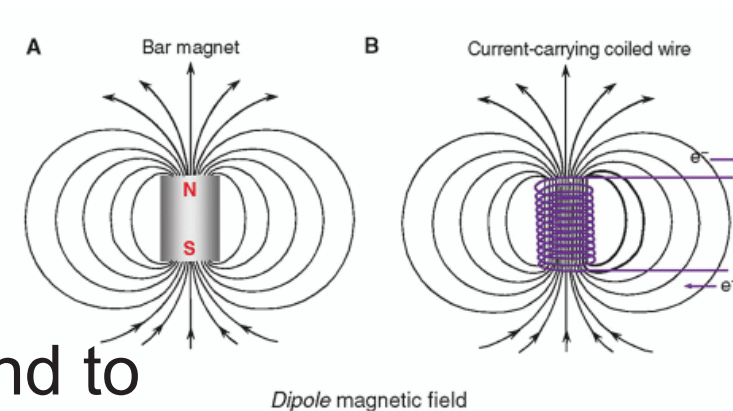


What is MRI?

- ★ MRI stands for Magnetic Resonance Imaging
- ★ MRI instruments use magnetic fields 60,000 times stronger than Earth's magnetic field
- ★ MRI instruments are used by researchers and doctors to detect atoms in samples
- ★ The stray field is the area around the magnet, where one experiences magnetic forces, which molecules respond to



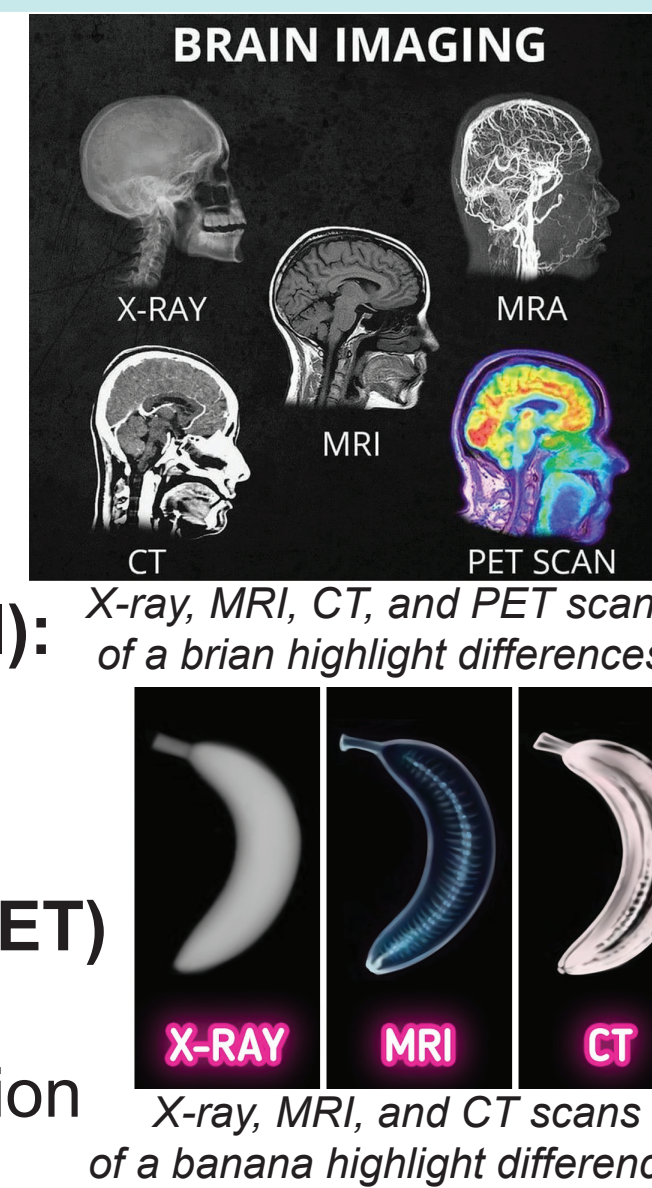
typical MRI instrument found in hospitals



