

ER. Walker

Portfolio·2023

The Pupillary Light Reflex

3D Medical Animation



3D Visualisation of the Orbit

September 2022-April 2023

The pupillary light reflex animation was created as part of an internship with the centre of anatomy and human identification (CAHID) at the University of Dundee.

The project situated itself in an educational need to aid medical and ophthalmology students visualize the nerves of the orbit and their functions, for which I decided that the best way to create these kinds of visualizations was with a 3D model.

The project involved intensive research of the subject matter along with visiting the cadaver labs at CAHID for primary references. Attending many meetings with Dr Seaneen McDougall, Anatomist at CAHID, we decided that a 3D model for the nerves of the eye would be most beneficial to the students. The model would then be uploaded on the university's Sketchfab account for student use. Another point of the brief came in the form of helping students to understand the pupillary light reflex, to which I believed an animation would be better suited to walk through each of the steps of the reflex.

Models were all sculpted in ZBrush; Texture, Displacement and Bump maps were painted using the exported UV maps in Adobe Photoshop and Adobe Illustrator; scene and animation was setup and rendered in Cinema4D and all 2D effects and compositing in Adobe Aftereffects.

While the internship itself ran for 3-months post-graduation, and in this time I was able to sculpt the base models for all of the structures and upload them to Sketchfab, there was not enough time to also produce the animation I had storyboarded. However, I was avid for more experience in 3D animation and continued to work on the project post-working hours for another 4-months while learning Cinema 4D and Adobe Aftereffects.

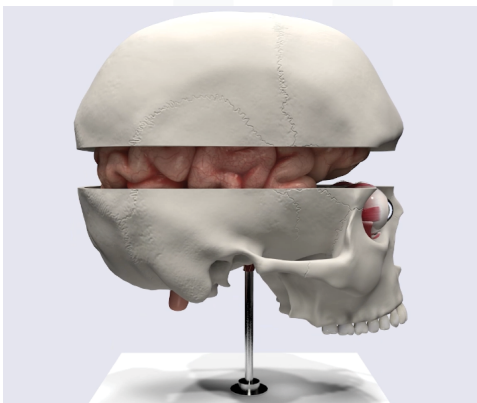
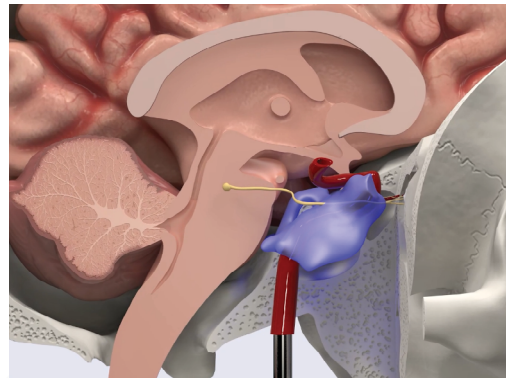
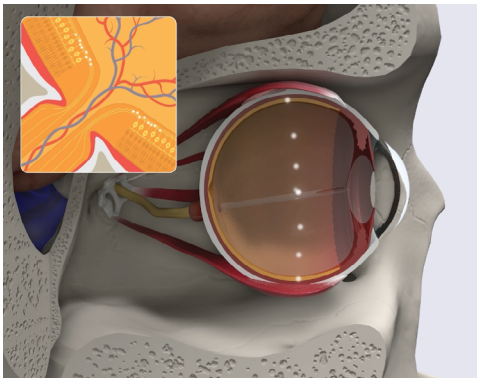
While the plans were a bit ambitious for the timescale of the internship, I acquired knowledge on a many aspects of the 3D processes and animation techniques. There are quite a few things in the various project stages that in hindsight could be improved or streamlined. One of these improvements would be the boolean cuts of the various structures, I believe there must be a better way to animate these functions without particulates or deformation of the meshes, the results of cuts have much less detailed edges than I would have liked but increasing the subdivisions was too much for my computer setup. Another part would be the lighting of the scene, something I knew little about at the point of creating the animation, but have since expanded on in my independent 3D studies.

