

XXIII. *Extraordinary Electricity of the Atmosphere observed at Iffington on the Month of October, 1775. By Mr. Tiberius Cavallo. Communicated by William Watson, M. D. V. P. R. S.*

R. Mar. 12, 1776. **B**EFORE I enter on the particular narration of the observation made with an electrical kite on the 18th of last October, it will be necessary to give an idea of the scale of my quadrant electrometer used on the occasion, which, being constructed in some measure different from what are commonly sold in shops, will, no doubt, give an unsettled idea of my narration, by expressing the same intensity of electricity under different degrees from the others. In order to this, therefore, it must be observed, that, when the kite is raised, I generally connect with the end of its string a small cylindrical conductor, nine inches long and one inch diameter, made of pasteboard covered with tin-foil; with this I connect the quadrant electrometer, which shews me exactly the state, increase, and decrease of electricity. The apparatus being thus disposed, I have observed, that when the electrometer is at 10° , a little bran presented to the conductor will be attracted by it at the distance of about six-tenths of an inch; when the electrometer is at 20° , the bran will be attracted at the distance of one inch and a quarter; when at 30° , it will be

be attracted at the distance of two inches and one-fifth; and when at 35° , it will be attracted at the distance of three inches. This being premised, I come now to the narration of the experiment.

October the 18th, after having rained a great deal in the morning and night before, the weather grew a little clear in the afternoon, the clouds appearing separated and pretty well defined; the wind was West, and rather strong, and the atmosphere in a temperate degree of heat. In these circumstances, at three o'clock in the afternoon, I raised a small electrical kite, which measured three feet nine inches in length, and three feet in breadth, giving to it 360 feet of wired string. The angle that the string, or rather the cord of the incurvated string, generally made with the horizon, was near 60° , and, in consequence, the kite's perpendicular height was about 310 feet. After the end of the string had been insulated with a silk lace, and a leathern ball covered with tin-foil had been hanged to it, I tried the power and quality of the electricity, and found it positive and pretty strong; in a little time a small cloud passing over, the electricity increased a little; but the cloud being gone, it decreased again to its former degree. The string of the kite now was fastened by the silk lace to a post in the yard of the house where I live, which is situated near Islington; and I was amusing myself and some other persons with charging two coated phials, and giving several shocks with them. While I was so doing, the electricity, still positive, began to decrease; and in two or three minutes time it was so weak, that it could be
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hardly perceived with a very sensible electrometer, made with two cork balls after Mr. CANTON's manner. Seeing at the same time, that a large and black cloud was approaching the zenith, which, no doubt, caused the decrease of electricity, indicating imminent rain, I introduced the end of a string through a window in a first-floor room, wherein I fastened it by the silk lace to an old chair; the quadrant electrometer was fixed upon the same window, and was connected by a wire with the string of the kite. Being now three quarters of an hour after three o'clock, the electricity was absolutely unperceivable: however, in two or three minutes time it began again to appear, but now, upon trial, was found to be negative; so that it was plain, that its stopping was no more than a change from positive to negative, which was evidently occasioned by the approach of the cloud; part of which by this time had reached the zenith of the kite, and the rain also had begun to fall in large drops. The cloud came farther on, the rain increased, and the electricity keeping pace with it, the electrometer soon arrived to 15° . Seeing now that the electricity was pretty strong, I took again the two coated phials, and began again to charge them, and to give shocks to several by-standers; but the phials were not charged above three or four times, before I perceived that the electrometer was arrived to 35° , and was still increasing. The shocks now being very smart, I desisted from charging the phials any longer; and, considering the rapid advances of the electrometer, thought to take off the insulation of the string,

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in case, that, if the electricity should increase farther, it might be silently conducted to the earth, without causing any bad accident by being accumulated in the insulated string. To effect this, as I had no proper apparatus near me, I thought to take away the silk lace, and fasten the string itself to the chair; accordingly I disengaged the wire that connected with the electrometer, laid hold of the string, untied it from the silk lace, and fastened it to the chair. But while I effected this, which took up less than half a minute, I received about a dozen or fifteen very hard shocks, which I felt all along my arms, in my breast and legs, shaking me in such a manner, that I had hardly power enough to effect my purpose, and to warn the people in the room to keep their distance. As soon as I took my hand off of the string, the electrical fluid, in consequence of the chair being a bad conductor, began to snap between the string and the shutter of the window, which was the nearest body to it. The snappings, which were audible at a good distance out of the room, seemed at first *isochronous* with the shocks I had received; but in about a minute's time they became more frequent, so that the people of the house compared their sound to the rattling noise of a jack going when the fly is off. The cloud was now just over the kite; it was black and pretty well defined, of almost a circular form, its diameter appearing to be about 40°. The rain was copious, but not remarkably heavy. As the cloud was going off, the electrical snappings began to weaken, and in a short time became inaudible. I went then near the string, and finding the electricity weak,

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but still negative, I insulated it again, thinking to keep the kite up some time longer; but, as another larger and denser cloud was approaching apace towards the zenith, and I had then no proper apparatus to prevent bad accidents, I resolved to pull the kite in. Accordingly, a gentleman, who was by me, began pulling it in, while I was winding up the string. The other cloud was now very nearly over the kite; and the gentleman who was pulling in the string told me, that he had received one or two slight shocks in his arms; and that, if he were to receive one more, he would certainly let the string go. Upon which I laid hold of the string, and pulled the kite in as fast as I could, without any farther observation. When the kite was pulled in, it was ten minutes after four o'clock; so that all the time that this experiment took up was one hour and ten minutes. There was neither thunder or lightning perceived that day, nor indeed for some days before or afterwards.