Dipole magnetic field

MRI vs other imaging types

- ★ **X-Rays:**
 - ionizing radiation
 - shows bone/skull only
- ★ **Computed tomography (CT):**
 - ionizing radiation
 - shows brain at low resolution
- ★ **Magnetic resonance imaging (MRI):**
 - magnetic fields
 - shows brain at high resolution
- ★ **Positron emission tomography (PET)**
 - ionizing radiation
 - shows brain activity at high resolution



X-ray, MRI, CT, and PET scans of a brain highlight differences of a banana highlight differences

How MRI works

THIS IS HOW MAGNETIC RESONANCE IMAGING WORKS

detect MRI active atomic nuclei:

- water
- proteins
- sugar
- fats
- minerals

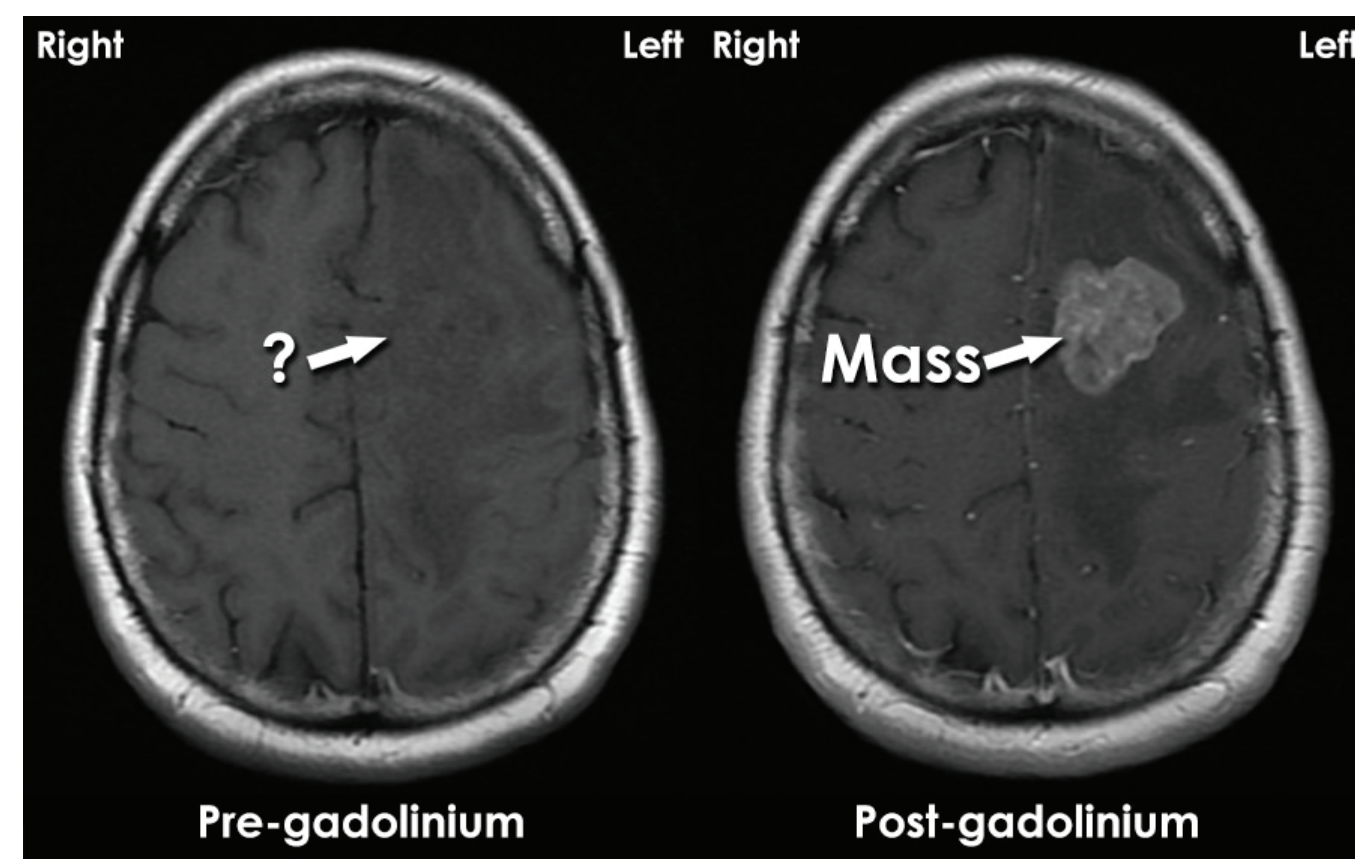
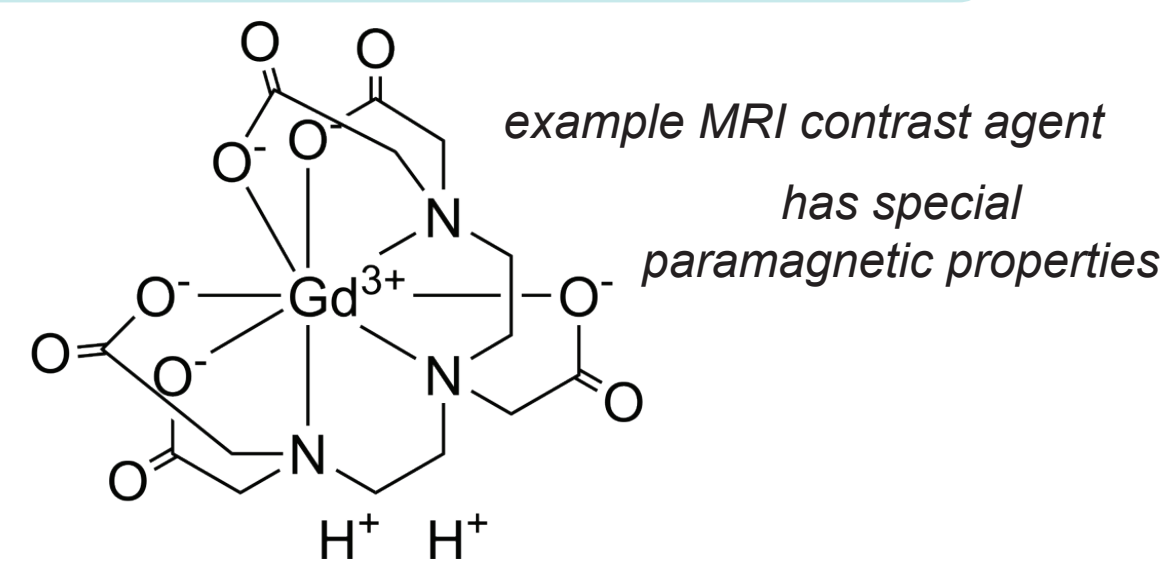
hydroxyapatite mineral found in bones

