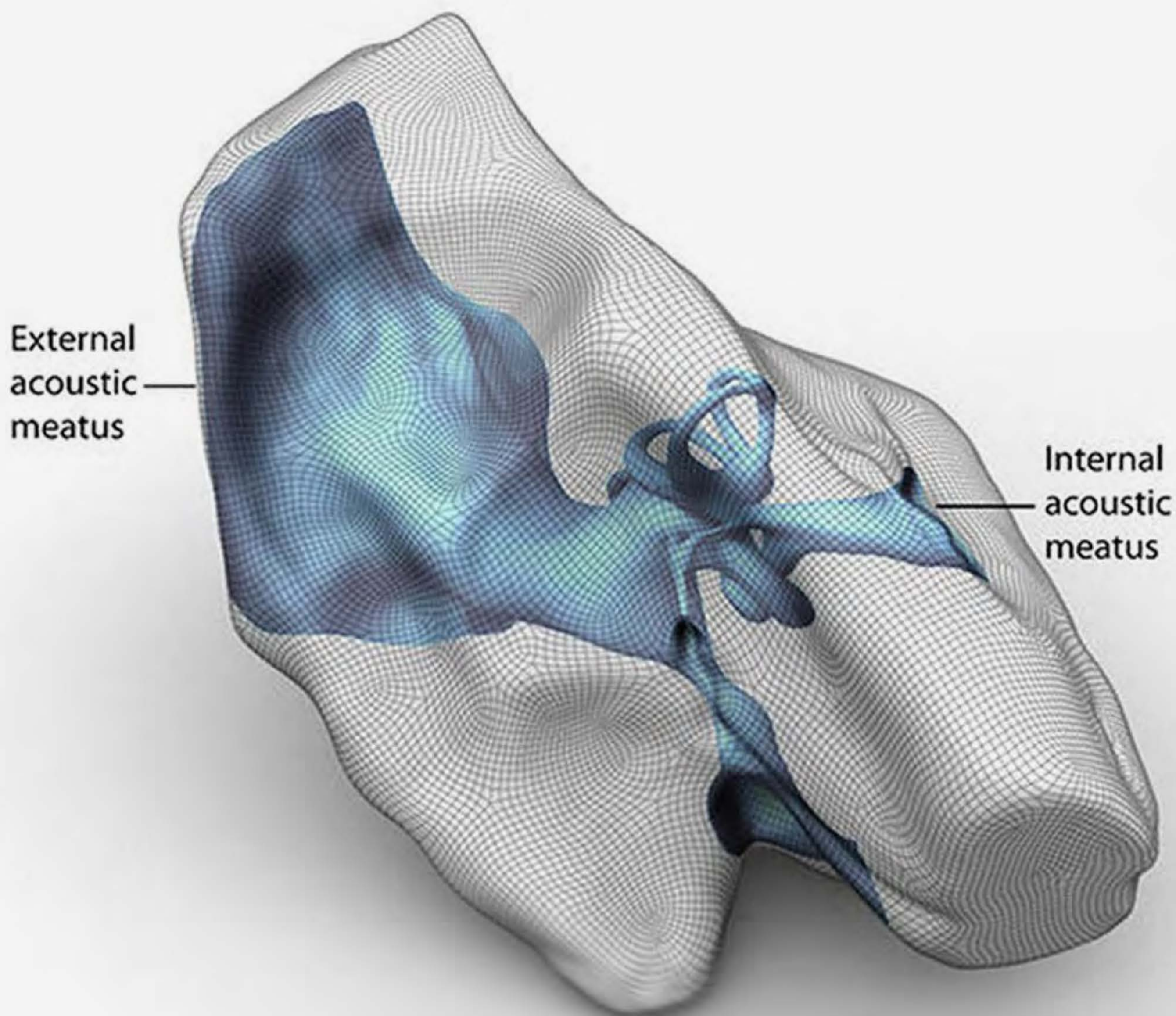


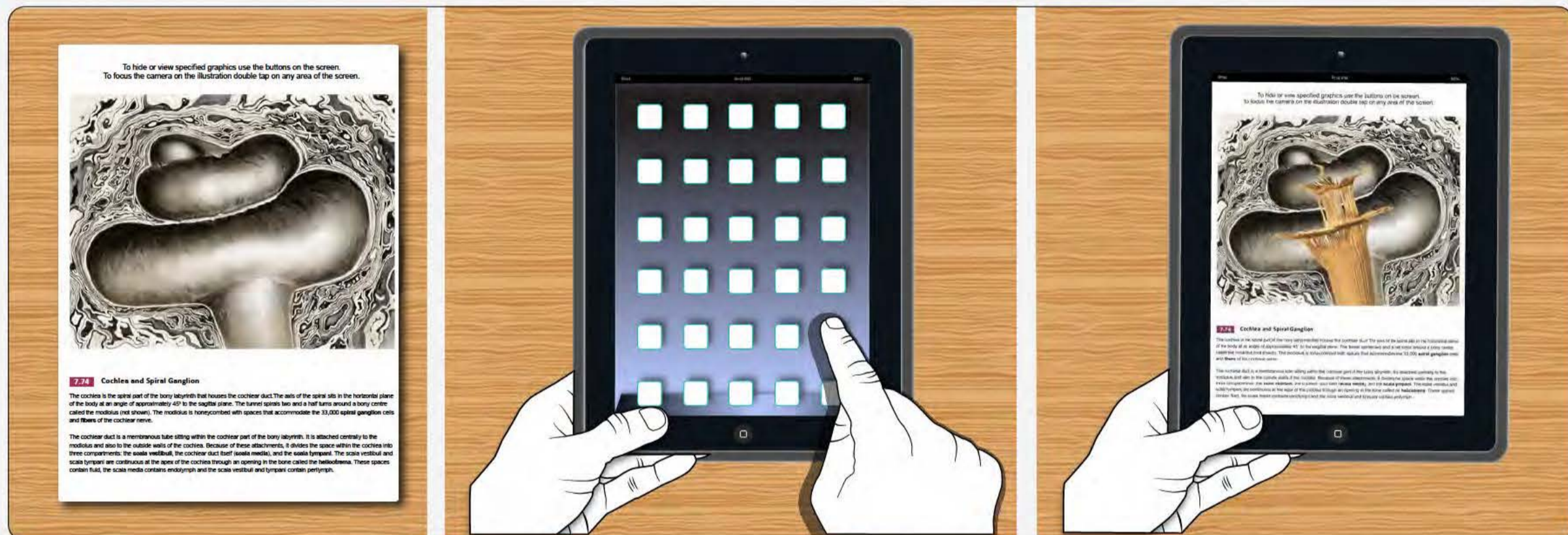
