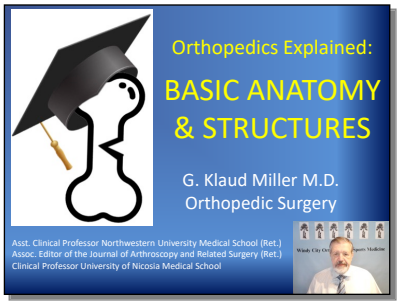
Slide 1



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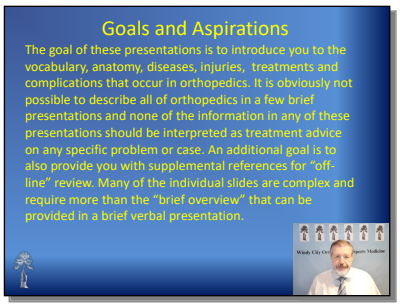

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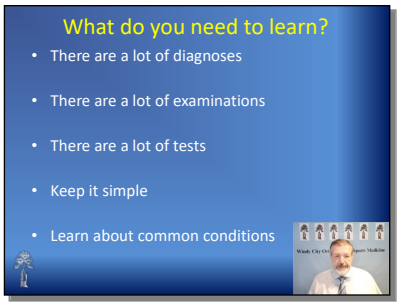

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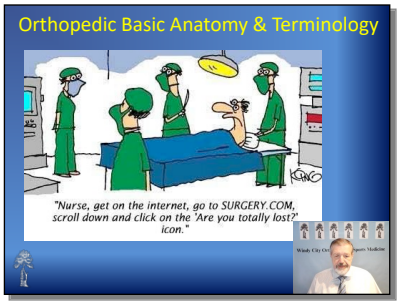

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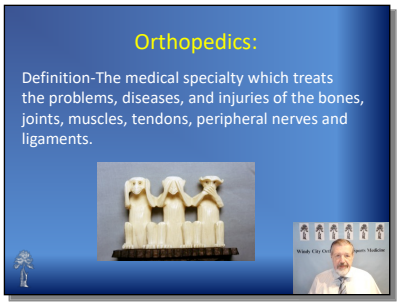
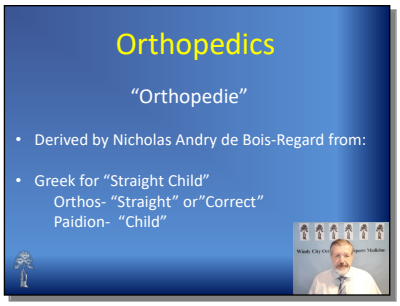


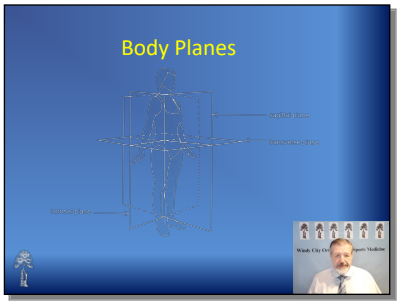
The definition of orthopedics

Slide 6



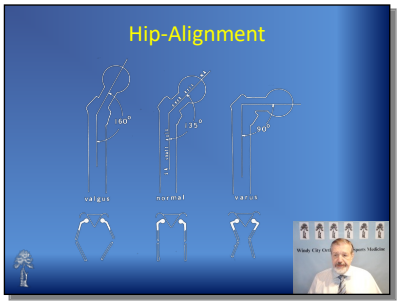
The derivation of orthopedic was derived from the Greek for straight child.

Slide 7



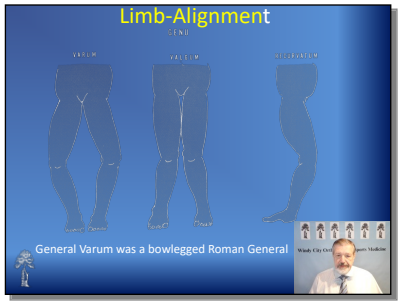
Think of the body as a loaf of bread. It can be “sliced” in 3 directions. There are 3 “planes” or axes to describe positions on the body. Sagittal, coronal and transverse. All measurements are assumed to have a ”fixed” central body.