Safety Concerns

- ★ No magnetic items allowed!
- ★ No magnetic implants or pacemakers
- ★ Loud acoustic noise requires ear protection
- ★ Magnets stimulate peripheral nerves
- ★ Cryogenics (Liquid helium)
- ★ Painless but claustrophobia and discomfort

Contrast Agents

- ★ Contrast agents are used to improve the visualization of specific organs, tissues, and blood vessels.
- ★ Usually administered orally prior to the MRI scan
- ★ Many are based on the element Gadolinium and are safe to use
- ★ Reduce signals coming from background water, allowing signals from other things to be visualized more readily



use of MRI contrasting agent to spot a brain tumor

Medical Imaging

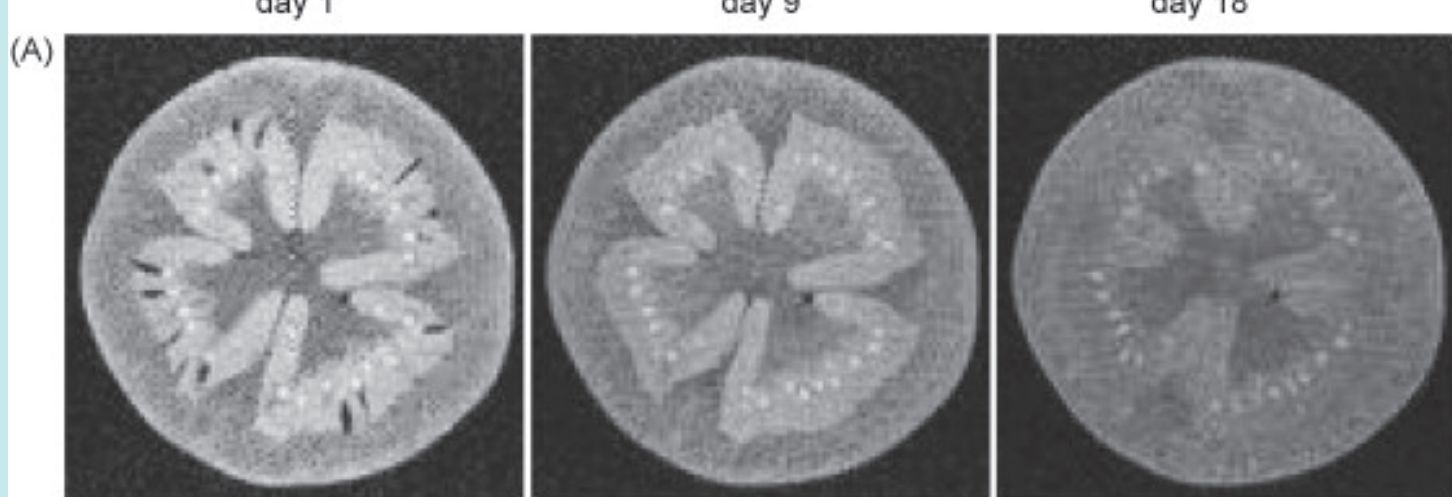
- ★ Neuroimaging
- ★ Cardiovascular
- ★ Musculoskeletal
- ★ Organs and arteries

3D models of fossils and mummies

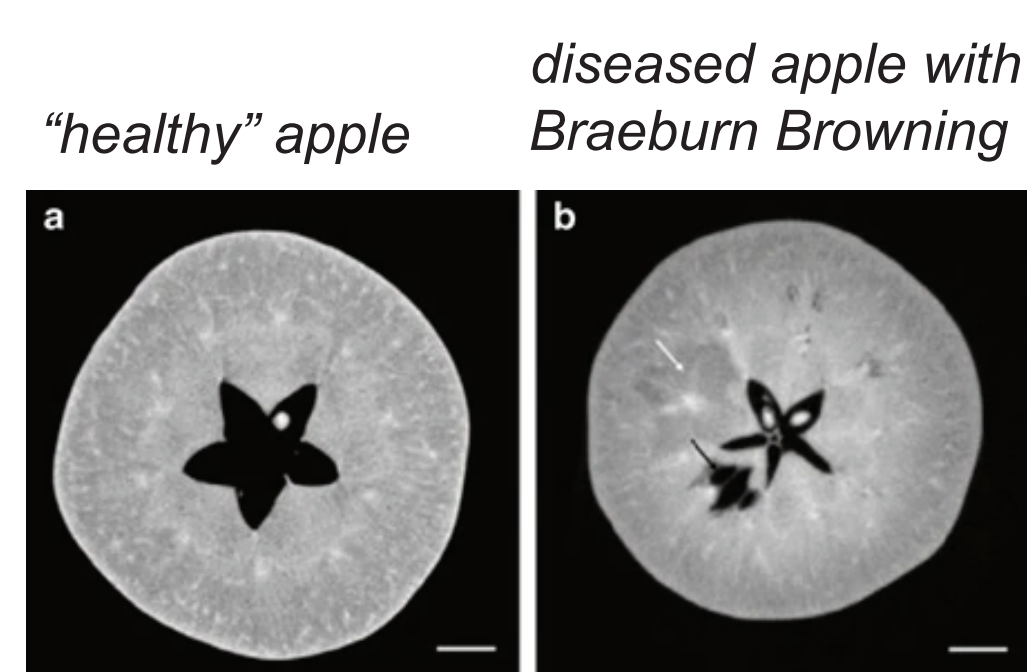
- ★ MRI of millions of year old fossils
- ★ MRI to understand mummies

