

solace during the weary hours; of young Princess Louise too, the king's only child, who has humbler aspirations, and owns a little kitchen and range of her own, whereat she loves to cook, and who has entertained her "little papa" at a lunch to-day of her own preparing, in honor of the occasion, as some court lady smilingly tells.

This reverie is brief, and again broken. There comes stealing through curtained arches, welling and leaping adown the galleries, a merry waltz tune, and at the magic sound faces brighten, doorways are gained, and you emerge with the eager throng into the great ball-room—the "White Sea."

Ah, yes; white and still and stately, like a frozen ocean. Its pure pillars are garlanded; their fluted capitals rise, coldly shining, to the immense white roof; the deep embrasures of the windows are hung with frosty laces; across the polished surface glide the sweetest women of Sweden, in white robes, with snowy arms and shoulders. There seems no color any where: all is dazzling purity. The royal dais is white-carpeted, with snow-white chairs of state; does the eye rest on the gilded balcony whence the music comes pealing, garlands of pure blossoms hide its gaudiness; glance out of a window, there lie frozen lake and snowy plain together. There is but one great white light from every thing—torch-light and wax-taper, diamonds and pearls, dresses and room together. It is the fabled palace of the ice queen; it is winter poetized.

Now sweet perfumes and lovely maidens are floating, floating, to the silver trumpet notes; the king is dancing hotly, wildly, as he ever dances; the hours are rose-hued and rare. There comes now a stately quadrille, in which you dance—by royal order—opposite bright Princess Sophie, with a blue-eyed Swedish count, a poet of great promise.

After a time there is a pause, and a long procession files into the banqueting-room, where you are surprised anew by fresh brilliance and flowers and fountains playing, perfumes and more strident music—a room all crimson and gold. The tables are artistically decked with many-hued wines and fruits, and every "made dish" known in this epicurean Northern land. The groups are not uninteresting. The king laughs with his aids-de-camp. Prince Oscar has gathered about him a knot of the most distinguished men present, whom he leaves presently to accost the handsome, courtly American minister. "Drink with me, Sir," he says. "I have here a bottle of rare Johannisberg, one of a dozen sent me by my brother-in-law Nassau, who owns the vineyard." And the wine is live amber for color and mellowness. Beyond the centre-table stand a knot of diplomatés: the French minister, who has recently stood as proxy for Napoleon III. at Prince Oscar's youngest boy's christening,

and who has just transmitted to the Princess Sophie the superb bracelet which she wears to-night, the gift of the imperial godfather. There is the gray-haired, courteous minister from Spain, who knows not from day to day what dynasty he serves, or what political opinions he should express in this tumultuous year of '66-'67, and whose salary, *dit on*, is in long arrears. Truly in these days the terrible motto, "All ye who enter here, leave every hope behind," would not be unsuited to the slippery vale of Spanish diplomacy. The Austrian minister comes up: a thin seedling of a man, who polishes his eyeglass languidly, and asks politely if the buffaloes are not very troublesome in the streets of New York, and who, in reply to your indignant disclaimer, murmurs, suavely, with the air of a surprised *savant*, "None! not so barbarous, then, as I supposed."

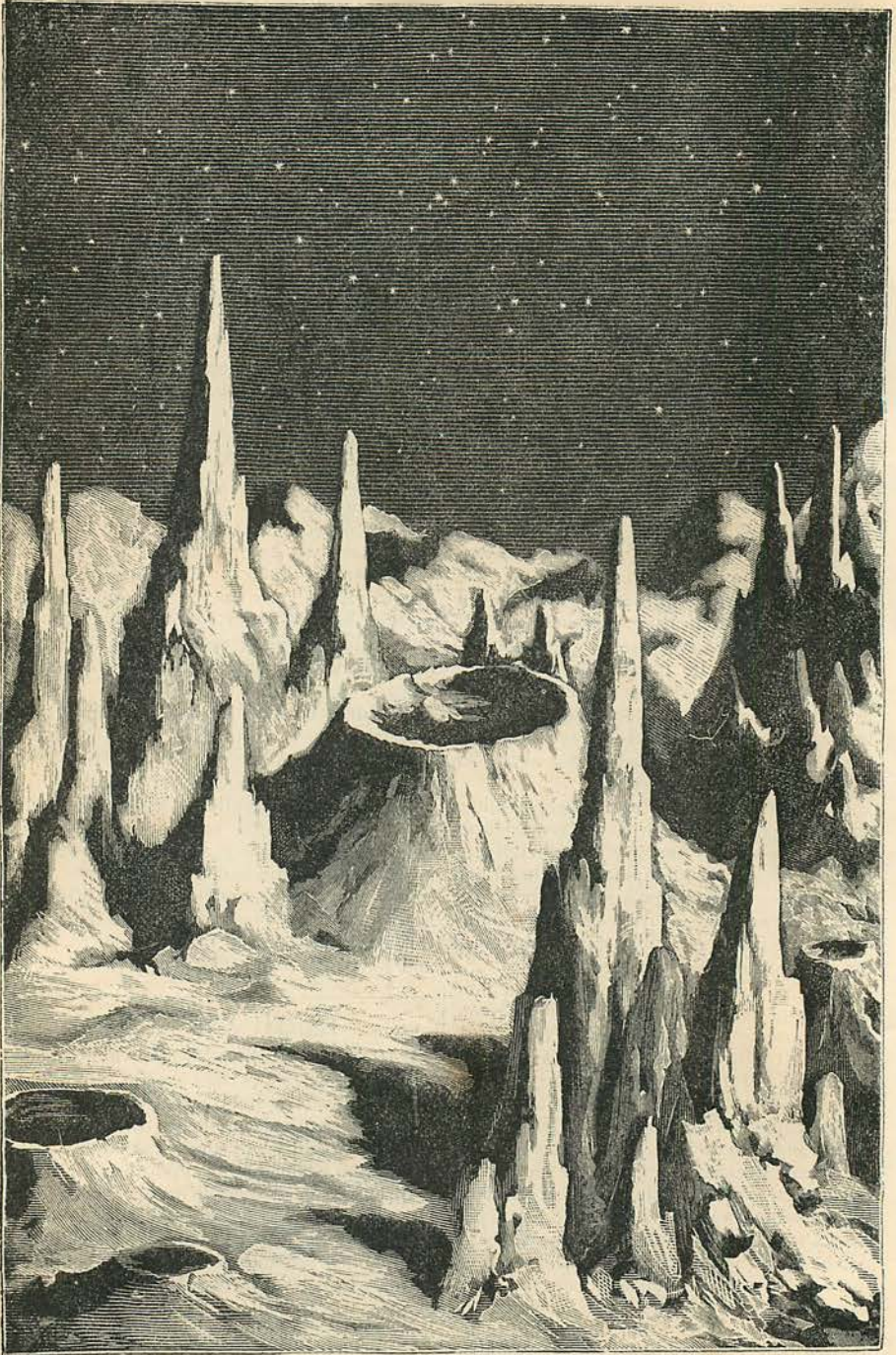
The special servants of the royal ladies are worthy of notice, in their fantastic dresses of blue and orange (national colors), with knee-breeches and ruffs, and skull-caps of four colors, whence spring three towering white ostrich plumes. The king has a negro valet, the only one in Sweden, who is present in a Moorish costume, and who is not unlike a gaudy parouquet as he leans against a white column in the now deserted "Sea."

