Lightning

and Other

Phenomena

Lectures on Electricity

Similarity of E. Mo

1 Crooked Path —

2. Shuns the highest and most
haunted objects — Spirit. trembe

3. Prefers the best conductors
Ind.ty — metals

4. Melts metals — Wire — Gold
Leaf — Sword — Money —
+ cold Insects —

5. Sets fire to inflammable
substances — Spirits — Gun-
powder — Cotton —

6. Shallow non conductors

7. Kills animals —

8. Names compost

9. Subterranean mud

Doctor Franklin's discovery
— Rile — with handkerchief —
— wire twisted — with Earth thrown
— silk ribbon — Ship —
— struck by lightning —
— "
— cruel of the world —
— several showering clouds
passed — at length fiber
repelled — knuckle received
fire with Earth — pleasure —
— great discovery — June 1752
French acknowledged — May 1752
— Great discovery since
Newton — Accident had no
share — most delightful train
of reasoning — the finest
Parkyns — Experiments
Pleasure in both —

An Iron rod of a moderate
length will extend more Elec.
than two yards of string —
reason — Model —

~~Rosenoff~~ Monastheri Ecl.

— Sic always clubfist —
Clouds more — canus —
+ Heating and wolens —

2. Friction — Sic Gum —
In hail showers — In a fog
~~the~~ car is strung by clubfist
— Some we account for light
on hair — mane — clothes
— Relunch — stars — Lark —
and Centaur — falling stars
— Lighter the spindle of
ship — Castor and Pollux
— Coal was singed with
light —
+ Pliny — Seneca — Lucan —

Thunder —

— Cloud contains more
electricity than that part
of the earth to which it
is presented — Stubbins Ust.
— flash of light" is a term
often — (Does not make
use of strange elusions —
— cloud two ams —
— Two clouds equally charg:
effect — move in contrary dir
and contrary to the wind.
— Differently electrified clouds
— small clouds hang be-
low — repelled from a
point rise to the cloud —
— clouds dart into each other

Light: rushing through the
watery cloud causes the
noise — Light moves with
inconceivable velocity — its
duration owing to the impr.
made on the eye — Sound also
one jolt. but its continu-
ance owing to the different dist.
of the clouds through which
it moves —

— Light is without Thunder
no clouds — Darts from one
part of the earth to another
or from the earth into the
atmosphere

2 Thunder bolt — cause —
/ Clouds negatively electrified
— Battle — Double flash

Situations

1. Night stars must dance.
2. Lay down — Love enough
3. Flowers thro' not in the highest point may be
   struck —
4. Under a tree or hedge
   — two present friends —
   — stand 20 or 30 yards from
   a tree —
5. Dangerous to be crossing
   a river —
6. Wet the clothes —
7. In a house will not
   mar the chimney —
   — Bell wire — working by

– Stand next in a Door – window

8. Sit in the middle of the room – Mattrass – feather – bed – chairs hung with silk cords –

9. Days without Hours

10. Trees about Houses & Steeples in a Town –

11. Ringing of Bells & noise – to distance the Sound – Discharge of Cannons –

12. Windows are better down than up –

Conductor ——

Bar of iron an inch square

all of one piece — 3 or 4 feet

above the chimney —

pointed and gilded —

fixed by tarred wood to the

staff — enclosed in a wooden

case — Lower end carried to a

distance from the foundation

Lead rod and points are

enough. —

We know not the quantity

of lightning in a cloud

but we will have sufficient

safety a quantity that has

done much damage for to.

a house —

Pointer — round conductors
— Mr. Wilson's Experiments
— Experiments to determine
— Conductors for Ships —
chain — wire better —

+ conductor should be either
enclosed in wood, varnished or
covered with lead —

— Other Phenomena —

+ Streamers — have always been seen — more frequent than thunder — Different colours — corona — converging rays —

— from 9 to 3 in the morning

2. Water Spouts —

3. Earthquakes —

4. Whirlwinds —

5. Hurricanes &c —

+ Returning stroke —

— Observations —

— old customs ——

— Electricity checks fermentation
— rail in fermenting ale
in a beer —

— Iron hoops on ale casks
useful — when one casks is
sound and the rest crack
it has been by a stroke

— To cover the fire useless
practice — Do not act
on each other —

— Electricity promotes vege-
tation — use of lamps
and sprinkles on vegetables.

— Useful to animals
Flannel —

— Back of a Rat — Silk.

