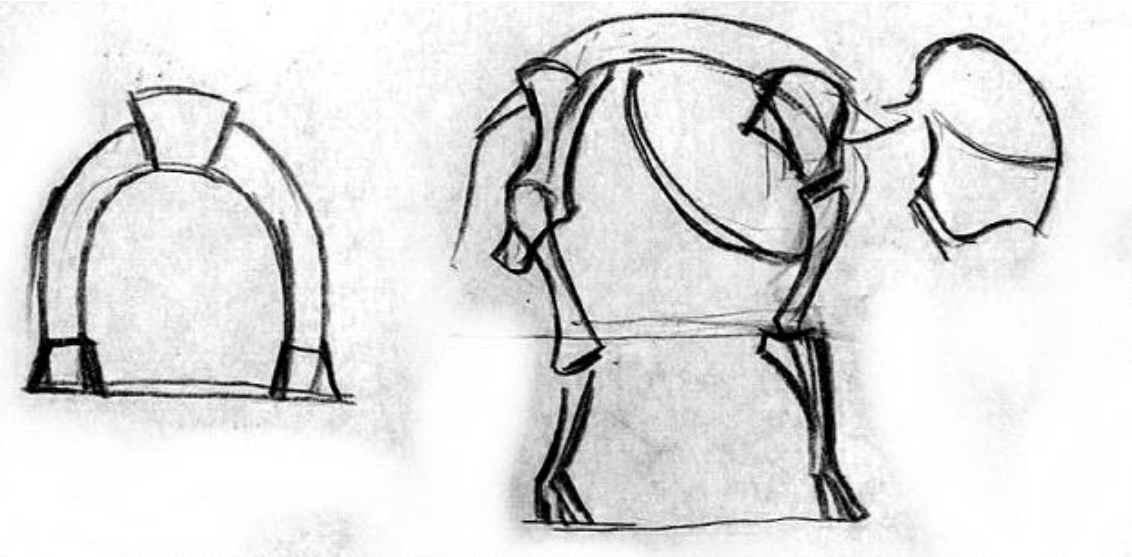
Most wiszący



IF WE LOOK AT A COW FOR A MOMENT WE CAN COMPARE THE OPPOSITE EXTREME. COWS HAVE NOT ONLY A MASSIVE RIBCAGE BUT ALSO A HUGE BELLY, BECAUSE DIGESTING GRASS IS VERY INEFFICIENT AND TAKES A BIG LENGTH OF GUT. THE SKULL IS HUGE AS WELL, FOR THE BIG TEETH NEEDED TO CHEW GRASS. TO SUPPORT ALL THIS WEIGHT THE SKELETON GIVES UP MOST OF IT'S FLEXIBILITY, AND IS BUILT IN HORIZONTAL LINES LIKE A SUSPENSION BRIDGE.



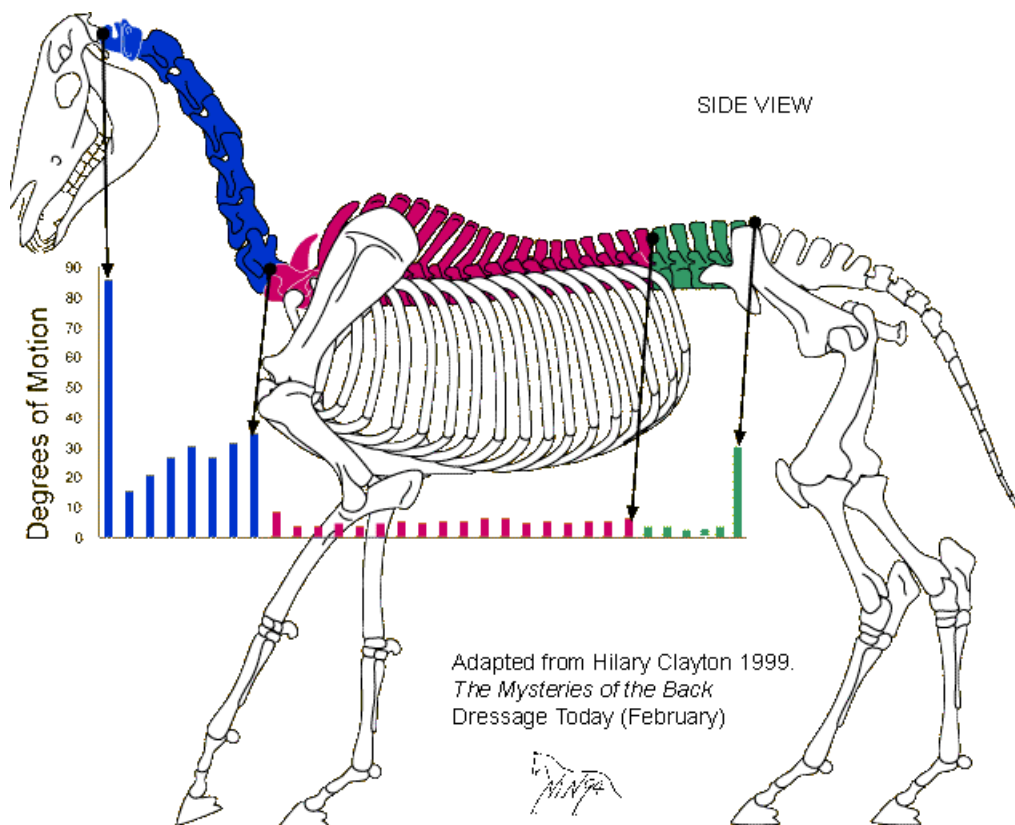
Sklepienie łukowe



ANOTHER SOLUTION FOR WEIGHT IS AN ARCH SHAPE LIKE AN INDIAN ELEPHANT-- NOTICE THE PELVIS IS TILTED STRAIGHT BUT THE OPPOSITE WAY TO A COW'S.



Kręgosłup konia





Rozwój kręgosłupa

Etapy rozwoju kręgosłupa dziecka



kifoza



pierwsza faza



kifoza piersiowa



lordoza lędźwiowa