You drift back to it presently, finding it still luminous and beautiful, and the music plays faster, the dancers grow more reckless; cheeks are flushed, and eyes are sparkling, and Time passes rapidly by, his cruel scythe in hand, and laughs as he goes. For lo! five brief years are garnered in now, and two royal lives are ended; the "White Sea" is deserted; in the mausoleum in Riddarholm there lies one more dead king; and Oscar rules the united kingdoms of Sweden and Norway. "*Le roi est mort; vive le roi!*"

#### EARTH AND AIR.\*

AMONG the illusions swept away by modern science was the pleasant fancy that the moon was a habitable globe, like the earth, its surface diversified with seas, lakes, continents, and islands, and varied forms of vegetation. Theologians and *savants* gravely discussed the probabilities of its being inhabited by a race of sentient beings, with forms and faculties like our own, and even propounded schemes for opening communication with them, in case they existed. One of these was to construct on the broad highlands of Asia a series of geometrical figures on a scale so gigantic as to be visible from our planetary neighbor, on the supposition

\* *The Atmosphere*. By CAMILLE FLAMMARION. With numerous Wood-cut Illustrations and Ten beautiful Chromo-lithographs. Translated by C. B. PYTMAN, under the superintendence of JAMES GLAISHER. New York: Harper and Brothers.



A LUNAR LANDSCAPE.

that the moon people would recognize the object, and immediately construct similar figures in reply! Extravagant and absurd as it may appear in the light of modern knowledge, the establishment of this Terrestrial and Lunar Signal Service Bureau was treated as a feasible scheme, although practical difficulties, which so often keep

men from making fools of themselves, stood in the way of actual experiment; but the discussion was kept up at intervals, until it was discovered that if there were people in the moon they must be able to live without breathing, or eating, or drinking. Then it ceased.

There can be no life without air. Beautiful to the eye of the distant observer, the moon is a sepulchral orb—a world of death and silence. No vegetation clothes its vast plains of stony desolation, traversed by monstrous crevasses, broken by enormous peaks that rise like gigantic tombstones into space; no lovely forms of cloud float in the blackness of its sky. There daytime is only night lighted by a rayless sun. There is no rosy dawn in the morning, no twilight in the evening. The nights are pitch-dark. In daytime the solar beams are lost against the jagged ridges, the sharp points of the rocks, or the steep sides of profound abysses; and the eye sees only grotesque shapes relieved against fantastic shadows black as ink, with none of that pleasant gradation and diffusion of light, none of the subtle blending of light and shadow, which make the charm of a terrestrial landscape. A faint conception of the horrors of a lunar day may be formed from our illustration representing a landscape taken in the moon in the centre of the mountainous region of Aristarchus. There is no color, nothing but dead white and black. The rocks reflect passively the light of the sun; the craters and abysses remain wrapped in shade; fantastic peaks rise like phantoms in their glacial cemetery; the stars appear like spots in the blackness of space. The moon is a dead world: she has no atmosphere.

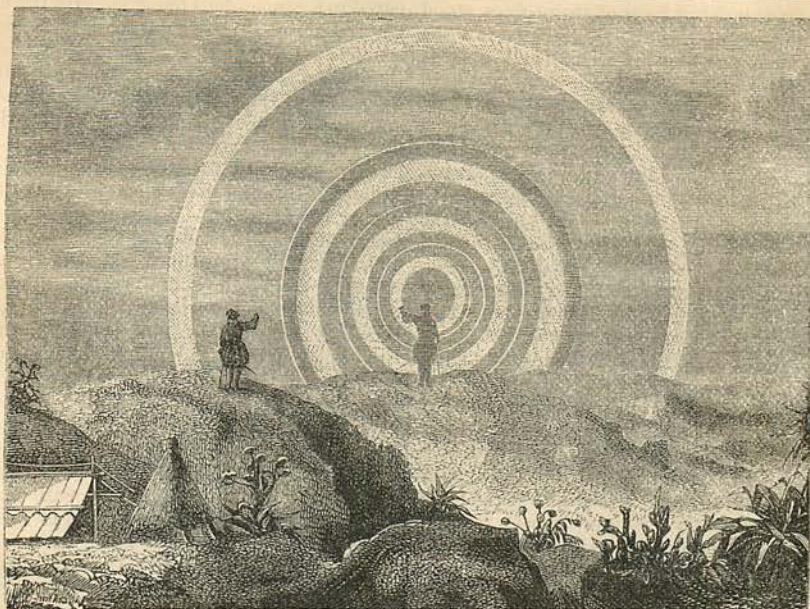
Let us return from this dismal region to our own fair earth, which we will love still better after our imaginary visit to the moon. Descending, or rather moving, through the depth of space, we catch a glimpse of our home planet, still far in the distance, shining like the full moon in the gloom of night. On its surface we recognize spots formed by continents and seas, by the polar snows, and the cloudy bands of the tropical regions. Now we distinguish on the rapidly swelling globe principal geographical shapes, visible athwart clouds and vapors. As we near the surface our eyes are charmed by the beautiful variety and blending of colors beneath us, while above the black expanse of space assumes the most lovely tints. What a contrast to the bleak and inhospitable landscape in the moon! It is all owing to our atmosphere.

