

VI. *Extract of a Memoir concerning the Communication of Electricity; read at the public Meeting of the Royal Academy of Sciences at Paris, Nov. 12. 1746. by Monsieur le Monnier the younger, M.D. of that Academy, and F.R.S. communicated by the Author to the President of the Royal Society.*

Read Dec. 11. 1746. **T**HE Author of this Memoir proposes therein to examine these three Questions; that is to say, How is this electric Virtue to be communicated to such Bodies as have it not, and which are not capable of acquiring it by bare Friction only? How is the electric Matter propagated? And, lastly, in what Proportion is it distributed?

As to the first, The Author observes, that this electric Virtue is no other Way to be communicated, but by the near Approach of a Body already actually possessed of the same: That the Rule laid down by Monsieur *du Fay*, *That Bodies never receive Electricity by Communication, unless they are supported by Bodies electric in their own Nature*, does not always take Place, and that it is subject to great Exceptions. For, first, in the *Leyden* Experiment, the Phial filled with Water is strongly electrified by Communication, even when carried in the Hand, which is not a Body electric by Nature. Secondly, all Bodies that are electrified by means of a Phial of Water fitted to a Wire, and which

which has already received a great degree of Virtue by Communication; all such Bodies, I say, placed in any curve Line, connecting the exterior Wire, and that Part of the Bottle which is below the Surface of the Water, acquire Electricity, without being placed upon Resin, Silk, Glass, or the like.

Thus one may give a violent Concussion in both the Arms to 200 Men all at once, who holding each other by the Hand, so form the Curve just mention'd, when the first holds the Bottle, and the last touches the Wire with the End of his Finger; and this, whether these Persons actually touch each other's Hands, or whether they are connected by iron Chains, that either dip in Water, or drag upon the Ground; whether they are all mounted on Cakes of Resin, or whether they only stand on the Floor; in all which Cases the Experiment equally succeeds.

Electricity has in this Manner been carried through a Wire of the Length of 2000 Toises, that is to say, of about a *Paris* League, or near two *English* Miles and a half, tho' Part of the Wire dragged upon wet Grass, went over Charmil Hedges or Palisades, and over Ground newly ploughed up.

Thirdly, the Water of the Basin in the *Thuilleries*, whose Surface is about an Acre, has been electrified in the following Manner: There was stretched round half the Circumference of the Basin an iron Chain, which was intirely out of the Water: The two Extremities of this Chain answer'd to those of one of the Diameters of the Octogon: An Observer, placed at one of these Extremities, held the Chain with his left Hand, and dipped his right at the same time into

into the Water of the Bason; whilst another Observer, at the opposite Side of the Bason, held the other End of the Chain in his right Hand, and a Phial well electrified in his left: He then caused the Wire of his Phial to touch an iron Rod, fixed upright in a Piece of Cork that floated near the Edge of the Bason; at that Instant both Observers felt a violent Shock in both their Arms. This same Fact was again confirmed, by Experiments made upon two Basons at the same time, that it might appear distinctly, that the electrical *Effluvia* did really pass along the Superficies of the Water.

Fourthly, It has been confirmed, by repeated Comparisons, that a Bar of Iron placed in the above-mentioned Curve, does not at all acquire more Electricity, when it is suspended in silken Lines, than when it is held in the bare Hand. Whence it appears, that, in this Case, the contiguous non-electric Bodies do neither partake of, nor absorb in any way, the Electricity that has been communicated.

Besides many strong Exceptions to the Rule laid down by Monsieur *du Fay*, the Author adds another yet stronger, and indeed directly contrary to that Rule; which is, that the same Phial of Water, fitted with its Wire, receives either no Virtue at all, or at least none that is sensible, so long as it is either placed upon a Stand of Glass that is very dry, or that it is suspended by a silken Thread, whilst its Wire rests upon the Globe; and that, to make it receive the Virtue, the Part of the Phial which is below the Surface of the Water, must communicate with some
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Body that is not electric; as is evident, when it is touched, whilst it rests on the Stand of Glass, with the Finger, for it then instantly becomes electric: and the same will also happen when it is touched with a Piece of Metal; but not when it is touched with a Tube of Glass that is dry.

