XXIII. On the production of lightning by rain

William Radcliff Birt

To cite this article: William Radcliff Birt (1849) XXIII. On the production of lightning by rain , Philosophical Magazine Series 3, 35:235, 161-165, DOI: [10.1080/14786444908647184](https://doi.org/10.1080/14786444908647184)

To link to this article: <http://dx.doi.org/10.1080/14786444908647184>

Published online: 30 Apr 2009.

Submit your article to this journal [↗](#)

Article views: 2

View related articles [↗](#)

THE
LONDON, EDINBURGH AND DUBLIN
PHILOSOPHICAL MAGAZINE
AND
JOURNAL OF SCIENCE.

[THIRD SERIES.]

SEPTEMBER 1849.

XXII. *On the Production of Lightning by Rain.*
By WILLIAM RADCLIFF BIRT*.

ON the 26th of July, 1849, a severe thunder-storm, accompanied by the destruction of property and the loss of human life, passed over the metropolis. About 1^h 30^m P.M. the clouds towards the north-east presented a very dark and threatening aspect; they assumed an inky colour, and the velocity of their motion was very slow; in fact the appearance noticed was strikingly of that character which the writer has frequently observed to precede a thunder-storm. On this occasion his attention was more particularly directed to the connexion between the electric discharge and the sudden gush of rain that more or less accompanies it, with a view to illustrate the question occurring in the Report of the Committee of Physics approved by the President and Council of the Royal Society, p. 46, "Is this rain a *cause* or *consequence* of the electric discharge?"† On the previous day, the 25th, about 3^h 50^m P.M., during a thunder-storm a sudden gush of heavy rain occurred,

* Communicated by the Author.

† The paragraph runs thus: "There is one point to which we wish that some attention might be paid,—it is the sudden gush of rain which is almost sure to succeed a violent detonation immediately overhead. Is this rain a *cause* or *consequence* of the electric discharge? Opinion would seem to lean to the latter side, or rather, we are not aware that the former has been maintained or even suggested. Yet it is very defensible. In the sudden agglomeration of many minute and feebly electrified globules into one rain-drop, the quantity of electricity is increased in a greater proportion than the surface over which (according to the laws of electric distribution) it is spread. Its tension therefore is increased, and may attain the point when it is capable of separating from the *drop* to seek the surface of the *cloud*, or of the newly-formed descending body of rain, which under such circumstances, and with respect to electricity of such a tension, may be regarded as a conducting medium. Arrived at this surface, the tension for the same reason becomes enormous, and a flash escapes."

Phil. Mag. S. 3. Vol. 35. No. 235. Sept. 1849.

M

which within two seconds, by estimation, was *succeeded* by a vivid flash of lightning: the thunder occurred at a further interval of some few seconds. From this it would appear, provided the heavy rain fell over the entire space between the place of observation and that of the electric discharge, that it was not a *consequence* of that discharge, the gush occurring at a sensible interval previous thereto. The setting in of the storm of the 26th, about 1^h 45^m P.M., again called the attention of the writer to this point; and several flashes occurred between 1^h 45^m P.M. and 2^h 3^m P.M. without being preceded by a gush, although heavy rain more or less accompanied the discharges, in one or two instances almost simultaneously or immediately afterwards. At length, about 2^h 4^m P.M., a most violent and very remarkable gush of rain occurred, which was followed within one minute by a most vivid flash of lightning, the thunder succeeding almost instantaneously. The windows of the house in which the writer was observing the storm were sensibly shaken, and portions of the mortar between the arches over the windows and the frames thrust out, of course by concussion. Within a minute or two after this discharge a partial cessation of the heavy rain took place, but sudden gushes occurred at short intervals within the next six or seven minutes; they were, however, unaccompanied by lightning. At the end of this period the atmosphere presented a very remarkable appearance; a perfect stillness characterized the air, which possessed great transparency, so that the surrounding objects were seen with very minute distinctness of detail. The stillness and transparency during the time they continued, riveted the observer to their contemplation. It appeared that during this time the storm was hushed, and a calm of a rather extraordinary character succeeded it, during which a rather large break in the clouds was seen towards the south-east, and the entire phænomena at this time induced the idea that the weather was clearing up. Within ten minutes, however, the storm again burst forth; the lightnings played, the thunder roared, and heavy rain, mingled with hail so thickly that comparatively near objects could scarcely be distinguished, fell in torrents, and the writer observed during the remainder of the storm four or five sudden gushes that were quickly *succeeded* by lightning. On all these occasions he is quite certain that the sudden gush of rain *preceded* the electric discharge. Of all the discharges, which were very frequent, that at or near 2^h 5^m P.M. appeared to the writer to be *nearest* his own locality; the lightning appeared to him to be quite as, if not more, vivid than that at any other discharge; and the interval between it and the thunder was certainly the shortest, the thunder being

