Vol. 3

Liturgie
Interpretation

1018

London Thursday 29th Jan 1810

Mr Singer gave his ~~12~~ 13th Lect:
on Electro-chemical Science

Great decomposing power of a large Voltaic battery. Decomposition of the Alkalies. Exhibition of the base of Potash, a metal which burns ~~in water~~ most brilliantly in contact with water or ice. The base of Soda, a metal possessing nearly similar properties. Decomposition of the Earths. Chemical and Physical character of these new substances. Enquiry into the general nature of Alkaline bodies. Influence of the new facts on experimental Science

Mr Davy's attempts to decompose the Muriatic acid, and first Ash He failed in both – It was only the water that was decomposed. –

– Mr Davy's first attempts and the cause of their failure. He first made use of a solution of pure pot ash, but the result was the decomposition only of the water.

– At length he succeeded in decomposing the solid pure Potash

– Mr S. said that he could dissolve pot ash with one trough, containing 50 pairs of three inch plates. He tried the experiment but did not succeed. The trough was amplified and more acid added but did not succeed. A third trial was made, also without success. – much time lost. –

– He then tried the experiment with the large battery plates of 6 inches square of 4 inches small globules of potassium were soon produced, which exploded on water. He then Electrified a Globule of Mercury in contact with potash, making the mercury Negative and the Potash positive, when an amalgam of Potassium and Mercury was obtained – He next decomposed Soda and obtained small particles of Sodium

– Mr S. says that he has never been able to preserve potassium in Naphtha, tho' many times distilled, for any length of time. It always acquires Oxygen –

Monday 25 June 1810

14 Lect: on El: Ch: Science

— Process for obtaining the base of Potash in large quantities. Its activity as a chemical agent. Its importance to the purposes of chemical Analysis. Experiments on its energy in decomposition. Enquiries into the nature of Sulphur, Carbon & Phosphorus. Composition of Ammonia. Experiments on the Muriatic acid and on Nitrogen. Advantage of the preceding facts in the explanation of Natural Phenomena. New experiments and researches —

— Conclusion of the course —

Recapitulation of the principal facts in Galv. Electricity
Voltaic decomposition with a battery of 100 —
Ammonia amalgamated with mercury — Mercury negative — swells to ten or six times the size — specific gravity 3.2
This amalgam consists of the base of ammonia and mercury the former only $\frac{1}{12,000}$ part of the latter — Constituents of bitter almonds from water, but not with an explosion like potassium
Mr Davy thinks Sulphur Charcoal and Phosphorus triple compounds. Oxygen. Hydrogen and a metallic base. The results of these experiments are not decisive — As the neither Sulphur nor charcoal can be entirely freed from water, Mr Davy's conclusions are imperfect — and founded, says Mr S. —
Platina, Mercury exploded by the battery. Slip of Glass bitumen — burn burned in oxygen gas. light from the battery.

Wednesday 7th Feby 1811

Mr Singers 1st Lect: on Electro-Chemical Science —

— History of the rise and progress of Electricity — Amber — & Gilbert's discovery — Glass tube, sealing wax — feather — pith balls — Otto Guericke — Globe of sulphur — Hawksbee, Cylinder — Newton's experiment with a piece of Glass. Light Objects attracted by the sun opposite to that which is called Gray's discovery of conductors and non conductors — Positive, negative electricity. Vitreous, Resinous, improper terms.

— A variety of Experiments with a Glass tube, stick of sealing wax, pith balls and feathers, was performed to illustrate attraction and repulsion Positive and negative Elect: &c. —

— The following is a neat experiment. Lay a downy feather on a brass plate insulated, touch the lower side of the plate with an insulated glass tube, the feather will instantly jump up and continue entirely off the plate — Repulsion.

Monday 11th Feb.y 1811 —
Electrical & Electro Ch. Science Lect. 2

— Mr. Singer in this lecture recapitulated the principal subjects of last lecture, and illustrated them by other experiments in a very pleasing manner

* The body rubbed to produce Electricity must be dry.

1 Esp.y common writing paper rubbed with Electric Gum, did not affect the pith balls but

2. When heated at the fire and rubbed also on them strongly.

3. The paper when insulated Stuck to the wall of the room

4. When laid on an insulated plate, a spark may be taken from the lower side of the plate

The last experiment is an illustration of Newton's experiment with the prism of Glass. So is the following

5 Large tumbler and pith balls
Tumbler inverted over the balls and the bottom connected with the conductor of the small machine

6 Two drinking glasses one charged inside the other on the outside, pith balls thrown into one their being applied to each other, the balls move from one glass to the other.

7. Construction of the Electrical, in whom described - Naimes - Oiled silk best - Silk should be sewed to the upper edge of the rubber, seam should project to prevent the Amalgm from getting on the Silk.

