Keraunography

Notes on the photographic effects of lightning as reported in 19 century journals

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At the beginning of my career I was avid for information about the attitudes and ideas of 19th century photographers. It seemed then, and still does, that the closest I would come to the mindset of our medium's first practitioners was to systematically read their photographic journals. I would select a particular periodical and read every page of every volume beginning with the first issue and ending around 1910. I then began again with another title. From these readings I selected, for xeroxing and filing, what I considered the most significant articles.

My attention was caught, right from the start of this self-learning process, by innumerable items that were not serious in and of themselves, and would not find themselves in any history books, but their constant reoccurrence indicated the topic's fascination for the Victorian reader.

These items included a plethora of poems about photography, the explosive potential of collodion, the suicide rate among photographers from potassium cyanide poisoning (used as a fixing agent), post mortem pictures, investigations into what was called psychography or thought-photography, and so on.

One of the topics which was commonly reported in the photographic press from the 1850s to the firs years of this century was the phenomenon of *keraunography*, or the ability of flashes of lightning to produce photographic image of surrounding objects, often - usually - on the skin or nearby people.

The occasional mention of the photographic effects of lightning, particularly when reported with highly sensational breathless prose, would not have intrigued me nearly as much as the fact that accounts of this phenomena occur with such frequency, are treated with puzzled respect, often cite historical precedents and lay claim to serious investigations by some of the most-respected scientists of the 19 century. As one writer stated in 1888, this is a subject which

> *has gradually emerged from the mysterious traditions of the early ages until it has reached the bed rock of modern scientific investigation.* (1)

The writer, Henry E. Davis, is typical of the serious students of the photographic medium who placed a considerable amount of validity on the lightning prints. This report on keraunography to The Photographic Club in 1888 is terse, factual, cautious and respectful. He stated:

> *Although for long such effects of the lightning flash were regarded with more or less incredulity, or at least doubt, the observations of the last half century have fully confirmed their existence and then frequent recurrence, and established a field of work which has well-merited the careful investigation which it has now for many years received from the world's leading scientists.* (2)

Among the "leading scientists" with a special interest in keraunography were, the Lt. Hon. Sir W. R. Grove, Dr. Boudin and Baron d'Hombres-Firmas in France, Professor Francesco Orioli in Italy, and Andres Poey, Director of the Observatory in Havana.

Of the scores of examples which could be stated at this point, perhaps those given by Poey will indicate the type of photographic effects produced by lightning. At a meeting of the prestigious Meteorological Society, held on 24 March 1857, Poey read a paper *(3)* in which he cited the following cases. Benjamin Franklin, in 1876, frequently stated, and communicated to Leroy, that about 20 years previous, a man who was standing opposite a tree that had just been struck by a thunderbolt had on his chest an exact representation of that tree. A similar case was of a little girl who was standing at a window in front of which was a young maple tree. After a brilliant flash of lightning a complete image of the tree was found imprinted on her body. Again, in 1855 a boy was climbing a tree in order to rob a bird's nest when the tree was struck by lightning, and the boy thrown to the ground. On his chest the image of the tree, with the bird and nest on one of its branches, appeared very plainly.

Not all of Poey's cases concerned tree images (although they do tend to be the most common instances of lightning induced images. This fact will be discussed later). He repeated four examples previously brought before the Scientific Congress at Naples by Professor Orioli. *(5)* In September 1825 lightning struck the foremast of the brigantine St. Buon Servo in the Bay of Arriero. A sailor sitting under the mast was struck dead, and on his back was found an impression of a horseshoe, similar, even in size, to one fixed at the masthead. Another ship example concerned a sailor who was also standing beneath the mast during a lightning storm. On the left side of his chest was imprinted the number 4.4 - an identical image of a number 4.4 that was at the end of one of the masts. Orioli was also the source of a quite different account. On 9 October 1836, a young man was found struck by lightning. He was wearing a 'girdle' (presumably a money belt) containing a few gold coins. These coins were imprinted on his skin in the same manner they were placed in the pouch - producing a series of circles on the skin. In 1847 an Italian lady of Lugano was sitting near a window during a thunderstorm and saw a flash of lightning but felt no injury. But a flower between her body and the flash, was perfectly reproduced on her leg, "and there it remained permanently."

