in fact, under the influence of this attraction, the ocean waters are periodically upraised, and assume the appearance of a mighty liquid mountain, which follows the apparent motion of the sun, and moves consequently in a direction opposite that of our planet. But these first oscillations of the ocean, these *solar tides*, are nothing when compared with the lunar tides, and only become perceptible when combined with them. For, though the attractive force of the sun is incomparably more considerable than that of the moon, yet, owing to the far greater distance of the former of these two planets, the difference of effect which the liquid atoms experience on the diametrically opposite surfaces of the globe is much less. Thus, then, the moon, the earth's handmaid, plays the principal part in the production of the tides. As between bodies attraction is always reciprocal, as the stronger—that whose density is the greater—always controls the weaker, the moon is compelled to obey the earth and gravitate round her; but the seas, boundless as they appear to us, represent only a minimum portion of the terrestrial mass, and our satellite is strong enough and sufficiently near us to draw in her train a portion of the waters of our ocean around the planet from which it cannot separate them. The sun, on his side, influences them in the same manner, only much more feebly; the phenomenon is, therefore, two-fold. There is a solar tide and there is a lunar tide; the former is three times less than the latter. In fact, it is never seen as a distinct and isolated phenomenon; it is perceived simply in the modifications which it effects in the height and in the periodicity of the lunar tide. We shall see immediately what these modifications are. The tides usually happen twice in twenty-four hours, because the rotation of the globe brings the same point of the ocean twice under the meridian of the moon. A complete oscillation is accomplished in the space of about twelve hours fifty minutes. The ascending movement of the sea towards the coast is called the "flux,!' or "rising tide;" the retrograde movement is the "ebb," "flux," or "falling tide." "Spring-tides" happen at new and full moon, and, conseqnently, twice in a month, because in both cases the sun and moon are in the same meridian. For when the moon is new they are in conjunction, and when she is full they are in opposition, and in each case their attraction is combined to raise the water to its greatest height; while, on the contrary, the "neap," or lowest tides, happen when the moon is in quadrature, or 90° distant from the sun, for then to a certain extent they counteract each others' attraction. When the flow or flux is complete, it is said to be, "high water;" and when the tide has ebbed it is spoken of as "low water." It remains stationary for seven or eight minutes both at ebb and flow.—*Our Own Fireside.*

Electricity.

Although great advances in the science have been made since Franklin's time, the question, What is electricity? remains unanswered; and a not uncommon result of such new discoveries as have been made has been the overthrow of pre-existing theories upon the subject....

The most important law of electricity is, that it seeks what is called a state of equilibrium; that is, if we consider it a single fluid, that it tends to diffusion in equal proportions throughout all matter; or, if we choose to adopt the theory of the existence of two distinct fluids, then that these two fluids tend to unite in equal proportions everywhere. When electricity is so diffused, or, (if there be two fluids) when they are so united, no electrical effects are observable, and there is then a state of rest or quilibrium. But this state of rest is constantly disturbed by the operations of nature—by evaporation, changes in temperature, friction, motion of all kinds, even the movement of our bodies; and currents of electricity are immediately set in motion to neutralize the disturbance. These currents may be of such low tension as to admit of detection only by the aid of the most delicate apparatus; or they may be developed with such spasmodic irregularity and force as to interfere with the use of the telegraph; or, again, with such constancy of direction and tension as to be made use of in sending messages on the wires. Finally, in a state of extreme tension, they exhibit themselves to us in the form of explosions or discharges of lightning.

We may familiarly illustrate the idea of these currents of varying tension by reference to the spectacle of a tea-kettle or boiler filled with water, which, when first placed on the fire, sends forth from any opening gentle clouds of vapour. As the heat increases, the steam rushes out with a spiteful hiss; and finally, when it has acquired sufficient tension, if the means of escape are inadequate, it bursts the boiler with a violent explosion. So electricity flows in currents of more or less tension, according to the degree or extent to which its equilibrium is disturbed, and manifests its great known tensional force in the form of a discharge of lightning,—the discharge or explosion being the consequence either of interruption in the flow of currents of low tension, or of an immediate and extensive evolution of electricity; in other words, a sudden and extreme disturbance of the equilibrium.