Stockings. Knives Etc —

+ Fowls — Electric Eel —

— Lamprey —

+ Elephants —

— Electricity negative —

— Why it continues so long

12 9.
10
110
4
400 | 7 Reste 1
100

— Anaxi — Thales 300 yrs
— Theophrastus — Lyncurium
— 1900 years — mid for the
greatest part of this time
a Dark cloud hung Over Europe
~~Learning~~ and Science of
every kind was almost totally
extinguished — It was not
till the beginning of the
15th Century that Electricity
— began to be considered
as a Distinct Science and the
foundation was laid of all
those discoveries which have
so much astonished mankind
the world. —

In the year 1600 Doctor Gilbert an English Physician published his treatise on the magnet which also contains several curious experiments — chiefly augmented the list of Electrics —

Excepting some trifling additions to the catalogues of electrics nothing was done till the year 1670 Mr. Boyle enlarged the catalogue of Elec.— writing, — Dry — Heat — Wood & work-had an imperfect view of the Electric light

Otto Guericke — Globe of Sulphur — saw the Elect. Exp. — heard the hissing noise (discovered electrical repulsion

The next Discovery of any
consequence was made by
M. Isaac Newton i.e. that the
different and Refrangible Rays
of Light through Glass.

1709. M. Newton published
a Treatise on Electricity —
— a Glass globe instead of the
Sulphur or Amber which
till then had been generally
used —
— Electricity had a rest of 20
years — Newton writes

1729. M. Gray among many
other Discoveries found that
some Bodies were not con-
ductors of Electricity —
— thus the Foundation of all
the Experiments

1734 Mr. Du Fay — Two sorts
and negative Electricity.
— vitreous and resinous.
— That it is impossible to
excite e. Gr. when the
air is much rarefied
Wittenberg.

1742. Mr. Boze again intro-
duced Glass globes — Pours
conductor if was a metal
tube held in a man's hand
fixed on a cake of re-
sin or wax — If was after-
wards supported on Silk
strings, a wire to which
it conducted with Negative

1746. Electricity first
discovered at Leyden by
Mr. Van Kleist, whereby

is in a Letter to Doctor ~~Hoond~~ Lichtenstein at Berlin —

On the 2.d of Nov. 1745 he sent an account of it to the Acad. the substance of which was "that a man of much brass was put into a small Glass Globe which emptied & closed again & that while this was doing, the Globe was filled with a little mercury or Spirit of wine in it — that he held for some time at the conduct and removed it at Park row it ended out a strong breath of Electric — without this I can see Spirit of wine — but what appears most surprising

is shot off I shut my fingers
on a bit of gold to the nail
which it is clutching. I re-
ceive a shock which almost
my arm off & hundreds
M. Marchese knows
M. Lemmo ——

Electricity now became the
general subject of conversation
Electricity & machines were soon
after exhibited in every part
of Europe and greater number
gathered to the house of Elec-
tricity had ever been known
before ——

1752. January of Electricity
and Lightning ——
—not the result of accident

Glass tube —

3 ways of Inducing Elect.ty

1 Friction 2 heating 3 bring

two bodies producing

but a small quantity —

only Mutual method produces

Every substance excites

with communicates its elect.ty

to any body in its neighbour

hood or touches it and be

-comes it said to be Electri-

fied.

Every substance which by

rubbing it can be made to

exhibit signs of Electricity

is called an Electri —

— non electric or Conductor

Electrical machine
Elect: sithes from the Glass &c
Prime conductor on Stand
on Glass — Knobs —
+ Person on Electrics
Jars Electrics with exhibit e
strong elec: and repulsion that
will not emit any conducible
Sparks — others will emit
vigorous sparks and yet at-
tract but weakly — Ner-
Electrics not taken with
f / with exhibit a fur-
nament and strong elec: D
exhibit shower luminous
sparks —
2. Glass exhibits the El.
light elec: and repulsion
in such manner as

Air is always electrique
— positively — negatively. —
— Electrique
by heating and cooling —
— heated air negatively —
2. By friction — Air gives
light in the dark
In hail shows — Positive
— Fog always strongly electric
Clouds Powder — negative
— Rit. does not show so much
electricity as a rod — Why.
Proofs of air being electrique
light on the hair and helmets
of Soldiers &c — on a frost one
Air reflects Sound frozen in a

Fog, and Mist shown —

— at the Grounds of Ships

+ Clouds are often charged

in different Colors. owing to the

different of heat and other causes.

— Two Clouds charged with

opposite electricities —

— Spheres of attraction — Produce

— Thunder — Clouds moving

in different Directions a Prow of the

Keys are differently charged.