Slide 8



In the hip, if the downstream (distal) part of the femur goes “away” from the midline, that is valgus alignment. Varus alignment is the opposite, the limb goes “towards” the midline),

Slide 9

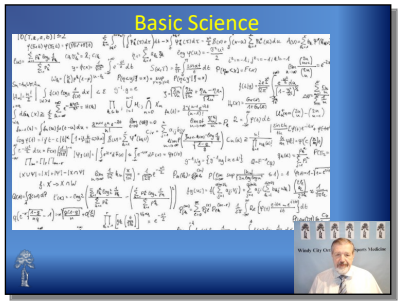


General Varum was a bowlegged Roman general. Recurvatum is when the knee deviates forward (i.e.”back-knee”)

Slide 10

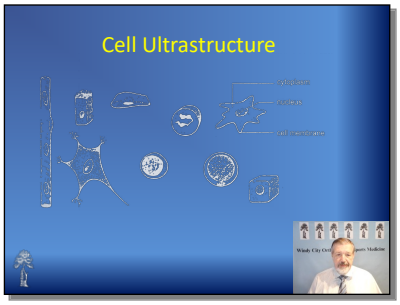
Lots of words begin with ost- or oss-; Osteoarthritis, osteoporosis, osteomyelitis and many others. However, Ostium is a hole not a bone!

Slide 11



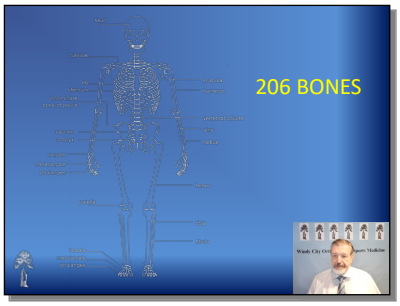
Not to bore you, but you need to know some basic science

Slide 12



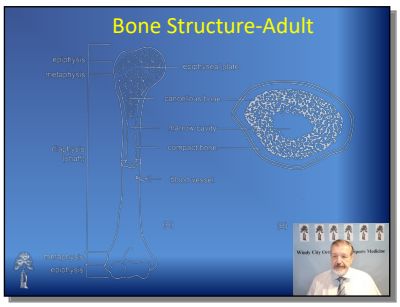
Cells may look different but all cells have the same basic cell structure, an outer membrane, a nucleus and cytoplasm.

Slide 13



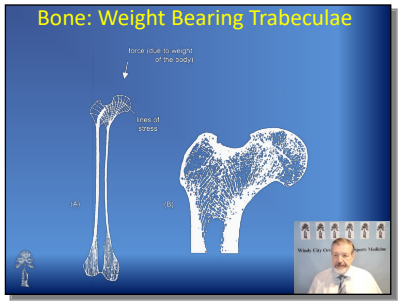
There are classically 206 “normal” bones in the body.

Slide 14



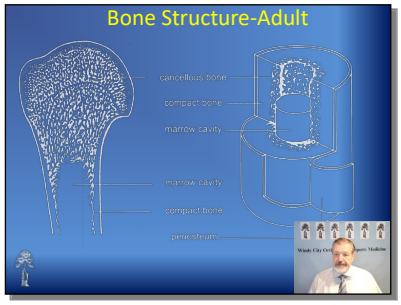
The 3 parts of a normal bone; The epiphysis on the end where growth occurs in children but which merges into the rest of the bone in an adult, a metaphysis (which is the “Flare”) and the thick shaft (Diaphysis). The epiphysis and metaphysis have what we call spongy bone and the shaft has cortical or compact bone (think of a round steak bone)

Slide 15



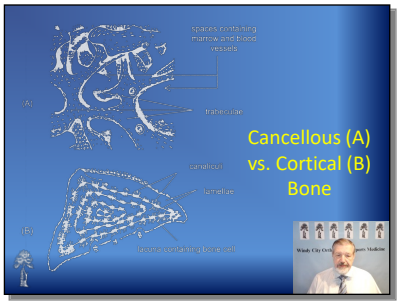
Macrospically, trabecula are lines of thicker bone aligned along the weightbearing axis of the bone to reinforce the structural integrity. Think ”rebar” in concrete that provides extra strength for weight bearing