What is the atmosphere? It is the breath of life for the earth and all that live upon or within it—a gaseous film which adheres to the surface of the globe, extending with uniform thickness over its whole extent. The earth, flying through space, has been com-

pared to a cannon-ball launched into the air. By imagining this cannon-ball to be surrounded by a thin ring of smoke not more than  $\frac{1}{2000}$  of an inch thick, we may form some idea of the position of the atmosphere around the globe. It is from its position that the atmosphere derives its name, from two Greek words (*Ἄτμος*, vapor; and *Σφαῖρα*, sphere). It is the great element of life, the first bond of society. Were our atmosphere to vanish into space, eternal silence and desolation would wrap the world. The air is the great medium of sound, the liquid channel in which our words travel. It is also the first element of our bodily tissues. Breathing affords three-quarters of our nourishment; the other quarter we obtain in the aliment, solid and fluid, in which oxygen, hydrogen, nitrogen, and carbonic acid are the chief component parts. Further, the particles which are at the present moment incorporated in our organism will make their escape either in perspiration or in the process of breathing, and after having sojourned for a certain time in the atmosphere, will be reincorporated in some other organism, either of plant, animal, or man.

With the unceasing metamorphoses in beings and in things, there is at the same time going on a continuous exchange between the products of nature and the moving flood of the atmosphere, by virtue of which the gases of the air take up their abode in the animal, the plant, or the stone, while the primitive elements, momentarily incorporated in an organism, or in the terrestrial strata, effect their release, and help to recombine the aerial fluid. Each atom of air, therefore, passes from life to life, as it escapes from death after death; being in turn wind, flood, earth, animal, or flower, it is successively employed in the composition of a thousand different beings. The inexhaustible source whence every thing that lives draws breath, the air is also an immense reservoir into which every thing that dies pours its last breath; under its action vegetables and animals and various organisms are brought into existence, and then perish. Life and death are alike in the air which we breathe, and perpetually succeed the one to the other by the exchange of gaseous particles; thus the atom of oxygen which escapes from the ancient oak may make its way into the lungs of the infant in the cradle, and the last sigh of the dying man may go to nourish the brilliant petal of a flower. The breeze which caresses the blades of grass goes on its way until it becomes a tempest that uproots the forest trees and strews the shore with shipwrecks; and so, by an infinite concentration of partial death, the atmosphere provides an unending supply of aliment for the universal life spread over the surface of the earth.

It is this unceasing activity of the aerial



THE CIRCLE OF ULLOA.

envelope of gas which forms, nourishes, and sustains the vegetable carpet that extends over the surface of the dry land. From the meanest blade of grass to the colossal trees of California, this rich and diversified covering draws all its sustenance from the air.

And while it keeps up the vital circulation of the earth by incessant exchanges of which it is the vehicle, the atmosphere is also the aerial laboratory of that splendid world of colors which brightens the surface of our planet. It is owing to the reflection of the blue rays that the sky and the distant heights near the horizon assume their lovely azure tint, which varies according to the altitude of the spot and the abundance of the exhalations; and to it also we owe the contrast of the clouds. It is in consequence of the refraction of the luminous rays, as they pass obliquely across the aerial strata, that the sun announces its approach every morning by the soft and pure melody of the glowing dawn, and makes its appearance before the astronomical hour at which it should rise; it is owing to a similar phenomenon that, toward evening, it apparently slackens the speed of its descent beneath the horizon, and, when it has disappeared, leaves floating upon the western heights the fantastic fragments of its blazoned bed. Without the gaseous envelope of our planet we should never have that varied play of light, those changing harmonies of color, those gradual transformations of delicate shades which lighten up the world, from the gleaming brightness of the summer sun

down to the shadows which cover, as with a veil, the forest depths.

The study of the atmosphere embraces also the general conditions of terrestrial existence. The notion of life is so bound up in all our conceptions with that of the forces which we see ever at work in nature that the myths of the early inhabitants of the world always attributed to these forces the generation of plants and animals, and imagined the epoch anterior to life as that of primitive chaos and struggle of the elements. "If we do not consider," says Humboldt, "the study of physical phenomena so much as bearing on our material wants as in their general influence upon the intellectual progress of humanity, it will be found that the highest and most important result of our investigation will be the knowledge of the intercommunication of the forces of nature, and the certainty of their mutual dependence upon each other. It is the perception of these relations which enlarges the views and ennobles our enjoyment of them. This enlargement of the view is the result of observation, of meditation, and of the spirit of the age in which all the directions of thought concentrate themselves. History teaches him who can travel back through the strata of preceding centuries to the furthest roots of knowledge how, for thousands of years, the human race has labored to grasp, through ever-recurring changes, the fixity of the laws of nature, and to gradually conquer a large portion of the physical world by the force of intelligence."