Poey concluded his report with a personal example, previously mentioned by him in his "Memoir on Lightning Storms in Cuba and the United States." On 24 July 1852, a poplar tree in a coffee plantation was struck by lightning. On one of the large dry leaves was found an exact representation of some pine-trees that "lay at the distance of 339 meters (367 yards 9 inches)."

By themselves such accounts would not be very convincing, even though the attention to detail - such as specific dates, the name of the ship, the distance of the leaf from the source of image - all tend to pull in the direction of reliability, away from second or third hand gossip. In addition, similar accounts of lightning photographs are reported in other scholarly works of the period including Boudin's Histoire Physique et Medicale de la Foudre and Phipson's Familiar Letters on some Mysteries of Nature and Discoveries in Science. *(6)* Dr. T. L. Phipson was formerly at the University of Brussels and, at the time of publishing the book in 1876, was fellow of the Chemical Societies of London, Paris and Antwerp, and a fellow of the Royal Society of Medical and National Sciences of Brussels. After a preface which exhorts those without an inquiring mind to "close the book!", he discourses on various natural phenomena - The Science of Sleep, The Marvels of Electricity Applied, Earthquakes, etc. - with a lively academicism. Chapter IX concerns Lightning Prints. Phipson is not gullible and does not take at face value all the accounts which he had collected. A few examples will suffice, from a large number of cases which he cites.

In 1812, James Shaw delivered a paper to the Meteorological Society of London. He described an extensive wood, near the village of Combe Bay, about four miles from Bath, in the center of which was a pasture, about 50 square yards in size. The pasture contained six sheep when lightning struck - and all the sheep were killed. When the animals were skinned, it was found that the interior of the skins each bore an accurate image of the surrounding landscape, every detail of which was distinctly printed upon the skins. Shaw remarked: "I may add that the small field and its surrounding wood were so familiar to me and my school-fellows that when the skins were shown to us we at once identified the local scenery so wonderfully presented." The skins were on public display for some time in Bath.

Phipson comments: "Now this account is not precisely satisfactory - it reads like a schoolboy's tale, recited long afterwards from memory; yet there may be something in it." *(7)* Phipson's cynicism is well-placed and not without a sense of a sneer, as in the following case. A Jose J. Figueroa knew an old inhabitant of Cuba, who told him that in his younger days he knew an individual who had the image of a piece of money printed on his arm by lightning. This time Phipson cannot resist a no-nonsense dismissal: "This account reminds us very much of the gentleman who was asked whether he could play upon the German flute, and replied that, though he could not do so himself, he had a cousin who knew a clergyman who had a nephew, who had heard the instrument played in Switzerland!"

After relating several more instances of the phenomena, Phipson concludes: "This collection of lightning-prints is scarcely worthy of discussion. Still, I would be the last to assert that there is nothing in them." This healthy skepticism makes his later accounts, which he asserts to be authentic, all the more believable. One example which he claims is known "to be perfectly authentic" is the account of the young man who was killed by lightning and the coins in his belt produced an image on his body, described by Professor Orioli at the Meteorological Society of London in 1857, and at the Scientific Congress in Naples in 1847. Although previously mentioned in this paper, the case is worth citing again since Phipson provides corroboratory evidence. He states the location as Zante, and adds that Dr. Paoli Dicapuolo of the same town, provided at the Congress a report of the circumstances and "certain legal documents" relating to the affair. A brief summary of the facts and theories, discussed by scientists at both later meetings of the Congress and at the French Academy of Sciences, are itemized. The conclusion is clear; Phipson is convinced that lightning-prints do occur, and he offers some tentative theories as to their origins, which, he admits, are not at all satisfactory.