Youtube Animation: https://youtu.be/aS-Mi7Nm_w4?si=ozvIMvslC2uYZBPU

SketchFab 3D Model: <https://sketchfab.com/3d-models/nerves-of-the-eye-b14e18482221471d9d6de4298b07fb87>



CLICK TO PLAY

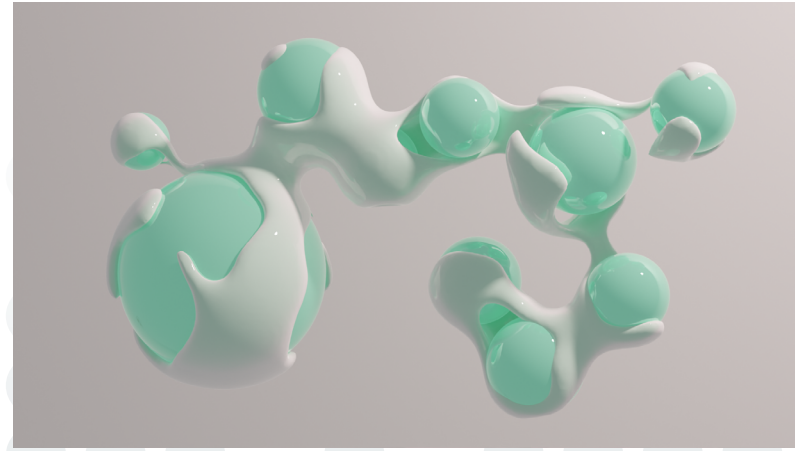
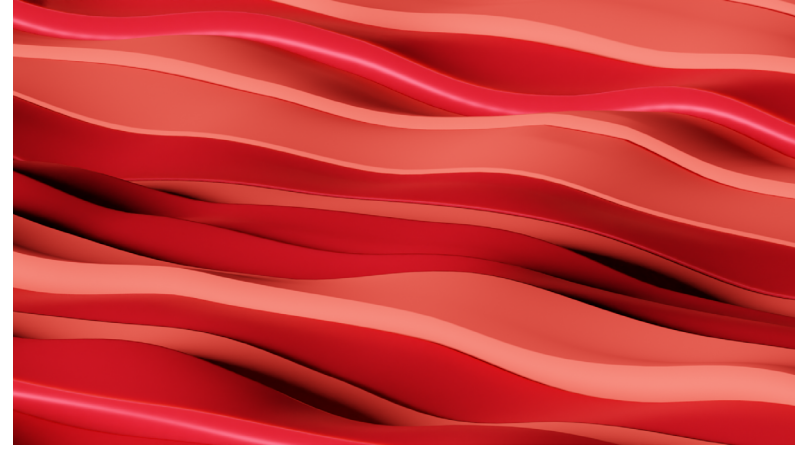