We may now contemplate our planet trav-

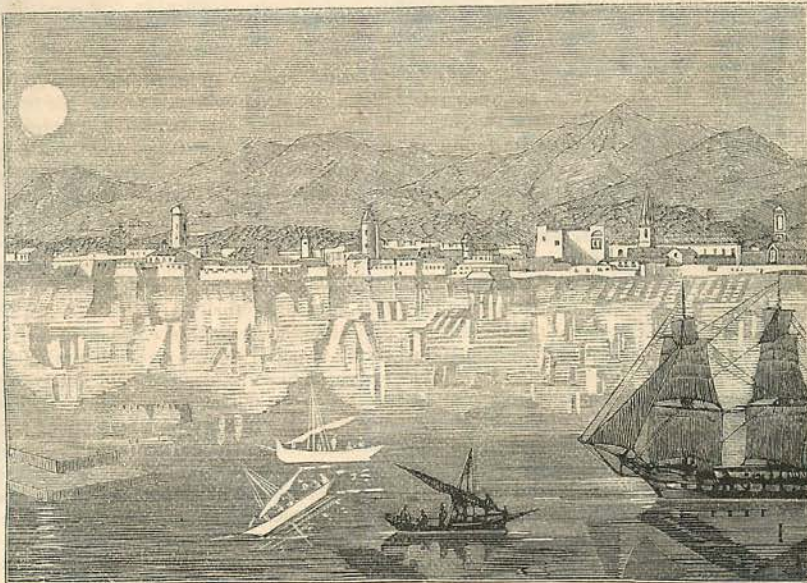
eling in space, and keeping about it the aerial envelope which adheres to its surface. Our imagination can easily comprehend the general shape of this gaseous sphere which encircles the solid globe, and which is comparatively thin and of slight bulk.

The exterior surface of the atmosphere is therefore curved like that of the sea, for, like water, the external layer of air tends to a level, all points of which are at equal distances from the centre. To the eyes of novices it seems difficult to reconcile the idea of the *spherical* surface of the ocean with what is commonly termed a *level*; the idea that the air has a horizontal level like water, and that, like an aerial ocean, this level is always tending to an equilibrium, seems at first sight somewhat obscure. Nevertheless, not only does the air possess to an unlimited degree all the properties of elasticity and mobility of a fluid seeking equilibrium, but, different in this respect from water and other liquids, it is extremely capable of compression, and, consequently, susceptible of extreme expansion.

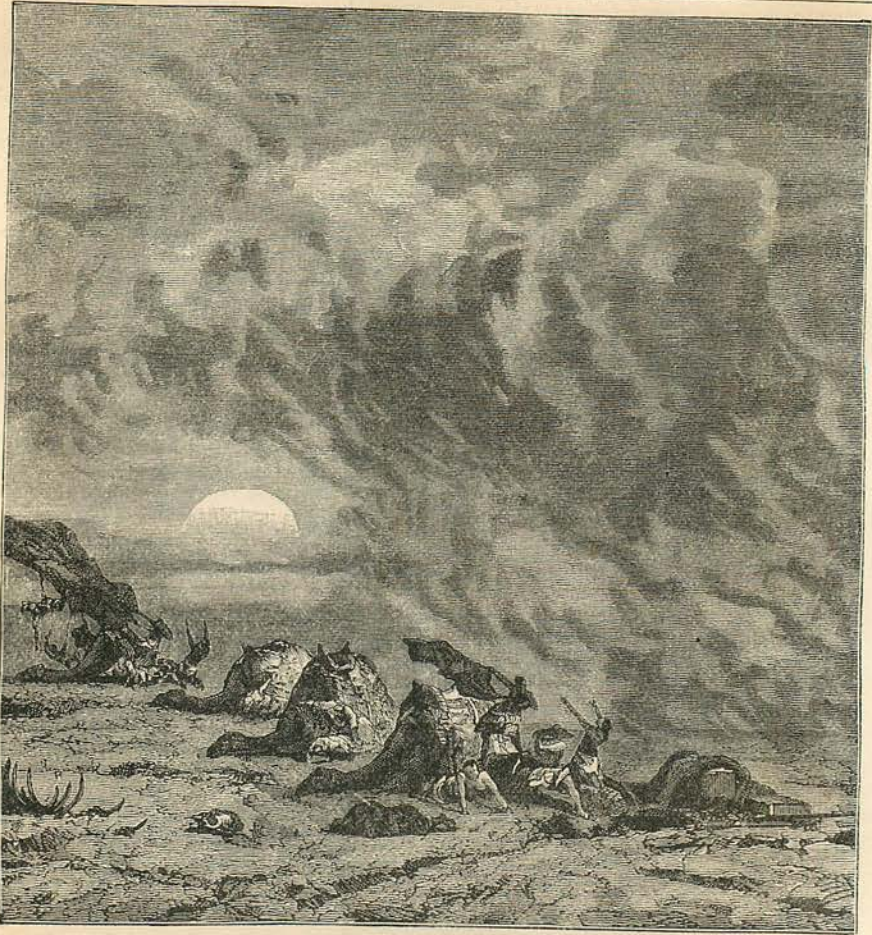
To what height does our atmosphere extend? Carried along by the daily rotation of the globe, we may conclude that at a certain height above the surface of the ground the movement of the atmospheric film is so rapid that the centrifugal force which it acquires would hurl into space the outside particles of air. Certain inventors of methods of aerial navigation have imagined that the atmosphere above a definite height does not turn round with the earth, and that, by rising into that motionless stratum, we would see the globe whirling