— Earth Point: and Key: with

respect to a Cloud — consequences

— Appearances are nearly

the same in both cases —

Thunder bolt meets Ship and

Lightning without Thunder
when the sky is clear thunder
is never heard, nor is there gen-
erally negativity, when there
are clouds and lightning there
is always thunder. ——

Dangerous — Nature of the
cloud. — *Security — in the
field — in a house without
Conductors —

— Stand not under high trees or
— tree — wet clothes — lay down
in a hollow — not carry a gun
— set the gun upright —

— Not near the Chimney —
— Bell wire — Coating Glass
in any Metal — Look not
out of a window nor go out
of the Door — Sit in the
middle of the room — on the
Carpet — Mattrass — Feather
bed — Seat hung by silk cords.
— Must be under all these pre-
cautions necessary the
hour it self can be prefixth
Secured from our being hurt
by lightn.g Great advantages
of Dr. Franklins discovery —

— Situation —

+ High Ground dangerous
— an high ground by down
— Place a Gun on Rising ground +
— Under a hedge — Tree
+ Stand near a tree +
— Pointed leaves of Veg:
+ In a room not near Exp! Lady —
— Chimney —
— Not near a looking Glass
— Cork —
— Look not out of a window
— Lady and her Daughter X —
— In the Door — Door Man —
≡ Safest Situation, — low
Grounds — on a Dry Sandy
or Rocky soil — In the
+ middle of a large room
— no Curtains in a small room

+ Corbet — Feather bed —
— Glass Wool — Hammock
— Slung with Web cords —
+ ~~Cordon~~ —
— Dangerous to cross a Ferry
— Ferry Bells —
x Returning Shore — not
very dangerous —
— Conductors —
1 Copper wire ½ Inch Diameter
2. Continuous —
3. Connected with the earth —
4 Firmly fastened Points —
5 Coated in Lead —
6. More Points on the Surface
7. Left in a Point Earth
— Short & Jagged Lead —
* Rods and Points x —

— Aurora Borealis —
+ quivering motion —
— Off: colours
tufted, partwhite, lower
end or purples —
— Produces height +
affects the sun +
affects the magnet —
— + noise —.
affects in Northern Climates —
— Theory — Prove seq.
now — and inverse —
— change of the face of a
country —

Earthquakes

— Supposed to owing to
their Gas: —
— Not agreeable to the
Phenomena —
+ Air highly elastic —
— Vegetation forward — animals
more — hurling among the
leaves of trees —
— Floods on Sandge months
— Have greater in the Ganges
and Water — all corresponds
with the Ebb & Flow Hypothesis
+ Theory —

Wall Struck

— Phenomena —

— Come back to and

— Violent agitation below

— Fruit — Fire from under, some

— times obliges — Natural any

more —

× Old Theory is confuted —

× Electric Fluid moisture

+ Flash of Light observed

Volcanoes

Electricity concerned —

Flashes of Lightning —

Mt. Vesuvius — Sir W. H.

Eruption — burning Lava

Fire balls — Great Effects

from them sometimes —

August 1783 over Italy &

and Ireland — Dust in above

the Atmosphere —

Oval Figure — Shaking him

Darkness Instant: in concern

Each with the Lenten

Land around — News expected

a river —

Falling Stars — The com

Direction

Light —

1 Zig Zags —

2. Flashes the brightest objects

3. — Flashes the best conductors

4. Melts Metals — X

5. Fuses iron & Cobalt

6. Smells of Phosph: & Sulph.

7. Affects the magnet

Sword will stay

Watch magnetism —

Doctor Lardner—

Bile — wine — well known

Hubbard — Ray — 10 June

1752 — French 15th May pro-

ceeding —

— Greatest discovery of modern

times —

— Student had no share —

— Finest train of reasoning,

most perfect analysis —

Air always Electrified
— Cause — heat — cold — Friction
— Evaporation — Crystallization
— Fermentation —
— Ice suddenly melted
— water suddenly frozen. —
— Fire Damp exploded suddenly —
when cooling exhibit signs
of Elect^y Chocolate —
— Change from Fluids to
Solids and V. V. and from
Fluids to Vapour accomp.
with Electricity —
— No wonder that Air
should be found Electrified
— Friction — Attrition — Collision
in the Earth —

— Phenomena —
— Cold — Dry —
— Hail Shower — Great coal
— Fog — Cobweb —
— Lights on hair — Incubi
— Roman Legion —
Lambent light —
+ Clouds Electrified —
— Thunder clouds — attract
upon equinoctial
between the Clouds —
+ Great Clouds roll on us
awfull burden on the
Winds" — Small white
clouds — Advanced Guards
of an Army —
+ Main Cloud now shuts
Flash of Light, Clash of
Thunder —
Light. before the report

