**Why Is Ophthalmology So Brilliant?**

**Introduction**

Ophthalmology is a field solely devoted towards treating disorders of the eye and visual pathway. The question arises, how can a specialty dedicated to an organ measuring just an inch and weighing only several grams be considered “*brilliant*”? The answer becomes clearer as we consider the significance of vision, the management of Ophthalmic disease and the unique innovations that Ophthalmology presents. The eye provides the sense of sight, an evolutionary gift that has an omnipresent role in everyday functioning. This ranges from sight-specific tasks, including reading and driving, to more elaborate operations, such as sleep-wake cycles.

The human dependence on vision makes any threat to our eyes disturbing and transformative. Consequently, the ability to restore vision is a gratifying privilege shared amongst those in Ophthalmology. Despite being limited in organ size, Ophthalmology remains a vast, diverse and vibrant discipline. It encompasses both medicine and surgery, has roughly nine distinctive (yet interlinked) sub-specialities and offers prospects within public health and research. The breadth and contrast of opportunity presents clinicians with a balanced profession that is stimulating and ever evolving.

Furthermore, to successfully answer the question posed, we must also consider what constitutes *brilliance*. Brilliance, from its French origins, refers to an object that shines brightly.[[1]](#footnote-2) Fittingly, Ophthalmology is a field built upon illumination, lasers and imaging; hence, this definition may resonate well with its patients. However, to be brilliant also means to be special, skilled and clever. Therefore, we must holistically consider brilliance through multiple lenses. Firstly, the brilliance of the eye and the impact of pathology; secondly, the brilliance of the Ophthalmologist; and finally, the brilliance of Ophthalmic innovation.

**Vision, Society & Pathology**

To understand why Ophthalmology is *so* brilliant, it is imperative to explore the phenomenon that is sight and the impact of visual impairment. Across the aeons of evolution, the human eye appeared in a blink, several hundred million years ago.[[2]](#footnote-3) Yet, this profound instance changed the course of nature entirely and its stunning intricacies became a fundamental argument for creationism. The complex anatomy and physiology of the eye became a vehicle for William Paisley’s infamous *watchmaker* analogy and even Charles Darwin conceded that it was “absurd” to consider the eye a product of evolution (although this was expertly deconstructed in his *On the* *Origin of Species*)*.2* Whilst eyes initially conferred a selective advantage in the prey-predator contest, they soon after held pervasive significance across religious and secular history. In ancient Egypt, the Eye of Horus was an omnipotent symbol of well-being, healing, and protection. In the sacred tale, Horus offered his healed eye to his father, Osiris, to sustain his living in the afterlife.[[3]](#footnote-4) In Hindu mythology, Shiva’s third eye, if opened, is considered apocalyptic and in *Genesis* after Adam and Eve eat the forbidden fruit “the eyes of both of them were opened”.[[4]](#footnote-5),[[5]](#footnote-6) Furthermore, the Eye of Providence, whilst emblematic of modern conspiracists, originally was conceived during the Renaissance period as a sign of God’s compassionate watchfulness over humanity.[[6]](#footnote-7)

In current times, despite reduced symbolism, the value of vision remains integral to social functioning. A recent cross-sectional survey discovered 88% of participants adjudged sight to be the most valuable sense.[[7]](#footnote-8) Despite this, its true value may only be appreciated during disease. Those with major visual impairments have their independence endangered and suffer a harsh reduction in their quality of life. As William Shakespeare’s *Romeo* perfectly described: *“He that is strucken blind cannot forget. The precious treasure of his eyesight lost.”[[8]](#footnote-9)* Patients lose their ability to enjoy quotidian details whilst becoming reliant on family and societal adjustments. Vision loss produces feelings comparable to any grief and a recent meta-analysis determined a prevalence of depression as high as 25% among patients attending eye clinics.[[9]](#footnote-10) Fortunately, however, many causes of visual impairment can be treated, and the return of vision can be just as transformative as its loss. This capability and privilege falls upon the field of Ophthalmology. Cataract surgery, the workhorse of the field, typifies this notion. An operation lasting minutes can eliminate visual obscuration and re-establish 6/6 vision. The direct gratification felt in restoring vision is difficult to rival from other walks of life. In summary, the marvel of the eye is evident throughout history and our dependence on sight remains in modern day. Ophthalmology is brilliant because it dedicates itself to restoring vision, an ability of intrinsic value.