- conductor takes the whole Elect.
Jar off at once. —
- multiplying wheels are also that of the negative cond.
will be ~~shown~~ explained afterwards

8. ~~By~~ Feather attracted alternately by the conductor and the hand - repulsion unnecessary —

9. Three balls as usual

10. Five balls - Dancing figure

11. Bundle of threads, connected with the Cond.r of the great machine - Swell out to an oval figure - Conductor touched with Metal, Glass, sealing wax &c —

12. Sparks from the large machine sent round the room several ways, Spangled table

Then to shew the great velocity of the Electric matter. —

3. The Glass support of the cond.r of the small machine stood no sparks—diminished sparks. —

Thursday 14th Feb.y 1811. —

El.t and Electro-Ch.t Science Lect. 3 —

— Franklin's Theory of Negative and positive — one fluid —

— Rubber produces Negative Electricity —

— Attraction and repulsion —

The Letter been unnecessary several days after gives exploded by Attraction alone

Exp.t Head — Foly — Electric Pneumatic, with Glass bottle. This acted very well.

Monday 18th Feb.

Elect.y — Lecture 4th —

Positive, - negative Elec.

Exp.t A wire with two pith balls placed on each conductor of Nairne's machine. When excited sealing wax was applied to the balls on the negative conductor, the diverged, move the handle of the machine a very little, they diverge still more. This proves that the Elect.y of the rubber is negative. If the excited wax be applied to the balls on the positive conductor, they will also diverge, move the cylinder a little and they will converge. An excited glass tube will produce the contrary effects

— Two black ribbons laid on each other and rubbed on woollen cloth (through of his breeches) ~~the~~ one both electrified when lifted from the hand they repelled each other and separated. Same Exp.t with two white ribbons, and with a white and a black.

(See Lyon's Exp.t and Obs.n on Elect.y, or Adams on Elect.y 4th Edition page 186.

— Bells (the chimes or octave set) two placed near the cylinder of the giant machine, the conductor being removed, rung. The fly had four rays.

— Sparks taken various ways.

— Experiments in the dark room — Spangled tubes of various lengths and colours — Diamond, rubies Emeralds &c.

— Common Light, Electric Light.
— Varying spiral round the outside of the a large cylinder not jar.
— Cornice for an assembly room —
Transmitted arts &c. — All these succeeded perfectly and had a fine effect.

× Expt. on the two states of bodies electrified — The conductor of Nairne machine was removed to the distance of a foot or more. On it was laid a piece of fur skin. This was rubbed with a large stick of bee's wax. During the friction the pith ball showed no signs of Elect.y, but on removing the wax they were charged with positive Elect.y

Thursday 21st Feb.y 1811
Lect. 5 — El. Ch. Given
— Recapitulation of the principal subjects of the former lecture. —
Electricity produced by friction that is, by a rapid succession of contacts of two bodies of different nature. By this action one body gives out and the other receives Elect.y
— Rubber given to the cylinder — Rubber supplied from the earth. Machine pumps up the Elect.y matter from earth to a water pump. Elect.y would pass from the conductor to the earth, but for its being supported on glass
— Conductors, imperfect conductors, non conductors. Water is an imperfect conductor.
Expt. a small spark taken from the surface of water in

a glass bowl.
— attraction, large ball of Sola between two plates. Repulsion consequent in Electricity.
— Points throw off Electricity more readily than large surfaces —
— Fly moved round both by negative and positive Elect in the same manner. The motion by the negative Elect cannot be explained on the received principle
— Mr S. Explanation. This I did not distinctly hear. —
— Sparks — a great variety from balls of various sizes down to a points — Nicholson's brass ball and Morelli's portrait exhibits sparks of all sizes.
A point in a glass tube gave a long and loud spark.
A spark from the end of a long conductor larger than from the same quantity of matter in a shorter form.
— A point on the end of a sponge tube, large spark —
— Spark down a sponged tube on a stand 5 feet in height —
— Through 3 sponged tubes each feet in length, placed above the charge piece
— Burning conductor, point at one end and a ball at the other.
— Six perpendicular sponged tubes differently coloured, fly two balls one arm longer than the other. This had but an indifferent effect
— Electric light arises from the decomposition of the atmosphere
— Different colours owing to different resistances from different quantities of matter. The greater

the resistance the brighter the
light and v. v. Exp.t Elect.c spark
taken through a piece of wood
by two wires with balls on the outer ends
The wires are moveable in the wood,
means to be farther from the surface.

Saturday 23d Feb 1811
Mr. Lydiat's — 1st lecture
on the metals and their
application to arts and Manu-
factures —

Introduction — Many Instr.
for public lectures — subjects in
general more curious than useful
— Advantages of his lectures
knowledge of the metallic arts
curious — useful — prevents us
from being deceived &c &c —
After a neat introduction
Mr. L. proceeded to his subject
began with Iron —
— Iron the most universal a-
bundant, and useful of all
metals, without Iron &c &c —

— Iron found united with different bodies — with sulphur it forms Pyrites — with carbon, carburetted iron, or Plumbago. It is united with several other metals, clay &c

— Method of preparing iron for its use — First desulphurate ment for broken into pieces of a moderate size. These mixed with lime stone & charcoal and thrown into a large furnace, some of them 20 feet deep. The charcoal absorbs the oxygen of the oxide of the iron, and flies off in the state of Carb. acid gas and leaves the iron in the metallic state. The lime combines with the clay, and both together run into fusion and form a kind of fluid glass. The iron is also melted by the violence of the heat, and being heavier than the glass, falls down and is collected at the bottom of the furnace. Then the contents of the furnace are separated into two portions; the glass swim at the surface and the iron rests at the bottom — let out into moulds, where it is formed into pigs —

— This cast iron is converted into malleable iron (see Cait. process in Thomson's Chemistry Vol 1 Page 229) —

— Iron is rolled into bars and cut and drawn into rods by Nailwork —

— Iron is the only metal capable of being soldered — process described — In soldering the surface is in a fluid state — to promote this the iron is sometimes rolled in sand.