Gold Award: Institute of Medical Illustrators 2023

3D Idents AMICULUM

October 2023-December 2023

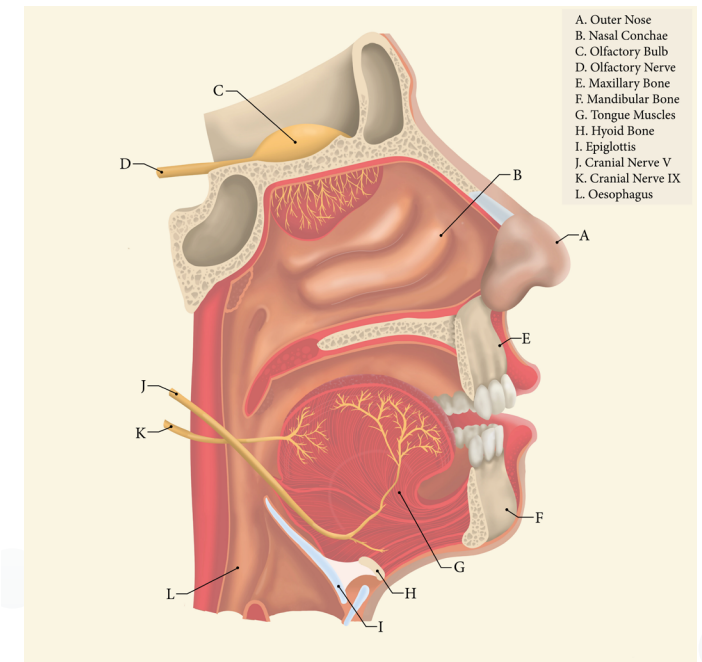
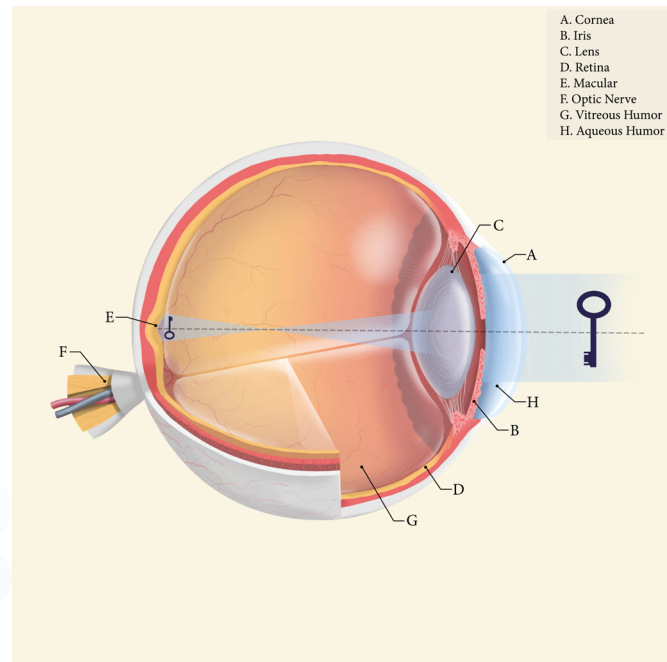
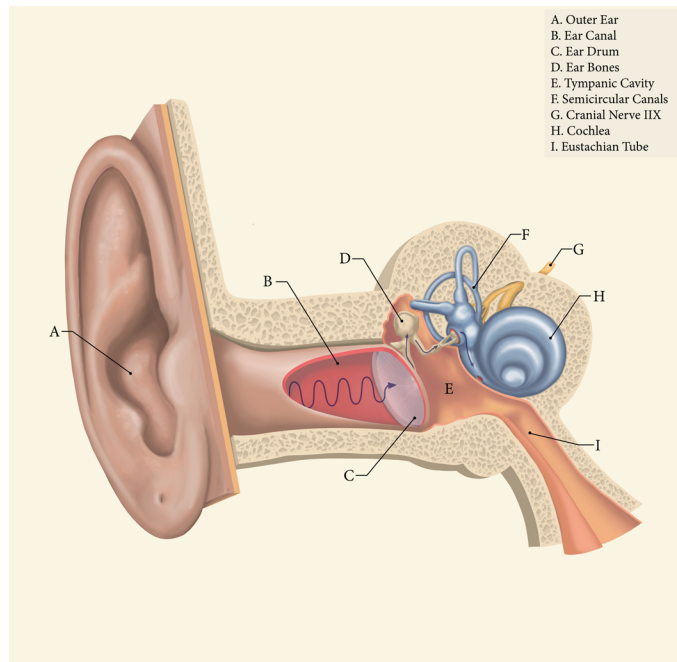
While at AMICULUM, I was part of an internal project team creating 3D idents for the AMICULUM homepage. Unfortunately I cannot show the specific animations I was involved in creating at this time, due to them belonging to AMICULUM. I can however, show a few stills from 3D motion graphics animation experiments I conducted independently in the lead up to the project and while learning the 3D software Blender. These motion graphic experiments involved working with geometry and material node-based workflows, something I had not previously delved into but now really enjoy working with.