Slide 16



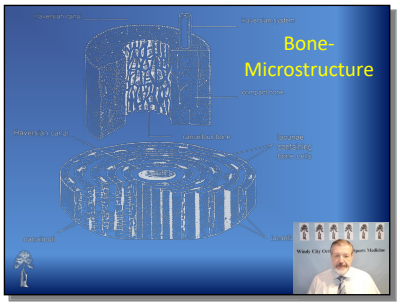
Normal bone structure. Cancellous bone is light weight, thin walled and near the ends of bones in the metaphysis. Cortical bone (The “round steak bone”) is strong and thick walled. The center of both areas has bone marrow where most blood is manufactured by the body. The periosteum is the outer layer (think of insulation on a wire) where a lot of the healing process occurs when the bone is broken.

Slide 17



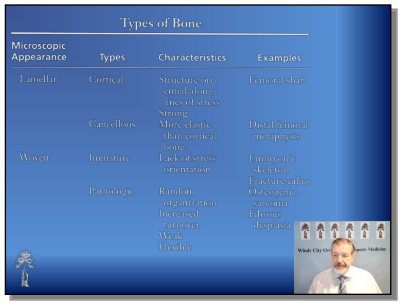
Macroscopically, cortical bone is very dense and cancellous bone is more like a sponge with a lot of space between the bone spicules

Slide 18



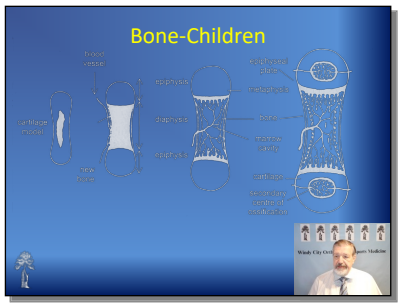
A cross-section of hypothetical example of the bone is at the top. Looking microscopically, bone is highly structured into layers and has multiple blood vessels running in Haversion canals. Around each blood vessel is bone in an onion skin type arrangement of lamellae. Cannalicli are even smaller microscopic tubes that channel nutrients from the blood vessel to the cells of the bone In the lamellae.

Slide 19



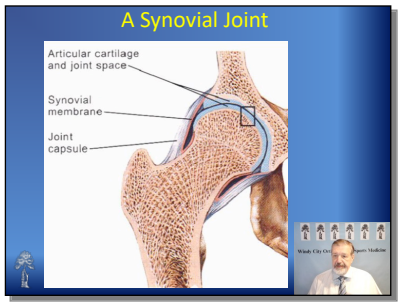
Different types of bone have different mechanical properties for different functional demands

Slide 20



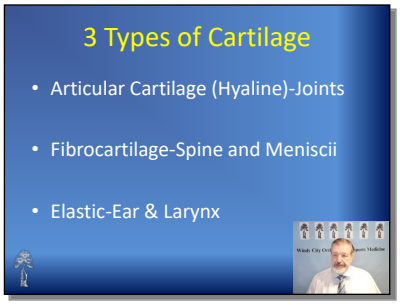
Juvenile bones have an area that allows for growth in both length and diameter called the epiphyseal plate. Children's bones have a lot of cartilage which only later becomes ossified in the adult

Slide 21



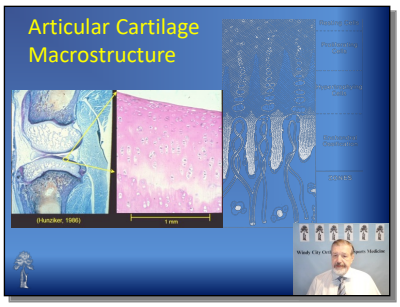
A synovial joint has an outer capsule which provides joint stability and encloses the synovial membrane which secretes the synovial fluid ("the joint oil") which in turn nourishes the articular cartilage that allows smooth and pain free motion.

Slide 22



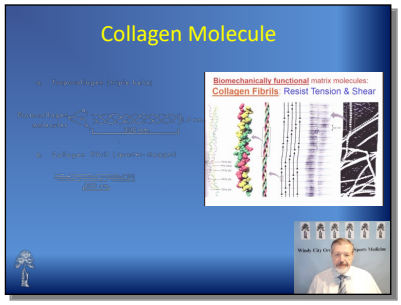
There are 3 types of cartilage.