round beneath our feet, and should only have to wait until the place where we wished to alight passed under the balloon. The idea is, of course, absurd, as the whole atmosphere revolves with the earth. Mathematicians have calculated that the distance from the globe where the centrifugal force would be great enough to hurl the aerial particles into space is about 21,000 miles above the surface. Theoretically, this is the maximum limit of the atmosphere, which, however, as a matter of fact, does not extend to this enormous distance. It is at a far lower elevation that the air we breathe really ceases. Thus at the height of 10,000 feet—say on the summit of Mount Etna—there is beneath us nearly a third of the mass of atmosphere; the column of air which presses upon the soil has already lost half its weight, and consequently the whole gaseous fluid, which stretches far up into the sky, does not weigh more than the strata compressed into the region below. In consequence of the forces that act upon it, the shape of the atmosphere is not absolutely spherical, but swollen out at the equator, where it is much higher than at the poles. It is also probable that a detached train of the lighter gases remains constantly in the rear of the globe during its rapid revolution around the sun. It need scarcely be added that the shape of the atmosphere undergoes further changes, owing to the atmospheric tides, due to the varying attraction of the sun and the moon.

How far the atmosphere extends below the surface of the globe, is a question which has not been definitely settled. Pressing



LA FATA MORGANA.



THE SIMOOM.

upon all bodies on the earth, it tends to penetrate in all directions between the molecules of liquids as between the interstices of the rocks. It is to be found in water, as in all vegetable and all organic structures; it impregnates the earth and all the porous stones in proportion to the force with which it presses. Certain *savants* have imagined that the air of which the atmosphere is composed is but the continuation of an interior element which permeates the whole globe; but the rise in temperature due to the central heat would prevent the condensation of gases, and must limit the presence of air in the under-strata.

We say "light as air," to indicate that a body has no weight. Popularly true, the comparison is scientifically inexact, as the air, light and unsubstantial as it seems to be, has a positive weight. Each square foot of the earth's surface sustains a considerable pressure, the amount of which corresponds to the height and density of the column of air above it. The exact amount of this

pressure was not determined until the middle of the seventeenth century. In 1640, the Grand Duke of Tuscany having ordered the construction of fountains upon the terrace of the palace, it was found impossible to make the water rise more than thirty-two feet. The duke wrote to Galileo in reference to this strange refusal of the water to obey the pumps. Torricelli, the pupil and friend of Galileo, gave the true explanation of the fact, and proved, by a series of interesting experiments, that this column of water of thirty-two feet was in equilibrium with the weight of the atmosphere. Thus the surface of the earth sustains a weight as if it were covered with a body of water about thirty-two feet in depth, and we who live upon it undergo the same pressure. This pressure is equal to about fifteen pounds to the square inch, and as the human body contains, on an average, sixteen square feet, we may each of us be said to be subject to a pressure of about fifteen tons. That we are not crushed to the ground by this enormous weight is

because it does not all press vertically down on us. As the air surrounds us on all sides, its pressure is transmitted over our body in all directions, and, in consequence, becomes neutralized. Air penetrates every part of our organism; hence we have the same pressure inside and outside, and thus these weights become exactly balanced. This is easily proved by experiment. Place a cylindrical glass vessel, hermetically closed at the upper end by a piece of gold-beater's skin, on the plate of an air-pump; as soon as the air begins to be exhausted from the vessel the gold-beater's skin becomes depressed under the influence of the atmospheric pressure from above, and soon bursts.

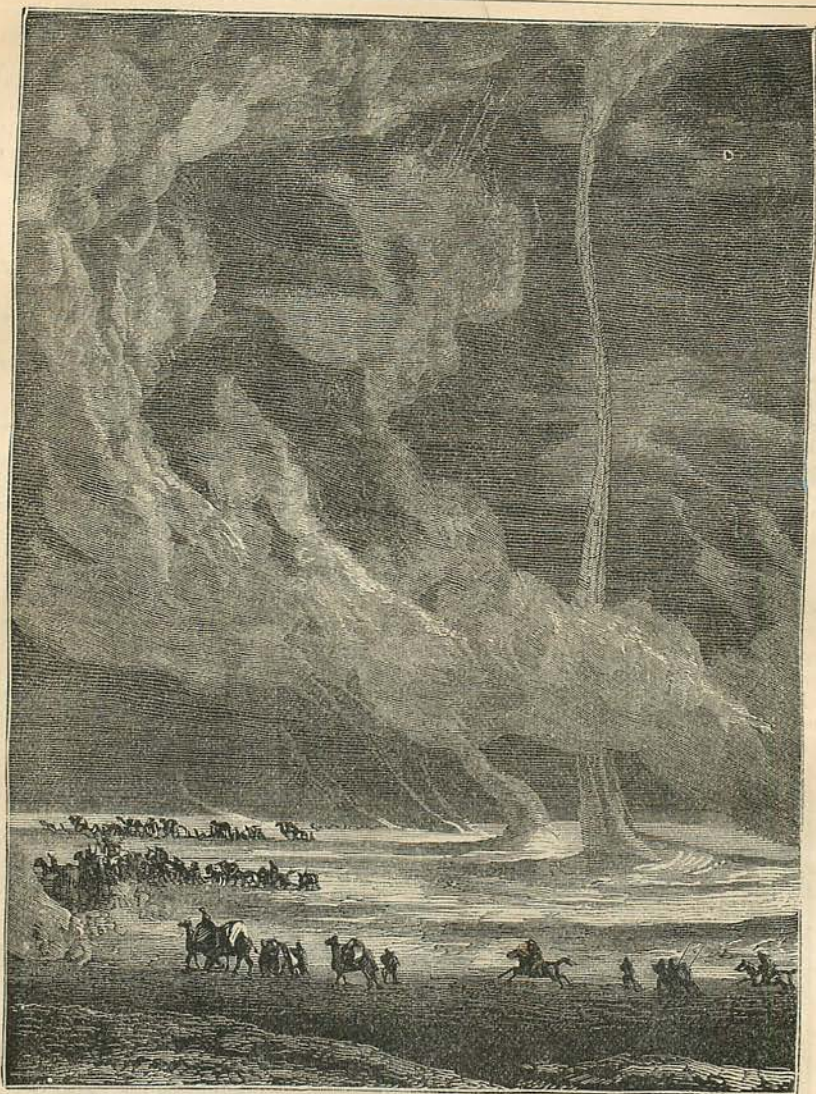
It would be pleasant, if we had time and space for it, to consider the chemical nature of the atmosphere and the interesting experiments by which it was ascertained; but this branch of the subject alone would require a long article for its elucidation, and we will pass to some of the more popular and striking phenomena of the aerial regions.