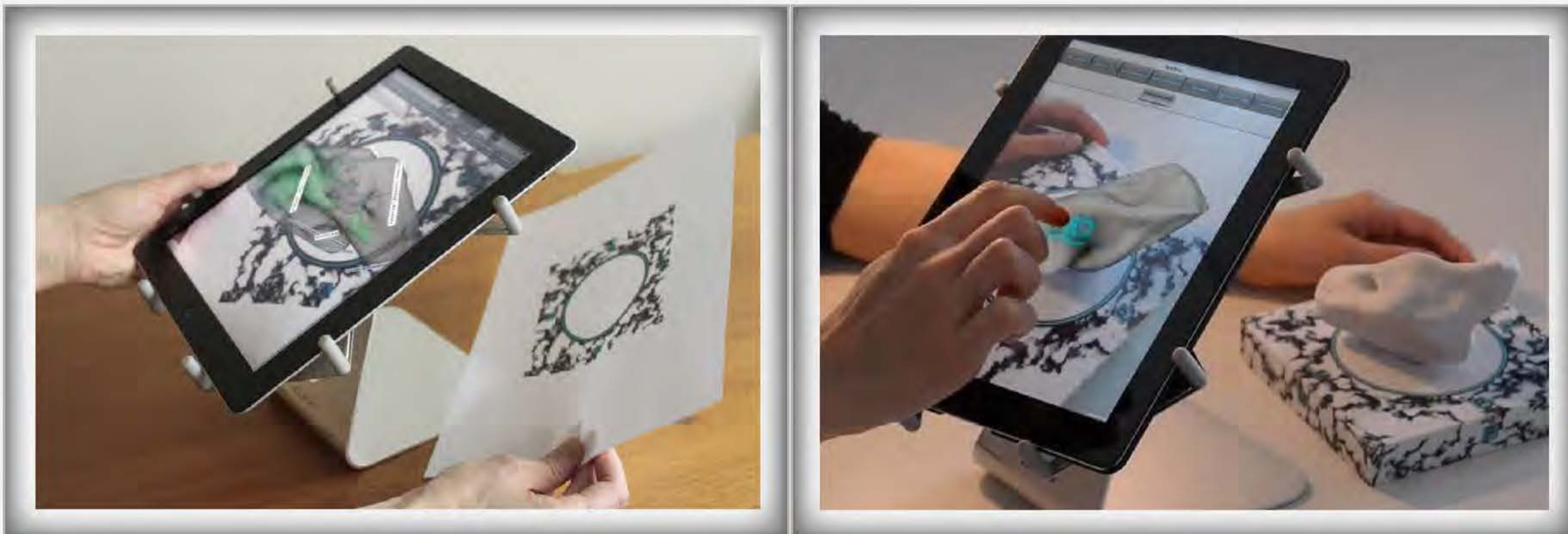
InvisibleEar©



