Saturday 21st April 1810

Phel.a of Natural History

Lecture 4 Dr Smith

Characters and history of the

Second order of Mammalia

Did not attend

Tuesday 24th April 1810

Phel.a of Natural History Lect 5th

Further remarks on the Mam-

malia.

Did not attend

Thursday 26 April 1900

Mechanical Phil.: and its application to Physical Sci.

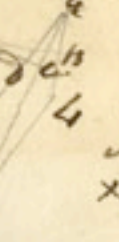
Lecture 2 Mr Pond

— On the composition and Res.: of forces. Equilibrium of a material point — Illustrations of an elementary proposition of Statics. Investigation of different cases of rectilineal motion

The comp.: and resolut. of forces explained & the usual notation first by a rectangular and after by an acute & par.: —

— The following curious property of a parallelogram was shewn

Take any point A within the Par.: GRZL from A Draw perpend.: on GL, GZ



and GK thus AC × GZ = AB × GL + AD × GK. —

This proposition applied to the Lever in all its forms

— Equilibrium of a material point illustrated by a figure and by 3 weights balancing each other, one below, and one on each side, the strings passing over pulleys — The explanation also of this and other cases on Mr Dalton I could not distinctly hear Mr Pond's back being turned towards the side of the room where I sat, by which I lost much of this interesting lecture

— Various cases of rectilineal motion investigated, and explained on the card machine

$V = PT$

$V^2 = PS$

Friday 27th April 1810

Mechanical Philosophy Lect 9th

Mr Allen.

— Various sources of Mechanical power or force. Effects of Steam. Working model of the Steam Engine. —

Man's strength applied as a power

Table

Belt

11,000 ℔ from

$\frac{20}{30000} \div 60 = 513 \div 5 \cdot \frac{513}{8} = 64$ Gallons P. minute, which a man can raise 10 feet high —

— Horse as a power, can do as much work in drawing on a horizontal picture as 6 men

— Wind as a power acts on bodies in proportion to its velocity

Effect on the sails of a wind mill —

— Water rots by its weight water mills. —

— Steam — power of boiling water a flowing stark over a patent lamp. — Taken off the lamp and instantly stopped with a common cork, the boiling ceased, if plunged into cold water the boiling commences again, I have seen this experiment seemed better

— Black's Theory of Latent heat, now called Specific Caloric illustrated in the usual manner — water cannot be heated above the boiling point — a piece of ice in a warm room continues at the freezing point till every particle of the lump be melted. — Steam gives to cold water much more heat than a quantity of boiling water which would produce the same quantity of steam — Papin digester heated a few degrees above the boiling point, steam escaped with great force when on the hand, was parted precious cold. — Division into permanent and non permanent elastic fluids. —

— History of the Steam Engine — Marquis of Worcester — Savery, Newcomen — Watt. all explained by drawings and Models — Working model of Watts Engine. performed very well — Also a model of a rotative engine lately imported by

Mr. Clegg of Manchester —
It did not act so well, nor, as Mr. A. thinks, will it ever perform so well as the reciprocating engine —

— Two excellent engines by Watt at London bridge — he described their performance, the dimensions of the pumps, height to which the water is raised, quantity of coals consumed &c. &c. —

— Power of Steam increases in a higher degree than the temperature

Inch		°		Diff —
1	—	80	—	5
2	–	103	—	23
4	–	127	—	24
8	–	153	—	26
16	=	183	—	30
32	=	216	—	33
64	=	257	—	41
128	=	314	—	57

Thursday 26 April 1810

— Physical Astr. Lect. 12 Mr. Pond

On the composition and resolution of forces. Equilibrium of a material point. Illustration of an elementary proposition of the plan. Investigation of different cases of rectilinear motion —

— The composition and resolution of forces explained in the usual manner first by a rectangular, then by an oblique angular parallelogram

Saturday 28th April 1810

Phil.y of Nat. History Lect. 6th

– General remarks on birds.