HX for Designers

June 2022-August 2022

The Human Experience (HX) for designers project involved creating an interactive learning resource for design students at the University of Dundee working with Dr Rodney Mountain, ENT at Ninewells hospital Dundee. The learning resource explained how each of the human senses worked alongside illustrations which were appropriate for the anatomical knowledge of the target audience. Delving into design considerations for the human senses in both able bodied and disabled individuals, for example designing using high contrast for legibility of text, or using specific colours for differing types of colour-blindness.



MSc Medical Art Coursework Pieces

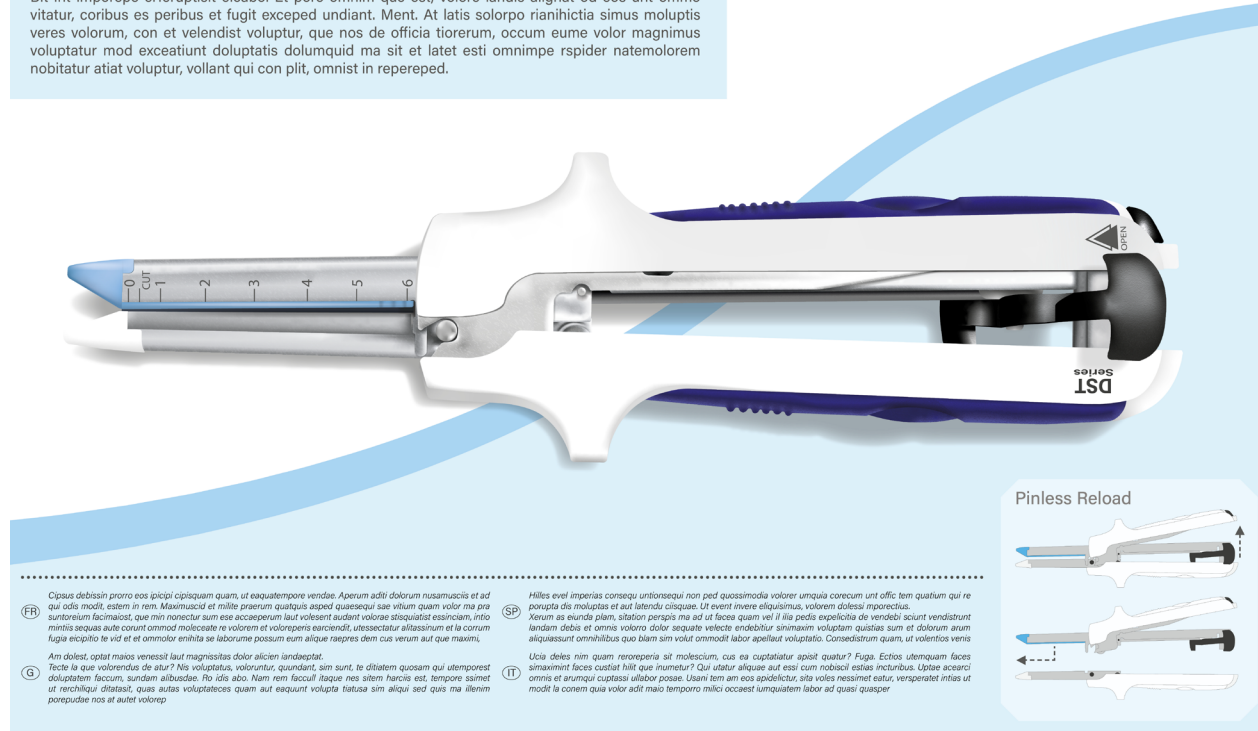
September 2021-May 2022

During my time on the Medical art Masters at the University of Dundee I produced many pieces which make up this portfolio. While these pieces I consider a bit outdated, I do not currently have pieces which would replace them, but they do have some merit which demonstrates my skills and journey.