INSTRUCTIONS

TO ACTIVATE THE AUGMENTED REALITY DOWNLOAD THE PDF IMAGES OR PURCHASE THE 3D PRINTED MODEL FROM andreazariwny.com/invisibleear

Increase the learning educational value of this App with the **3D printed model** of the petrous temporal bone.



FEATURES

- Read more on the gross anatomy of the ear.
- Control the display of all labels, or tap on specific areas of the model on the iPad screen to display corresponding label.
- Exit the app to view the InvisibleEar© AR app demo video, and download the glyphs.

PETROUS BONE:

- Toggle to hide or show the entire **negative space** of the ear within the petrous temporal bone.
- Toggle to hide or show the negative space of the **inner ear**, the cochlea and the semicircular canals.
- Drag the slider from side to side to increase or decrease the transparency of the **temporal bone**.

- Glyphs to use:



COCHLEA:

- Toggle to hide or show the perilymph or endolymph within the cochlea.

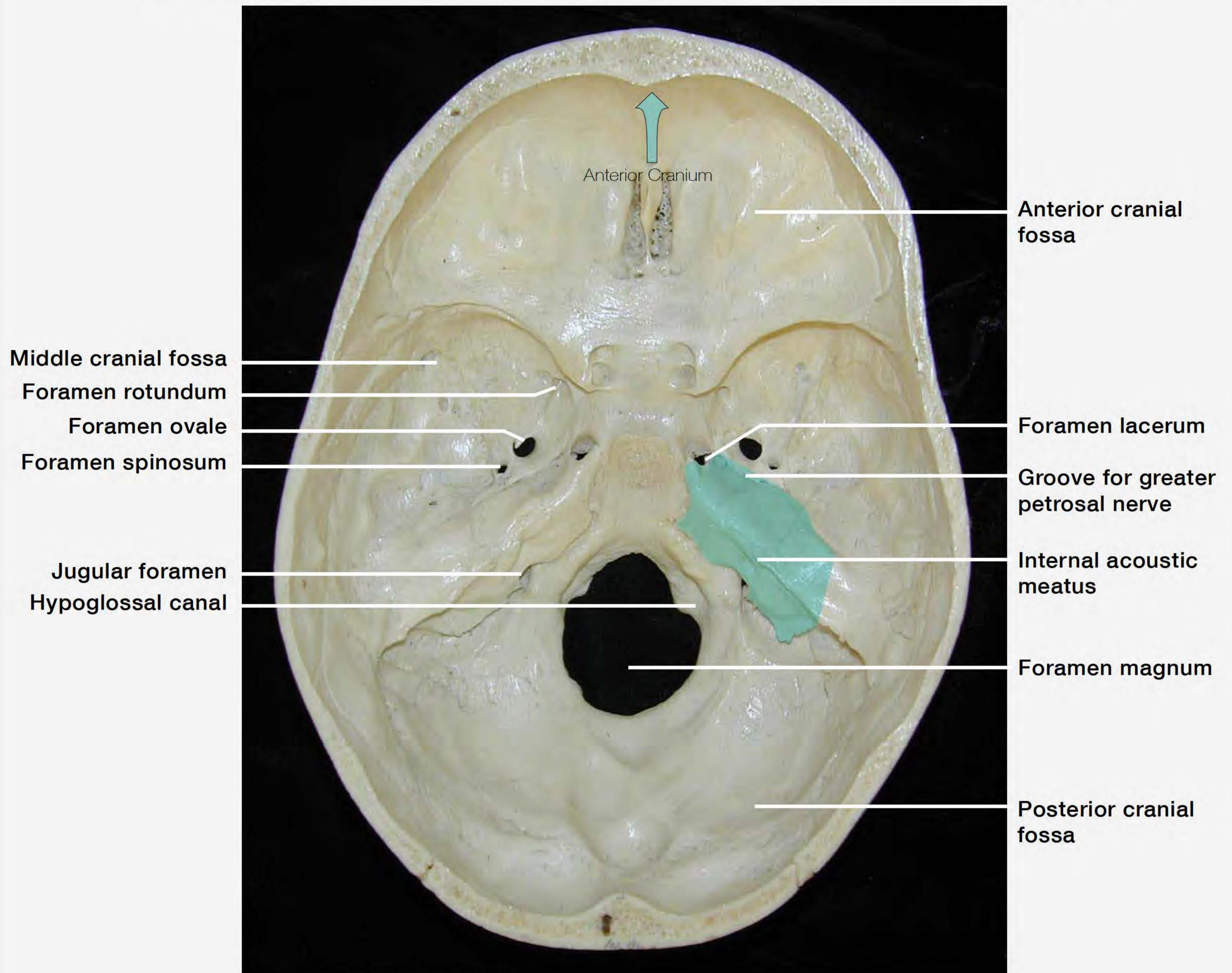
- Glyphs to use:



PETROUS BONE GROSS ANATOMY

The below image is a superior view of the cranial floor.

The area **highlighted below in cyan** indicates the petrous temporal bone.

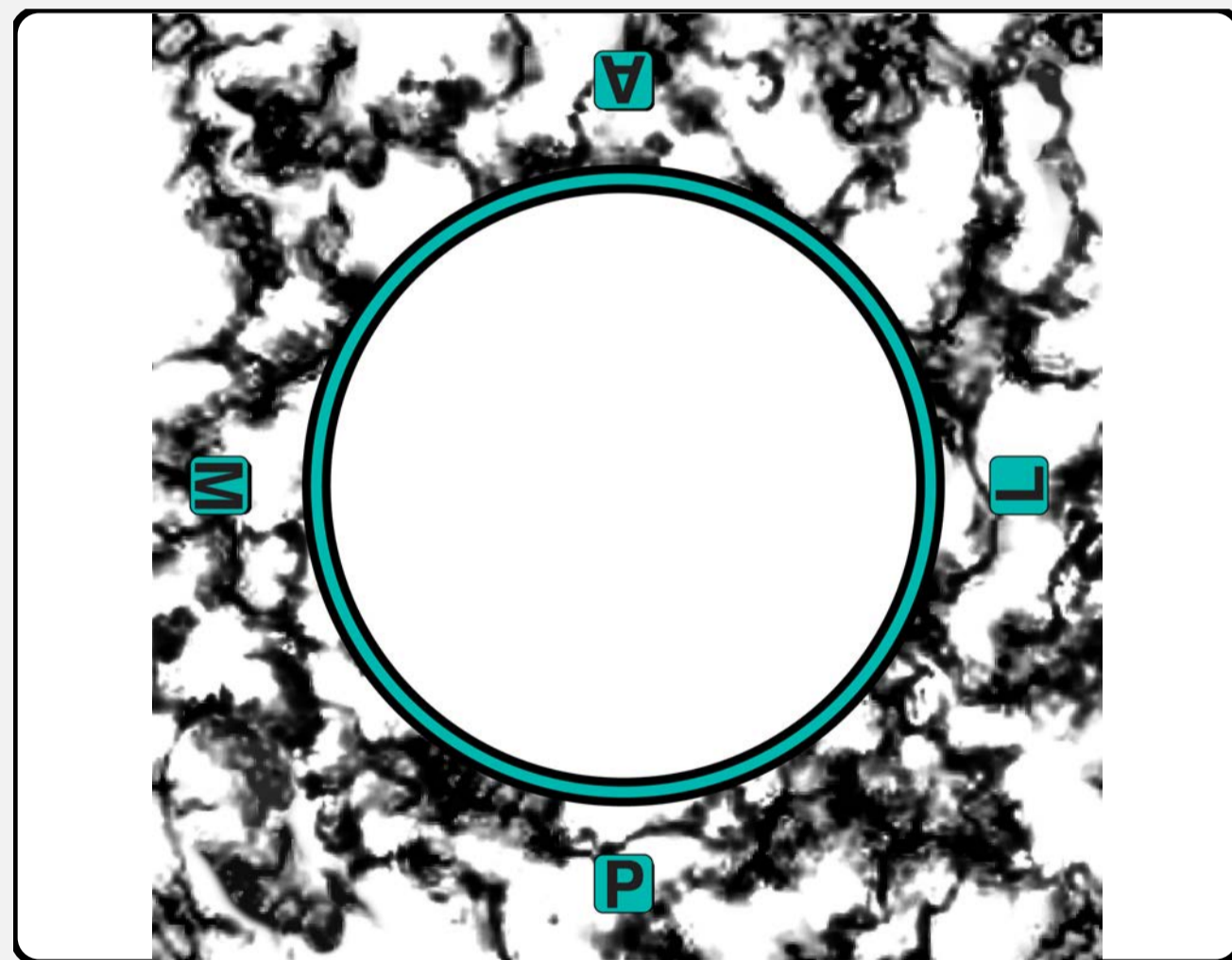


DESCRIPTION OF THE INNER EAR

The inner ear is past the eardrum within the petrous temporal bone, the most dense bone in the body located on the lateral sides of your skull. The bony labyrinth of the inner ear, is a negative space divided into two main spaces within the petrous bone:

- 1) The cochlea houses the organ and nerves responsible for relaying sound to the brain. The cochlea is <4mm in diameter, and contains 33,000 spiral ganglion cells and fibres belonging to the cochlear nerve.
- 2) The vestibule and semicircular canals house the sensory system responsible for sensing movement and balance. The nerve fibres within meet up with the cochlear nerve forming the Vestibulocochlear Nerve, otherwise known as Cranial Nerve VIII. This nerve leads to the brainstem from the ear with sensory information.

Glyphs for iPhone view



PETROUS TEMPORAL BONE

After launching the InvisibleEar®, place the camera over the image to view the petrous temporal bone, the inner ear, and the entire negative space of the ear. Rotate to view all labels and aspects of anatomy!

