AN

INAUGURAL DISSERTATION

ON

The Eye,

Anatomically & Physiologically.

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Anatomy of the Eye.

He Whose purpose in life is to alleviate the sufferings of his fellow Man. Must, before he can justly lay claim to the standit of the good and faithful disciple of the healing art, first attain by close and persevarant Study, the Natures of the diseases he Wishes To Subdue.

And it is evident that the foundation upon which his Knowledge must be based is a Exact and intimate acquaintance with the Structure and Relation of the different parts of the Organism. Associated with a Knowledge of the Physiological action

of its various parts. There is probable No Organ of the Organism to which such such a knowledge is more indispenciple to the Physician, who administers to its relief, than the one under Consideration. That he may not like the Empirant, in his ignorance apply such Remedies or inadvertly wield his instrument to its destruction, so far atleast as to deprive it of that power forever, by which the Sencation from the image is conveyed to the Mind. The Eye as an Organ of Vision, so constructed as to be well adadapted to make us acquainted with Objects around us. Its delicate parts are enveloped in a protecting Membrane, and

These Situated in a bony Casement.
The Orbits are Two hollow Conical Shaped Cavities, placed in the upper portion of the face, Their bases presenting forwards and outwards, their Axes inclined towards each other, if extended they Meet behind at Right angles. The bones making up their Structure, are the Frontal, two Malar, the Superior Maxilary, Os Planum of the Ethmoidal, the Os Unguis, the Sphenoidal, and the two Palate.
The Cavities of Orbits are enlarged immediately behind its Margin. A perceptable depression, for the Lodgment of the Lachrymal gland is seen on the Os Frontis. The principle Openings of the Orbits, are the Optic foramina, Sphenoidal fissure

Spheno-Maxilary fissure, Infra Orbital
Canal, Super Orbital Canal, and the
Opening for the Nasal duct. Muscles
immediately Surrounding the Orbits
and entering into the Construction
of the Lids, are the Orbicularis Palpe-
brarum and Corrugator Supercilliary.
The Palpebarum, a Sphincter Muscle,
encircles the Orbit and Eye lids, the
Palpebral portion acts involintary
in closing the lids. The Corrugator
Supercilliary is a Small Muscle
Situated above the Orbit, arising
from the inner angle of the Sup-
ercilliary Ridge, and inserted in the
lower border of the Orbicularis
Palpebarum, it draws the eye brows
downwards and inwards.
The Muscles in more immediate

Relation to the Eyes Themselves, Controlling their Movements, will be noticed after the different parts entering into the Construction of the Eye ball are first considered.

The Eye ball is situated in the anterior part of the Orbit, Seperated from it by its auxiliary parts, and these embedded in a soft Cushion of adipose tissue. It is nearly Spheroidal, the antero-posterior diameter being somewhat the longer, from the projection of the Cornea forming a segment of a smaller Circle in front. The axes are parallel one with the other, but oblique with respect to the Orbit. It is Composed of tunics in concentric layers and humours within these

Of the tunics, the Sclerotica and Cornea is the exterior, Choroid and Iris the Middle, the Retina the interior. The Sclerotica, an investing membrance for the protection of the more delicate parts within, is formed of white fibrous tissue, and extending about four fifth of the globe, it is about a line in thickness at the posterior part, and diminishing one half that thickness to the anterior. Upon the posterior surface to its Nasal side, it is perforated by the Optic Nerve into several foramina, called the Cribiform lamella. At the anterior its border is beveled for the reception of the Cornea. This Coat is very strong and inelastic. The Cornea

fills the interspace left by the Sclerotica; it is placed upon the anterior part of the globe, and itself a Segment of a smaller Sphere, causing an increase in the antico-posterior diameter of the globe. It is an elastic fibrous Membrane, of an equal thickness, and composed of an indefinite number of layers. It is very transparent, admitting the Rays of light to pass through to the pupil. The Choroid; the second Tunic, is placed immediately with the Sclerotica, and of an equal extent. Of a dark appearance on the external Surface, and a deep black on the internal. Considered by some Anatomists

