

the superior rectus of any animal be cut, it will be at once seen that the voluntary power of looking up is lost; but let the same eye be irritated, and the cornea will be found to turn up out of view, as much so as though the superior rectus were uninjured. Let the inferior oblique then be cut, and the superior rectus left uninjured, and, no matter how much the eye is irritated, the involuntary power of turning up the cornea will be lost.

But the question will naturally arise, what is the great benefit to be derived from these involuntary movements of the eye, and would not the voluntary motions answer all purposes? No! The involuntary motions of the eye are (as has been already stated) altogether for its protection, or nearly so; a use which the voluntary muscles do not possess. If danger threaten the eyes, up goes the cornea for its protection by the action of the inferior oblique, at the same time that the orbicularis closes the lids. Sir C. Bell gave another benefit to be derived from this action, which was that it stretches the lachrymal ducts like a nipple, and thus produces a greater quantity of tears to lubricate the cornea, and wash off any offending matter that may have adhered to it, producing the irritation. When it is remembered where the lachrymal ducts open, it will be at once obvious that the above-mentioned action must put them on the stretch.

The inferior oblique always acts consentaneously with the orbicularis palpebrarum; for at the very moment that the orbicularis acts in closing the eyelid, the inferior oblique turns up the cornea almost entirely within the orbit; and by this action it proves a protection to the retina, for it darkens the eye as if in sleep, and prevents the light, which in passing through the lids becomes red, from reaching the retina, upon which the continuous action of the red ray is always hurtful.

The orbicularis palpebrarum thus acting at the same time, the effect will be to carry any simple foreign body that may have got under the eyelids and produced those actions, into the internal carthus, where it is protruded from the eye by the caruncula lachrymalis and semi-lunar membrane.

The direct action of the superior oblique is to turn the cornea downwards and *inwards*; its anatomy will show that this *must be* the result of its action. That it is involuntary, is evident from the fact, that no exercise of the will can produce the same effect. It has been stated that the inferior oblique acts in unison with the orbicularis palpebrarum, for when the orbicularis closes the lids, the inferior oblique turns the cornea upwards and inwards. The superior oblique acts consentaneously with the levator palpebræ superioris; for when the levator raises the upper lid, the superior oblique turns the cornea downwards and slightly inwards. This action,

with that of the inferior oblique, takes place every time the eye is shut and opened, as in winking, but the actions are so very rapid as not to be observable. But if a person be watched awaking out of sleep, (when there is no will exercised), it will be seen, the moment the levator raises the upper lid, that the superior oblique turns down the *cornea*, which thus *depresses* the lower lid, so that the superior oblique muscle is the true but negative depressor of the lower lid. This is a novel statement, but of which I shall adduce conclusive evidence presently.

Previous to the views taken by Sir C. Bell, anatomists and physiologists, perceiving that in opening the eyes the lower lid is depressed, sought, but in vain, for a depressor for it. He looked for a direct muscular depressor, and thought that he had found it in the levator palpebræ superioris, which he said not only raised the upper, but depressed the lower lid. The following are his words, (page 153, third edition of his work on the nervous system)—“The muscle elevator palpebræ superioris opens wide the eyelids, depressing the lower eyelid at the same time that it elevates the upper one. If we put the finger upon the lower eyelid, so as to feel the eyeball when the eye is shut, and then open the eye, we shall feel that during this action the eyeball is pushed outwards. Now, the lower lid is so adapted as to slip off the convex surface of the ball in this action, and to be depressed whilst the upper eyelid is elevated.” He then gives a plate of the eye and levator muscle, showing that the muscle, from its origin to its insertion, is in contact with half the circumference of the globe; and infers the above conclusion to be the result of its contraction; evidently having forgotten at the time that the levator was not in such close contact with the globe of the eye as he stated—the superior rectus muscle lying between them—so that the contraction of the levator could not produce the effect he alleged. But he was wrong in supposing the eyeball to be *protruded* at all. If the finger be placed on the lid, as he recommends, it would appear as though the eyeball were protruded; and certainly the lower lid is depressed, but *not* by the agent to which he ascribes it. It is effected in this way. The globe of the eye is composed of the segments of two spheres of different diameters, of which the cornea is the segment of the less sphere; in consequence of which the antero-posterior diameter of the globe is much its larger diameter. Hence it follows that when the orbicularis closes the eyelids, and the consentaneous contraction of the inferior oblique takes place, whereby the cornea is upturned, a vacuum occurs in the spot previously occupied by the cornea, which is filled by the rising of the lower eyelid, due partly to the elasticity of its structure, and partly