Apart from Phipson and Poey (who published 24 case histories of keraunography in 1861) two other scientists of the 19 century should be mentioned as being particularly intrigued by the photographic effects of lightning. Professor Francesco Orioli was not only a gifted scientist but also active in political, social and artistic circles. His major work, published in 1824 at Bologna, is a collection of scientific papers by various authors, containing some of the earliest and valuable notes on the subject. The other researcher was Boudin, who, in his Treatise on Medical Geography, proposed the new term "keraunography", from the Greek, meaning "to write with thunder*" Boudin relates that he first became interested in this line of study after a particularly severe storm in Paris in 1854, when several deaths and injuries due to lightning took place. He subsequently published a pamphlet giving the results of his research and mentions actually seeing the corpse of a man who, having been killed by a lightning flash, received on his chest an image of the tree under which he was sheltering. He, like Poey, is convinced that these images are 'photographic' in nature, in which the skin is the sensitive surface, the tree the object, and the lightning the force which impresses the image.

Up to this point, I have concentrated on the accounts of keraunography cited by relatively well-known, respected scientists of their day, in order to indicate that the lightning effects of photography were treated with respect. However, numerous cases could be quoted from lay magazines and local newspapers which, although they are unsatisfactory as documented evidence, indicate the frequency with which lightning prints on the human body occurred during the 19 century. I have selected a few of the more "colorful":

> *(At Candelaria in 1828) a young man was struck dead by lightning near a house upon one of the windows of which was nailed a common horse-shoe... The*

image of this horse-shoe was most-distinctly printed upon the neck of the unfortunate young man, underneath the right ear. (8)

In the Vosqes two travellers sought refuge under a linden tree, which was struck by lightning; they both fell, and when picked up and stripped, were found to have facsimiles of the linden leaves on back and thighs. 'The fact is confirmed by the Mayor of Bergheim.' (9)

Upon preparing the body of Mr. Charles Lyle, who was killed by a stroke of lightning in this city, the imprint of a leaf was found upon his right breast. A leaf of an Allanthus (tree of heaven) was found at the feet of Mr. Lyle, he remaining in a sitting posture in the chair in which he was killed. This leaf and the imprint were alike in size, stem, ribs, and cellular texture of the former. (10)

In September, 1857, a peasant-girl, while herding a cow in the department of Seine-et-Marne, was overtaken by a thunder-storm. She took refuge under a tree, and the tree, the cow and herself were struck with lightning. The cow was killed, but she recovered, and on loosening her dress for the sake of respiring freely, she saw a picture of the cow upon her breast. (11)

The circumstances of the case appear to be these. During a thunderstorm in the Midland counties, a little while ago, a great many cattle and sheep were struck by lightning, and a lamb which had taken shelter under an oak shared this fate. What was the astonishment of the rustics, when they came to examine this lamb, to find a picture of the tree, sky, and meadow outlined upon its fleece. Even the hedge-row dividing the fields was to be seen, as also a group of huddled sheep, which were not, however, very sharply defined. This marvellous picture was impressed upon the lamb's wool, it is said, by the vivid lightning that killed the animal. (12)

A phenomenon occurred at Ellenville during a recent thunderstorm. A youth of about 17 years sat near the window during the storm and despite the warning voice of his mother, who spoke to him of the lightning rods placed just outside of the window, he insisted on remaining, saying he was not afraid. Scarcely had he spoken, when a sudden flash prostrated him, rendering him insensible. On opening his shirt front to give him air, we were startled to perceive the likeness of an adjacent old apple tree plainly pictured in lines of fire on his breast. It remained distinctly visible for several hours. Fortunately, beyond rendering the young man insensible, and giving him a sickening sensation, the effect of the lightning wore off after a short time. (13)

A young girl was dressing in her room during a thunder storm. Her pug dog ran in. She clasped it to her bosom. A flash of lightning instantly killed it. She was horrified to find that the image of her dog had been photographed on her bosom.