D. S. began this lecture with observation on the order of mammalia – Cete – He then proceeded to the 2 Order Aves – Structure – a bill instead of teeth feathers, – their various shape – Hollow bones and quills for lightness. Birds that fly high like the Eagle have the lightest bones. Poultry, Ducks, Storks, and the like have bones more solid and strong. – Eyes on opposite sides of the head and not in front as in the mammalia –

2 Stomachs – Crop – Gizzard –

Gizzards
next pass of the Stomach of
birds — iron nails bent &c —
small and pebbles swallowed by
birds to grind the grain in their
Stomachs Gizzards. — Rumi-
nating animals draw the ma-
terials from the top or first
stomach, and afterwards send
it to the principal Stomach
— Nest of birds is much greater
than any other animals. The
ovum from more easily exit.
and consequently enable them to
fly with more ease. —
— Birds of Carnivorous Animals
hooked, Eagle, — Others such as
the Duck, poultry straight bills.
Birds do not
carry their young like
the Mammalia, if they did they
would be too heavy for flying
Egg a curious substance —

— Migration of birds — Some
birds migrate when food has
spread them of food in their
native country, such as Woodpeckers
ducks &c — Some, such as swallows
have been found torpid in their
native country. — Dr. S. has
seen birds in the coast of Nor-
folk, which came from the
continent — known to be natives
of the continent — Dr. S —
thinks that birds do not mi-
grate to great distances as some
Naturalists have supposed. —
Swallows to migrate from Europe to Sene-
gal !!

Monday 30th April 1810

Phil.a of Nat. Hist.y Lect.r 7th

J. Smith

— Scientific character of the birds of prey and some of the following genera —

— Did not attend —

Wed.y 2 May 1810

Phil.a of Nat. Hist.y Lect. 8th —

Same subject continued

— Did not attend —

Thursday 3 May 1910

Physical Astr. Lect: 3 W. Rom

- Particular cases of equation illustrated. Investigation of the law of varied motion. Deflative forces producing curvilinear motion. Explanation of the principle of Maupertuis called the principle of the least action

- Motion by gravity. The falling bodies must have attracted attention since the earliest ages, yet Galileo was the first who ~~discovered~~ proved the laws of bodies descending by gravity to the earth. Used hanging for figure — Two tall rods divided one into spaces moved through in successive equal times, the other rule — This I could not hear distinctly. —

- Galileo also first proved that the path of the projectile is that of a parabola — This illustrated by the conical figure, and a frame with threads and a bent wire to represent the curve — DSS

$11 \div 10 = 121 - 100 = 21$

$10 \div 9 \quad 100 - 81 = 19$

- $\frac{1}{2} V \div PT$

$V^2 \div PS$.

+ These numbers were given in last lecture, but I could not hear the application of them.

- Newton first applied the law of suspended motion descent by Gravity to motion in a curve —

Wanderers Theory.

Tuesday 8th May 1810

Phil.y of Nat.l History Lect 10th

Character of the Giraffe and some of the Gallinae

— In this Lecture D. Smith in considering the Peacock, said that its voice, which is very harsh, emitted the sound páo, hence probably its Latin name pávo, this seems, in his opinion, to prove that the English pronunciation of the vowel a is that of the ancient Romans! This is a weak argument indeed —

Wed.y 9th D. Smiths 10 Lecture

— Same subject continued — Passerine or small birds —

— Did not attend —

Thursday 18th May 1810 —

Mech. C. and its appl. to Physical Astr. Lecture 6th — Mr Pond —

— Theory of projectiles. Central forces. Explanation of the Newtonian method of investigating the nature of the planetary orbits

~~Central~~ Theory of projectiles illustrated by the figure of a parabola, by two frames with threads, one with equal divisions to represent the projectile force, the other with unequal divisions corresponding to the spaces described by a body descending to the earth by gravity. When these two frames were laid on each other and applied to a figure of the parabola described on paper, the curve passed thro' all the intersections of the lines on the two frames.

— The resistance of the air renders the theory of projectiles of little use in the practice of Artillery.

— An ellipse is whose centre is at a very great distance in proportion to the breadth of the figure, approaches very near to a parabola — Cardinal points — — Circle, Tangent, abscissa, sagitta —

— Part of an orbit with two parallel to apply the composition of forces to explain the motion of planets round the sun in an orbit. Diagonals are supposed to be infinitely small &c

— Centre of forces. The sun

Friday 11th May 1810 —

Mr. Allens 10th Lect. Mech. Phil.
Continuation of the last subject.
Compound Engines. Teeth of Wheels.
Clocks and Watches. —

— Could not attend —

Tuesday 15th May 1810

Dr. Smiths 11th Lecture

— Amphibia their Character and History

— Wed. 16th General remarks on the lower classes of Animals
Conclusion of the Course

— Could not attend either of these Lectures.

