

- Bodies luminous, opaque
 - Particles - straight lines
 - Reflection - light does
 not touch the surface -
 particles small, surface
 irregular - Angles of $\frac{1}{2}$ Right
 - Mediums - air, water, Glass
 + Refraction - surface of lens
 mediums - thick - bond -
 bottom of a pool - At
 microscope - sun's evening
 - Sines & Cos: : S, L, R: in a
 given ratio
 E. g. Air to Glass 3: 2
 Air to Water 4: 3
 - Mediums of unequal thick-
 ness, may incline to the
 denser part -

- Different forms of Glass
- Have no effect - Independent of emergent rays parallel
- When rays meet at $\frac{1}{2}$ Rad
- Double convex at the centre of convexity -
- Single convex 2 Radii
- Double concave virtual focus centre of concavity
- Plano concave 2 Radii
- Meniscus -
- Multiplying Glass -
- + Magnitude of -
- + Effect of a convex lens
- + Concave -
- + The magnifying power inversely as the Radius -

- + Image in a plane mirror the size of the object - behind
- In a concave it is mag?
- In a convex diminished
- + Two specula parallel - Divide 360 by the angle of inclination gives the number of images $\frac{360}{30} = 12$

- Inverted image in a focus of a convex lens or concave mirror -

- The Image is to the object $\frac{1}{2}$ from the lens -

- Ball and socket -

- This Image will increase and decrease with the optic angle

- 'Tis the image not the object which the mind contemplates -

- Camera Obscura -

+ Portable Ditto -

Eye

- Globular form near an inch in Diam.

+ 3 Coats - a bag.

1 Sclerotic - not elastic - Corona

2 Choroid - ^{vulva} - Pupil -

3 Retina - attached to the Choroid by one point

3 Humours

1 Crystalline Divides the eye into two unequal parts - Ligamentum Cili.

1 Stygian humour, very transparent - near pincers. Let out is supplied again

2. Vitreous, tho' apparently of a yellowish tinge, &c.

- very transparent
- + Manner of vision like the ball and socket
- + Magnitude of the picture least visible 5000 part of an inch
- + Short sight - concaves
- + Long sight convexes
- + Spectacles - low magnifying power at first
- Green Glass
- Small lenses - same power
- Now tried
- Two lenses should make an angle
- + Axes of both eyes directed to the same object

- + Squinting
- + Causes - cure
- ≠ Single Microscope
- Magnifying power
- as the limits of distinct vision to the focal lengths
- how the object must be small and placed in one focus
- + Refracting Telescope
- History - accident
- Two lenses of equal focal distances no magnifying power
- Image of the object glass inverted in the focus which is the focus of the eye glass

- Object seen inverted
- Magnifying power
- as the Focal length of the ob-
- ject lens : eye glass
- Two instrumental glasses
- of equal focal Distances with
- the eye glass
- Refractor with a concave
- eye glass — — — — — erect
- Compound Microscope
- Two eye glasses
- Solar Microscope
- + Reflecting Telescope
- Two concave Mirrors and
- eye glasses — Newtonian
- Gregorian
- Herschell's Telescope

- Diagonal print Machine
- Maju Lantern &c

~~See previous~~
 & New method of calculating
 the Magnifying power of
 every lens &c

Vision

1. Why is not the object double
2. Distance vision at different distances
3. Contraction of the pupil
4. Use of two eyes
5. Object appears brighter but not larger to two eyes than to one $\frac{1}{2}$ part
6. Objects inverted on the retina
7. Known objects appear near and under view magnified by the Telescope
8. Light of the moon ^{300,000} miles
- Description
9. Horizontal moon
10. When one turns round objects in the contrary direction and more after the eye is at rest

11. An object in motion will appear at rest provided the space it moves thro' in one second does not exceed the $\frac{1}{14,000}$ part of the distance
12. Torch whirled round
13. Best way of viewing a piece of perspective is with one eye, or even thro' a tube
14. Cat's pupil long vertical
Ox's horizontal
- 15.

Burning Specula -

1. Heat in the direct ratio of the square of the Diam. and inverse ratio of the focal length
2. Air not water heated - wood in water burnt
3. Rays very little heated at a small distance from the focus -
4. Mirror remains cold

320
1000
2400
2400
1920
1080
1800
<u>1440</u>

80
40
60
60
48
47
45
<u>960</u>

Vision



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— Description of the Eye
— Globular form —
— Coats and humours —
3 coats — a bag
Sclerotic. — Choroid.
— Retina.