Among the natural phenomena which now attract our attention, but fail to excite surprise, are some which ignorant imagination once invested with supernatural terrors. Such is the well-known Spectre of the Brocken, in Germany, which is merely a gigantic shadow on a distant cloud. Similar

spectres are sometimes visible in other places. One of the most remarkable was that witnessed by Ulloa, in company with six fellow-travelers, upon the Pambamarca, at day-break. The sun had dissipated the heavy clouds that hung over the mountain, leaving only light vapors in their stead. The travelers, standing back to the sun, were suddenly startled to behold each one his own image reflected in the air, as in a mirror, and apparently at a distance of about seventy feet. The image was in the centre of three rain-bows of different colors, with an outer bow of only one color. The inside color of each bow was carnation or red, the next shade was violet, the third yellow, the fourth straw-color, the last green. All these bows were perpendicular to the horizon; they moved in the direction of, and followed, the image of the person whom they enveloped as with a glory. The most remarkable point was that, although the seven spectators were standing in a group, each person only saw the phenomenon in regard to his own person, and was disposed to disbelieve that it was repeated in respect to his companions. The extent of the bows increased continually, and in proportion to the height of the sun; at the same time their colors faded away, the spectres became paler and more indistinct, and finally the phenomenon disappeared altogether. At the first appearance the shape



DURING THE PASSAGE OF THE TEBBAD.



SAND COLUMNS IN THE DESERT.

of the bows was oval, but toward the end they became quite circular.

The phenomenon called *mirage* is mentioned by very early writers. We read in Diodorus Siculus: "An extraordinary phenomenon occurs in Africa at certain periods, especially in calm weather; the air then is filled with images of all sorts of animals, some motionless, others floating in the air. Now they seem running away, now pursuing; they are all of enormous proportions, and this spectacle fills with terror and awe those who are not accustomed to it. When these figures overtake the traveler whom they seem to be pursuing, they surround him with a cold and shivering feeling. Strangers not used to this extraordinary

phenomenon are seized with fear; but the inhabitants, who are in the habit of seeing it, take no particular notice of it."

Allusions to the mirage are frequent in Oriental writings. The phenomenon is not confined to the land. It is often witnessed at sea. This will explain the appearance of those unknown islands which sometimes mislead the navigator. For a long time Swedish sailors went in search of a magic island that seemed to rise between the islands of Aland and Upland, but which vanished on their approach. In May, 1837, during the French Algerian expedition of that year, a very curious mirage was observed by M. Bonneforet. He describes it as follows:



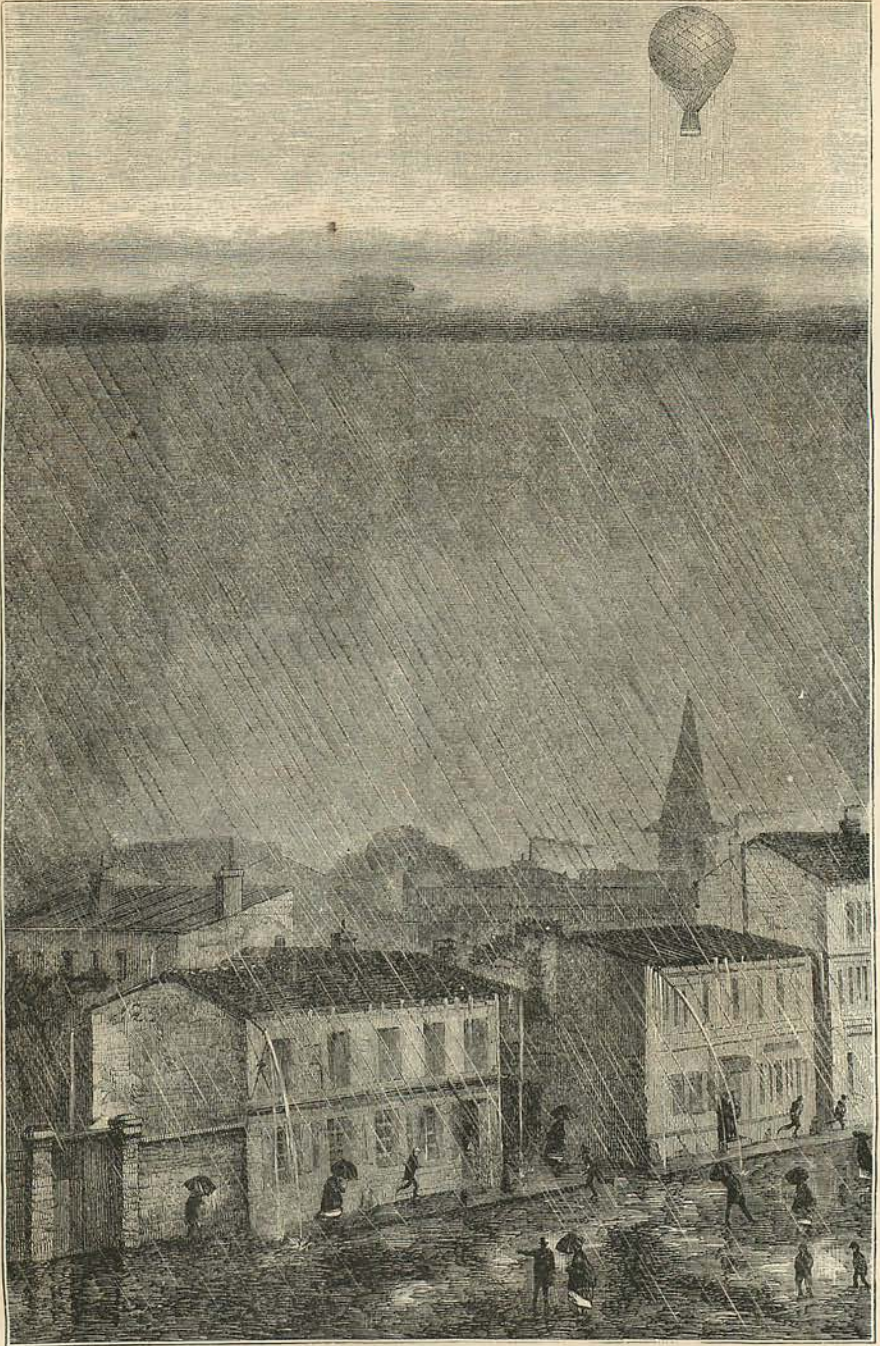
"A flock of flamingoes was seen upon the southeast bank, about three miles and a half off. These birds, as they left the ground to fly to the surface of the lake, assumed such enormous dimensions as to give the idea of Arab horsemen defiling one after the other. The illusion was for a moment so complete that General Bugeaud sent a spahi forward as a scout. The latter crossed the lake in a straight line, but when he had reached a point where the undulations commenced, the horse's legs became so elongated that both steed and rider seemed to be borne up by a fantastic horse several yards high, and disporting itself in the midst of the water that appeared to submerge it. All eyes were fixed on this curious phenomenon, until a thick cloud, intercepting the sun's rays, caused these optical illusions to disappear, and re-established objects in their natural shape."