Mr. W. R. Birt *on the Production of Lightning by Rain.* 163

the loudest. Between 2^h 0^m P.M. and 2^h 15^m P.M., according to the concurrent testimony of several witnesses, and preceding the precipitation of the hail nearly half an hour, a discharge struck half-a-dozen houses, being Nos. 17 to 22 in West Street, North Street, Whitechapel, between one-fourth and one-third of a mile south of the writer's residence. The stroke appears to have presented some phænomena of an interesting and remarkable character. Immediately behind and to the west of the houses in question is situated a large open space of ground, known as a Jews' burying-ground, in which is a piece of water not far from the houses. The gable end of No. 22 faces the west, the fronts of the houses the north, and their backs the south; the flues of No. 22 form part of the wall at the gable end. At the front and between every alternate house is a metallic spout, for the purpose of carrying off the water from the roof; the water is received from the tiles in a leaden or zinc gutter, which is in metallic communication with the spout; but it does not appear that there is a metallic communication between the gutters from house to house: these metallic spouts are short, not in any case descending so low as the doors; they are replaced by wooden spouts, which convey the water to the street. It appears that the stroke perforated one of the chimney-pots of No. 22, descending the flue to the roof, which it stripped of a great portion of the tiles*, and then passed to the metallic spout in front, disrupting and tearing away the lower wooden spout, a piece of which, seven feet in length, it rent off and hurled with great violence into the back yard of one of the opposite houses which abutted on the north side of West Street: a great portion of the piece rent from the spout was shivered into small splinters about two inches long. A portion of the stream appears to have been conducted by the gutter communicating with the metallic spout of No. 22 to that between Nos. 20 and 21, down which it proceeded, thrusting the lower wooden spout about three or four inches from the wall, and chipping away portions of the brickwork in its passage through the front wall of No. 21, which it perforated (the aperture being of a considerable size), and immediately passed to the principal wheel of a silk-winding machine. A woman who was attending the machine, and had in her hand at the moment a spindle, received a severe shock, and was hurled by the force across the room. This stream appears to have given off a lateral stroke, which manifested its effects at the box of the lock of the street door, tearing away the plastering and paper as it passed into the front room, in

* The western wall of this house has been so shaken by the stroke that it is considered necessary that it should be taken down and rebuilt.

which a pane of glass was shattered. A woman who was near this room at the time described the passage as being filled with a light of a blue colour, and saw the lightning pass out of the back window over her child's head. It would appear that at the time the lightning was passing from one metallic conductor to another in the immediate front of the houses, a young man named Thomas Johnson opened the street-door of No. 17: he was accompanied by a lad of about fourteen years of age, who was, almost immediately after the door was opened, thrown backwards. The shock was so sudden that he knew not what happened to Johnson, who was found shortly after lying on his side, his back to the wall, and feet just beyond the threshold of the door, quite dead. He was evidently struck by the lightning, which, playing in the front of the houses, was probably attracted by the metallic spout that terminated a few feet above the door. The plaster just above the door, and which was most probably over his head, was torn away; but there is no mark or perforation to trace its entrance from above; the probability appears to be, that a stream struck upwards immediately after striking him. The two houses immediately opposite to Nos. 21 and 22 also received some injury from the lightning glancing sideways, as it were, from the principal stream which shattered the roof of No. 22.

It cannot fail to be remarked, that the principal mischief after No. 22 was struck occurred in the front, and more or less in the neighbourhood of the metallic spouts, which answered the purpose of *imperfect* conductors, the metallic continuity being *interrupted* on the roofs by the leaden gutters extending only a certain distance on each side of the metallic spouts, and also in front of the houses by the wooden spouts carrying the water to the earth. In connexion with the presence of the lightning in the front, the altitude of the houses struck renders it rather improbable that the stroke descended *immediately* from the cloud. The houses in West Street are the *lowest* in the neighbourhood; those in the street immediately to the north are rather higher; and at the further end of the street, near No. 1, are three houses in North Street considerably *higher*; so that had the stroke descended immediately from the cloud above, which it is to be presumed was at the usual elevation of clouds under these circumstances, the probability is that the *high* houses in North Street would have been struck rather than the *low* houses at the further end of West Street. Should it have been the case that the stroke emanated from an altitude but little above the houses struck, we have evidently to seek the cause of the discharge *below the*

cloud. It is extremely difficult to connect the stroke with the discharge at 2^h 5^m P.M.; although the concurrent testimony of the witnesses would lead to the high probability that such was the case, especially as one stated that it occurred some considerable time previous to the hail that fell. The general impression in the neighbourhood appears to have been, that the lightning shot or glanced over the houses to the north of West Street, when it struck the corner, and did not descend perpendicularly from a considerable height. The discharge at 2^h 5^m P.M. was, as we have already observed, *preceded* by a gush of heavy rain; and taking the suggestion in the report alluded to above into consideration, there appears to be great probability that the formation of the lightning was in accordance therewith. For upwards of half an hour violent meteorological action had taken place, the precipitation of rain being very prominent. There can be no question that this precipitation was accompanied by well-marked electrical phenomena; and when, as at 2^h 5^m P.M., an increased but sudden precipitation occurred, it is likely that an agglomeration of the smaller drops took place, increasing, as suggested, the electric tension to such an enormous extent, that a flash escaped *in the immediate neighbourhood of the houses struck*; and when we consider that at the time several millions of drops must have been falling, each contributing its quota to the general result, it is not to be wondered at that the tension of the electricity was so great as to produce the very violent effects witnessed.

Bethnal Green, August 4, 1849.

XXIII. *On Anharmonic Ratio.* By Professor DE MORGAN*.

GEOMETRICAL communications to scientific journals are not so common as they used to be, which may partly be attributed to the expense of woodcuts, and partly to the decline of taste for geometry. The latter is accelerated by the paucity of geometrical reading arising from the former cause: and its effect upon soundness of mathematical habits is deadly. But there is no reason why the expense of woodcuts should place any obstacle in the way. I am satisfied, from sufficient trial, that when proper description of the diagram is given in the text, the person who draws his own diagram from the text will arrive at the author's meaning in half the time which is employed by another, to whom the successive appearance of the parts is prevented by his seeing the whole from the be-

* Communicated by the Author.