Slide 23



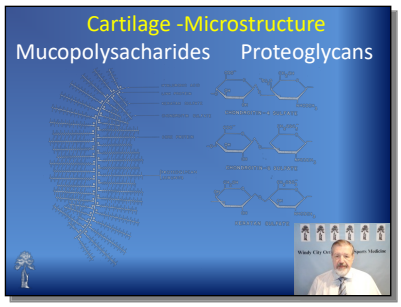
Cartilage is a highly organized structure, it is not “shoe goo”. The deepest level is next to the bone. There is an area of endochondral ossification where cartilage cells start to grow. The next level is where the cells hypertrophy and grow bigger. They become more numerous in the proliferating cell layer. The cells on the surface are called the resting cells. Once articular cartilage is damaged, it does not heal.

Slide 24



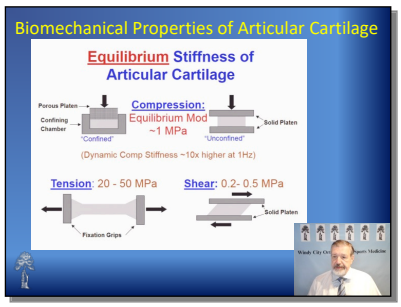
As opposed to bone, collagen fibrils are the basic building blocks of cartilage

Slide 25



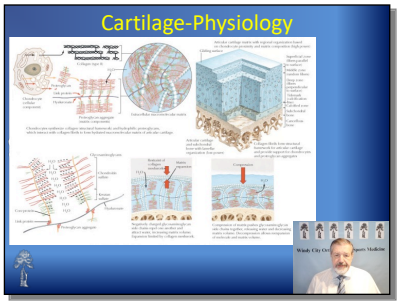
Cartilage microstructure- Collagen fibrils are organized into a “bottlebrush” structure with mucopolysaccharides on a core of hyaluronic acid.

Slide 26



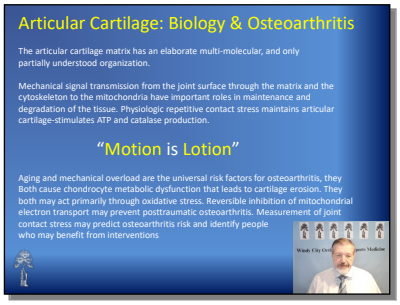
Cartilage is viscoelastic, it is strongest in compression and weakest in shear

Slide 27



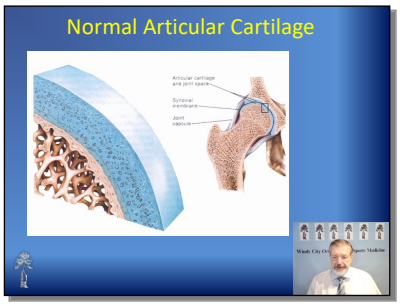
A 3-D diagram of articular cartilage in the upper right. Cartilage is nourished by the “sponge effect” (lower right) where compression and release, causes synovial fluid to be “sucked in and out” to provide nourishment to the cells

Slide 28



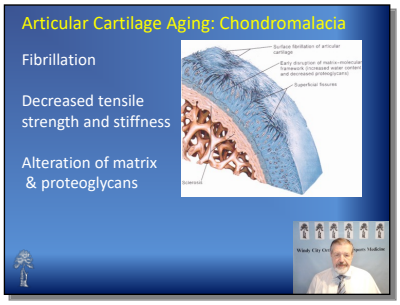
Motion is important for maintenance of normal joint function, immobilization is not good

Slide 29



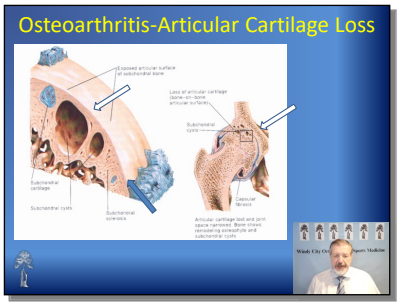
Normal articular cartilage

Slide 30



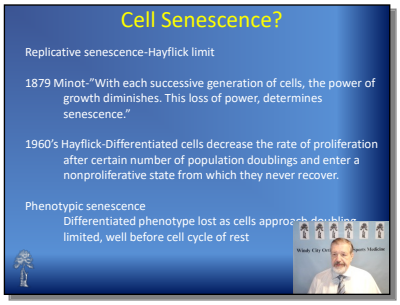
Chondromalacia is early degeneration and softening of the articular cartilage, fraying and thinning but not yet complete loss of cartilage