Thursday 17th May 1810

Mr. Pond's 5th Lecture —

Continuation of the investigation of the planetary orbits. Motion of a point in a circle, an Ellipse, a parabola and Hyperbola. On retarded motion. Theorem of D'Alembert. —

— Could not attend —

Thursday 24th May 1810

Physical Art. Lect 6 — Mr. Pond continuation of the former subject Application of D'Alembert's theorem to different cases of retarded motion. Indirect plain Method of deducing the distance of the moon from the length of the pendulum

Tangential force — increase in velocity and direction —

— Law of velocity will cause the body describe an ellipse, a greater velocity a Parabola, and a still greater a hyperbola. The number of miles & second required for each of these. Direction — angle with the radius vector continually varying.

— Why does the planet not fly off in the opposition, or fall into the Sun in the conjunction? We can give no answer to this all that can be said is that it does not necessarily follow from the elements of the orbit and motion that it should be so. Contrapetal force increases near the sun, but

Thursday 31st May 1810

Mr. Bond's 7th Lect: Ph: Nl

On the theory of the Equilibre
of the Equilibrium of a System
of Bodies. Historical account of this
part of the science of Mechanics.
Principles illustrated by a descripti
of the construction and verification
of Troughton's Hydrostatic balance

Equilibrium on the inclined
plane — a demonstration by a
string of beads —

— Balance with the arms moved
at the centre, a weight placed
either above or below the centre
of motion —

— Lever. Archimedes's demonstration
of the properties of the lever de
pends on this datum, that when
the arms are equal, equal weigh

both balance each other.
— The three kinds of beam drawn on two large sheets of paper —
— Lever, its fulcrum a weight passing over a pulley —
+ Trough balance, has its beam like a transit telescope, two cones joined at their bases, through which a wire passes perpendicularly. On this a small brass bell slides and may be made fast to the wire
— by this contrivance the beam may be adjusted in the most accurate positions
— Beam poised at the end of a cross (like St Andrews cross) both balance each other when the two descendent weights multiplied into their respective spaces are equal to the sum of the products of the ascendent weights into their respective spaces. —

Thursday 7th June 1810

Physical Astr. Lecture 8th — M. Pond

Theory of universal Gravitation.
Application of it to different celestial
Phenomena. Density of the Satellites
Precession of the Equinoxes. Nutation
of the Earth's axis. Conclusion of the
Course.

The Tangential force difficult to
be explained — when or how it was
given — The centrial force well known
— Gravity above the surface decreases
Inversely. Below the surface in the
direct ratio of the distance from the
centre — Illustrated by a ring or
of Matter. — — A pendulum below
the surface vibrates slower, the same
as if placed above the surface.
— A body projected horizontally on
the surface of the earth with a
velocity of 5 miles in a second would

If there was no resistance from the air circulate round the earth in 1 hour. The moon at 60 times the distance must round the earth in 29 days this is proportion to its distance and proves the centripetal power to be the same —

— Mode of ascertaining the density of the planets — This at first thought would be impossible but as attraction is in proportion to the quantity of matter, from the magnitude of the planets and their satellites the densities may be ascertained —

— Familiar way of ascertaining the cause of the precession of the equinoxes and the rotation of the earth — With this Mr Pond concluded a very interesting course of lectures. —

Royal Institution 1811

Thursday 24 Jan.y at 2 o'clock

Mr. Pond —

Astronomy Lect.e 1st History of ancient Astr.y and Geogr.y Origin and progress of Civilization in the world. Early Astr.y of the Chinese, Indians, Babylonians & Egyptians. State of Astr.y in Greece previous to the foundation of the Alexandrian school.

Every science has something peculiar in itself to recommend it. Chemistry has many beautiful Experiments. Astronomy has not this advantage. It possesses, however, a sublimity and grandeur superior to all other sciences. Chemistry is employed in investigating the properties

lies of the animate, indeed, the invisible, particles of matter; Astronomy of the immense globes which occupy the Celestial regions. The one screens ignorance the nature of bodies in apparent contact, the other contemplates bodies at immense distances from each other. The phenomena of Chemistry are perpetually changing and the theory extremely defective; the phenomena of Astronomy are uniform, the theory perfect, and the system, for aught we know, may be eternal. —

History of Astr[y]. Its origin — It is difficult impossible to say when Astr[y] had its birth, or whether it had a common origin — Chinese — Indian — Chaldean — Grecian Astronomy —

Inducement to the study of Astr[y] Famine — Diurnal Phenomena rise out of and set in the Ocean — Pole Star — motion — Sun on the Equator, equal length of time above and below the Horizon.