When, instead of occurring in plane and regular strata, refractions and reflections take place in curved and irregular strata, a

broken and fantastic mirage is produced. This is the case with the singular aerial picture formerly attributed to a fairy—the Fata Morgana—which sometimes attracts crowds of people to the sea-shore at Naples and at Reggio, upon the Sicilian coast. The phenomenon generally occurs of a morning in very calm weather. For an extent of several leagues the sea upon the Sicilian coast assumes the appearance of a chain of sombre mountains, while the waters upon the Calabrian side remain quite unaffected. Above the latter is seen depicted a row of several thousands of pilasters, all of equal elevation, of equal distance apart, and of equal degrees of light and shade. In the twinkling of an eye these pilasters sometimes lose half their height, and appear to take the shape of arcades and vaults, like the Roman aqueducts. There is often also noticeable a long cornice upon their summits, and there are also seen countless castles, all exactly alike. These soon fade away, and give place to towers, which in



WATER-SFOUT AT SEA.



ABOVE AND BELOW THE RAIN-CLOUD.

turn disappear, leaving nothing but a colonnade, then windows, and lastly pine-trees and cypresses, several times repeated.

The chapters on the wind form a very interesting portion of M. Flammarion's work.

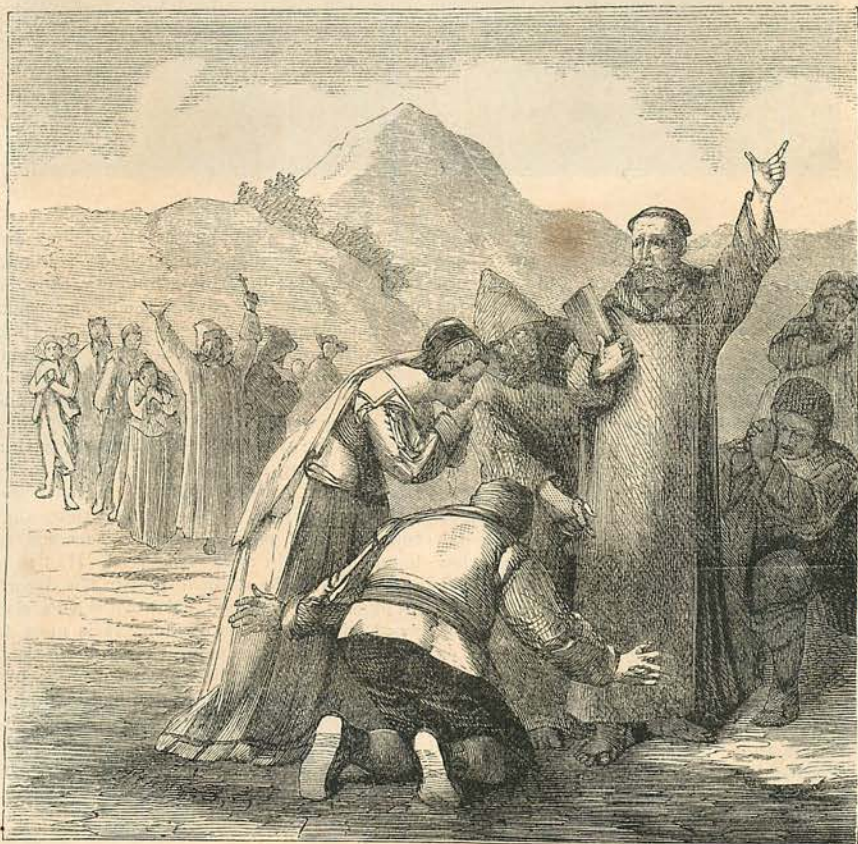
There is the *Fochu*, which blows from the hot deserts of Africa, and carries spring-time to the Alps, without whose genial influence those lofty peaks would never lose their covering of snow and ice, and the