Slide 31



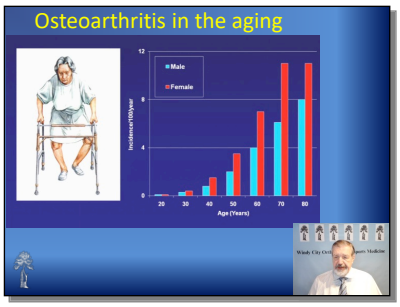
Osteoarthritis is a complete loss of all cartilage with exposed subchondral bone. Radiographically , you will see joint line narrowing. This is the definition of osteoarthritis. Note you may see subchondral cyst (white arrows) or subchondral sclerosis (thickened bone) (Blue arrow)

Slide 32



Senescence is a process of normal aging in which all cells ultimately lose their ability to reproduce

Slide 33

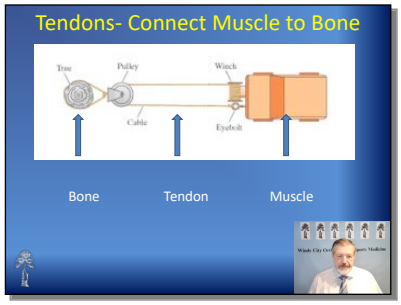


The frequency of arthritis increases with age in both females and males

Slide 34

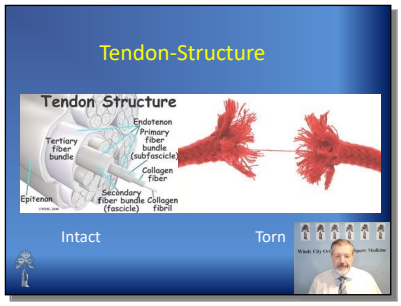
Muscles

Slide 35



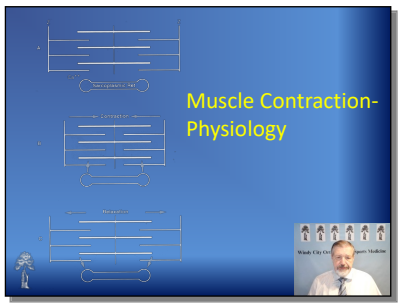
Tendons (the cable) connect muscle (the motor) to the bone (tree). If one component is missing, the system won't work and the bone will not get moved.

Slide 36



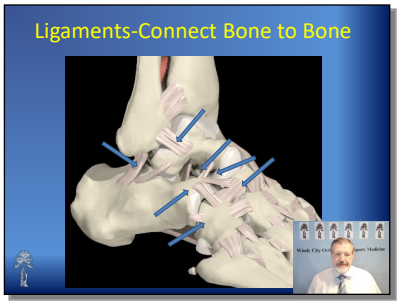
Tendons are like a cable, lots of little wires

Slide 37



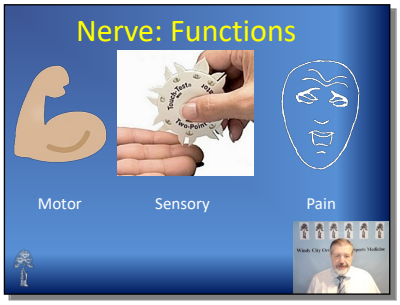
Muscles contract like a zip tie, but then can release

Slide 38



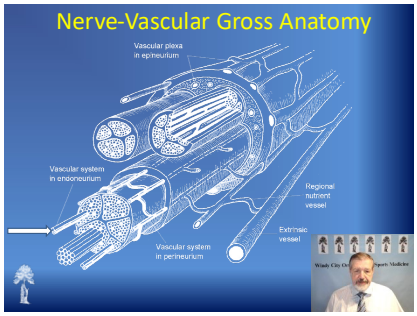
Ligaments connect two bones together to allow motion in some direction but not others. This is a lateral view of the ankle and shows ligaments connecting the bones of the foot and ankle (blue arrows).

