



# Peregrine Vision

*Incredible Eyesight*



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### **An Introduction:**

When referring to someone with exceptional observational skills or 20:20 vision we will often refer to them, in conversation or writing as being 'Eagle Eyed' or even 'Hawk Eyed', in fact the modern world has embraced these terms with digital technologies to determine the correct call in sports such as 'Cricket' and 'Tennis', with the so called 'Hawk Eye' camera technology.

So it is without surprise that the terms used are therefore extremely accurate and well founded in there derivation.



Going back to ancient times raptors were long admired for their keen sense of vision and they were trained and used by the gentry for the sport of falconry. Kings and Lords would hunt for game birds on horseback carrying their favoured bird on one arm, they would be flown to track and seek out a meal. No different to a wild falcon or hawk providing food for itself or when raising young.

So what makes these birds have such fantastic visionary powers to aid them in hunting?

**Raptor Eyes:** The first thing to examine are the physical aspects of the eye, Like many other birds, the diurnal (day flying) birds of preys' eyes are very large in relation to the size of their skull and their body mass, as seen in the image below. The eyes in a Peregrine Falcon skull take up over 50 percent of the volume of the birds cranium.



There is also a bony ridge that runs across the top of the eye just like a humans. Have a feel for it above your own eye. In raptors, this ridge helps to protect their eyes from protruding branches or any other foreign objects that they may encounter. It can be very helpful, for example in species such as the Goshawk or the smaller Sparrowhawk who are both adept to hunting in Woodland, where areas of thick vegetation could accidentally poke the bird in the eye when in pursuit of prey. This ridge also serves as a shade to their eyes from the sun.

It is this rigid brow that can make many raptors look angry or menacing but in reality it is just one of the many useful features that bird of prey has developed to help it's eye remain healthy.

Due to the size there is little room for manoeuvrability, thus Raptors are not able to move their eyes around in the way that a humans can. To compensate for this they have extra bones in their neck; these bones enable them to move their whole head around (See below - this Peregrine turns it's whole head sideways in order to look above)



Nocturnal (night flying) birds of prey, like owls, are able to rotate their heads up to 270 degrees!

In addition, this forward placement of the eyes gives them good binocular like vision, this in turn facilitates their very accurate judgment of distances.

Peregrines are believed to be able to identify prey up to 10 km away, thus allowing time to position themselves to launch a surprise attack or ambush.

All Falco species eye have a dark brown iris with a very dark pupil, Hawks on the other hand tend to have an orange/red iris with dark pupil. Raptors can see in colour and can also see some Ultraviolet ranges not visible to the human eye.

**The Sensory Cells:** The ability for the eye to focus, clearly and sharply, on an object is known as Visual Acuity (VA), which is based upon the number of visual cells in the eye. We humans have around 200,000 visual cells per square millimetre (called photoreceptors), but birds have a much larger density of visual cells. Small songbirds have twice the density when compared to humans, however, the Peregrine Falcon, has a visual acuity 4-5 times that of a human.

The peregrine, unlike a human has two fovea's' one deep and one shallow containing these tightly packed photoreceptors. Positioned such that the deep fovea is designed to focus on close up objects in great detail, whilst the shallow fovea is used to see objects at a greater distance.

When observing peregrines you will notice that on looking at an object the bird will tilt its head to one side this engaging the deep fovea so it can see in much greater detail that which it is watching.

In addition, the photoreceptor cells of diurnal raptors are not distributed uniformly across the eye. There are more cells in that part of the eye that looks at the ground and less in the part that looks at the sky. It is due to this cell arrangement that the birds engage in these unusual looking neck contortions. This extra visual detail allows the falcon to make split-second adjustments.

Using these two fovea's the bobbing of the head movement will allow the Peregrine to triangulate or build three dimensional picture of exactly what it is looking at. This movement can look quite comical when observing the birds.

**A Third Eye Lid:** The falcons eye has an extra lid, called the nictitating membrane, this thin translucent skin keeps the eye moist and clean as well as preventing any wind damage. Essentially, the membrane serves as a see-through eyelid, which can be closed without limiting the birds visibility. Also beneath his eye is a dark patch, similar to a that used by American football player's "eye black." This dark shading minimises sun glare to a minimum.