GIA™ Stapler with DST Series Technology

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Above: Raster digital painting of a human scapula from primary Reference. Adobe Photoshop
 Left: Vector illustration of a linear surgical stapler, speculative advertisement. Adobe Illustrator

MSc Medical Art Coursework Pieces

September 2021-May 2022

This trifold leaflet for Retro vascular Dupuytren's contracture was produced for Ninewells hospital Dundee, intended for patients with retro vascular Dupuytren's disease to understand the condition and the surgical procedure better.

What is Dupuytren's Contracture?

Dupuytren's disease is a condition in the hand and fingers where the layer beneath the skin thickens, adhering to other structures in the hand and creating rope-like nodules. It is most common in the little or ring fingers, the Dupuytren's affected cord prevents the fingers from being straightened.

Within the hand there are various layers of different tissues. The top layer of tissue underneath the skin is known as the palmar fascia which is formed from many cord like structures running horizontally and vertically. Dupuytren's disease affects these cords causing them to become bunched up and stuck together and to other structures in the hand like the blood vessels, nerves, tendon sheaths and even bones.

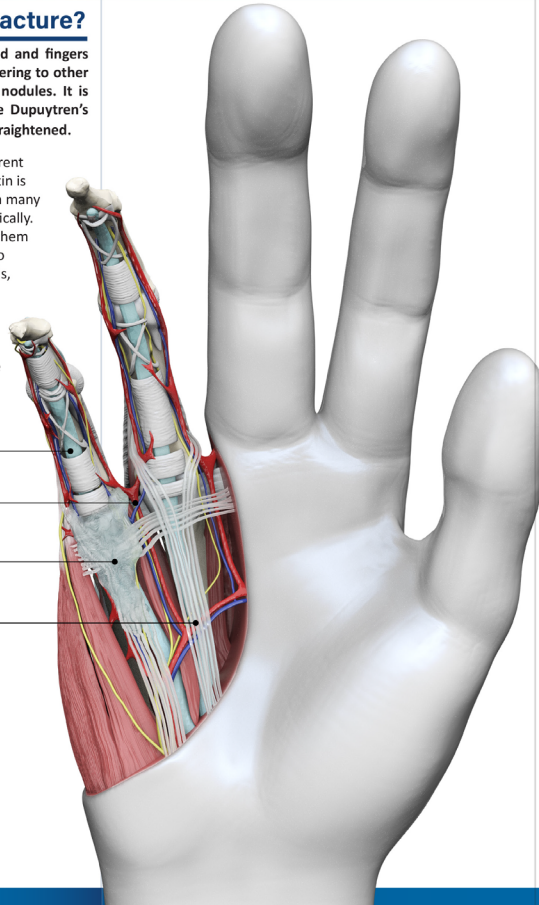
Dupuytren's Disease can spread along the cords in the palmar fascia resulting in more than one finger being effected. This is also how recurrence of the disease happens after treatment.

Tendon in Sheath

Blood Vessels and Nerve Bundle

Dupuytren's Diseased Cords

Healthy Cords



Treatment Options

Treatment for the disease is optional, however it can cause inconvenience and can progress to more severe restriction of movement. Lumps (nodules) can be removed from the hand via surgery to increase the range of motion but there is always a chance of the disease recurring. Depending on the severity of the disease a couple of treatment options can be considered.