Slide 39



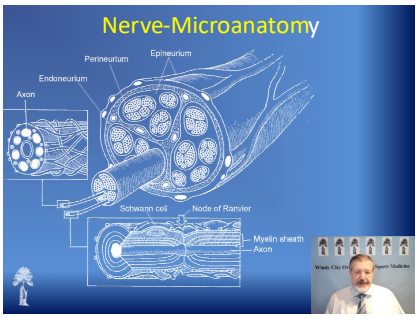
Nerves have 3 functions, motor, sensation and pain

Slide 40



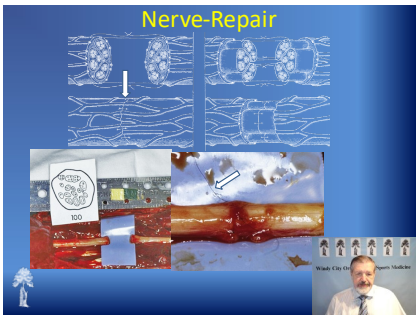
Nerves also are made up of multiple smaller nerve fibrils (wires) and ar bundled into a bigger cable.

Slide 41



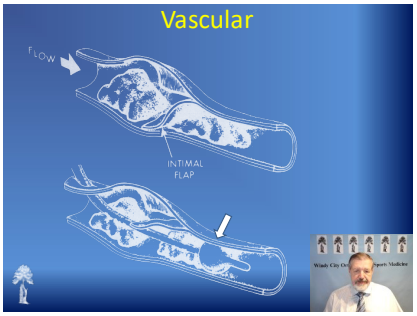
Each nerve fibril is made up of even tinier fibrils called axons. Axons are the smallest “wires” in a nerve

Slide 42



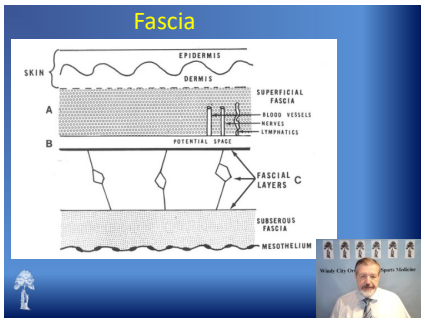
We repair nerves with sutures smaller than a human hair (white arrow). The arrow on the right shows a magnified view of the suture. The nerve diameter is <1/4”!

Slide 43



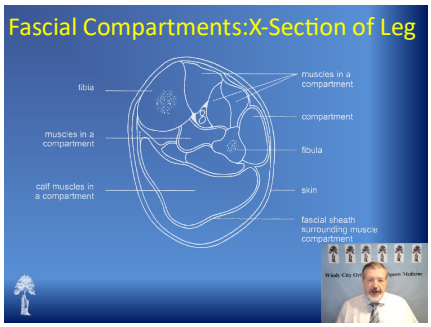
Blood clots and an intimal flap block flow in a vein or artery. A Fogarty catheter being used to remove the clot (arrow)

Slide 44



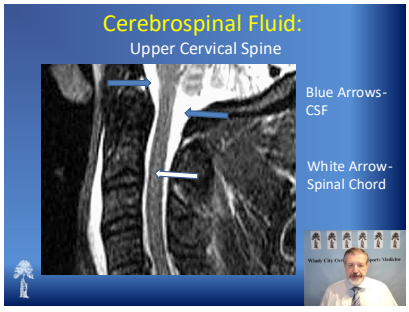
Fascia is the extremely tough reenforcing tissue around muscles and underneath skin

Slide 45



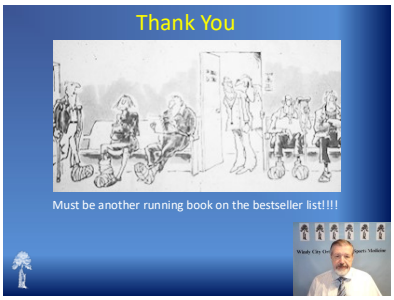
Fascia surrounds muscles and divides an extremity into compartments. These are the structures that are involved in compartment syndromes and requires release to prevent permanent damage.

Slide 46



An MRI shows cerebrospinal fluid (blue arrows) which surrounds the brain and spinal chord (white arrow) and provides a “cushion” so that the brain does not get bruised with activity.

Slide 47



Thank you !