

Vol. ~~4~~ ~~5~~

Scientific Institute

1911

London

Thursday - 25th April 1811.

Chem: a course of Elect. Lect: 5th -

- Exhibition of the Experiments made by Mr Cuthbertson, D. V. in the Museum and others with the ^{course} apparatus at Garden. Production of the metallic oxides, and the beautiful figures they impress on glass or Paper. Experiments on Electric fluids, and on other Chemical effects of Electricity.

+ This lecture was dedicated entirely to the Oxidation of metals by Electricity -

- Expt - Course file dust of zinc passed on burning charcoal, acted on by a stream of oxygen gas from a galvanic, was converted into white oxide of zinc.

W.S. then proceeded to oxydate
wires of a great variety of ^{different} metals
- The wires were all 6 inches in length
sketched on the little frame formerly
used, with a piece of writing paper
below on which the oxyds formed
beautiful figures differing both in
form and colour - All the Expts.
were performed with one battery
of 15 Jars = square feet of coated
surface, and all succeeded in the
best manner. The last exper. was
a lead wire supported by a silk
cord in a resin. The oxyd, in
fine white powder, appeared on
the inside of the resin. A kind of
fetus resembling vegetable iron
was round the silk thread
(see Cuthbertson's *Elect.* page 225)

th Monday 29 - April 1811
Chem: a journal of *Elect.* Sect 6th -
View of the progress of Electro-
chemical discovery to the year
1800. Best modifications of an *Elect.*
apparatus for similar enquiries
Circumstances which led to the
Discovery of the Voltaic Battery.
Progressive improvement in its
structure. Electrical powers of the
Voltaic Battery. Experiments of
the British Philosophers on its
agency in chemical decomposition
&c &c.

- History of the decomposition
of water, by Common *Elect.* &c.
- Galvanic discovery - Account
of Electricity - Volta's great discovery
of the Galvanic pile - and that
two different metals produce
Electricity - Improvements on the
Voltaic Instrument

Cruikshanks trough - Withen-
son's improvement of the trough.

Plates not soldered. Lifting out of
the trough when not in action
- Both sides acted on. Babington
improvement, troughs of wood-
lame. Objection to this construction
The troughs occupy too much room
and require too much acid. Very
expensive.

- M. S. then proceeded to show
the Chemical Agency of ^{Volts} "Elect."
by six troughs = 300 series
of four inch plates. These troughs
were charged with water only.

Exp. Water in small glass
tubes decomposed - proved to be
oxygen and hydrogen by the paper.
Electric spark - ~~of~~ small wire
burned

- Galvanic and common ^{Elect.}
the same. The copper end of the
battery produces negative zinc
positive electricity - proved by the

Gold leaf Electrometer - Small
jar same as my smallest charge
by the voltaic battery - proved by
the G. L. Electrometer. The jar
was held in the hand with one
wire of the battery on the coating
The ball of ^{the} jar brought into instan-
taneous contact with the wire of the
other end of the battery, the charge
was ^{made} very sensible by the Electro-
meter.

- Water was decomposed by sending
the charge of an Electrostatic
through the ~~of~~ tubes of glass tubes,
even strong sparks will produce
the same effect - But this and
every other mode of decomposing
water by common Electricity is
so extremely slow that it would
require several days to produce
the two gases in sufficient quan-
ty for experimenting on. -

The decomposition of water by
Voltaic Pile is much quicker
and in this respect the two Piles
differ from each other —

The shock from three Batteries
was very sensible on the fingers —

M. S. asserts that batteries
like these, charge with water only,
are better calculated for explaining
the principles, than where acids
are ~~used~~ used.

— Prostate of Lead — Arborescence —

Thursday 2 May 1811

Chem: Obj: of Electⁿ Sect: 7th —

— Particularities attendant on the a
variation in the number and
size of plates in the Voltaic
Battery. Effects of small and large
plates. ~~causes~~ Cause of these
effects. Cause of these effects.

Power of a large Voltaic appa-
ratus. Inflamⁿ of combustible bodies,
and deflagration of metals.

Continued ignition of wire.

Ratio in which the power of the
battery increases. Brilliant light
evolved from Charcoal. —

— Shock from small plates =
The shock from the largest sized
plates provided the number be
the same. This M. S. says is
in every to the body being

Act 4

a bad conductor of Electric:
The following Experiment
was exhibited. A jar was
discharged through a piece
of wood, large resolution.

A large and small jar
were separately charged by
the same N. of turns of
the cylinder, the discharge of
the small jar was much
stronger than that
of the large jar (these Expts
I think not conclusive).