— Moon an early object of contemplation — Lunations in a year, first 12 of 30 days each = 360 the length of the year. —

— To determine the seasons and the length of the year — Hesiod Evening and setting of Constellations Orion, Sirius, Pleiades and others. Gnomon ascertained the length of the year or number of days between two shortest shadows.

— Astrology is to Astronomy what Alchemy is to Chemistry

Royal Inst.n 31st Jan.y 1811

Astronomy Lect.e 2d – W. Pond

Geographical history of the civilization of the World. Continuation and conclusion of the history of Ancient Astronomy.

M.r Baillie is of opinion that Astronomy and all the other sciences and arts were cultivated and flourished in a higher degree in remote ages than at present that the earth has experienced some great revolution, some terrible convulsion, by which the arts and sciences of former times have been lost. That the earth has suffered some violent convulsions previous to our most ancient history, all the phenomena of Geology seem to prove.

(Here some of the principal Nations might with great propriety, have been mentioned). M. B– supposes that Mankind were all destroyed, except a very few and that these had to repeople the Earth, and reinvent many Arts and Sciences. That many Arts are very ancient there can be no doubt. The procuring Gold and Silver and Copper from their ores was accomplished in the first ages of history. But many centuries must have elapsed before this could have been done. The principal improvements in this art are modern. —

Instead of adopting M. Bailli's opinion, the phenomena might perhaps be accounted for, by supposing civilization to have commenced at a period much anterior to our earliest records of history and Chronology. In what country civilization first began it is impossible now to discover. It was probably in a warm, & at least a mild climate and on the banks of a great river. Possibly in Asia. The alluvial matter washed down by rivers would soon attract the attention of the inhabitants on its banks. The Golden age was probably referred to the banks of rivers. It must have been of short duration.

It is remarkable that there is no history of the discovery of fire — The story of Prometheus is a fiction, which has no reference to any historical fact. Perhaps Volcanoes might first suggest the idea of fire

It is impossible to say in what country Astronomy first had its birth. —

W. Pond has gave a short history of the Chinese Hindu – Chaldean – Egyptian Grecian, and Arabic Astr.

Royal Institution
Thursday 7 Feb.y 1811
Astronomy Lect.d – W. Pond
Explanation of some elementary principles of the Science, Comparison of the ancient and modern methods of measuring Ast.l Distances and of the Instruments now employed for this purpose, Use of the transit Instrument, Quadrant and Astronomical Circle, with other Instruments for determining the Solar Theory.

– W. Pond began this Lecture by explaining some terms or principles of the Science – Circles of the Sphere &c. &c. —

– A spectator in a star light night viewing the heavens. He would after an

from or two observe the stars moving some from East to West, others from W. to E. He would suppose them at no very great distance from the Earth – that the heavens do not form a hemisphere but are flatter in the middle, rather resemble a Spheroid. He knows not whence the stars come at their rising and whither they go at setting. In this way Mr. P. treats, analitically the Phenomena in a neat and very satisfactory manner. –

– Lat. – Longitude – Decl.n Right Ascension Quadrant the oldest Instrument – Circle – Then ascertain the Altitude & consequently the Declination. The R.A on different principles – Transit Instrument – Time – Pendulum Clock. Sidereal time. Some Astronomical Clocks show degrees on the dial, instead of hours. Inconvenience of the division into twice twelve hours. Astronomers reckon to 24 hours. The transit telescope is the most useful of all Astr.l Instruments

– The use of the telescope of this Instr.t is to render the motion of the heavenly body visible, like looking at the minute hand of a watch with a microscope, when its motion tho' invisible to the naked eye, is distinctly seen.

– Telescopes mounted on an axis parallel to the earths axis, and round which it moves at right angles. Use of this is to keep the object always in the field of the Instrument.

– All these Instruments were shewn at the Lecture; but on purpose to explain the principle, Mr. P. told us that a more full and Annual description will be given when he comes to Practical Astronomy. –

Thursday 14th Feb. 1811

Astr. Lecture 4th W. Pond

Explanation of some Elementary principles of Astr. His lowest are of the early attempts which were made to explain the annual and diurnal motion of the Sun. Description of various Instrument and Modern Instruments for the Investigation of the Solar Theory

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In order to lay down any point or place on the surface of the earth its distance from two circles must be at right angles to each other, must be taken - Meridian, equator Lat. Long. &c - In the Heavens, Lat is reckoned on a Secondary of the Ecliptic and agrees at the ecliptic, the longitude is counted from the vernal Equinox on the Ecliptic

— Most ancient Astronomical Inst.ᵗ was the Gnomon — used by all nations — Invented — modern improvement of the Gnomon — A small hole in a high building — In some chambers in Babylon high-Cupolas —