**The Ophthalmologist**

Thus far, the focus has been on appreciating vision and the impact of pathology. However, it is equally important to investigate the perspective of the doctor. Is Ophthalmology so brilliant because its doctors are? Brilliant is to be skilled and intelligent. Whilst some may consider this a pre-requisite to becoming a doctor, if extrapolated to mean reaching one’s potential, Ophthalmology provides an array of opportunity to accomplish this. Ophthalmology is vast and varied. Retinopathy of prematurity affects those taking their first breaths, whilst age-related macular degeneration manifests in our last decades. Acute angle-closure glaucoma is a medical emergency, whilst diabetic retinopathy runs an insidious course. Ptosis repair requires the precision of a plastic surgeon, whilst Charles Bonnet Syndrome necessitates the insight of a neurologist. Furthermore, management requires an array of skills, from effective history and slit-lamp examination to interpretation of optical coherence tomography (OCT), angiography, and microbiology. Ophthalmology allows every clinician to discover their niche, maximise their talent and achieve brilliance.

Furthermore, Ophthalmic burden is substantial. Within the NHS, Ophthalmology boasts the busiest outpatient department with 7.9 million appointments in 2020, consisting of 40% of a hospital’s outpatient work and major day-case operating.[[10]](#footnote-11) This colossal demand is dwarfed when considering resource-scarce regions, such as Sub-Saharan Africa, which has an estimated 2.5 Ophthalmologists per million people.[[11]](#footnote-12) Such demand commands opportunity for making profound impact through initiatives such as *Unite for Sight*, a charity that has provided care for nearly three million patients living in poverty.[[12]](#footnote-13) Moreover, this pressure has selected the advancement of fields such as Tele-medicine, for which Ophthalmology is an emerging leader. Recently, we have seen development of apps, such as *Alleye,* that permit home-monitoring of macular diseases, and success of consultation platforms, such as *AttendAnywhere*, which sustained outpatient and emergency services at Moorfields Eye Hospital through the Covid-19 pandemic.[[13]](#footnote-14),[[14]](#footnote-15)  All in all, Ophthalmology is a richly diverse profession that allows clinicians to become well-rounded, develop their interests and achieve *brilliance*.

**Ophthalmic Innovation**

Part of the brilliance of Ophthalmology is pertained to its status as a frontier of research and innovation. The eye, unique in its function, is appropriately unique in its structure. Both the fields of gene therapy and artificial intelligence (AI) have profited from this. In 2017, the first gene therapy was approved by the FDA for the treatment of Leber congenital amaurosis, a retinal dystrophy causing early and severe visual impairment.[[15]](#footnote-16) 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. Consequently, transplanted cells are able to avoid rejection, and retinal ganglion cell function can be rescued. Subsequently, we have witnessed expansion into a novel field coined Optogenetics. This technology provides a method to control neuronal activity through expression of light-sensitive structures.[[16]](#footnote-17) Last year, Optogenetics was employed to successfully restore partial vision in a patient with retinitis pigmentosa, a debilitating neurodegenerative disease affecting more than two million people worldwide.16

Another unique feature of the eye is the transparent window created by the pupil, lens, aqueous and vitreous. Whilst permitting light to reach the neurosensory retina, this also allows for direct visualisation of neural tissue, retinal vessels, and ocular pathology, thus facilitating non-invasive monitoring. The field of AI, and specifically machine-learning, has capitalised on this. Machine-learning is a process in which software algorithms are developed to autonomously perform tasks, notably detection and prediction. A pre-requisite to building these models is a substantial dataset for the software to learn from. This materialised as 14,884 OCT scans during the GoogleDeepMind and Moorfields Eye Hospital collaboration. These provided high-volume, non-invasive, and high-resolution data. This permitted the development of AI systems that rivalled expert performance in identifying and referring retinal pathology, such as diabetic macular oedema.[[17]](#footnote-18) The hope is that such clinical support systems can help ease the significant burden described previously. Overall, Ophthalmology is so brilliant because it pushes the boundaries of medical innovation. Unique characteristics such as immune privilege and transparency have advanced various fields and offer promise for more efficient and effective management of disease.

**Conclusion**

Ophthalmology, through the eyes of a foundation doctor, appears to truly be a brilliant speciality that offers an abundance of challenges, opportunities and satisfaction for both its service-users and service-providers. The importance of sight cannot be overstated, and this provides doctors with an intensely gratifying opportunity to alleviate disease and improve quality of life. The immense and intricate disease spectrum renders Ophthalmology an incredible field, with ample opportunity to develop specialist interest and aptitude. Finally, features including immune privilege and transparency make the eye a unique organ to research, fostering technology and innovation.

**Word Count: 1498**

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