— This property of soldering iron of great use — Hence, palisades, Gates, Anchors &c —

— Manufacture of Anchors described — Shank made of a great number of small bars of iron soldered together. Heated from the fire by a crane — Hammered on a long anvil by an great number of men. Hammers of four pounds wt with long handles to keep the men at a distance from the great heat of so great a mass of metal. By this process the outside bars alone are soldered and form a kind of hoop for the inner bars which are in their natural state. By this the anchor is said to be stronger than if all the bars were soldered. The arms are then soldered to the shank, and the flukes to the arms.

— Malleability — Ductility —

— Exp. on iron wire, which had scarcely any elasticity, was hammered on a small anvil it was then very elastic; and became hot. Mr L. accounted for the elasticity again, by the compression of its atoms, the particles were brought nearer together, hence the increased elasticity. —

— Wire drawing described and shown by drawing a lead wire

— In drawing wire of iron and other hard metals, the metal must after every three draws, in iron, be annealed, that is

exposed to a certain degree of heat to imbibe that colour which the iron had given out in drawing the ~~blast~~ effect of which renders the iron too hard for further drawing. — This annealing is also necessary in drawing copper and some other hard metals.

Monday 25th — 1811

Et. 7 & 8 Mch. seven Lect. 6th —

— The further we advance in the development of Electrical phenomena, the science becomes the more important. Hitherto the subjects explained are of little practical importance. We are now arrived at the most important discovery in the science (Leyden phial) — History of the discovery — Van Kleist — empty phial with a wire in it &c (see Priestleys history). —

Musschenbroek &c. Bain, out side coating — Watson — Franklin sheet lead — brass fellings inside — tatoo leaf — Tinfoil &

Experiments — Plane plate of glass charged — Coated plate Ditto — Jars of different sizes — spontaneous discharges, terms of the shock counted —

— Three small cups contain spirit of wine were placed one at each end of the room and one over the fire place — all fired at the same instant by the discharge of a middle sized jar — The discharge of the largest jar sent round the room by a wire with several intervals of gilt leather — repeated three times. The last did not succeed, the gold was, by the former discharges, burnt off the leather

Thursday 20th Feb.

Elect. & El. Ch. Science but of this lecture was wholly employed on the Leyden phial —

— The most interesting of Dr. Franklin's experiments were exhibited, to prove 1st That the Electricity in the inside is different from that of the outside — 2 — Inside positive outside Negative, — with balls — wax — glass tubes — jars charged at both conductors different ways.

3 The charge does not reside in the coating but in the glass itself. This was proved by (to me) a

new Experiment. A glass jar uncoated stood in the inside of a moveable metalic coating which fitted it. A common Leyden phial, ~~without an outside coating~~ filled the inside of the glass jar. Several experiments with this apparatus. — For this lecture two Leyden jars with an Electrometer on the wire of each, were much employed. —

— A large spark, and afterwards the discharge of the large jar sent through a bad conductor, illuminates the conductor as in Galvanism. The conductor was gold leaf. From experiments of this kind hopes are entertained that the effects of Galvanic Elect.ty may be equalled by the Electric Machine —

— Charge depends on the proximity of two conducting bodies having a non conductor between them.

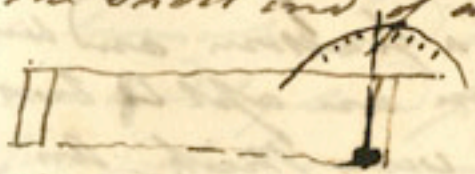
1811

Saturday 2 March

Mr. Lydiat's 2 Lecture Jun.

– Tenacity – a bar $\frac{1}{10}$ Inch sq. will support 500 pounds. Is the most tenacious of all metals

– Expansibility by heat shewn on a wooden frame with a small wire attached to the short end of an index



Contracts in cooling

– Inconveniences attending this property – Iron Gates will not shut in summer, and keep throwing the frame in winter

— Advantages arising from the property of Iron — Wheel wright fits on his tires red hot — In cold water it is turned round like a grinding stone tools — contracts, screws or nails (contracts with such a force as ~~that~~ to bend the spokes of the strongest wheel. —

— Manufacture of Gun barrels. Bread plate of iron turned round a pattern and welded. These are apt to burst unless very thick — An effectual remedy for this is the twisted barrel. This shewn by twisting a piece of lead round an iron rod — engraving continuous bar, much lightly much stronger

— Iron is a combustible body This was shewn at last lecture by burning small iron at the flame of a candle —

+ Also in this lecture by burning spirit wine in Oxy Gas. The body falls down and is three times heavier than the iron burnt. —

— Brilliancy — a piece of soft iron filed, then polished with a burnisher and oil — Polish removed by sand paper. The fine polish on iron grates is done with burnishers. The iron is soft and the burnisher so hard that a file will not touch it. — The use of the oil is to prevent small pieces of the iron being thrown off by the burnisher.