+ Interval how measured
4.7 seconds to a mile
— watch beats —
+ reason — Sound moves at the
rate of 1142 feet p. second —
— Velocity of Light —
+ Condensation of the vapour
owing to the distance of the
cloud —
— When Light. shuts near
vapour very short. —
+ Forms of Light.
— Sometimes red & dang
Pale yellow more dang.
Fire balls more dangerous
— Double — treble Flash —
— Reflection
— Omniscience —
+ Clouds move against the wind
— and run in contrary direction

~~Lightning~~

Balls of fire are sometimes
seen to descend from one cloud
to another —

Thunder bolts sometimes
are seen descending from the
heavens — always
Bones not so found —
Reflection comes on
quicker — Trees —
Ground ploughed up —
Returning Storms —

Electric circuits

Velocity

No electric motor however
low can consume more
than the circuit of seven miles by
Poles Watson and hinds.
The objects of these experiments
was to ascertain the distance
to which the Electric motor
can be used, and the velocity
with which it moves —
15 July 47 — The sent a short
distance the river Thames
the body of the river making
half the circuit —
— was fastened alongside

bridge one end touches the
outside coating of a charged
jar. An observer on the other
side of the room touches the other
end of the wire in one hand
and an iron rod in the other
which he directed into the ground.
— On the same side with the
machine was placed another
person who directed one iron
rod &c. and in the other hand
a wire to discharge the Jar —
— The shock felt by both
through the machine —
— Coleman received a shock
on both sides —
— Shock felt by two men at

A circuit of two Miles — half
water half Land —

— Circuit of four Miles —
half Iron insulated — half
(Red) earth — no Turnpikes
time — Guns — Clock work.

÷ Small ones might perhaps
— in Discharge — in measuring
the velocity of sound —
But the following Expt
was as perfect as the subject
seems to admit —

+ Circuit of two miles one Half
Iron Rail, Iron insulated —
— Middle of the circuit in the
wood with the Mahin —
— Excellent Disposition of the
Apparatus — Just room enough
he should immediately the

2° after it had passed through
a mile of wire — the last 2
miles — left both merely at the
same instant —

— Some think the Electricity
does not make the whole cir-
cuit — Beam — This cannot
be the case in an Earthen Vessel.

—

Conductors

Requisites

1. Best Conductors — Metals
2. Sufficient Thickness
3. Continuous
4. Perfectly connected with
the Common Clock —
5. A sufficient height above
the building —
6. Firmly fastened and firmly
7. Bent Points on the Ends
all connected with Conductor —
8. Painted or covered with Lead
9. Upper Part of copper with
a fine gold needle or such —

— Remark —

1. 2. In nov 2nd one inch
or a Copper $\frac{3}{4}$ inch square

3 — If of sweat Irons should be
screwed into each of the with
head shoulders and then filed
of lead or tin leaves them —
— no oil

4. — Lower extremity into works
at Less or 12 yards distance
If this cannot be done let
a round rod of Copper or Lead
be carried from the Lower end
of the conductor to 15 or 20
yards distance and connected
with a broad piece of Cop-
per or Lead jagged at the edges
and laid deep in the ground.

5th — Eight or ten feet above
the building — Iron rods and
projections to receive Projectiles

7. — For a Chain Tower, or rare
may conduct a Stroke to one
part of a building tho' there
is a conductor on the other —

8. — Should not be Iron'd
at the top — nor even Gilded
for Paint is a bad conductor
and Gilding prevents its be-
ing so easily Ignited —

10. Lead to the wall by mean
of pieces of Dry wood —

11. — Insert Conductors if the
building is large or long."
not more than 40 or 50 feet —

12. Conductors should be pointed
not have knobs — should
discharge gradually — they
act on the electricity of the
atmosphere —

Remarks on Makers

Electricity —

Sect. 1. Law is not this at

most often occasioned by the

rare particles of bodies which

float in the air: and if the

body electrified be an electric

in a high degree then the

more particles would remain

undisturbed at the bottom

would it have an electric

atmosphere? —

Sect: 29 Law is not an im-

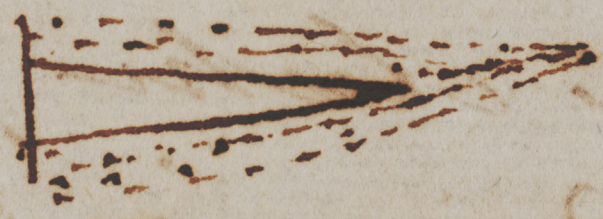
pulse by electricity, and does

not the electric fluid by

surrounding the particles of air

make them and thus an electric

atmosphere is formed

Exp. If a funnel air was
inverted in the mercury of an
air pump, and closed in
that all the air in the recei-
ver could be comm. under it,
a small hole was made in
the receiver would there not be
a perceptible current of air
passing through the hole —
Sect. 24. If the elastic atmos-
pheres of the objects of the two
the atmosphere will be greater
at a hemisphere than any where
else, this appears evident from
the figure 
Sect. 53 ± Hydrostatics