Fruits and Veggies

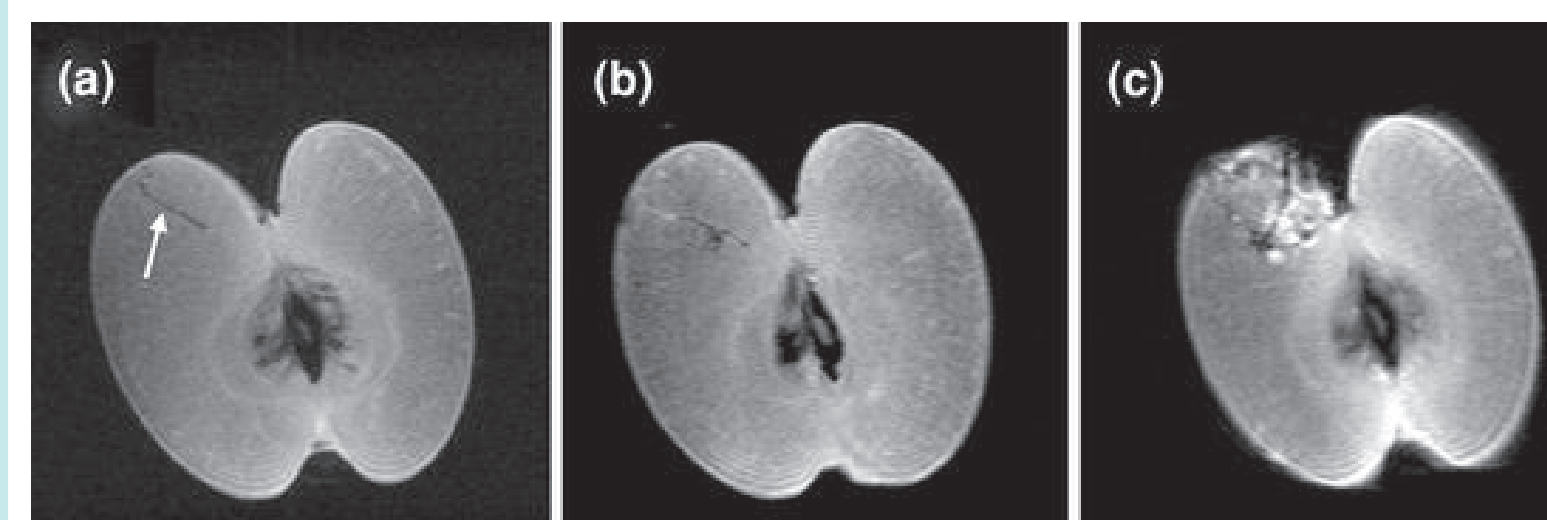
- ★ Ripeness and freshness (tomato)



- ★ Healthy vs diseased (apple)