Monday 4th March 1811

W. Singer's 8th Lect. Elect.

Leyden or Electrical Jar.

A jar when charged has just with as much Electric from the one side as it has received on the other – Almost all the Experiments were intended to illustrate this important fact

Experiments

1st An insulated Jar cannot be charged – Jar on a glass stand – small charge – A round coated bottle hung from the large conductor see a very small charge.

2. A jar charged from the outside of another, different ways.

3. Middle sized jar with an Elect. charged at the positive conductor, then applied ~~applied~~ to the negative conductor. On turning the Machine the Elect. descends, the jar is exhausted. Keep turning the machine, the Elec. ball rises again with negative Elect.— If this jar with the negative charge be now applied to the positive conductor, the same phenomena take place, but the Electricity is reversed.— Naires Mss

4 Jar charged on the outside.

5. Two jars charged by the same conductor, the one positive the other negative. Let the two jars be insulated on the same plate of metal, connect the ball of the one with the conductor of the machine, and touch the ball of the other with the hand. The first will be charged, on the inside positively, the other negatively.

6. An insulated jar with a chain hanging from the conductor of the large Machine into the jar near its bottom, but not touching any part of the bottom. When the Machine is just in action the chain begins to move round the inside of the jar, and continues for a considerable time. When it stops, apply the discharger to discharge the jar, when the chain begins again to move.

7. Double jar — outside of the upper jar applied to the conductor — inside of the lower to the outside of the upper — The upper jar is not charged, the under one is charged positive in the inside — several discharges.

8. Charge does not reside in the coating proved by 4th & later by Jar same ways. —

9. The nearer the coatings are to each other, the higher the charge. — illustrated by Volta's condenser.

10. D. Franklin's experiment of a chain in a metal dish insulated, and filled with an Electrometer. — When one end of the chain is lifted up, by a Silk thread, the Elect. falls. When the chain is let down it rises again. — capacity of bodies for Elect!!

11. The theory of charging explained on last two Experiments (not quite satisfactorily).

12. While a jar is charging, the Elect. property from the outside is positive. When the charge is completed, the outside is found to be negative. — This gave rise to the unfounded opinion that a jar may be charged with negative or positive Elec. on both sides at the same time.

N.B. The 10th Experiment was only described — to be exhibited next lecture —

Thursday 7th March 1811
W. Sturgeon 9th Lecture. Electr.

— Charged Electrics —

1 Plate of air charged 2 feet
diameter boards in diam., covered
with Tinfoil. The upper one
supported on a glass rod which
fixed in the under board, and
passing through a wooden table in the
upper board, to which it is made
fast, at any required distance
by a wooden screw. The plate
of air between is charged, and
the strength of the charge is
inversely proportional to the
distance of the plates boards
or coating are from each other
— Leyden jar the same.

2. Electrometer – Quadrant
Lanes – Cuthbertsonia –
– Wire melted by a small
jar with Lanes Elect. —

3. Passage of the Elect. fluid –
– from the inside of the jar
to the outside – In general from
a body electrized positively to
one electrized negatively –
Sparks are seen to pass
from a ball on the pos. to
a ball on the negative Cond.
– small pith ball laid on
making tour on the uni-
versal discharger, and
a small shock sent through
it, compelled in to the nega-
tive side. This did not always
succeed. It was drawn somewhat
to the positive side

– Flame of a candle drawn to the
negative side – but what answered better
– spirit of wine lamp supported
on the cotton pillars of Nairne
Machine, two balls from the
conductor brought near the
flame it was blown strongly
towards the negative ball
which was much heated, while
the other remained cool –

4. Electrical fluid material –
– Card on the universal dis-
one point a bow and the
other below the card. The Elect.
in all papers over the card from
the positive wire, and from
leaves it just over the negative
– this is also a proof of the
direction of the electrical fluid
—

— wood split — Thick glass shattered to pieces — Glass tube with water burst — A ball of Tola wood drawn out of a mortar of wood placed for pendulosity — A mortar charged with spirit of wine and a heavy ball — did not succeed — the ball remained on the piece

5. In discharging the large jar through a dollar, the dollar stuck to the coating. Foil made fast to the coating in this manner — Tinfoil is positively found.

Philosophy of the Mechanics — Lect 3. W. Lydiat —

— Iron continued — Magnetism

— This subject discussed in a way not very interesting

— Magnets, straight and Horse-shoe — needles, common dipping

+ A magnet having an iron ring applied to it lifts more weight than without it — This was the only new fact, to me, in the lecture. —

Monday 11th March – Mr Singer
Electricity Lecture 10th –
Further proofs of the corporeal
nature of Electricity. Its influence
on Inflam.e bodies. Cause of these
effects. Fusion of two feet of wire
by a single jar. A wire melted
in contact with a thread, without
burning it.

