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cannot be excluded. Allele association studies are hampered by several possible sources of error.[11] Our study emphasises the need for additional, carefully designed studies when applying this potentially useful method in the search for genetic factors contributing to the aetiology of Parkinson's disease.

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HISTORICAL NOTES

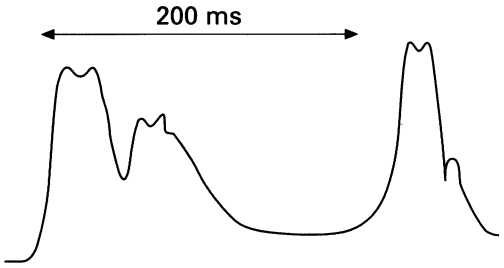
The Marcus Gunn pupil

Marcus Gunn (1850–1909) is most often remembered for his description of jaw-winking. The sign consists of widening of a ptosis when the patient chews or opens the jaw. Seen in congenital ptosis, there is an aberrant connection between the innervation of the pterygoids and levator palpebrae. However, Gunn also described an abnormal pupillary response: "dynamic anisocoria" that bears his name.

> "It is not sufficient" he says,[1] "to find that it [the pupil] contracts well or fairly well on exposure; the eye must also be kept under direct stimulation of light and the pupil watched as to whether or not it shows that secondary dilatation under continued exposure that is found associated with the amblyopia of retro-ocular neuritis. If the vision of one eye only is affected, it is important to compare the behaviour of the two pupils when stimulated directly or consensually. Thus, in partial affection of the right optic nerve the right pupil will show this secondary dilatation during continued exposure to direct stimulation, while the left pupil will show the same behaviour on consensual stimulation. On the other hand, on stimulation of the left eye both the right and left pupil will behave normally. I need not remind you of the importance of this observation, inasmuch as it not infrequently enables us to diagnose a retro-ocular neuritis in the absence of all ophthalmoscopic evidence."

Levatin's "swinging flashlight test for pupillary escape"[2] is a modification of Gunn's technique. However, the appropriate speed of swinging the light from one eye to the other has to be found by trial and error; and, the procedure is unreliable in the presence of bilateral afferent defects of light conduction.[3]

The Marcus Gunn pupil in effect is an adaptation of the light reflex during persistent stimulation. It corresponds to the *decrement* of evoked axonal potentials in the optic nerve of the rabbit that follows after a biphasic response to light (figure).[4] In afferent lesions the input of the residual stimulus that normally triggers pupillary constriction after several seconds of continued stimulation is reduced and approximates to the background light. The pupil again dilates.



Optic nerve response to full field flash for 200 ms (arrow). Biphasic "on" response followed by low voltage sustained activity, and final brief "off" wave. Modified from Bartley and Bishop.[4]

Born in Culgower in Sutherland, Marcus Gunn, a contemporary of Robert Louis Stevenson at Edinburgh, graduated aged 23. His fascination with ophthalmology was aroused by Walker and Argyll Robertson. After a brief visit to Moorfields Eye Hospital, he studied comparative anatomy at University College, London. Returning to Scotland, at a Perth asylum, single handed, he produced a series of relatively original observations of the fundus using the recently developed direct ophthalmoscope. (It was not until 1897 that Gowers' *Medical Ophthalmology* was published as the first major atlas of the fundus as revealed by direct ophthalmoscopy). A visit to Vienna in 1874 brought further training with Jaeger. Moorfields again drew him to London, where he improved medical records. He managed to reduce the sepsis rate of cataract surgery by implementing Lister's aseptic techniques. After a visit to Australia he became the senior surgeon at Moorfields. He made outstanding observations of the human retina and vessels, describing the poor prognosis of soft exudates in "albuminuric retinitis". A keen student of nature, Gunn collected the fossils of plants and fish of the Jurassic period from sandstone rocks. Many of his specimens were retained by the British Museum.

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The Marcus Gunn pupil.

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