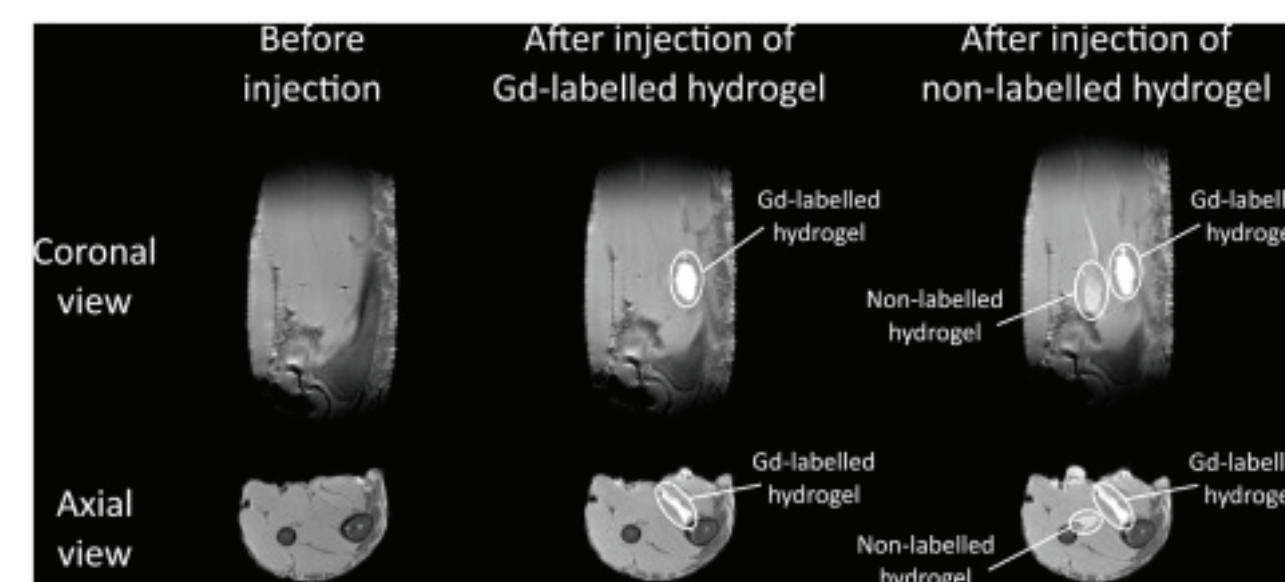


- ★ Infection and infestation (apple)