1st – The Exp.t of the pith ball (see
last lect. art. 3) was repeated
by sending the shock through
the universal discharger with the
balls of the discharger taken off
when it succeeded perfectly. –
– He also repeated the Exp.t
with the wooden mortar and
spirit of wine, the ball was
drawn to the opposite side of
the mortar

– Gum of paper – card – burn on both sides
– if the card is on side hot, no burn on other side

2. Effect of Elect. on insts. substances
— Spirit of wine fired by a spark from the finger — different ways
— Cotton with powdered rosin, by the discharge of a small jar —
— Slip of Gold leaf on the universal discharger — from green wax
— Ditto between two plates of Glass
— Inflam. air pistol — loud report.
— Glass ditto — very thick —
— Inflam. air from a Bladder fired by the spark different ways.

3. Cause of these effects. —
— Heat not in the Electric matter but from the body through which it passes — the air —
— Powdered rosin on the surface of water fired by the discharge of the large jar — twice
— Wire may be ignited in water (also in vacuo)
— 2 feet of silver — then iron ignited by the large jar. —

4. History of the various methods of increasing the power of a Jar.
— Blowing into it — for a great number of Jars or Battery this very troublesome
— Moistening the inside with water and with oil
— Putting a slip of paper round the upper edge of the inside coating this answers very well when moist but when dry it is apt to be torn off by the repulsion. — When a great force is wanted for a particular occasion, let the paper be pasted on immediately before the jar is wanted. —

Monday 4th March 1811

Elect. Lect 11 – Mr. Singer

– Structure and management of the Elect. battery; its effects on metals. Fusion and deflagration of wires ~~[illegible]~~. Upwards of ten feet of wire melted at one explosion. Peculiarity of these effects.

– Effect of breathing into Jar thus – paper – oil &c –

– Great density of the report through a long conductor – Charge in this case moves with less celerity.

– Different lengths of wire melted – last about 10 feet placed on the charging frame, had a fine effect.

– Proportion of charges used –

— When great strength are wanted it is best to employ a greater surface with a less intensity. By this means there is less risk of your breaking by a spontaneous discharge —

& Caution — Heat and light not in the electric matter itself but proceeds from the matter through which it moves, occasioned either by the vibration of the particles of matter, which is Dr. Darwin's opinion, or by disengaging the heat which is latent in the body.

Saturday 16th March 1811

Phil.y of the Mech.l arts Lect.e 4th —

— Manufacture of Steel. Peculiarities by which it is distinguished from iron. Demonstration of the most important properties of steel. Consideration of the cause of these properties.

Mr. L began with observing that the use of steel must have been very ancient, tho' totally unknown when discovered. Architecture could not have existed without steel. How could even the rudest huts have been constructed, without instruments to cut down trees, and in after ages to hew stone for more stately buildings — Pyramids of Egypt — Stonehenge —

— Three kinds of Steel — Bar, or Blistered Steel — Shear Steel and cast or refined steel —

+ Process for manufacturing each described —

— Is steel capable of receiving a temper which iron is not —

— To distinguish iron from steel let a drop of Nitric acid fall on both. After a minute or two wash off the acid, when the spot on the steel will be black, on the iron a light green —

— Steel differs from iron in containing ~~fr~~ carbon. The quantity has not been accurately ascertained.

— Cast steel is employed in razors and all the other finer cutlery. It is more dense, and consequently takes a finer edge and polish —

+ A bar of red hot (2nd) soft steel was plunged into a solution of soap and water without injuring the temper or hardness.

Monday 18th March 1811

Elect. Lect 12 – W. Sturgeon

General survey of the history and practice of the science. Demonstration of its laws by the Electrophorus. Universal existence of Elect.y and spontaneous production of Electrical effects shewn by some common experiments. Conclusion of the historical and practical part of the series –

– A short history of the principal facts in Elect.y Then explained by the Electrophorus – An Elect.r abt 12 or 14 Inches in Diameter, furnished with two pairs of pivot balls. The resinous plate and

and bare metallic plate occasionally insulated – A piece of glass for a rubber – A number of Experiments, on the common explanations given. (Not quite satisfactory)
– Notes made in the side of a small phial filled with oil –
– Small jar, burst by an attempt to charge it from the large one.
+ Several tubes of different lengths burned –
– Largest feet long
A beautiful experiment.

Thursday 21st March 1811
Electricity – Natural agencies
Lect 1st – Mr. Singer
– Cause of thunder. Dr. Franklin's Experiments. Means of defending buildings from the effects of thunder storms, exemplified by experiments and models.

– Mr. Grey's and the Abbe Nollet's conjecture respecting the resemblance of Electric light to lightning – Dr. Franklin's reasoning on this subject.
– Effect of points – Exp.
– point at a greater distance than a ball from the conductor prevents the spark

— A pointed wire placed at a great distance from the conductor draws off Elect[ricity] — proved by obtaining sparks from the tuft cotton on the upper part of the insulating stand

— Feathers connected with the conductor, attracted by a ball but repelled from a point —

— A point draws off a stream of Electricity, but placed between the fingers and thumb shows sparks —

— A point on the end of the sponged tube — shows spark —

— Sparks of the large jar taken through a point —

— Obelisk — Thunder house — Fire house — Powder magazine — Ship a large vessel of water — The stick drawn towards the destroying ball by a string.