As the sun is the most important object in the heavens to us, his motions must have attracted the earliest attention of Astronomers. Diurnal motion — It was soon observed that, if the sun rose exactly in the east point of the horizon, he did not set in west, but a little to the north or South of the west. If it was in the spring he would set to the north of the west. Next day he would be seen to rise a little to the Northward of the East and to set still farther to the Northward of the West. Then Ascendency in a round of year

for three months, when he was observed to be stationary. This determined by the Gnomon, when the shadow was shortest. He returned in the same spiral manner by the same distance on the opposite side of the Equator, which the Gnomon determined by the shadow when longest. In a similar manner the distance of the solstices are ascertained at present only by much better Instruments. For these small instruments on the table can determine the Altitude of a celestial body but must greater accuracy than a Gnomon of a hundred feet in height.

To us the sun rises in three or four minutes; but to an inhabitant of the pole rather more than 30 hours to rise — Phenomena at the pole explained.

There a difficult matter for the ancients to ascertain the Precession of the equinox by the

Gnomon. The modern by the transit Instrument can determine this very easily. Once the invention of that Instrument instead of the Lat: & Longitude of the celestial bodies as refered to the Ecliptic the Declination and Right Ascension have been introduced as more convenient. Then are the same as Lat: and Long: on earth — By the introduction of these terms the Lat and Long: of the Ancients are still preserved, tho' now of but little use.

Thursday 21st Feb: 1811

Astronomy Lecture 8th Mr Ford.

Continuation and conclusion of the subject of the former lecture.

After recapitulating the principal subjects of last lecture, Mr F. proceeded in the investigation of the Solar theory — Ancient Systems of Astronomy, Egyptian Platonic &c were explained. — Terms explained on the Globe and projection made use of as former lecture on Eclipses, & Tables use on the Terrestrial Globe. All the others have corresponding circles in the heavens. This has none — Its principal use is in those problems that require the same plane

place to be previously known
— Oblique diurnal motion of the
sun observed by the prot[ected] axis
telescope — Other phenomena
East and west points — Twilights
length of the day &c. Tropics, &c.
— To determine the position of
the Equinoxes and Solstices. The
latter more difficult than the
former. The ancient Astron[omers]
had no other method of determ[ining]
the Solstices than taking the mean
time between the Equinoxes —
It was soon found this determi-
nation was not correct, for the
two intervals between the Equi-
noxes are unequal, the summer
interval being eight days longer
than the other. This suggested
the notion that the Solar Orbit
is not circular. The ancients
however had no mode of discov-
ering the real figure of the orbit. This
is a modern discovery — Then
an Achromatic telescope with
Dollond's object glass micrometer
shewn and its use explained
— A drawing of three pairs of suns,
one in contact with each other,
another larger with the limbs
over each other, and the third
pair smaller than the first, the
limbs at a little distance from
each other — These represent the
diameter of the Sun as measured
by the micrometer at the mean,
the least and greatest distance
from the Earth. This subject
was also illustrated on a drawing of

a large Ellipse — Perigeum —
Apogeum — Great and Minor axis
Foci — Eccentricity — Radius Vector
Equal areas in equal times —
— Apogee and perigee move in
the order of the signs about 1,2
in a year. found by comparing
two observations of the Ap: made
at a great distance of time.
Exaple — Hipparchus 140 years
before Ch.t found the Sun Ap:
to be Gemini 5° 30" and Ric-
ciolus in the year of Christ 1646
found it to be 7° 26 of Cancer.
Hence the An: motion is 1,2 as
above

Thursday 28th Febr. 1811
Astr. Lect 6th by Mr Pond (Ast. R.)
of the magnitude of the sun
and its distance from the Earth
Rotation of the sun on its axis.
Solar Atmosphere. Zodiacal light
Of the measure of time. Mean
time, Solar time, and Sidereal
time. Equation of time.

— Obliquity of the Ecliptic
Decreasing. The earliest ob: on
record is a Chinese Ob:
1100 before Ch: Ob.n 23, 54. 2
the same as observed by other
Ast.rs down to A. D. 1800 when
it was found by the French Ast.r
23° 27' "
— According to Herodotus, the
Egyptian Ast.r told him that

There was a time recorded in their Annals of Astronomy when the Ecliptic and the Eq.r intersected each other at right angles!! That if true must have taken place about years ago, and in those days one half of the earth would have been in darkness.