Hence the insulation of lightning-rods is not only an absurdity—as indeed Dr. Franklin perceived a hundred years ago, when it was first suggested—but it is also a grave error; because the insulators, to some extent, arrest the flow of currents of rarefied electricity, which it is the true function of the lightning-rod to facilitate. On the other hand, the insulator amounts to nothing as a barrier against a discharge of lightning, which can either pass through it or leap the short distance between the rod and the building. The prejudice in favour of insulators arises from a misapprehension. Strictly speaking, there are non-conductors; but that term is applied to substances which conduct very imperfectly and are subjected to violent disruptive effects when a shock of electricity passes through them.

The insulation of telegraph wires is frequently referred to by lightning-rod men as exhibiting the necessity and usefulness of insulating lightning-rods; but the cases are not at all parallel: currents of electricity of low tension are used for telepraphing; and whenever a discharge of lightning strikes the wires, it breaks the insulators and passes down the poles to the earth, as the frequently splintered telegraph-poles bear witness. The object of insulating telegraph-wires is to postpone the restoring of the equilibrium, by preventing the electric currents from taking the shortest course from pole to pole of the battery; whereas the purpose of a lightning-rod is to promote the restoration of the equilibrium as rapidly as possible. If the rod be insulated, the "non-conducting" substance between the rod and building intercepts and stops the flow of currents of rarefied electricity from the building to the rod, and thence to the atmosphere and *vice versâ*, thus permitting a continued disturbance of the equilibrium of the building, under the influence of a "thunder-cloud," until a discharge of lightning takes place. Then the fluid has sufficient force or tension to overcome the obstacle which the insulators present, and an explosion into or from the building is the necessary consequence. Of course, the quantity of electricity required to restore the equilibrium of the building is small compared with the whole discharge, which may come from a cloud thousands of acres in extent; but it is enough to do injury if it comes all at once and in a high state of tension. To insulate the lightning-rods, therefore, is to fasten the safety-valve and render it inoperative.

To prevent a discharge from leaving the rod and passing through the building, something more must be done than to attempt to keep it out by erecting such a flimsy and insignificant barrier. The rod must be arranged so as to prevent points for the reception and discharge of electricity at the extremities of the building, both above and below, and the different terminations in the ground must be connected by rods lying across the roof, so that lightning can be provided with a path in a horizontal direction, which, being continuous, will be preferred to any series of detached masses of conducting matter contained within the building.

In construction and application, lightning-rods should be simple, substantial, and durable, and any metal is a sufficiently good conductor for the purpose. The difference in the conducting power of iron and water, which ranks next to the metals as a conductor, is, according to Cavendish, as millions to unity. The relative conducting power of different metals is, therefore, not worth considering in this connection: hence iron is used for the telegraph instead of copper, which is theoretically a better conductor than iron. A lightning-rod made of the precious metals (which are the best conductors) would not be effective if it were improperly located and arranged. If a rod of any metal be rightly constructed and judiciously applied, there is no danger of a discharge of lightning leaving it for any less perfect conductor within the building, and it is only those substances which are poorer conductors than the metals that are injured by the passage of electricity upon them.—*Exchange.*

Interior Decoration—Management of Colours.

Painters, as a general rule, acknowledge but three primary colours—blue, red, and yellow; and whatever exception may be taken to such a statement on scientific grounds, there is no question that such a view of the subject does afford certain practical advantages. It is further assumed, that all other tints are mere mixtures of these three colours. For instance, green is made up of blue and yellow; violet of blue and red; and orange, of red and yellow. If one has no taste and no power of discriminating between colours, it is a useless task for him to undertake decoration; it is useless for him to