the process of evaporation which is going on all over the surface of the globe, more particularly in equatorial regions, every particle of water, as it rises into the air, carries with it its portion, however minute that portion may be, of the earth's electric charge. This small charge distributes itself over the surface of the aqueous particle, and the vapour rises higher and higher until it reaches that point above which the air is too rare to support it. It then flows away laterally, and as it approaches colder regions, gets denser, sinking lower and nearer to the earth's surface. The aqueous particles, becoming reduced in size, the extent of their surfaces is proportionately reduced. It follows that as the particles and their surfaces are reduced, the charge is confined to a smaller surface, and attains, therefore, a greater "surface density," or, in simpler language, a greater amount of electricity per unit of surface. Electricity, as above set forth, is in what is known as the "static" condition (to distinguish it from electricity which is being transferred in the form of a current), when it has the property of "repelling itself" to the utmost limits of any conductor upon which it may be confined. This will account for the charge finding its way to the surface of the water particles and will furthermore account for the greater density of the charge as the particle gets smaller and has the extent of its surface rapidly diminished. It may be mentioned that the surface of a sphere varies as the cube of its radius. Returning to the discussion of the state of affairs existing when the particles have reached their highest position in the atmosphere, we may imagine that they set themselves off on journeys towards either the north or the south pole. As they pass from the hotter to the colder regions, a number of particles coalesce; these again combine with others on the road until the vapour becomes visible as cloud. The increased density implies the increased weight, and the cloud particles, as they sail pole-wards, descend towards the surface of the earth. Assuming that a sperical form is maintained throughout, the condensation of a number of particles implies a considerable reduction of surface. Thus, the contents of two spheres vary as the cubes of their radii, or eight (the cube of 2) drops on combining will form a drop twice the radius of one of the original drops. We may safely conceive hundreds and thousands of such combinations to take place until a cloud mass is formed, in which the constituent parts are more or less in contact, and, therefore, behave electrically as a single conductor of irregular surface, upon which is accumulate all the electricity that was previously distributed over the surfaces of the millions of particles that now compose it.

The tendency of an electric charge upon the surface of a conductor is to take upon itself a position in which it may approach nearest to an equal and opposite charge, or, if possible, to attain neutrality. If, then, a cloud has a charge, and there is no other cloud above or near it, the charge *induces* on the adjacent earth surface, electricity of the opposite kind. Thus, assuming the cloud to be charged with positive electricity, the subjacent earth will be in the negative state. The two electricities exert a strong tendency to combine or to produce neutrality, whence there is a species of stress applied to the intervening air. Possibly the cloud will be drawn bodily towards the earth more or less rapidly, according as the charge is great or small. Or, on the other hand, the cloud may roll on for leagues, carrying its influence with it, so that the various portions of the earth underneath becomes successively charged and discharged as the cloud progresses on its journey.

Should the cloud be near the earth, or should it be very highly charged, the tension of the two electricities may be so great as to overcome the resistance of the intervening air; and if this resistance should prove too weak, what happens? How does the discharge show itself? It takes place in the form of a lightning flash, and passing from the one surface to the other—or, may be, simultaneously from both—produces neutrality more or less complete.

There has recently been a little discussion in these pages on the subject of lightning, some having stated that they discerned the discharge to take place upwards—that is, from the earth towards the cloud. I will not venture so far as to say whether or not the direction of the discharge is discernible; possibly the flash may sometimes be long enough to enable one to tell; but I have never so seen it, and have always looked upon the eye as a deceitful member—very. "The lightning flash itself never lasts more than $\frac{1}{100000}$ of a second." It is, however, just as likely that a discharge may travel upwards as downwards. What controls the discharge? Does the quality of the charge?—that is to say, is the positive or the negative more prone to break disruptively through the insulating medium? Investigations with Geissler's and other tubes containing highly rarefied gases have made it tolerably clear that there is a greater "tearing away" influence at the negative than at the positive pole, and if two equal balls, containing one a positive and the other a negative charge, be equally heated, the negative is more readily dissipated than the positive. But, so far as we at present know, this question enters into the discussion scarcely, if at all. Our knowledge seems rather to point to the substances upon which the charges are collected. The self-repellent nature of electricity compels it to manifest itself at the more prominent parts of the surface, the level being forsaken for the point. The tension of the charge, or its tendency to fly-off, is proportionately increased. And if at a given moment the tension attains a certain intensity, the discharge follows, emanating from the surface which offers the greatest facilities for escape. The earth is generally flatter than the cloud, whence in all probability, the discharge more frequently originates with the cloud.

Should a lightning flash strike the earth and produce direct neutrality, it is possible that no damage will result, although this again is not always certain, because when the cloud charge acts inductively upon the earth it produces the opposite (say negative) charge on the nearer parts, the similar (or positive) state is also produced at some place more or less distant. Sometimes this "freed" positive (which, by the way, accumulates gradually and physiologically imperceptibly) is collected at some portion of the earth's surface. When the negative is neutralised by the discharge, the freed positive is no longer confined to a particular region, but tends to dissipate itself and a shock may be felt more or less severely by any within the region. Or, again, a similar shock may be experienced by a person standing within the negative zone on the neutralisation of the charge.

I may take the opportunity here to mention a highly interesting and instructive incident observed on local telegraph circuits during a thunderstorm. The storm may be taking place at some distance from the point of observation. The electrified cloud induces the opposite charge beneath it, the similar charge being repelled. It is noticeable that the needle of a galvanometer, starting from the middle position, goes gradually over to one side, eventually indicating a considerable deflection. Suddenly, owing apparently to a lightning discharge some distance away, the force which caused the deflection is withdrawn, and the needle rebounds with great violence to the opposite side. In a short time, the cloud becoming again charged on its under surface, and recommencing its inductive effect upon the subjacent earth, the needle starts again, and goes through the same series of movements, a violent counterthrow following every flash of lightning.

If we can so far control our imagination, we may conceive the earth to be one large insultated conductor, susceptible to every influence around it. If, then, the earth, as a mass of matter, behaves as above indicated, there is no plausible reason for declining to regard any other large conducting mass in a similar light, and, as a body capable of being subjected more or less completely to the various impulses affecting the earth. In other words, a large mass of conducting material, partially or perfectly insulated is, during a thunderstorm, in considerable danger. With this portion of the subject I shall, however, deal more fully when discussing the merits of lightning protectors.

Lightning discharges do not take place between cloud and earth only, but also, and perhaps more frequently, between two oppositely-charged clouds. We then get atmospheric lightning, the flash often extending for miles. This form of lightning is harmless, and in all probability what we see is only a reflection of the discharge. The oft-told tale of the lightning flying in at the window, across the room, and out of the door, or up the chimney, is all moonshine, and before dealing with lightning protectors I intend to expose some of the fallacies concerning lightning. Were the discharge to pass through a house it would infallibly leave more decided traces and do more damage than simply scaring a superstitious old lady now and again. Many people are often and unnecessarily frightened during a thunderstorm, but it may be safely predicted that a person under a roof is infinitely safer than one who is standing alone on a level ground, and making himself a prominence inviting a discharge. Rain almost invariably accompanies the discharge, and the roof and sides of the house being wet, they form a more or less perfect channel of escape should a flash strike the building.—*Knowledge.*