To exhibit this and some other Phenomena on the Globe it would be extremely useful to construct a Globe with a moveable axis.

— Distance of the Sun much greater than the amount supposed

— Parallax explained by a figure — Earth and Moon. —

— very small at the Sun.

— first rendered sensible by the transit of Venus, A process by which the distance of the Sun from the earth is ascertained with great accuracy. ——

— Having the distance, the magnitude is easily ascertained

— A Globe or a Stand compared to a stretch Sheet or Paper represented the proportional magnitudes of the Sun and earth.

— Rotation of the Sun on its axis — by its spots — Motion of the spots — curves — Straight line & Ellipse explained in the usual manner. Spots appear very variable. Few have been lately seen. &c ——

— Various opinions respecting the solar spots — Protuberances cavities — Optical Telescopes deceptive respecting a ball — appearing in relief, because says M. R. by the objects being inverted, consequently the light is on the opposite side.

— Solar Atmosphere — Diff. opin.
— Zodiacal Light proceeds from the sun, at nearly right angles to the boundary of Twilight. Seldom seen in Northern Lat.

— Time — Ancient and Modern
Sun's rising and setting on noon and Midnight. —

Nov. 24. —

+ Solar, sidereal — equal time
Their uses explained in the usual manner. —

— Suppose the sun to be decreasing one inch in an hour, it will be 9.600000 years before it be exhausted

{ or 9.600 years before $\frac{1}{100}$ part of his semidiameter be consumed

Friday 8th of March 1811

Astr. Lect. on W. Pond

— Astronomy of the moon.
Phases of the moon. Telescopic
appearance of the moon. Con-
jectures on the state of the sur-
face of the moon. Theory of the
motion of the moon. Its distance
and diameter.

+ These subjects were discussed in
the usual way — little new
could be expected —

— W. Pond introduced the Lecture
by observing on some objections
made to the mode of teaching
Astr. in the Analytic way as
he had done. It gave wrong
principles and ideas of the
system. &c. —

— Advantages attending this
mode more Rational &c —
— In the hypothesis made the eye
is supposed to be in the centre
of the moon says W. P, and ob-
serving all the planets and
fixed stars in motion. This
manner is certainly the best for
calculations, or the application
of mathematics to Astronomy.
+ In explaining the dark hemi-
sphere of the moon being visible
and that this was owing to the
reflection from the Earth he saw
that it had been observed that
the reflection from this was less
than from the Atlantic Ocean
+ Observations of the Lunar
at Berlin and Capraine at
the Cape of Good Hope on the
parallax of the moon, illustrated
by a drawing —
+ Moon keeps always the same
side to the earth — shewn on
a twisting machine —
— Mountains their height
according to Herschel, must
be less than usually supposed
Mode of ascertaining their height
(W. Pond spoke uncommonly
low at this Lecture. He told me,
after the Lecture, that he was
not well.)

+ The moon appears to have
undergone great revolutions
on its surface like our Earth
— Ferguson's mode of shewing
the phases of the moon, by an

in any hall hung by a thread and stand directly either above or under the moon – Phases

Thursday 14th March 1811
Lect 8th Art. – N. Pond
– Conclusion of the Art. of the moon. Phenomena of Solar and Lunar eclipses explained

The inequalities at least the principal of the moon have been described in this Lecture – Solar and Lunar Eclipses explained by diagrams, much in the usual manner.
– In explaining the causes & Phenomena of eclipses he observed that neither Instruments nor diagrams could give any thing like correct representations of either the proportional magnitudes or distances of the bodies concerned

in Eclipses. — It is much easier to calculate eclipses of the moon than of the sun. The reason — One of the moons equations, her acceleration, occasioned by her approaching nearer the earth, will require a period of many thousand years to compleat one revolution. According to La. Place it will be years before it arrives at its minimum. &c

Astronomy Lect 9th M. Pond.

— Historical account of the Experiments which have been made to determine the Magnitude and figure of the Earth. Description of various instruments employed for this purpose.