Saturday 23 March 1811

- Philosophy of the Mechanics
Lect. 5 Mr. Leslie.
- Properties of Steel. Variation of these properties by temper. Demonstration of the different temperatures for springs, and edged instruments. Indication of these difference by the prismatic colours. Consideration of the corpuscular properties of Steel. -

Monday 25 March 1811

Natural agencies of Elect.
Lect 2 Mr. Singer
- Origin of Atmospheric Elect. Connection of Electrical changes with the evaporation of water in the ~~air~~ atmosphere. Explanation of the nature of thunder storms in all their variety of effect. Cause of the violence of tropical storms. Directions for security from danger &c.

- History of the discoveries respecting the identity of Light and Electricity — Dr. Franklin French — English Philosophers. Their Experiments with rods and kites — Phenomena similar in both.

— Cause of the Elect.ty of the atmosphere — Evaporation
Exp.t Water poured on red hot coals placed on a Gold Leaf Elect.r — Negative — The vapour is positive. This last shewn by receiving it in a large funnel insulated, and connected with the Electrometer positive
— Zig Zags shewn but not accounted for —
— Morgan's opinion that the earth serves as a discharging rod between two clouds, and is neutral with regard to El.ty Thus said by Mr. S — to be unfounded — Exp.t with a ball on each conductor, and one between them connected with the ground —
— Sound of lightning cannot be imitated by Electricity.
— Dalton's account of this — Different distances of the part of the flash
— Singer adopts the old opinion reverberation — He says there is no difference in the sound of thunder claps at sea!!
Flash crash when near an object struck — He alledges that the firing of Cannon has the like variety of the sound.
— Sheet lightning — seen only by reflection — Exp.t with the large circular Board, and a Leyden jar the inside coated as usual, but the outside coated

only about an inch above the bottom –

– Chimical Hypothesis – Inf.ce an.

– Experim.t soap bubbles blown with hydrogen gas – after this with a mixture of Hydrogen & Oxygen – They were found in the boat – Could not produce single bubbles to remain in the air.

Thursday 28th March 1811

– Nat.l agency of Electr.y Lect. 3

Luminous appearance of the Atmosphere. Origin and cause of the Northern lights, shooting stars meteors &c investigated and explained by an unusual variety number of beautiful experiments

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– Mr. Singer commenced the lecture by from the best mode of securing houses "by conducting from the best metal above ground and lead beneath the surface.

– safest and most dangerous situations during a thunder storm

– Northern lights – Mr. Dalton's hypothesis. (which I will see)

— Points and balls compared by experiments —

— Electric spark sent down a receiver on the air pump; exhausted to different degrees, the light exhibits a great variety of beautiful appearances — previous to this a large Aurora Bor: flash was shewn —

— The concluding experiment was to represent a falling star — A glass tube about an inch in diameter and two feet in length, was partly exhausted of air and the charge of the large Jar sent through its whole length, it some time appeared a long line of light but in 2 experiments it passed in a compleat ball, and was a good representation of a falling star —

+ Zinc being the most difficult of fusion by Elect. would be the best substance for a conductor, but that it oxydates rapidly, and is converted into a very imperfect conductor —

— From M. S.'s luminous Exp. this morning, it appears that the light is much varied both in form and colour by the degree of Exhaustion of the air —

(The phenomena of Steamers, Meteors &c are incapable on the principles of Electricity) —

Saturday 30th March 1811

Phil.y of the Mech.l arts

Lect 6 Mr. Lydiatt

Nature and properties of Copper; its application to the arts. Alloys with other metals, forming bronze, brass, Bell metal &c – Consideration of the properties of brass. Conclusion of the introductory course.

Monday 1st April 1811 -

Natural agencies of Elect.

Lect. 4th — W. Sayer —

— Penetrability of Electric light.

Phenomena of Phosphorescence.

Influence of Elect.y in the production of Phosphori appears

Brilliant luminous effects produced by Electricity. Singular facts derived from some original experiments on this subject.

+ This lecture was dedicated entirely to the Phosphorescence of bodies or that property of bodies by which they first absorb and afterwards emit light —

+ Before Mr S. entered on the proper subject of the lecture, he remarked

on Dr. Davy's objection to falling stars being electrical phenomena, from the circumstance of the great difference in velocity. He M. S. alledged that if the glass in the experiment of the preceding evening had been a mile long, the ball or star, in falling, would have ~~taken~~ appeared to move much slower. (This is not satisfactory).

Experiments

– A piece of Mahogany with a groove, had two wires which slided in the groove, and could be placed at any distance required. The interval was never greater than what the charge of the large jar could pass.