There seems to be no way of removing the picture, which gives every shade, colour, and wrinkle of the canine form. (14)

A curious electric phenomenon is reported from Fayette Township, Hillside County. Thursday evening a lively thunder shower passed over that region, during which the play of lightning was peculiarly frequent and vivid. Just before the storm broke, Amos J. Biggs, a farmer living midway between Hillsdale and Jonesville, who is quite bald, his head being smooth and shiny, went into his back yard to frighten away some cats that were fighting on the woodpile. So intent were they on exterminating one another as to allow Farmer Biggs to approach within a few feet of them. At the same instant there was a great crash, and an electric bolt struck the woodpile, scattering it and stiffening the cats in an intense rigor mortis. Aside from a prickly sensation and sudden contraction of the muscles, Mr. Biggs experienced no unpleasant effects. The fluid passed down his body, tore the works of his watch to pieces, breaking the cover, ripped his left trousers leg from top to bottom, and burst his left boot, tearing the upper clear from the sole. When he entered the house his wife fainted. Unconscious of the cause the farmer hastened to bring her to. The first words she uttered, "Oh, Amos, the devil has set his mark on you," excited his curiosity, and he looked in the glass and found the image of a black cat photographed in silhouette on his bald front. The picture was perfect. It was about five inches from tip to tip, and in perfect proportion. The cat's "whiskers," teeth, and even the hairs on its tail, were reproduced with exquisite minuteness. Curiosity being satisfied they tried to remove the obnoxious marking, using such homely remedies as soapsuds and scouring-brick, vinegar,& etc., but to no purpose. However, in the morning the picture was much faded, and by noon it had quite disappeared. (15)

*A portrait of the late John Taylor, which J. R. Smith has on exhibition in his store, attracts many visitors daily, and has caused a great deal of discussion. The portrait formerly rested on the mantelpiece at Mr. Smith's residence in Mt. Olive. Monday, during a heavy storm, a lightning flash struck it. The frame was demolished, but the flash left on the portrait a clearly-defined picture of an angel with out-stretched wings overshadowing Mr. Taylor's head, the arms encircling his neck and the right hand holding a bunch of flowers. The pose of the angel suggests protection and benediction. The dark line showing the lightning's journey along the cardboard turns abruptly just above the face of Mr. Taylor, giving the spectator the idea that the angel changed the lightning's course. Superstitious people consider it as an indication that Mr. Taylor is in heaven, but Mr. Smith explains the phenomenon by saying that the picture of an angel exactly like that which appears on the Taylor portrait, was on the back of a photograph near by. He believes that by some electric freak the picture of the angel was photographed over the portrait. The affair, however, has caused a great deal of comment, and people from miles around come to see the picture. (*16)

A gentleman killed by lightning at Harrogate was found to be impressed with a print, "or lightning photograph," of the umbrella which he was carrying at the time. (17)

J. P. Sullivan, of Salina, Kan., has a horse in whose right eye there is a photograph of his wife. He is offered $500 for the animal, but refuses to sell it. The photo is a perfect likeness. Mrs. Sullivan stood in front of the horse during an electrical storm and veterinary surgeons attribute to this fact the photo coming in the horse's eye. Its sight is not affected. (18)

Much public interest centers in a man named Abbott Parker, who was struck in the back by lightning on Friday afternoon in Morristown, NJ. Upon being removed to the Catholic Hospital, Parker was placed on a cot over which hung a large crucifix. While the patient's back was being bathed with alcohol and water the physicians and nuns were astonished to see a picture of the crucifixion on the flesh, whereas a few minutes before no picture was there. The nuns believed that it was a miracle, and the doctors were mystified, as they declared that the picture was not the result of tattooing. An expert tattooer, after an examination, also decided that the picture was not tattooed. A theory which seems generally accepted is that Parker's skin had become sensitized by the effect of the lightning, and acted as a photographic plate for the crucifix hanging over his cot. The patient, who is recovering, says that he was never tattooed. (19)