— This important problem was attempted in earliest stage of Astronomy — The first attempt was by Eratosthenes. He attempted from the Latitudes of Alexandria and Siene to solve the problem — very ingenious first modern method by a French man — Next Snellius in Holland — Norwood in England Picard in France.

the modern measurements in France and England described by a diagram — Two base measured Triangles Calculated — The result made the difference of longitude between the Paris and Greenwich Observatory, by taking a medium between the English and French calculations, exactly what D^r. Maskelyne has ascertained it to be by observation. —

+ M^r. Pond explained and described the ~~Survey~~ Operation both at the polar circle and in Peru —

— The extremities of the base on the north was not marked. On the Andes it was by two Obelisks — On these an inscription was placed highly in honour of the French Astronomers and of the French King but little honour was given to the Spaniards who made part of the Expedition

— Some years after, the business was brought before a Court. After matters were fully investigated, the ~~Court~~ Judges determined that the description was disrespectfull to the Spanish Nation and therefore ordered the Obelisks to be totally destroyed —

— M^r. P— apologized for not shewing the Instruments — They will be brought forward next lecture —

— The figure of the Earth not accurately known — Spheroid —

The late measurements have not ascertained this. The interior of the Earth, even near the surface

very irregular — Plumb lines de-
viate from its perpendicular by
attracted mountains — From this
seem apparent paradoxes arise
respecting the Lat: and Longitude
of places. — Two places may be
under the same Celestial Mer.
and yet have different Longitude
Two places may be under the
same parallel, and yet have different
Latitudes. —

Tuesday 23 April 1811.

Phil.ᵃ of Nat. Hist. by Lieut. D. Smith.

Introductory. General remarks on the Animal Creation. —

D.ʳ Smith began by apologising for his agent that he could not on the time presented for his last course go through what he proposed, and some of the classes of animals were left untouched. He proposed in this course to give a short recapitulation of the last, and then proceed to new matter — He said it had been objected to him that he had not given his course of botany last year. He must not flatter himself that that science he is so fond of should be so agreable to others

The Doctor then commenced the lecture, and conducted it in the same manner as his first lecture in last years course - which see
Tuesday 10th April 1810 Vol 2
Notes of Royal Institution -
+ Dr A thinks that there is no instinctive motion, but that even our sensations are acquired. This opinion which, some time ago, met with great opposition, is now become general, and entertained by the first Physiologists -
- What principles controls the efforts of Chemistry whilst the animal or vegetable lives, and after death, both animals and vegt: obey the laws of Chemistry alone.
- Reason in man - Instinct in animals - Parts of animals and veg! - two - Medullary - Cortical -
First the seat of the nerves and of sensation - second, all other parts of the body, whether animal or vegetable -

- ~~Organs of it~~
- Cruelty to animals - Even Men of Science sometimes chargeable with this.

Thursday 25th April 1811

Phil.y of Nat: Hist Lect 2 Dr Smith

Same subject continued. Princi-
ples of arrangement.

— In the 2d Lecture of last years
course 11. April 1810 Vol 2

— In the earliest part were
noticed the organs of Nutrition
and Digestion — Stomach — Secretion
of various kinds from the blood —
Circulation of the blood — Lungs
breathing. Animal heat — cause
not clearly ascertained —

Classification

Mam.[1] – Birds[2] – Amph.[3] – Fish[4] – Ins.[5] – Worm[6]

Distinctive properties

– Monkey order – several anecdotes
some of them fond of Oysters. When
oyster opens its shell, the monkey
puts a stone between, to prevent
it from shutting it again.
– They are very careful of their
young –

Monday 29th April 1811

Phil.y of Nat: History Lect. 3 Dr Smith

— General remarks on the orders of birds and reptiles, with the exhibition of some new or rare Species

The distinctive character of birds — A bill or beak instead of a mouth & no teeth — Feathers instead of hair — Hollow bones, filled with air from the lungs at the will of the animal. This last is a late discovery claimed by and the late John Hunter. It is most probable they both made the discovery unknown to each other. Warm air in the bones renders the fowl more bouyant, like an air balloon.

— Wings of birds curious Structure. Had we never seen a bird fly, we should, from the weight of some

birds suppose this flying to be almost impossible. —

— Stomach — Crop — Gizzard.
The power of the last is astonishing (Reaumur and Spalanzani experiments).

— Birds nests — Female not so shining in colour as the male She is more sombre so is her young ones. By this colour she and her family are concealed from their enemies —

— Birds are oviparous. (Final cause)
— Construction of the body and feathers admirably contrived for flying and throwing off rain.

— Migration of birds — (see last 6th Lecture last course)

Thursday 30th April 1811

Phil.a of Nat. History Lect 4

—Same subject continued. —

Amphibia —

Views written on this Plan on the other Page — Ugly —

— The amphibia can suspend the act of breathing for a considerable time, hence they can live for some time in water — The heart consists of but one Ventricle — Blood of a pale red, and colder than that of the mam.a and birds —

Thursday 2 May 1811.