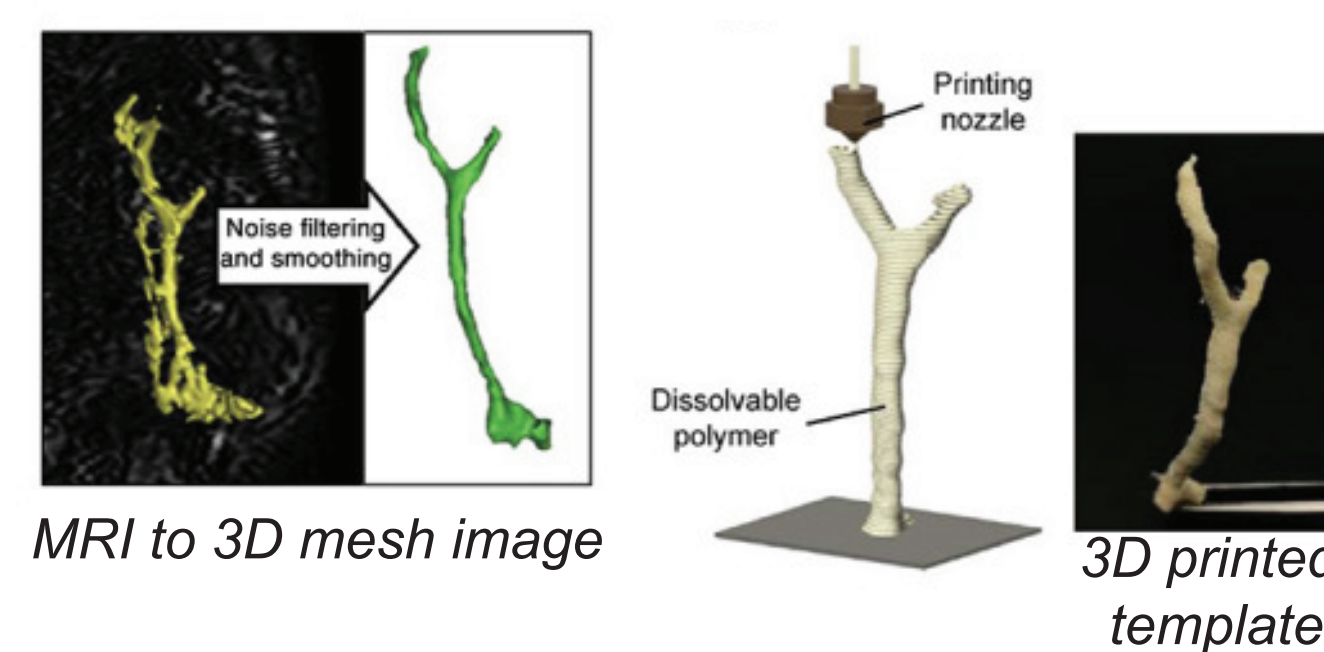
Bioengineering

- ★ MRI of hydrogels



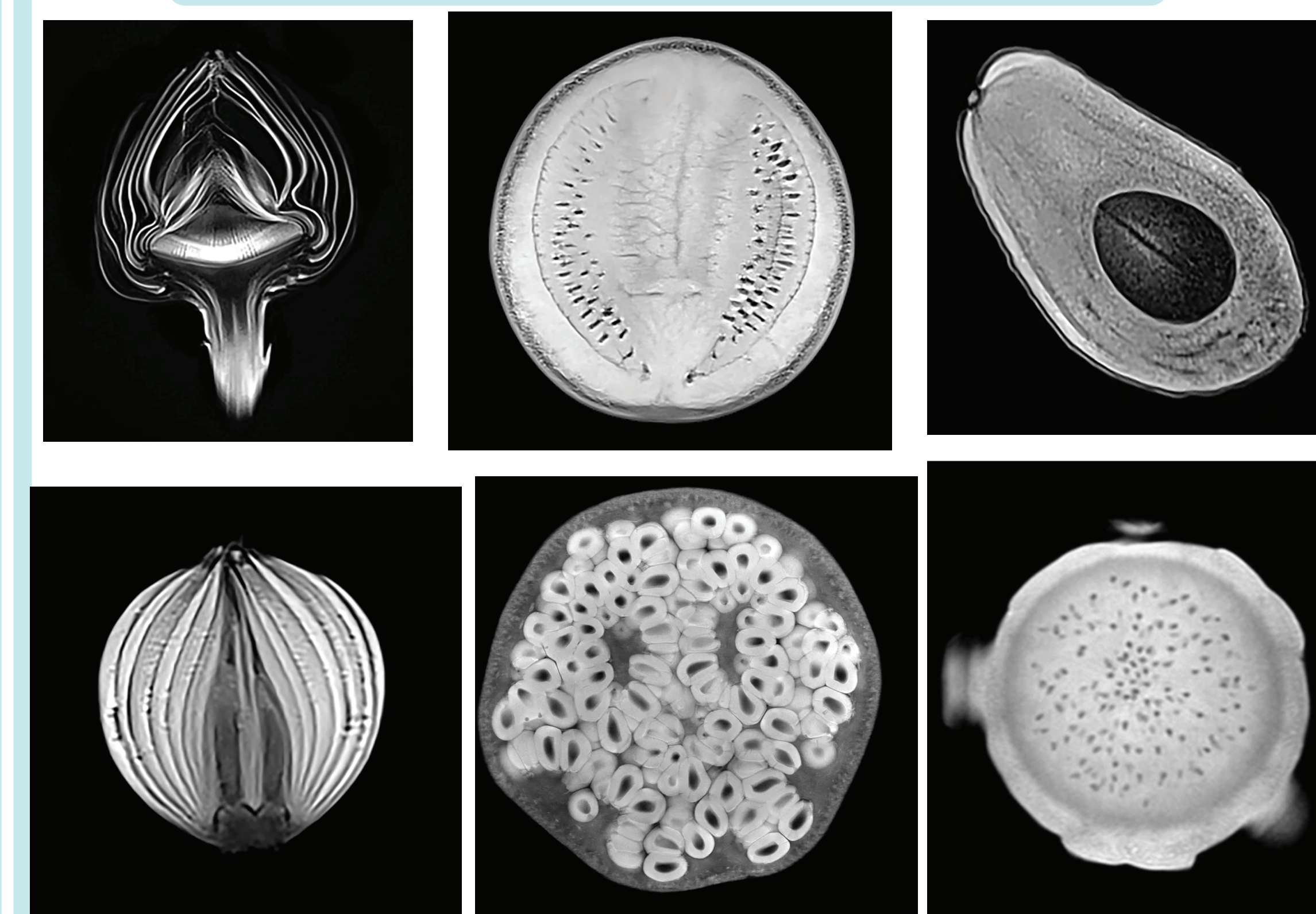
regenerative medicine, tissue engineering, drug delivery

- ★ MRI of implantable artificial tissues



artificial bile duct made with cells and biopolymers

Guess the fruit or veggie!



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