– Various bodies were successively placed over the interval and the jar discharged in the dark. The bodies all appeared luminous, tho' in different degrees. — Sulphur and Carbonate of Baryta, Gunny cloth, Sugar &c. The thumb laid on the interval of the wire, on the discharge became transparent. Jars of ~~Lead~~ Water three colours illuminated in the same manner.

+ Most of these experiments were repeated by sending the shock over the surfaces of the bodies, or reduced to a coarse powder and laid on the table, in a chain of an inch or two in length – These Experiments were more luminous in this, than in the former mode.

The solids already mentioned with the boracic and silicic acids (bizgoe, phosphorus and) acetic. Pot was scattered about the room in luminous fragments sugar the same, the not quite so luminous – lantern phosphorus.

+ Phosphoric Ether poured into a basin of water, surface luminous – solution of phosphorus in oil of cloves – take out the corks luminous &c. &c. —

Thursday 4th April 1811.

Natural agencies of Electricity Lect: 5th — Mr. Singer

– Relation of Elect.y to Vegetable and Animal life. Spontaneous developement of Electric powers, exhibited by some singular experiments.

– Instruments by which small quantities of Electricity may be indicated – Electrometer – Gold Leaf – Voltaic condenser –

Bennet's Electroscope – Caution doubling of Elect.y –

+ The condensing Gold leaf Elect.r is by far the best

— History of the effects of Elect[y] on vegetables — Ingenhousz — Berthelon &c —

— On animals — Eggs — Torpedo Electric Eel &c —

+ Bennets improvement of on Lichtenberg's Experiment on various states — a great variety of Experiments shewn.

— Mr S — adopts the opinion contrary to Mr Davy, that bodies are not naturally in different states of Elect[y] — They acquire Elect[y] by contact and subsequent separation —

— History of the effects of Elect[y] on Vegetables — Ingenhousz — Bertholon &c —

— On Animals — Eggs — Torpedo Electric Eel &c —

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— Mr S — adopts the opinion contrary to Mr Davy, that bodies are not naturally in different states of Elect[y] — They acquire Elect[y] by contact and subsequent separation —

Monday 8th April 1811

Nat. agencies of the Lect. & Influence of Elect. in the Animal Economy. Examination of the Experiments and Opinions to which the name of Galvanism is attached. Caution of Mr. Wells on action in the limbs of dead animals

Expert. of the copper and zinc applied to each other and after separation to the gold leaf Elect. arrest tower, the copper was shewn to be negative, and the Zinc positive, by the aperture of the condenser, without which the G. L. Elect. was not affected — The same fact was proved by applying copper filings through a zinc sieve and zinc filings through a copper sieve. In the first instance the Electricity was negative, the other positive. Then the condenser was also used —

— action of iron bolts on the copper sheathing of ships — of a piece of Silver and Zinc applied to the under and upper side of the tongue &c.

— History of Galvanic discoveries

— Frog — On a plate of zinc, Silver wire — Elect. jar discharged and immediately applied to the frog, convulsions

— Then Voltaic trough — The frog applied, was violently affected. — One trough contained 50 and each of the others 25 series at

In the Exp. with the trough the frog sometimes leaped off the trough and even off the table.

— A sheep's head was then galvanized by the three troughs = 100 times — The shock was sent first through the ears, then from the spinal marrow to the tongue and to each ear — The eye lids were winked — The ears were, in some of the experiments moved.

Thursday 11th April 1811

Chemical agencies of Electr. Lect. 1st Mr Singer Principles of Chemical Science Powers concerned in the production of Chemical Phenomena. Circumstances which influence the action of these powers. Popular exposition of the nature of Chemical action

Mr Singer in this lecture endeavoured to illustrate and render popular Chemical attraction or affinity — Exps. — all of them common — Mechanical, Chemical Combination — Chalk in water — Salt in water — Muriatic acid and Lime

Exp.s

— Sulph.c acid and water — heat
— Sol.n of Muriate of lime and alk.
li mixed, form a solid. —
— Retort filled with coloured wa.
and a tube Either in the lip
exp. ended by heat — Drawn out
the water — heat of the fire. —
— Oxy. m. of Pot ash and sugar
exploded by a few drops of Sul-
phuric acid — Glass tube —
— Oxy. m. of Pot ash and
Phosp.s exp. will fire the fire explode
violently

+ — Nitrogen and oxygen Gases
formed Nitric acid — Mr. Singer
called the apparatus for this pur-
pose a new one.

+ Sulphur burned over water
produces an acid — test paper
— Steadily or Mother water for solution

the

Monday 15. April 1811

Chem.y agency of Electricity
Lect 2 — Mr. Singer. —
Nature of Chemical Analysis.
Exhibition of the processes em-
ployed to ascertain the compos.n
of various bodies. Principles on
which these operations depend.
Limit of our decomposing power.
Chemical processes depending
entirely on the agency of at-
traction. —

— Decomposition and recompo-
sition of water — The first process
was only described — Oxygen &
Hydrogen burned from a bladder
with stop cock — water. —
— Decomposition of Atm. or phoric
air — into Oxygen and Nitrogen
Phosphorus burned in a glass