Sect. 62 The experiment was first made by Eds —

Sect. 101 — 2 .. By the force is as the density multiplied by the magnitude

Sect 125 If a hundred rather more gun shall the density of the Electric Atmosphere be ni- merely as the square of the distance —

Sect 381. For Sect. 33 and 41. he says the same part of the Electric atmosphere which surrounds the Electrified body with same quantities on the ~~same~~ equal on same of the electric fluid and keeps around so bounds throwing

off or drawing the Electric fluid
from them being removed only
this Electric atmosphere but how
he says the quality the density o
the clouds electrical atmosphe
he quality with the danger the
that atmosphere becoming a
conductor — & not this as wan
sidering? And he supposes an
electrical atmosphere to be a
nonconductor, afterwards a conduct
Sect. 396. I am mclined to think
that this reasoning doth
can never be sufficient to pro
he hath a man or to do any
other damage, because I do not
conceive that is sufficient electric
matter in any man to be he
cause of his destruction.

I can also of opinion that no human can receive a retarn-
dation unless he is in some deg-
ree insulated; for as the Electric fluid
is always tending to an Equi-
librium any part of the Earth has re-
gularly discharged its natural quan-
tity of Electricity which it contin-
ues to receive till an equilibrium comes
by means the power of the Electric
Electrical atmosphere surrounding
the Globe shall be
fully restored in the earth.
It cannot cause any part of
the earth to be in a minus
state; neither do I conceive
that the 3d. Exp. and 25th
a contradiction on the whole

Lord Mahon stood upon the
floor he was this tolerable
well insulated, as appears by
the sparks passing from his
hand into the other person's
whereas if he perfectly com-
municated with the floor and
common earth, they would
have passed through him im-
mediately into the earth, and
not have taken the course from his
to other persons hands &c. It
is very probable that Mahon
this Experiment has made
his shoes and the boards of
the room very dry and hum-
id had wet them. I have
drawing sparks from the com-

Doctor Franklin's Journal
During a Thunder storm
his windows Sash rais'd
gaping, and in a few min
after in a violent flash of Lightning
Did not Him and Several from
Great Fear of the same
Clan being in Effect
States of electricity? —

§. 570. — Notwithstanding
his Ledows of things it
most often occurred to
every one that the quan
ty of electricity
in a cloud was
Danger to be apprehended
D. For if we suppose two
similar clouds equidistant
from the earth and the El.
in the one as ℄, in the 3

Lord of the Purchase shall
pursue exactly as near as
the circumstances of the case
will admit. And if any
Tenant shall refuse or neglect
to perform his Suit or Service
at the Court, or shall commit
any Breach of the Customs
of the Manor, the Lord
may seize into his hands
such part of the Tenant's
Estate as will be sufficient
to compel the performance
thereof, by the Receipt
and Profits thereof, or
may grant the same
out to Farm for any
Term not exceeding
one year, reserving
the Rent accustomed,
or more (if the Value
of the Premises will
bear it) and may
distrain for the Rent
so reserved, as in
Cases of Common
Demises by Indenture
where the Rent is
usually double the
Value of the Premises,
and may bring Debt
for the Arrears of
such Rent, or may
enter into the Premises
and take the Profits
thereof, until he be
fully paid or satisfied
of the Arrears of
such Rent, and all
Costs and Charges
occasioned for Non-
payment thereof.

576. If a metal ball at the end of a wire be let into a jar and the jar exhausted of air when the wire is electrified with how will not the ball be attracted as before?

578 It is certain that all bodies are subject to the same law of attraction and repulsion. But whether this power be inherent in the matter of bodies or be impressed on them by some external agent we know not. When rubbed

When man summons all his
powers of mind, & an exhausted state
consequently arises, when
sleep can exist in peace,
and the air never neither
by any fault of it's own
mixes with it as it ought
to, and no way can
serve it but by using a
medicine confining to the
chamber ——

Nature works upon a large
scale in the torrid Zone —
— Mountains Rivers, Lakes
are all large within the
tropics —
— Hurricanes and Tornadoes —
— Use of winds — Navigation —
— Keeps the air pure — prevents
corruption —
— Use of tides and currents in
the sea the same —
Heat of the sun shining upon
Stagnant air, will soon putrify
it Vivifies motion also darkness
keeps the animals in Stagnant
and prevents their increase —