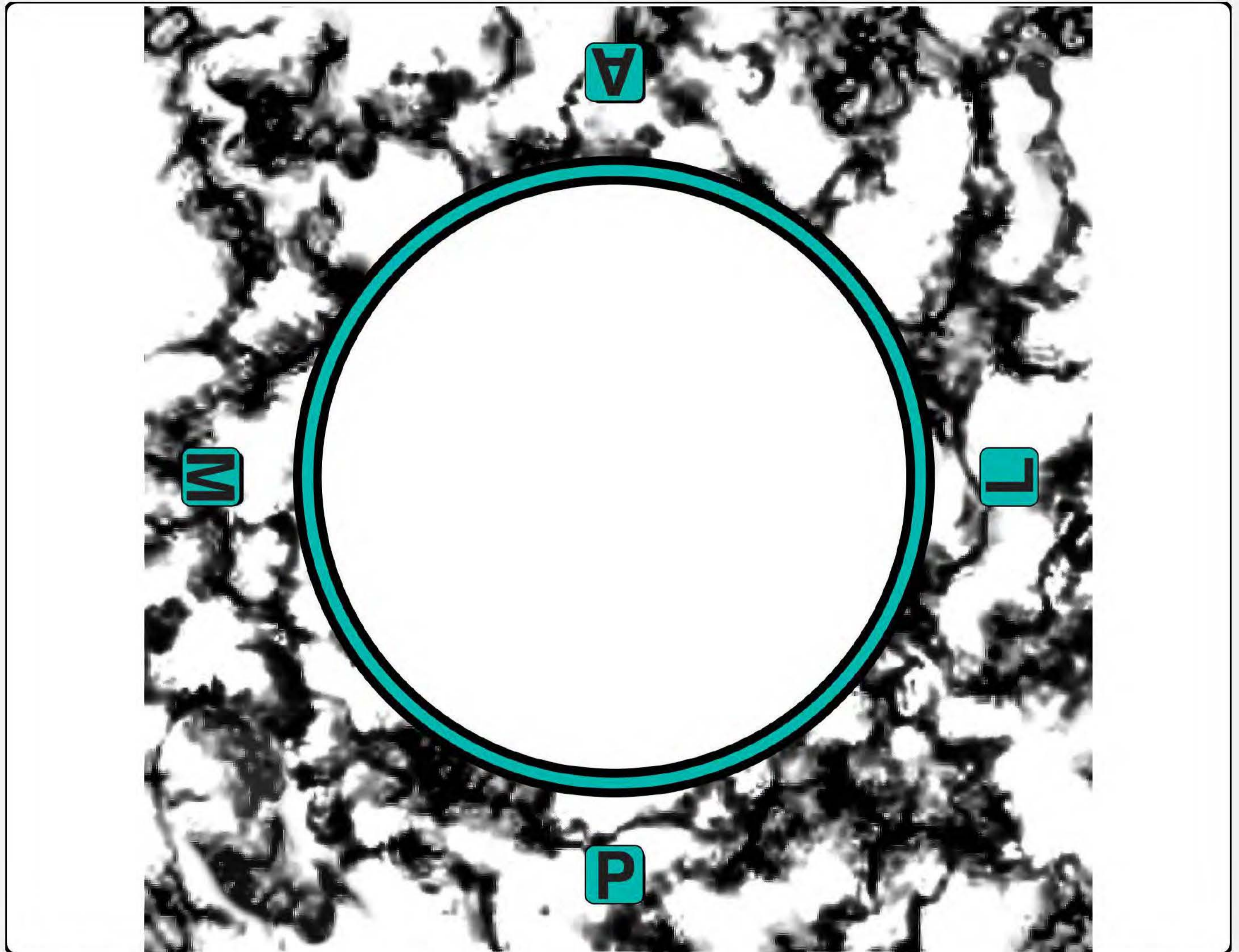


Fig: This glyph activates augmented reality. The letters represent the **A**nterior, **P**osterior, **M**edial and **L**ateral sides of the cranium.

