Why is Ophthalmology so brilliant?

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The ROYAL COLLEGE of OPHTHALMOLOGISTS

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Vision, Society & Pathology

- Sight has held significance across all of history
- The **evolution** of the eye changed the course of nature, conferring advantage in the **predator-prey contest**
- Its intricacies were an argument for **creationism** - *something so complex must have a maker*
- **Symbolism** of the eye and **sanctity** of vision has been pervasive in history and religion



Eye of Horus (Egypt)



Shiva's third eye (Hindu mythology)



Eye of Providence (Renaissance)

- Vision remains integral to **social functioning**
- 88% of respondents adjudged sight to be the most valuable sense[1]
- Yet it's true value may only be appreciated during disease – with **depression** 25% prevalent among ophthalmology patients[2]
- As William Shakespeare wrote:

"He that is strucken blind cannot forget. The precious treasure of his eyesight lost." – Romeo

- Fortunately, many causes of impairment can be treated – being just as **transformative** as its loss
- This **capability** and **privilege** falls upon the field of ophthalmology
- Cataract surgery typifies this notion. An operation lasting **minutes** can eliminate visual obscuration and **re-establish** 6/6 vision

Ophthalmology is brilliant because it dedicates itself to restoring vision, an ability of intrinsic value.



The Ophthalmologist

- Ophthalmology is **vast** & **varied** – providing an array of opportunities to become brilliant

ROP vs ARMD

- Retinopathy of prematurity affects those taking their **first breaths**, whilst age-related macular degeneration manifests in our **last decades**

Acute Angle Glaucoma vs Diabetic Retinopathy

- Acute angle-closure glaucoma is a **medical emergency**, whilst diabetic retinopathy runs an **insidious course**.

Ptosis Repair vs Charles Bonnet Syndrome

- Ptosis repair requires the precision of a **plastic surgeon**, whilst Charles Bonnet Syndrome necessitates the insight of a **neurologist**.

- Ophthalmic **burden** is substantial:
- It is the **Busiest** outpatient department, consisting of 40% of a hospital's outpatient work and major day-case operating[3]
- Only **Dwarfed** by resource-scarce regions, e.g. Sub-Saharan Africa, which has an estimated 2.5 ophthalmologists per million people[4]

- But this creates opportunity for impact!
- Initiatives such as **Unite for Sight**, a charitable organisation, have provided care for nearly three million patients living in poverty
- Led to advancement of fields, such as **Tele-medicine**, for which Ophthalmology is an emerging leader

Ophthalmology is a richly diverse profession that allows clinicians to become well-rounded, develop their interests and achieve brilliance.

Ophthalmic Innovation

- The eye is a frontier of **research** & **innovation** – attributed to its **unique structure**



- In 2017, the first **gene therapy** was approved by the FDA for the treatment of Leber congenital amaurosis
- This success is partly attributed to the **immunological privilege** of the eye.
- The eye limits the reach of the immune system and **modulates inflammation** in order to prioritise vision.
- Thus, transplanted cells are able to **avoid rejection**, and retinal ganglion cell function can be rescued.



- A unique feature of the eye is the **transparent window** created by the pupil, lens, aqueous and vitreous – allowing **direct visualisation**
- AI, specifically **machine-learning**, has capitalised on this – a technology which requires a large dataset
- This materialised as 14,884 **OCT scans** during the Google DeepMind and Moorfields Eye Hospital collaboration.[5]
- These provided high-volume, non-invasive, and high-resolution data for the software to learn from.
- The resultant AI system enabled instantaneous detection and prediction that rivalled expert performance in identifying retinal disease[5]

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1. Enoch J et al. Evaluating whether sight is the most valued sense. JAMA Ophthalmol. 2019;137:1317
2. Zheng Y et al. The prevalence of depression and depressive symptoms among eye disease patients: a systematic review and meta-analysis. Sci Rep. 2017;7:46453.
3. Summary Report - Treatment Specialities - NHS Digital.
4. Dean WH et al. Ophthalmology training in sub-Saharan Africa: a scoping review. Eye. 2021;35:1066–83.
5. De Fauw et al. Clinically applicable deep learning for diagnosis and referral in retinal disease. Nat Med. 2018;24:1342–50.