to be of one layer, by others of several.
It is a Vascular Membrane, and
shall here be considered as being
composed of three layers, 1st Vernal
Venous, Composed of veins running
in a Radical direction to many
Centers, an arterial, the Second
layer, Supplyed by the Short Ciliary arteries, from the Opthalmic.
In the internal of the last, is
a Membrance composed of hexagonal Cells, which Contain the
granules of pigmentum Nigrum,
This is the third layer of the
Choroid, called the Membrum
Pigmenti. The Vessels of the Choroid are for the Nutrition of the Eye.
The Secretion of the pigmentum
Nigrum is for the purpose of

absorbing the Scattered Rays of light passing through the retina. The Choroid receives its nerves from the Ciliary. The Choroid is connected to the Sclerotica by cellular tissue, Nerves and blood Vessels, it lies in simple apposition to the retina. At the anterior it is connected to the iris by a white fibrous ring, the Ciliary ligament. This ligament also connects the Cornea and Sclerotica at their junction. At the anterior of the Choroid the arterial layer is extended to form the Ciliary Processes. They are composed of triangular folds, the central parts resting upon the lens. They are thickly coated by pigmentum Nigrum.

The Iris is a septum placed between the anterior and posterior Chambers

of the Eye with an opening in the center. the Pupil. it is connected by its periphery to the Ciliary ligament. The Iris is composed of fibres converging from the circumference to the centre, Contracting they dilate the pupil, a circular band around the Margin of the pupil. Contracting they produce a contraction of its area. The Iris is abundantly supplied by blood by the long Ciliary arteries from the Opthalmic, and the anterior Arteries from the Muscular. Its Nerves are derived from the Ciliary and Facial. On the posterior the iris is coated with a dark ground, called the Uvea.

The Retina, the Third and internal Tunic of the Eye is an expansion of the Optic nerve, generaly

Considered to be composed of three layers. The external Sacous Membrane, a thin Serious Membran, The Middle a Nervous Membran, The true expansion of the Optic Nerve, The Third a Vascular Membran, Made up from the ramifications of the Arteria Centralis Retina, a Small artery which enters The Optic Nerve about an inch from the Eye ball, and entering The porus Opticus Though the Cribiform lamella. The Retina extends to the commencement of the Ciliary processes, its Vascular layer is extended to the anterior Surface of the Crystaline lens, fitting in the folds of the Ciliary processes, They are called the Ganglia Ciliaris. The Optic Nerve enters The Orbit obliquely to the Eye ball,

It arises from the Nates of the
Tuberculae Quadrigeminae, Connected by
Nervous filaments to the Geniculate
extremity of the Thalamus Opticorum.
The Nerve from each Side proceeding from
their Origin Meet and form a Commis-
sure Called the Chiasam. It is Situated
upon the processus Clivus. From this point
they proceed to the Eye. The outer fibres
of each Nerve passing directly to the
eye of that Side, But the fibres
from the inner Side decussate and
pass to opisite eyes. This at least
is the explination generaly given.
Some Anatomists however give
different views of it. At the
posterior part of the Retinae there
is an opening, the foramina of
Scemmering, this foramina is in the

direction of the Eyes axes. Situated
within the Tunics described, is the
Humours of the Eye, These are three,
from the posterior, they are the,
Vitrious, Chrystaline Lens and the
Aqueous. The Vitrious comprises
the greater part of the globe of the eye,
it is situated on the part, it is an
albuminous fluid, with a Specific gra-
vity a little greater than water.
It is enveloped by a Thin and delicate
Membrane, the Hyaloid, which send
processes thrughout the humours, divid-
ing it into Cells of various Shapes
and Magnitude. A small artery
traverses its Center, supplying the Capsule
of the lens. At the circumference of the
the lens and Ciliary processes they form
a small opening, the Canal of Petit

The Crystalline Lens a double convex lens, with the greater convexity upon the posterior surface. It is imbeded in the anterior of the Vitrious humour behind the iris. It is composed of lamina in concentric layers in parelal fibres. The centre as a Nucleous around which each lamina is applied increasing in density from without inwards. It is invelloped by a delicate membrane, its Capsule. Which is supplied by a small artery, a branch of the arteria Centralis Retina. No nerves go to supply the lens or its Capsule. The Aqueous humour fills up the anterior and posterior Chambers of the Eye. It is a weak albuminous fluid, a few grains in weight. The anterior

Chamber is the Space between the Cornea in front and iris and pupil behind. The posterior a very narrow Space intervening between the iris and pupil in front and Lens behind, they Communicate Through the pupil.

They are lined by a Thin and delicate Membran, supposed to be the Secreting Membrane of the aqueous humour.