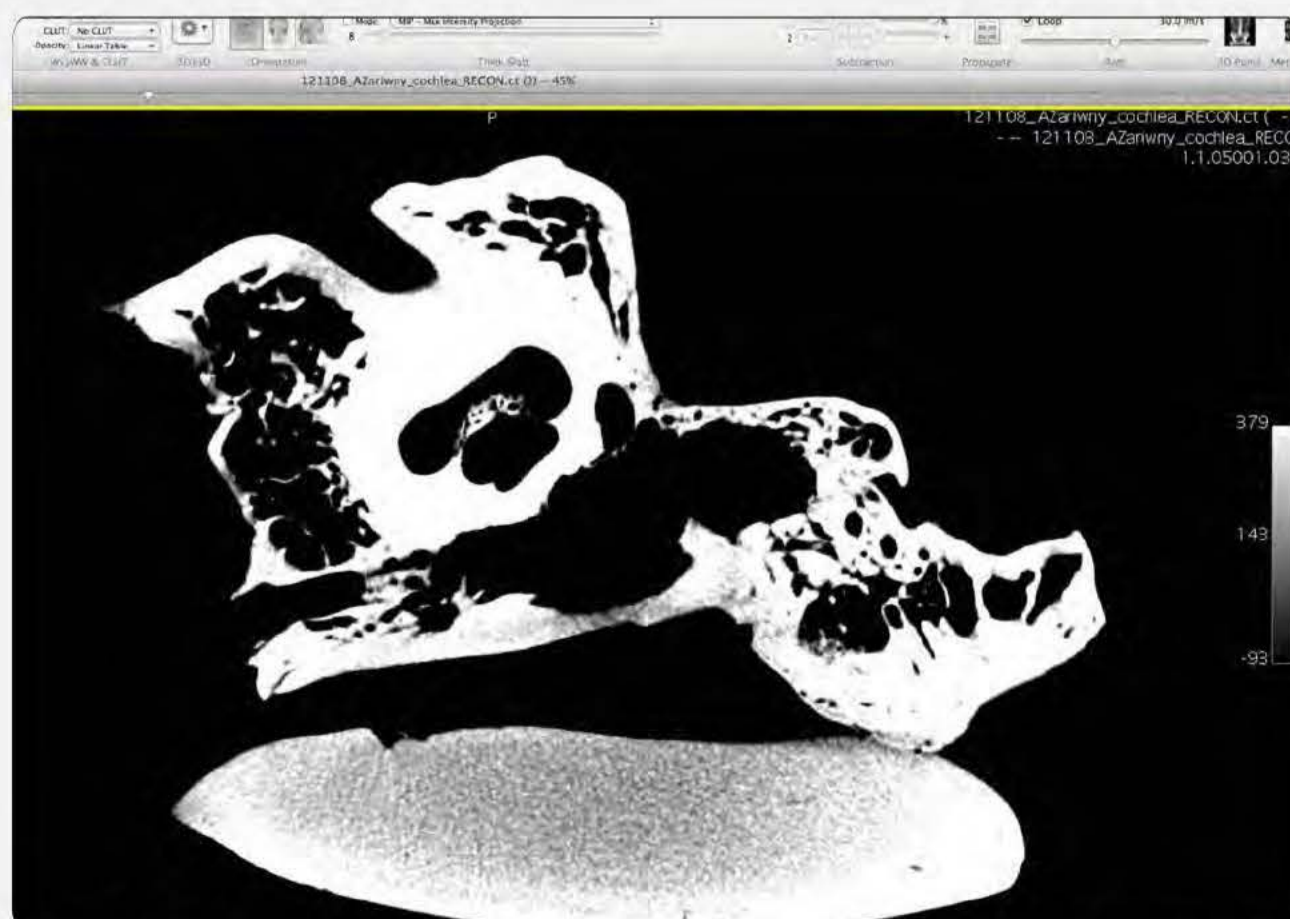


Fig: Cross-section of a high resolution CT scan of the petrous temporal bone showing the negative space of the cochlea.

The temporal bone consists of 5 parts. The styloid processes, zygomatic, squamous, tympanic, and petromastoid. The section of the bone above displays the tympanic portion, which surround the external auditory meatus, and the petromastoid, which contains the mastoid air cells and the inner ear. The **petrous portion** of the petromastoid temporal bone, is the most dense bone in the body.

Cross-sectioned PETROUS BONE Glyphs



FOLD

.....
on dotted line, only use one glyph at a time



COCHLEA

After launching the InvisibleEar©, place the camera over the image to view the cochlear nerve, spiral ganglion, and the fluid filled spaces, the endolymph and perilymph.



Fig: Illustration of a cochlea cross-sectioned through the petrous temporal bone. This glyph activates the augmented reality of the cochlea.







Cochlea and Spiral Ganglion

The cochlea is the spiral part of the bony labyrinth that houses the cochlear duct. The axis of the spiral sits in the horizontal plane of the body at an angle of approximately 45° to the sagittal plane. The tunnel spirals two and a half turns around a bony centre called the modiolus (not shown). The modiolus is honeycombed with spaces that accommodate the 33,000 spiral ganglion cells and fibers of the cochlear nerve.