Many more examples of a like nature could be extracted from the pages of the photographic and lay press of the 19 century. Usually these accounts are direct quotations from local newspapers, without comment or attempt to explain the phenomenon. Any editorializing that takes place is wholly of a facetious nature, preparing the reader for yet another funny story. Strangely, considering the scientific craze of the Victorian age, few investigators attempted to provide explanations for the lightning prints. One of the few was a Mr. Tomlinson, of King's College, who read a paper *(20)* "On Lightning Figures" at the British Association for the Advancement of Science meeting on the 6 September 1861. After recounting a number of Poey's cases *(21),* Tomlinson argued that the commonly accepted view of a lightning flash being zigzag in appearance was inaccurate. The flash is more likely to be a fern-like pattern, with discharges branching and subdividing from a main track. Tomlinson's theory was "that when a treelike impression is found on the body of a man or animal struck by lightning, a portion of the fiery hand of the lightning itself has passed over the victim and left its mark... but allowance must be made for the imagination of bystanders, which leads them to see in these ramified impressions 'an exact portrait of the tree', the blotches are taken for leaves, for a bird or bird's-nest, etc., as the case may be."

At the close of the discussion "The Astronomer Royal, Professor Henessy, and others, were disposed to agree to Mr. Tomlinson's view of the subject".

Although Tomlinson's theory sounded plausible enough, especially with such an endorsement as given by the British Association and The Astronomer Royal, it was not the only theory of lightning images on human bodies. Several scientists of the 1870s, including Arago and Leroy, were of the opinion that the electrical discharge of the lightning forces the blood into the capillary vessels below the surface of the skin, at the same time changing the chemical consistency of the blood and leaving an indelible impression upon the surface of the skin.*(22)* George Bruce wrote to the Berwickshire News *(23)* in 1883 with a suggestion that sounds like a perfect compromise between the scorch and capillary theories. "We are," he ventures to say, "compelled to come to the conclusion that the markings...were caused by the direct action of the electric fluid, paralyzing the nervous system, and causing, for a time, congestion in the capillary vessels, and therefore redness, wherever the treelike sparks touched the skin."

No one seemed to quarrel with that idea; in fact, Ernest C. Fincham expanded on the theme in an article for The Amateur Photographer in 1901. Not withstanding Fincham's impressive-seeming letters (M.R.C.S. Eng., L.R.C.P. Lond.) he is a plagiarist. The first part of his article, "On Certain Skin Markings caused by Lightning", is a direct lift from Bruce's article eighteen years earlier. However his conclusion is firm: lightning images are caused by the flash breaking up into branches on the surface of the skin, causing a coagulation of the blood in the capillaries *below* the skin, following closely the "electric fire" upon the surface. Fincham ends his article with the hope that "if he has helped to destroy the legend of the 'photographic action' of lightning, [he] feels that the time spent in writing it has been usefully occupied." *(24)*

Although Fincham did not reveal any new facts, or provide information that had not already been revealed 20 years earlier, his article does seem to have had the desired effect. Nothing of any consequence is published in the photographic press after that date, as far as I can ascertain. The branch-like action of lightning flashes account for the tree images, and coagulation of the blood in the capillaries for their permanency.

It is true that tree-images count for a disproportionately large number of lightning images. And that is reasonable since trees are common natural objects and tend to attract lightning due to their height. Also, it is common, if foolish, for people to shelter beneath a tree during a thunderstorm. These facts could account for the association of lightning burns with tree images. Unfortunately for this theory, it does not explain the large number of lightning images of various objects other than trees - such as dogs, cats, cows, pictures of angels, crosses, numbers, umbrellas, coins, horseshoes, etc., which on no stretch of the imagination can be confused for branches.

Another important fact seems to have been overlooked, or deliberately ignored, by such theorists: a large number of lightning images have occurred on inanimate objects, such as stone, tin, glass, and cloth. Presumably, the blood capillary theory does not work in these cases. Again, a few examples will suffice:

On the 14 November 1830 lightning struck the Chateau de la Benatonniere in La Vendee. The following day one of the inmates remarked upon the back of a lady's dress a peculiar design, which was found to be a perfect copy of the ornaments on the back of one of the chairs in the drawing-room of the chateau. The lady to whom the dress belonged remembered perfectly that she was sitting in that particular chair whilst the storm raged over the chateau... the image upon the dress was so distinct that it appeared as if it had been recently copied, with great pains, from the design at the back of the chair... (25)