The Muscles described as being necessary to perform the different Movements of the Eyeball, are Seven in number. The Levator Palpebra, the four Recti and two Obliqui.

The Levator Palpebra arises from the upper Margin of the Optic foramina and is inserted in the Tarsal Cartilage of the upper lids, by its action it raises the lid, it is supplied by a

branch of the Third Cranial Nerve.
The Superior Rectus also arises from
the upper margin of the Optic foramina.
It lies immediately beneath the
Palpebral, and is inserted in the
Sclerotica, about four lines from
its Margin. In contracting it
turnes the Eye upwards, a branch of
the third supplies it. The Rectus
Externus arises from the external
margin of the Optic foramina, and
inserted by a broad Tendon in the
Sclerotica, it abducts the Eye.
It is supplied wholely by the Abdu-
centes or Sixth Cranial Nerve
The Rectus Internus arises from
the inner Margin of the Optic foram-
ina and inserted in the Sclerotic
it addncts the Eye. A branch

of the Third Nerve supplies it
The Rectus Inferioris arises from the
lower margin of the Optic foramina
and inserted in the under surface
of the Selerotica about two lines from
the border, it depresses the Eye. it
also is supplied by a branch of
the Third Nerve. The four Recti Mus-
cles acting together, draws the
Eyeball within the Orbits. The action
of the the two opposite Muscles are
antagonistical, Other two acting carry
the Eye in a diagonal of the two
directions. The Superior Obliqne
arises from the upper and inner
margin of the Optic foramina
by a small round tendon, and near
the margin of the Orbit it is again
converted into a round Tendon

Which passes thrugh a loop to the
inner Side of the Super Orbital Notch.
And then it passes backwards to be
inserted in the posterior and outward
portion of the Sclerotica, near the
entrance of the Optic Nerve. It
Rolls the globe inwards and forwards
it is Supplied by the fourth Nerve
the Trochlearis. The Obliquus Infe-
rioris arises from the inner Margin
of the Inferior Maxilary bone, and
runs backwards under the Inferior
Rectus, to be inserted into the Sclе-
rotica, its posterior and outward side.
Acting alone it Moves the Eye forwards
and outwards. Acting in Conjunction
with the Superior they bring the
Eye forwards. A branch of the
third Nerve Supplies it.

The appendages of the Eye are the Eye brows, Eye lids. Eye lashes. Conjunctiva, Caruncula Lachrymalis, Lachrymal Gland with its appendages. The Eye brows are a projection of the Integument Covered with Short Thick hairs. The Eye lids are placed in front of the Eye, two to each eye, one above and one below, with three rowes of hairs Curved outwards. They with the Eye brows protect the Eye. Between the two lids is an elliptical space, the angles of which are called their Canthi. The integument Covering the lids is thin and devoid of adipose substance. They have entering into their Structure besides the Orbicularis Muscle, Tarsal Cartilage and Conjunctiva. The Cartilage are

Thin fibro Cartilage. Those in the upper lid longer and larger than the lower. About an inch in length of an elliptical shape. The Conjunctiva is a Mucus Membrane, it covers the posterior surface of the Cartilage, then is reflected upon the Eye covering its whole front surface. Upon the Cornea it is closely adherent, and probaly devoid of blood vessels. Upon the Sclerotica and Tarsal Cartilage it is thicker and not so closely adherent, and vessels can readily be traced within its substance. Between the tarsal Cartilage and Conjunctiva are imbeded the Meibomian Gland having the appearence of a long tube, with a number of Cells opening

into them. They Terminate at the Margin of the lids. To the inner Canthus of the Eye is a triangular Space the Lacus Lachrymalis, Within the Lacus Lachrymalis is the Carunculu Lachrymalis, a Small Reddish body, Consisting of an assemblage of Small glands, Secreting a White pasty looking Substance. The Lachrymal Gland is Situated at the upper and the outer angle of the Orbet, Consisting of two parts, an Orbital and Palpebral portion. The Orbital portion about Three quarters of an inch in length, and is placed upon the Frontal bone. The Palpebral portion Smaller than the Other, is Situated in the upper Eye lid. To the Margin of the Tarsal Cartilage. There are between ten

and twenty small ducts which convey the Secretion from the gland for some distance under the Conjunctiva, then opening upon its surface. The Secretion is then conveyed to the Sacks Lachymalis, from thence to the Lachymal Canal, which communicate by a small orifice by the Punta Lachymalis, situated in a projection called the Lachymal Papilla. The Canals proceed downward to the Lachymal Sac. The Lachymal Sac is the upper extremity of the Nasal duct Separated from it by a valve. This duct near an inch in length. descending to the inferior meatus of the Nose. The Lachymal Canal is kept dilated by a small Muscle called the Tensor Tarsi.