W. Singer then exhibited the
Effects of his Voltaic Battery
chiefly in burning Metals
of various kinds, in wires
and foil - The latter proved
best when a trip ball,

- insulated, was connected with
one end of the battery -
- Charcoal very brilliant. -
 - Silver leaf exhibits a green
color, but if the wire from
the battery is armed with Char-
coal, the flame is white. M.D.
once thought the whiteness was
owing to the silver being pure!
 - Fulminatory silver exploded on
glass - Glass is silvered. -

Monday 9th May 1811. —
Chem: Agri: of Nat Lect 8th —
- Experiments witnessing the forma-
tion of Acid and Alkali by
the Voltaic Battery. Conjectures of
Cruikshank and others, on these
Phenomena. D. Davy's Experi-
ments. The appearance of acid
and Alkali arises only from the
great energy of the Voltaic Battery,
as an instrument of decomposition.
Nature of those effects to which the
name of Natural agencies of Electricity
has been given. Consideration of the
Arguments for, and against the
Identity of Chemical and Electrical
actions.

The apparent production of
acids at the positive pole and
Alkalies at the negative pole
was shown by vegetable infusions

in a syphon glass ^{tube} supported
on a neat insulated stand.

~~Both~~ ^{Each} leg of the syphon was at first
filled with ^{blue} infusion of red cabbage
one leg was turned green, the other
red. In other experiments the legs
of the syphon were filled with diff-
erent infusions e. g. Solmes and Lucerne-
root. —

— Mr. S. then described Mr. Davy's
experiments by which it was
proved that neither acids nor
alkalis were produced by the
decomposition of pure water, but
+ that they arose from the decomposition
of the ~~some~~ ^{some} of the materials em-
ployed in the experiment

+ In some exp^{ts}. Wale's glass
was used instead of glass
tubes. Experiments minutely
performed —

Thursday 9th May 1811

Chem: agen: of Elect: Lect: 9th

- General application of the principles of Elect: Chem: Analysis.

(Decomposition of Saline and other compounds. Experiments on acids, and on acid and metallic combinations. Extent to which the decomposing power of Electricity may be applied.)

The most wonderful circumstance in the decomposition of water is the great distance at which the wires may be placed from one another - Mr. S. has succeeded with a distance of thirty inches - Glass tubes. As every particle of water must consist of a particle of Ox: and one of Hyg, the explanation is very difficult.

+ Decomposition of Sulphate of Soda
and other compound Salts by Gal-
vanic Electricity - Experiments in
Glass, Glass tubes and Wale's
Glass. The latter answers very
well

- Acids of Lead - Sulphuric and
Phosphoric acids formed by burning
Sulphur and Phosphorus in oxy-
gen gas. Decomposed by the Gal-
vanic Battery - Sulphur at the
negative and oxygen at the
positive pole. In burning, Phos-
phorus absorbs more oxygen, than
Sulphur, hence they are both
positive, yet Phosphorus is more
so than Sulphur. -

+ Transfer of acid and alkalis
in two wet Glass - afterward
in them. In the latter case the

acids and Alkalies changed sides,
and in some experiments passed
thru a substance on the middle glass,
which they have a powerful attraction,
without combining with it. -
- The Glasses were connected by moist
cotton. -

Monday 13th May 1811.

Chem: agencies of Electⁿ. Lect 10th.

- Result of the application of Electro-chemical Analysis. Decomposition of the Alkalies and Earths. Properties of the new metallic substances produced from them. Influence of these discoveries on Chem: theory. Recent inquiries of Professor Davy, and of the foreign Philosophers. Conclusion of the Course.

The whole battery, of 360 Series, was put into strong action in these experiments. The first decomposed soda, which requires a greater power than pot ash - when the power is too great, it ignites the substance. - Pot ash was then dissolved. It exploded in water. These Experiments were several times repeated.

N.B. The Cells = 300 of 6 inches by 6 of 6 inches

Thursday 16th May 1811. —

Lect. 1 on the various Theories
advanced to explain that Phenomenon — M. Singer

— Recapitulation of the most im-
portant facts in the preceding
lectures. Theories of Electricity.

Theories of Voltaic Electricity. Opinions
of Volta, Galvani, Nicholson, Comber
Shank, Galvani, Wallaston, Davy,
Kittel, Luthburton and others.

Experimental illustration of Prof.
Davy's Hypothesis Original Observa-
tions on the same subject.

Examination of the first part of
De la Rive's Analysis of the Voltaic
pile.

— Voltaic Theory — Two diff. metals
e.g. zinc and copper, when brought
into contact and then separated

are both destroyed, zero pos:
Copper Neg: - Different degree of at-
traction for Electⁿ?

- The plates of the Electro-phorus
are brought into contact then
is no appearance of Electⁿ till
friction is employed, and con-
tinued while the rubber remains in
contact with the resinous
plate, the fish balls exhibit no
signs of Electⁿ till the plates are
separated.