The cochlear duct is a membranous tube sitting within the cochlear part of the bony labyrinth. It is attached centrally to the modiolus and also to the outside walls of the cochlea. Because of these attachments, it divides the space within the cochlea into three compartments: the scala vestibuli, the cochlear duct itself (scala media), and the scala tympani. The scala vestibuli and scala tympani are continuous at the apex of the cochlea through an opening in the bone called the helicotrema. These spaces contain fluid, the scala media contains endolymph and the scala vestibuli and tympani contain perilymph.

PRICE LIST FOR InvisibleEar© 3D PRINTED MODEL

Please email model request to andrea.zariwny@mail.utoronto.ca
and a customer representative will contact you!

	<p>True scale petrous bone model with plinth</p> <p>Bone: 2 x 1.25 x 1.25" Plinth: 3 x 3 x 0.5"</p>	<p>\$125</p>
	<p>True scale petrous bone model cross-sectioned</p> <p>Bone: 2 x 1.25 x 1.25"</p>	<p>\$140</p>
	<p>True scale petrous bone model with plinth and cross sections petrous bone model</p> <p>Bone: 2 x 1.25 x 1.25" Plinth: 3 x 3 x 0.5"</p>	<p>\$250</p>
	<p>2x scale petrous bone model with plinth</p> <p>Bone: 4 x 2.50 x 2.50" Plinth: 6 x 6 x 0.5"</p>	<p>\$425</p>
	<p>2x scale petrous bone model cross-sectioned</p> <p>Bone: 4 x 2.50 x 2.50"</p>	<p>\$475</p>
	<p>2x scale petrous bone model with plinth and cross sections petrous bone model</p> <p>Bone: 4 x 2.50 x 2.50" Plinth: 6 x 6 x 0.5"</p>	<p>\$850</p>