The rest graduated in Cubic Inches.
The common air in the Retort
was diminished and the water rose
The dim.n has been ascertained,
by various experiments to be
21 parts in 100 of Atmospheric air — The oxygen unites
with the Phosphorus and forms
phosphoric acid. The other
constituent part of the Atmosphere is Nitrogene or Azote.
The principal properties of
oxygen and Nitrogen gases
shewn by the usual experiments
Taper — Spirit wine &c — Three
Jars were filled, one with Oxy.n
another with Nitrogen Gas, and
the third with atmospheric
air — Taper burned as usual
in the latter, was extinguished
in the Nitrogen, and lighted again
in the Oxygen Gas. (The Nitrogen gas was, in this experiment
produced from the lungs, hence
it was not pure).
+ Acids and Alkalies — Now
detected — Infusion of red cabbage
was used as well as litmus —
— The gases do not appear to
advantage in candle light —
Test paper —
— Sympathetic Ink — a few
specimens shewn, which seemed
very well. —
+ Two Gases
two mixed in an air jar, Mr.
D. brought the jar from on his
hand from the cistern. When
it was suspended from his hand,

by the diminution of the gas in the jar.

Thursday 18th April 1811

Chemical agencies of Elec. Lect 3 — Examination of the Phenomena of attraction as produced by various operations. Particular consideration of the nature of Elect. action; correspondence of its rules with those of Chemical action &c

Mr. Singer's object in this lecture was to shew that Attraction alone, without the aid of repulsion, is sufficient to account for all the Elect. Phenomena: and that Electrical and Chemical attraction differ from each other in three of the principal circumstances. 1st Elect. attr. acts at a considerable distance; Chemical attraction only in contact. 2d In Chemical attraction great heat is produced; in the Elect. attraction none.

3.th In chemical attraction great changes take place, the compound possess properties totally different from those of the ingredients; Electrical attr. produces no change takes place —

Exp.t Ex prove repulsion unnecessary. —

1. Pith ball on the conductor attracted by the atmosphere
2. Lock of cotton attracted, alternately by the hand and conductor
3. Man on hand attracted by the air —
4. Chippings of the balls attracted alternately by the centre and outward ball. —
5 The Electric fly moves round in a direction opposite to the points, because the Electricity flowing off the points Electrifies the air in their neighbourhood, consequently there is an Equilibrium on that side; the opposite side of the air will be attracted towards the air on that side which is not Elec.d the fly must therefore move round in that direction —

6. In the Electrical Pendulum the glass balls move with the brass orbits, because the neighb.g parts of the Elect. orbit attract those parts of the glass ball near the Electrified point of contact — but in reflection the same, the ball should not move at all —

7. Small conductor — pith ball attached to one extremity. If sealing wax be held near the opposite end, the pith ball at the other end diverges with positive Electricity — The negative Elect. draws to itself the Elect.y on the

half of the conductor next to it
city which thus becomes Negative
while the other end remains
positive —

— Several experiments of this
person nature on two and three
non omnett conductors or rods as
Mr. S. called them, with pith of
both ends, all explained by the
General Elect. Effluvium being
disturbed by attraction. —
Indeed Elect.ty vindicated by Mr. S.
some of Davy's Explanations
but Ind. Elect.ty objected to —

(In proof of Elect.ty and Chem.
attraction being different, few
Experiments were performed. In
deed they were not necessary)

1. Muriatic and Gas and Ammonia
formed a Solid — Sal Am.a —

2. Two Amateur Expts. on the gas

3. Phosphorus burned in a Jar
Jar of Oxygen Gas. —

Monday 22 April 1811

Chem: agencies of Elect.y Lect. 4th —

— Elect.y applied to Chemical Decomposition. Researches and Exp.s of Franklin, Priestley, Cavendish, Volta and others. Interesting chemical facts derived from these enquiries, illustrated by numerous Experiments

German Philosophers first discovered that Elect.y sets fire to inflam.le substances — Exp.s Alcohol — a small exp. on the conductor fired by a spark from the finger Abbé Nollet showed that Elect.y increases the evaporation of water and ignition of fluids in small tubes Exp.t Barrel with small tube in the bottom. —

— Dr. Franklin found that Elect.y would not only fire inflam.le sub.s such as spirits &c but that it would also burn iron wire and even reduce tin and also gold itself to an oxyd. — Exp.t Iron wire with the battery made red hot and in about a second it fell into globules — Second attempt did not succeed so well. — (When one experiment succeeds well, another of the same kind should not be attempted again in the same lecture.)

— Gold leaf calcined and united to the surface of the slips of glass so intimately that no chemical agent can separate them. (S. medium of three slips of glass)

— Experiments of Bevis, Priestley Cavendish and Volta on the chemical effects of Electricity on water, oils, Alcohol, Ether and other fluids, also on Gaseous substances

The decomposition of fluids was effected on small glass tubes bent at obtuse angles, with platina wires having their points near the end at a small distance from each other. Strong sparks, and occasionally small charges were sent, when the fluid between the points was decomposed and the gas was seen ascending to the corked end of the glass tube. Several exps on these substances, and on the decomposition of water were shewn. Oxygen and Hydrogen Gases exploded many different ways, water produced (as in many of these experiments)