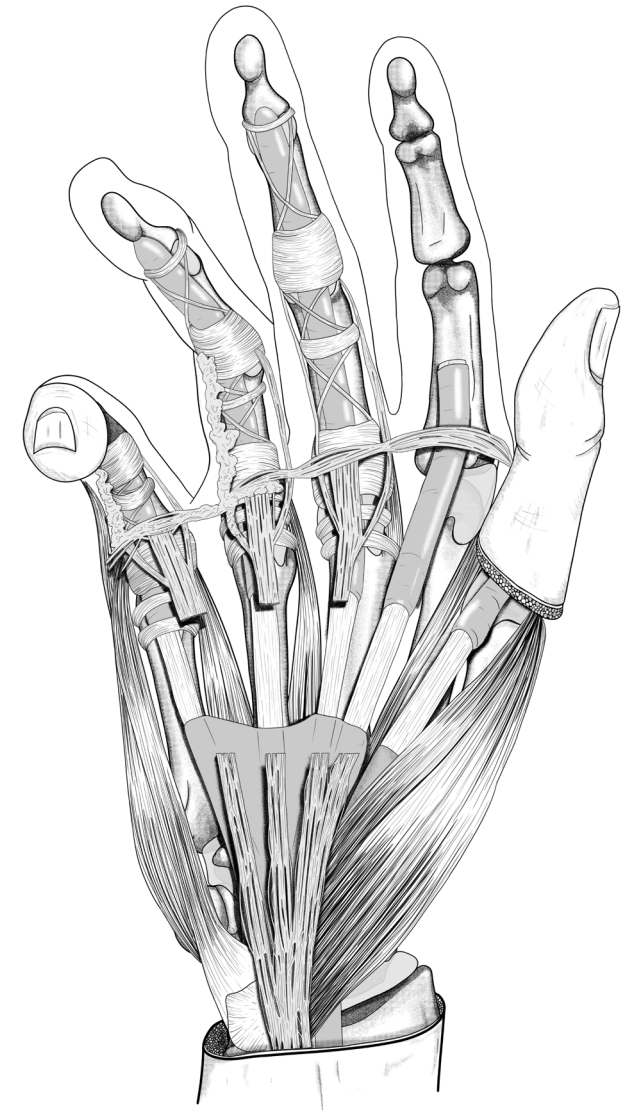
Needle therapy or fasciotomy: Performed while awake under local anaesthesia, for mild forms of contracture involving cutting affected chords to relieve tension. While the least invasive, unfortunately the recurrence rate is high and subsequent surgeries may be required.

Fasciectomy: Performed under general anaesthesia removing all of the affected tissue. Often performed in more severe cases of the disease or cases of recurrence. Different types of fasciectomy may be performed depending on the location and severity of the chord contracture, ranging from a small incision to a much larger section of skin being removed requiring a skin graft to close up. Risks can include nerve injury, bleeding due to blood vessel injury or infection, the surgery can be very difficult as there are many delicate structures in the hand.

Dupuytren's Recurrence

Recurrence is the result of the disease spreading to previously healthy tissue and causing more contractures. Generally after 5 years the recurrence rate of Dupuytren's contracture after fasciectomy surgery is 25% or 10% for dermofasciectomy (removal of all connective tissue whether affected or not).

Fasciectomy surgery is deemed much more effective than needle therapy because rather than just severing the bunched cord to release the tension, the diseased cord is removed thus reducing the chances that the disease will spread.



Silver Award: Institute of Medical Illustrators 2022

MSc Medical Art Coursework Pieces

September 2021-May 2022

The course was also where I got my first experience of working in 3D using ZBrush to sculpt. Below is my first foray into working in 3D with the clean-up of skeletal CT scan data which I sculpted additional organs and blood vessels. Looking back at this piece, much of the sculpting could be greatly improved, especially the location and shaping of the blood vessels.

Below is a still from a short turntable animation on polycystic kidney disease. This was my first foray into a 3D animation, and while simplistic, was a vital step in beginning to learn UV and texture mapping. It was at this point I really fell in love with working in 3D for the possibilities were so endless at what could be achieved.