- Volta concluded, from his Exp^s,
that the power of the pile was
in the direct proportion of the
number of plates. This M^r S.
endeavored to prove by trying
the effect, first of one battery,
then of 2, 3, 4, 5 and six of the
same size, on the Gold leaf

electrometer. The distances to
which the Gold leaves diverged
he observed, were in proportion
to the number of batteries em-
ployed (this experiment was,
by no means satisfactory)

- From this and some other ex-
periments, M^r S. concluded that
M^r Davy's hypothesis of the course
of power being at first as the square
of the no. of plates, and decreasing
in great number of plates, per-
haps to the state of Equality,
is confirmed.

^{flat}
- A tube with two pieces of
cork in its inside, through which
two pieces of paper passed, the
ends of them were placed at
the great distance for decom-
posing water, they are also at

the same distance from the wires
at the ends of the tube, which con-
nected it with the battery - The tube
was filled with water which in the
the three divisions had a com-
munication with each other through
grooves in the cork. The wires
were of brass - On connecting the
tube with the battery, the ends
of the wires pointing to the nega-
tive side were soon oxidated and
the other ends, directed towards the
positive side produced hydrogen
gas.

- This experiment was varied by
using a longer tube and man-
aging it, and filling the tube with a
solution of acetate of Lead.

Ends towards the Negative side
covered with Arsenic, the
others produced inflamm^g air.

- The same fact was proved
by the following beautiful
and simple experiment.

Four small glass Syphons were
placed ^{upward} with their angles in notches
in a board filled with an infusion
of red cabbage prepared with a small
quantity of sulphuric acid.

The syphons were connected with
one trough of fifty three inch
plates, and with one another,
in the same manner as in
decomposing water with platinum
wires. In a few minutes the legs
of all the Syphons, next to the
positive ^{hole}, were turned red, and the
others green. The parts of tubes
below the ^{lower ends of} bottoms of the wires,
retained their original colours.

From this experiment, which

It may be agreeably varied it is
as proved that the common hypothesis
of the insulations of the Electric fluid
from the positive to the Negative
pole, is unfounded.

The infusion of red cabbage
was prepared with ^{the} addition of
a little sulphuric acid By
which it is rendered a better and
more permanent test.

Monday 20th May 1811.

Theories of Elect. examined.

Lect 2 - M. Singer

Continuation of De Suis analysis of the Voltaic Instrument. Importance of some facts derived from this analysis. Confirmation of these facts, by new, and singular Expt. Establishment of these facts by

De Suis Electric Column or perpetual Electric machine. Improvement in the structure of this instrument into Emulation of a perpetual motion. Influence of these Expts on Professor Davys's hypothesis of Electro-Chemical affinity. Observations of Maycock and Donquar. Announces what appear any poss. Concl. on this subject in the pres. state of our knowledge. Concl. of the Lect. for the session

In the experiments of this evening a voltaic battery of 4 troughs ^(360 grains) charged with common water was used. This battery acted weakly, it did not ignite wire but when connected with the 15 Jar battery and remaining some time in contact, the power was much increased - here was born - This may possibly lead to some important discovery.

Mr. Smyth then proceeded to the analysis of the galvanic fluid by De Lue (see Nicholson's Journal for nos 116, 117, 119, 122, 123, 124, 126)

The present and electric effects proceed from different

arrangements of the plates - see De Lue -

- Various experiments on the Electric column -

1. Cell presented to the Gold leaf (with Pt) showed pos. Pt and neg. end and Negative with the other
2. Two Cells both in contact with the Plat. made the leaves diverge a little more than with one but when one was suspended to the other and the lowermost brought in contact with the Plat. the leaves diverged more than in the last case.
3. A Cell. was supported at its ends by two Plat. - The gold diverged gradually and struck the glass at certain intervals. - When a communication was formed between one end of the

Tuesday 13 August 1911

+ This morning Mr. Sanders & I went to see Prof. Leslie Experiment on freezing, by Mr. Singer.

- A glass basin, of a size to go within the largest receiver, was placed on the plate of the air pump, and nearly filled with Sulphuric acid. Over this, at about four inches distance was placed a small glass vessel supported on a small stand or support of copper wire, the whole covered by a common receiver. During the exhaustion, small

bubbles of air, as usual,
escaped from the water. When
the exhaustion was carried
by as far as the pump could carry
nearly on it, large bubbles
darted now and then from
the water, to a considerable
height above the surface.

When this phenomenon ceased
the water froze instantaneously.
The first experiment did not
succeed, the pump was worked
more than half an hour.

M. S. thought that the fault
was owing to there being
too much water in
proportion to the sub. here
used. The experiment was
repeated with half the quan-

ty of water, and succeeded
completely in four minutes
and a half. A beautiful
experiment. —

— The large bubbles are not
easily accounted for. —

— At the commencement of the
freezing, a number of small
air bubbles were generated below
the ice, then uniting together,
formed large bubbles which lifted
up one side of the ice, into a si-
tuation oblique to ^{the} surface of the
water. —