Astronomy Lect 10/11 W. Pond

On the different Instruments used to determine the figure of the Earth. On the construction of Theodolites and other Instruments employed in Geodetical calculations

Mr P gave a short acct of the subject of last Lecture – the various methods of ascertaining the figure and magnitude of the Earth – Figure with the Triangles and base – Another representation of the Triangs, a board with pins of unequal height, their tops covered with thread

– Apparatus employed – Astronomical Quadrant, used either in a horizontal, perpendicular or oblique position. Theodolite.

French repeating circle. Comparative advantages and disadvantages of each — The circle measures the oblique angles between the stations. The theodolite measures these angles as horizontal. The Circle answers the purpose of a Zenith Sector. The circle by a particular repetition of the observations diminishes the error — But on the whole the Theodolite ~~is the best~~ as made by English artists is the best Instrument.

Result of all the Obs.

A mean of the English and French observations give the diff. of longitude between the Paris and Greenwich Observatories to be what Dr. Maskelyne made it extremely near by Astronomical Observations.

Equatorial Radius	.	3962 miles
Polar	—	3950
Difference	—	12
Ellipticity	—	$\frac{1}{336}$

From the spheroidal figure of the earth the perpendicular to the surface of the Earth when produced will not pass through the center (except on the Equator and at the poles). This occasions irregularities in the motion of the Earth. —

Tortoise, Crocodile, Alligators, Frogs Toads are of this class. —

Sunday 7th May 1811

Phil: of Nat: History Lect: 5 D. Smith

Characters of fishes. General History

of Insects. Of their Characters.

– Did not attend ——

Mond: 8th May 1811 – 6th Lect

Same Subject continued –

This Lecture was wholly on Insects.

Monday 13th May 1811. ——

Phil: of Natural Hist: Lect 7 – D. Smith –

D. S. was employed in this Lecture,

wholly on the Class of Vermes.

Shells, formation of Corals, and coralline

+Crabs, Lobsters, snails cockles muscles

&c all form the shells from within,

and cast them shells at certain

ages. — Lobsters and Crabs are sometimes found without a Claw, having just cast it —

+ Observations on some Microscopic animals — What animal only appear to them round — animals from the scrapings of a Lead Gutter — from Peate, pepper, vinegar &c. ——

Thursday 12th May 1811

Phil. of Nat. History Lect. 1st

Introductory, on the history of

Botany.

20 May 1811

Nat. of Bot. History Lect. 9.

Structure and configuration of plants. The characters and ~~[illegible]~~ distinctions —

(For the substance of this lecture see Smith's Introduction to botany)

Sunday 21 May 1811.

Phil: & Nat: History Lect: 10 A.M.

same subject continued. —

/ see Smith's Introduction to Bot:

+ Heritage of a plant includes every part under the flower/fructification).

— use of the Nectarium. The bees and other insects are attracted by the honey, and fluttering in the Corolla, scatter the pollen about on the stigmas. —

Thursday 23 May 1811.

Astronomy Lect: 11/12 M: Pond.

On the different methods of determining the positions of places on the surface of the earth. Latitude. Longitude. Methods of finding the Longitude at sea. Distance from the centre of the earth, by the Mountain Barometer; and explanation of the principle by which the height of Mountains are determined by it. —

— Geography and Astronomy are intimately connected. The situation of places on the surface of the Earth can be determined only by Astr: Lat: Longitude — Equinoctial — Meridian. Lat: easily found — method difficult — Longitude more difficult — reason, no fixed points East or West — Sun every

to the diurnal motion of the Earth
— Different methods of finding the longitude, or difference of longitude
* between two places
1st By transportation — This can only be practised when the difference is small —
2. Explosion of gun powder on the top of a mountain observed at considerable distance. Diff. of time gives the diff. longitude
3. Eclipses of the moon
4. —— Jupiters Satellites
5. Occultations of fixed stars by the moon — The most accurate of any other — Calculation of results
6. Lunar Observations —
7. Chronometers — One chosen in an exhausted receiver —
— Mountain barometer exptd.
Two chosen one on the bottom table and the other on the floor, difference of height three feet. This can be ascertained on the scale of the barometer —
+ The formula for measuring heights subject to inaccuracies
— Decrease of gravity not the same at the top as at the bottom of a high mountain —
— Decrease to the centrifugal force from the diurnal motion of the Earth, the pressure of the atmosphere is different in different latitudes — This would require different formulae. ——
(I am of opinion that these differences will not sensibly affect the practice). ——

Monday 26th May 1011

The remainder of Mr Pondcome is deferred till our next session.