A curious freak of nature was recently discovered. It is a slab of Mexican marble about two feet long and a foot wide, bearing upon its face a beautiful mountain landscape? which has in some strange way been pictured there by nature. It is now in the possession of Col. A. C. Hawley, formerly adjutant-general of Minnesota, and was given him by Major Knappen, who owns the quarry in New Mexico, where this was found. The major is authority for the statement that the picture in the marble is the exact reproduction of the scenery on the side of the valley opposite where the quarry is located. Col. Hawley explains the curiosity in this way: He says the river and cliffs must have been photographed on the marble, when it was in a plastic condition, by the rays of the sun. (26)

A remarkable incident shows the sensitiveness of lacquered tin to flashes of lightning. On the evening of July 18th, Miss Lilliam Paul, of Plainfield, N.J., sat up alone at a late hour awaiting the return of a belated servant. A terrible thunderstorm was raging without, and Miss Paul, fearing that the metal tray, which rested near an open window, would attract the lightning, stepped to place it in a more secluded spot. As she did so, she was startled by a wonderfully vivid flash of lightning, and hurriedly drew back. Timidly advancing again, she threw over the tray a rug, to secure it from the lightning. The next morning, on removing the rug, the pretty profile of Miss Paul was discovered fired upon the lacquered Japan tray. Since then experiments have been made by experts to produce similar effects on lacquered trays, but, so far as we have heard, without success. It still appears to be a mystery. (27)

We have heretofore published an account of a portrait supposed to have been photographed by lightning on a pane of glass in the window of an old farm house in this county Another instance of the same curious phenomenon has been found in the window of the mansion house on the Mount Eagle farm. The portraits of four persons are plainly discernible; the faces are not all on one pane, and the theory is that the party were all looking through the window during a thunder-storm, when a sudden flash of lightning, by some mysterious process, instantaneously fixed their features on the glass. (28)

A curious instance of this is to be found in a photographic gallery in Colorado

Springs, United States, belonging to a Mr. Guernsey, where may be seen the photograph of the figure of a bear on a rock. The history of this "great natural curiosity" is as follows: --In the county of Bent, on the Purgatoire River, eighteen miles from Las Animas, Colorado, on the smooth face of a sandstone cliff overhung by a wall of rock, a hundred or more feet high, was found this life-size photograph of a grizzly bear. The picture is not an accidental resemblance to the animal, but a portrait more perfect and lifelike than any human art can supply. The short tail standing straight out, the ears visible, the mouth open, with eyes and teeth plainly to be seen, the attitude not constrained but perfectly natural, all demonstrate beyond the shadow of a doubt that the picture is a photograph stroke of lightning during the progress of a storm. (29)

If these examples, and the scores of others that could be quoted, are not explained by the scorch/capillary blood vessel theory, it seems reasonable to fall back on Poey's and Boudin's theory that the images were somehow created by a "photoelectric" effect of the lightning flash. One 19 century scientist who subscribed to this explanation was the Right Honorable, Sir. W. R. Grove *(30)*, Fellow of the Royal Society. He was one of the earliest investigators to demonstrate the value of electricity in photography, presenting to the London Electrical Society in 1841 a paper entitled "A Voltaic Process for Etching Daguerreotype Plates." But his experiments that seem more valid in the present context date from 1856. Grove thoroughly cleaned two small sheets of glass, between which were sandwiched the word 'volta' in thin paper letters. Pieces of tin foil were placed on the outside of the glass, and connected to the terminals of "a Rulunkorf coil" and a spark of electricity passed between them. When one of the glasses was fumed to hydrofluoric acid, the previously invisible letters came out clearly. A sharp permanent etching of the word "volta" was produced on the surface of the glass.