The electrical Rests produce here upon the Bottle an Effect so contrary to M. *du Fay's* Rule, That, if one places a Phial, perfectly well electrified, and which throws out the Pencil of Fire copiously, upon a dry Stand of Glass, or upon a Line of Silk; its Light immediately goes out, and its Electricity is as it were laid to sleep. One may then securely approach the Finger to its Wire, and there will come no electrical Sparks from it. The Author has even drawn out of it intirely both the Wire and the Cork, and has kept it half an Hour in his Pocket, without destroying the Electricity. But one must only, in this Case, touch the Wire, and not the Phial itself; for, in touching the two at the same time, one returns to the *Leyden* Experiment; but when one touches the Phial only, the Electricity revives in the Wire, and the Pencil of Fire displays itself again, provided one has not staid too long: But if the Wire only is touched, the Body of the Bottle becomes strongly electric, and draws to it, from a considerable Distance, any light Substances.

This last Case gives Room to an Experiment that looks at first like Magic: There was hung up a little tinkling Bell by a silver Wire, at the Height of eight or nine Feet, and there was placed upon a glass Stand well dried, a Phial newly electrified; the Centre of
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the Bell, and that of the Phial, were nearly in the same horizontal Line; but the Bell was between six or seven Inches from the Surface of the Phial. Every thing being in this State, the Bell remained quite still, if the Stand was very dry; but the Instant one either approached a Finger, or any other non electric Body, to the Wire of the Phial, the Bell leaped to it: and one might begin again, and repeat the Experiment twenty Times together, without having any Occasion to new-electrify the Phial.

With regard to the Propagation of Electricity, the Velocity with which the electrical Matter is convey'd, has been found too great to be yet determin'd with any Exactness.

The Author made an Experiment with an iron Wire of 950 Toises in Length, and He was not able to observe, that there pass'd so much as a Quarter of a Second of Time, between the Wires receiving the Electricity at one End, and his feeling the Shock in both his Arms at the other; which infers a Velocity at least thirty times as great as that with which Sounds are propagated.

In seeking what might be the Force which shot forward the electric Matter, with so much Rapidity, through the Length of the Wire, he at first thought it might be performed by the Explosion of the Spark of Fire, which is perceived when the electrified Phial is brought into Contact with the Wire conducting the electric Matter; but the following Experiment soon convinced him he was mistaken.

He dispos'd horizontally a Wire folded in two, upon Lines of Silk; the whole Length of this Wire
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was of 1319 Feet, and the two parallel Halves were at the Distance from each other of about six Feet: The Electricity was then communicated by means of a Phial, and it preserved itself in the Wire for several Minutes, by reason of the silken Lines upon which the same was supported: A Finger was then brought to one of its Extremities to take away the Virtue; and in the same Instant it ceased also at the other Extremity of the Wire: So that, in this Case, the Matter in Question returned to the Finger, that is to say, marched backward, with the same Velocity with which it was before shot forwards: The electric Matter therefore now came towards the explosive Spark, for this Spark appeared upon the Finger as soon as it approached the End of the Wire to take away its Electricity, and therefore it is not this Spark which shoots forward the electric Matter with so great a Velocity.

The last Part of the Memoir concerns the Proportion in which the electric Matter is communicated to Bodies of the same Nature. And here the Author first establishes, that it is not communicated to homogeneous Bodies, in proportion to their Masses or Quantities of Matter, but rather in proportion to their Surfaces. Yet all Bodies having equal Surfaces do not receive equal Quantities of Electricity: Those receive the most, whose Surfaces are extended the most in Length. Thus a square Sheet of Lead receives a much less Quantity of Electricity, than a Strip of the same Metal with a Surface equal to that of the square Sheet: Insomuch that the only Way to increase in any Body its Faculty of receiving the electric Virtue, is continually to increase its Length.