Scl.^{ic} covers the whole
eye except the fore part
which is transparent, it
is call'd the cornea from
its resemblance to horn
Choi. coat within the
other, the fore part is

called the Uvea or Iris
in middle the Pupil —
3- The Uvea, then membrane
— 3 Humours

Crystalline Humour
is placed a little behind
the Pupil — like a lens
flatter before than behind
— Glazys apparent
— Divides the Eye into two
unequal parts — In the
foremost part is the Aq.
Humour from its resom-
blance to water — In the
hindmost is the Vit. H.
from the ^{supposed} resemblance to
melted glass

3 H

3 O V

2 H and K

Nature of Vision —

— Like the Camera Obsc.
— Distinct visions when the rays fall meet on the Ret.;
The picture is then distinct
— How do we know that our picture produces distinct vision? — By the Camera Obsc.
The same camera produce an indistinct picture in both. —

Picture inverted on the retina — Why do objects appear erect? Position of the picture has no share in theⁿ apparent situation.

but from our own position up and down — Objects appear erect tho' viewed with the head down, or oblique — Erect through an inverting glass. —

Short sight remedied by concave glasses, they make the rays diverge —

Long sight cured by convex glasses —

— Eye adapts itself to different distances
— Object appears single tho' seen by two eyes —

- Contraction of the pupil

- Use of two eyes - $\frac{1}{13}$ ft.

Squinting - Causes

1. Muscles not acting in unison

2. Most sensible part of the retina to one side the axis

3. Habit

4. Defect in one eye -
Limits of distinct perception unequal.

Can this be the cause
in a whole family?

It may, as figure column 8.

- Cure

1. Shut ~~the~~ ^{the good} eye

2. Direct the axis to a point

3. When the eyes are very unequal it is in vain to attempt a cure

Observations

1. Objects seen at different distances

2. Contraction of the pupil

3. Use of two eyes

4. Candle and finger

5. Two tubes, shellings

6. An object to be seen must subtend an angle of 1' at least, the picture on the retina $\frac{1}{5000}$ Inch.
7. An Object appears at rest if the space it runs over in a second of time be to its distance as 1 to 11000 - Watch-hand - Planet
8. An object appears brighter but no larger to both eyes than one
9. Bright objects appear larger than dark ones.

10. When a man turns round objects appear to turn in the opposite direction, and move after the eye is at rest.
11. A lock whirled round with a certain velocity forms a circle - These two from the same cause.
12. Known objects appear near and unknown, only magnified by the Telescope
13. Best way of viewing a piece of perspective painting

14. Light of the moon
 $\frac{1}{300,000}$ of the sun
Deception in estimating
light - rooms, window -

15. Horizontal moon. -
we judge more accurately
of Distances when there
are objects interposed -
look on a hill - Stone
on the road - Moon sun
over a hedge - by a tree -

According to Mr. Ashby
it is known we estimate the
length of time -

but the quality as well
as the quantity of the
objects must be taken into
account. - What we by sight
racked with pain or brooding
over the melancholly re-
membrances of a departed
friend slowly do the hours drag
on; on the other hand
what we are engaged in
conversation with a few agree-
able friends, how rapidly
do they glide along. -
Number of objects that
pass in review before the
mind the same - our
Estimate different -

16. Globe and cube -

17. To draw two rows of lines
that from a given point
shall appear parallel -

* 18. Why do objects appear
erect - Kepler's account
The apparent position
of an object has no
connection with the
position of the picture
- Object appears erect
when viewed with the
eye, in a horizontal
or inverted position

Up and Down relative
to our own position
Objects appear inverted
through an inverted
telescope -

Perhaps children see obj
as first inverted

* Craystone humours
of children twisted -
viable combination -
Dumms of the eye mov
low -

Phocodol	16	
Elect.	7	
Instant	10	10
Mechanism	5	
Hydrostatu B.	1	10
Hydrostatu	2	2
Mess.	2	2
Globes	8	
Microscope	1	1
Astronomical	1	1
Telescope	51	76
	20	10
	<u>61</u>	<u>86</u>

A 1780