Experiments continued in directions that are extremely similar to those in Kirlian photography, a field of photography that was only 'discovered' in the USA in the 1970s, although it was widely reported *(31)* in the 19 century. Other researchers continued the laboratory practice of producing 'photographic' images by means of sparks of electricity, although the interest seemed to have subsided by the turn of the century. However the ability to produce 'lightning-prints' on a small scale in the laboratory does seem to suggest the possibility that the infinitely more powerful flashes of natural lightning could produce images on human bodies and other natural objects. There is no doubt that electrical experiments fascinated Victorians with a scientific frame of mind, although few of their experiments impinge directly on the phenomenon of keraunography. It may well be that their work would have naturally led into the realms of Kirlian photography and lightning prints had not the introduction of x-rays, with their immediate and practical applications, diverted the attention of both investigators and public alike. When the excitement (and the enthusiasm with which x-rays were greeted should not be underestimated) had abated, the thread of research into other, more esoteric, areas of electrical phenomenon, had been broken.

Perhaps now, as in the case of Kirlian photography, it is time to reopen the investigation into keraunography.

Notes and References:

1. "Keraunography", Henry E. Davis, The Photographic News, 10 February 1888, p. 91. Davis was primarily on exhibiting photographer, much respected if “taciturn”. He wrote rarely.
2. Ibid.
3. Reported in The Athenaeum,. 28 March 1857, No. 1535.
4. Reported in the Journal of Commerce, New York, 26 August 1853.
5. Scientific Congress at Naples, 22 September 1845. Orioli was President. The phenomenon was discussed at the next sitting, on 23 September, and again on 17 December 1846, and in January 1847 at the French Academy of Sciences.
6. Published by Sampson Low, Marston, Searle, and Rivington,London, 1876.
7. Familiar Letters on Some Mysteries of Nature and Discoveries in Science, by Dr. T. L. Phipson, London, 1876, p. 203.
8. Handbook of Curious Information, p. 72.
9. Paris correspondent of a London newspaper. Reported in The Photographic News, 14 September 1866, p. 433.
10. Philadelphia Record, 1872. (August?)
11. Handbook of Curious Information, p. 73.
12. Pictorial World, August 1875.
13. Evening Star, Philadelphia, September (?), 1884.
14. From "a Toronto paper". Quoted in The Photographic News, 30 September 1887, p. 623.
15. Chicago Tribune, December/January 1888.
16. Atlanta Constitution, September 1890.
17. The Amateur Photographer, quoting "one of the morning papers", 22 June 1900, p. 482.
18. St. Louis and Canadian Photographer, July 1900.
19. Daily Mail, from its New York correspondent, 1904.
20. Reported in The Photographic News, 4 October 1861, p. 472.
21. Poey's memoir, "The Photographic Effects of Lightning", containing 24 case histories, had appeared in a 2nd edition during the same year.
22. Phipson discusses this theory in Familiar Letters ..., p. 209.
23. Quoted in The Photographic News, 6 July 1883, p. 423.
24. The Amateur Photographer, 12 July 1901, pp. 22-23.
25. From a letter addressed to Dr. Boudin by M. de Bessay, who was present at the Chateau during the related events. It was quoted by T. L. Phipson in his book Familiar Letters...
26. Photography, 20 February 1890, p. 117.
27. The Amateur Photographer, 24 September 1886, p. 147.
28. The Photographic News, 18 June 1880, p. 289.
29. The British Journal of Photography, 10 February 1875, p. 95.

30. Sir William Robert Grove (1811-1896) was a man of science and a judge. He was a vice-president of the Royal Institution; was appointed to the chair of experimental philosophy at the London Institution; was an active member of the Royal Society, at which he was awarded the royal medal; he took silk in 1853; and was knighted in 1872. This early research was published under the title The Correlation of Physical Forces, London, 1846, which passed through six editions.
31. See "New Methods of Producing and Fixing Electrical Figures", Sir. W. R. Grove, Philosophical Magazine, January 1857. Grove's experiments were also published in the sixth edition of his The Correlation of the Physical Forces. See also "Photographs of the Electric Flash", The Photographic News, 29 July 1887, p. 465, which contains a line drawing (albeit upside down) of lightning-prints on a human arm.

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