Sense of Vision.

Having now imperfectly Considered The Anatomical Structure of the Eye. It May now be Noticed with Respect to Vision. Which is to be understood the faculty by which we are enabled to form a Correct Notion of Eternal Objects, By which We are enabled to understand their position form, distances Magnitudes and Colors, et Cetera, The Complex but beautiful Macanism of the Organ described is well adaptted to this purpose. Consisting as is seen, of what is Most essential, a Nervous expansion. the Retina, receiving the impressions of Objects. And the Continuation of a Nervous Cord to Convey these impressions to the brain. But in order that Correct images of Objects May be

formed upon the Retina, it is essential that light should Stimulate only Cirtain portions of its Surface at the Same time. This is effected by Cirtain Refraction Medias, That the Rays may be Thus brought to a focus. A Membrane Coated with pigmentum Nigrum, To absorb the superfluous rays of light passing Through the Retina, So That the lights may not be Reflected back, Thereby Causing indistinctness of Vision. A Contracting diaphrum, with its Central opening to regulate the quantity of light to the lens. The rays of light proceeding from an object passes in Straight lines to the Eye. Here they Thus to proceed in Straight lines Through the Cornea and Chrystalin

Lens to The Retina, No Correct impression would be produced. But it is a law in Optics, that rays of light passing from a denser into rarer Medium or from a rarer to a denser Medium, are refracted. The Convex Cornea being a denser medium than air. The rays of light are refracted towards the central ray. On reaching the double Convex lens they are still more refracted, untill they meet at a focus on the Retina. But the rays that though the margin of the Cornea and Chrystaline Lens, are refracted more than those that pass though and near the Centre, and are therefore brought to a focus at a point anterior to the Retina. This is called Spherical Aberation. The iris placed

between the Cornea and lens, Count this by preventing all but the Central rays from passing to the lens. An object placed near the Eye the greater will be the Angle of divergence of its rays, but the pupil Contracting allowes fewer rays to enter the Eye. Again light paping though an ordinary lens, is divided into its elementry Colord parts, by unequal refraction of those Colors, This is Called Chromatic Aberations, it is Corrected by uniting together two or more Substances of unequal refractive powers, it is supposed to be Corrected upon the Same principle in the Eye. The Meadia that light paper though in the eye, the Cornea and Chrystaline lens, are made up of layers of different densities. by which

it is supposed to enable the different parts of a Color to be brought to the same focus. The Iris also assist to render the eye achromatic. As has been said the distinctness of the image is dependant upon the rays being brought to a proper focus upon the retina, if the focus occurs at a point either anterior or posterior to the retina, indistinctness of vision ensues. This focal point being regulated by the Convexity and density of the Cornea and Chrystaline lens, varies with the distance that the object is placed from the Eye. There must then be some provision made, so the Eye can accomodate itself to vision at different distances. The means by which this has been

accounted for, are both varied and
contradictory. Now by varying the dis-
tance between the Refracting Medium
and Retina, or by an alteration in
the form of the globe of the eye, or the
action of its Muscles, so that the
antero-posterior diameter may be
increased or diminished. Also a
change might be effected in the
Cornea - a lengthing in the axes of the
Eye would increase its Convexity,
and shortning the axes the Conve-
xity would be diminished. Or by
a change in the position of the
Lens itself, The mode by which
this is explained is various. By some
the Influence of the Ciliary processes
will account for it. Others by the
Contraction of Muscular Tissue

in the Ciliary body and processes.
Explained by others upon the Supposition that the aqueous humours entering the Canal of Petit, distending it, and propelling the Chrystaline lens forwards. Or a change in the figure of the lens itself. Thus causing the rays of light paping Through it to be More or less refracted.
Those that assume the Muscularity of the lens, explain it by the Contraction of its fibres. By others that it is compressed by the humours by which it is Surrounded. No one of these of themselves could likely prove Sufficient. But probaly Most or all may participate in Some degree in the adaptation of the Eye to distinct vision. With the associate

movements of the pupil, which dilate or Contracts to admit a greater or less quantity of light to the Chrystaline lens. But in some persons there is scarcely any power of addaptation, this is of two kinds. In the one case an object placed at the ordinary distance, the rays of light proceeding from it, in consequence of an undue convexity of the Cornea and Chrystaline lens, is brought to a focus before they reach the retina, this is called Myopia. An object to be seen distinctly will have to be brought near the Eye. Presbyopia or long sightedness, from the flatness of the Cornea and lens. the rays of light were brought to a focus would

reach beyond the Retina. To see distinctly the object would have to be removed from the Eye. This is remedied in the one case by placing a lens of a Concave Surface before the Eye, so as the rays will be diverged upon the refracting Media of the Eye. On the other hand a Convex lens of Sufficient power to Cause the rays to Converge on the Chrystaline lens, so as the focas point will be brought back upon the Retina. Rays of light proceeding from an object, those from the upper part of the object impringes the lower portion of the Retina, and those from the lower part of the object, the upper portion of the Retina. Hence the image of the object on the Retina is reversed. Then has

been no satisfactory explination given how it is that we see objects the erect position. The general conceived opinion is that the images of all the objects around us are impressed on the Retina. even the hand we use in touch, it follows that the relative position of objects are unchanged, hence we see objects in their erect position. The Retina itself has no power of sensation but reflects it to the brain. Probable as nigh as we can arrive at an explination, is to refer it, as an act of the Mind. By a Mental act we are enable to perceive one or more objects at the same time, and to direct our attention to objects near by or at a distance. But it is evident that we can not

percieve a greater number of objects than can occupy the retina at the same time. Still the field of vision can be enlarged or circumscribed at pleasure. Small as when there are impediments placed before the Eye. Enlarged when the view is not confined by any near obstacles. We are enable to appreciate the distance of objects, by noting the several circumstances surrounding them, as the visual angle subtended by them. By the intensity of light. And by the convergence of the axes of the Eyes, and these assisted by the association of near objects. The visual angle subtended by an object is diminished as the object recedes from us. And within a certain distance we are able to appreciate

the distance by this angle, by what we have learnt from experience. We also judge of it by the intensity of light. For it is known that the intensity of light diminishes with the distance. We also judge of the distance of objects in some degree by the convergence of the axes of the Eyes. This Convergence differs of Course with the distance; being less as the object is at a greater distance. In estimating distances we are probably assisted more by the interposition of known objects; by which a comparison may be formed. But if an object is placed at a very great distance, or so situated that we are unable to judge by intervening objects, we are unable to form a Correct idea of its distance.

Our estimate of the Magnitude of bodies is intimately connected with that of distance. By knowing the distance we can form an idea of the Magnitude from the Size of the images formed. It is probable that we first learn the real Size of objects by experience; by the Sense of Touch. It is also by the Sense of Touch that we first become aware of the form of objects. The images beings but a picture upon the Retina, all bodies appear flat until Corrected by experience. The Correct Notion of Shape may also be assisted by the projection of the same Objects, presented Simultaneously to the Mind, by the images from the two Retina. We judge of the Motion of bodies from

the Motion of its image upon the retina, or the Motion of the Eye following the object. A body moving in a direct line to or from us, we judge of its Motion from the visial angle it makes, either increasing or diminishing. An object in the field of vision impresses alike the retinas of each Eye, How is it then that the Sensation Conveyed to the Mind is single. It is contended by some that at first we really see double; and not untill we learn by experience, as by the Sense of touch, that it is but one object, and thereby acquire the power of single vision. But the fact that there has been persons deprived of sight

until after an operation has performed in advanced life, without double vision ensuing, would disprove such a supersition. Others hold that we employ but one Eye at the same time. But various direct experiments would go to prove that both act simultaneously in vision. And our estimate of the form, Size and distance of objects are in a great measure dependant upon the use of both Eyes at the same time. The probable explination is that the impressions are made upon parts of the retina accustomed to act together. But not as some contend that it is

essential that strictly corrispon-
ding parts, only can act together.
As for instance the inner parts
of one retina acting with the
outer part of the other, and vice
versa; For vision is perfect in
persons who have long squinted
in one Eye. In uniting this
defect in the Eye, double vision
ensues at first, but soon these
parts of the retina accustome
themselves to act together and
single vision is the result.