greater part of Switzerland would become as bleak and inhospitable as the polar regions. There is also the Harmattan, a dry, scorching wind which blows in December, January, and February along the coast of Africa from Cape Verd and Cape Lopez toward the Atlantic Ocean. Its duration is from two to sixteen days. All this time the sun is obscured by a dull fog, which gives it a malignant red color. In the path of this scorching wind vegetation withers and dies, the leaves fall from the trees, and the grass becomes hard, crisp, and brittle. If it continues several days at a time, its effects on the human body become very painful. The eyes and lips dry, and the skin peels off. Covering the exposed parts with some oily substance is the only protection against its effects. The Arabs ascribe to it certain poisonous qualities—a fiction to alarm Europeans and keep them from invading the sacred precincts of the desert.

During the period of the equinox the desert storms become terrible. All the world has heard of that awful scourge of the desert, the Simoom, the poison-wind of the Arabs. In Egypt it is known by a name

signifying *fifty*, because it blows for twenty-five days before and after the vernal equinox. The Simoom announces its approach in the desert by a dense blackness on the horizon, which spreads rapidly as it approaches. A dull yellowish fog fills the air, and clouds of sand obscure the sun. The moment its approach is perceived the birds seek safety in flight. The inhabitants of towns and villages shut themselves up in their houses, and those in the desert burrow in pits dug for the purpose. Many persons die of suffocation when suddenly overtaken by this terrible wind. It is most fatal to caravans, where there are no opportunities for protection. The only safeguard is to fall prostrate on the sand and cover the mouth and nostrils. Camels instinctively bury their noses in the sand on perceiving its approach. In 1805 a caravan consisting of 2000 persons and 1800 camels perished in a Simoom.

Not less terrible are the great sand-storms which sometimes sweep over the vast deserts of Africa and Asia. The Hungarian savant Arminius Vámbéry, who traveled through many countries of the East in the disguise



BAIN OF BLOOD IN PROVENCE, JULY, 1608.



SHOWER OF LOCUSTS.

of a dervish, graphically describes one of these tempests encountered while traversing the desert between Khiva and Bokhara. Having quitted the country of the Turcomans and the Oxus, his caravan penetrated the sandy waste. The fatigue of marching was terrible. Camels and asses sank nearly to the knees in the fine sand. The second morning they camped at a station bearing the charming name of Adamkrylgan (which means "the place where men perish"). A dismal prospect extended on every side. Let the reader picture to himself a sea of sand stretching out to the horizon, on one hand rising into wave-like hills, on the other smooth and level as a lake. Not a bird was visible in the air, not a sign of living creature on the earth—nothing but traces of death in the bleaching bones of man or beast, thrown into heaps, the ghastly guide-posts of the caravan! After five days of weary marching, during which the water gave out, they neared the limit of the desert, and all eyes were searching eagerly to discover a shepherd's hut or a drove of cattle, when the leader drew attention to an approaching cloud of dust, and ordered every one to lose no time in dismounting from the

camels. The poor brutes themselves discerned the coming of the terrible "Tebbad," or sand-storm; uttering a loud cry, they fell on their knees, stretched their long necks along the ground, and strove to bury their heads in the sand. Vámbéry and his companions intrenched themselves behind the crouching animals, lying there as under the cover of a wall; and scarcely had they done so when the wind rushed over them with a dull clattering sound, leaving them, in its rapid flight, covered with a crust of sand two fingers thick. "The first particles that touched me," says Vámbéry, "seemed to burn like a rain of fiery flakes." Had they encountered the storm deeper in the desert, all must have perished. Tebbad is a Persian word, signifying *fever-wind*. It is most to be dreaded in the sandy deserts, where it may not only bring the torture of fever, but overwhelm every thing under dense volumes of sand.

Less destructive in their effects, but hardly less terrifying to the beholder, are the enormous sand columns raised by whirlwinds in the sandy deserts of Asia and Africa. They sometimes assume the most fantastic shapes, and move with almost in-

credible swiftmess. We can easily imagine that the superstitious children of the desert saw in these monstrous phenomena the manifestation of supernatural power, and that the whirling columns of sand and dust took shape in their minds as the dreaded genii and afrites of the *Arabian Nights*. Unlike the great sand-storms of which we have just been speaking, which sometimes overwhelm caravans and extend the desert area over vast tracts of fertile land, these sand-spouts, as they may be called, rarely produce much mischief. M. Flammarion relates several instances where the whirlwind or tornado which occasions them has done great damage to villages in France.

Analogous to the sand columns are the water-spouts frequently observed at sea, and sometimes also on land. They are columns of cloud or water, generally in the shape of a double cone, having its least diameter in the middle, and reaching from a low cloud to the surface of the land or water. When formed at sea by the action of the wind, they generally begin to form at the surface of the water, rising gradually until they meet the upper portion, which nearly at the

same time begins to descend from the cloud. On land they almost invariably commence in the under surface of a cloud, and descend rapidly until they reach the earth. At sea the spout or spouts, when formed, move in the direction of the wind, with a horizontal whirling motion; and when several of them are observed together, as is frequently the case, they present a majestic spectacle. Even when there is apparently no wind, the spouts may be seen to move along the surface of the water, sometimes in different directions, and to bend and twist as if violently agitated by some interior force. Some observers say that the formation of these spouts is accompanied with a dull rumbling noise, like that of a heavy cataract heard from a distance; the parting is sometimes followed by a loud report. The column sometimes disappears as if it were drawn up into the cloud from which it depended, sometimes in a heavy fall of rain, and at other times in a solid mass of water, popularly known as "a cloud-burst." The sailors' theory that a water-spout can be dissipated by a cannon-shot is not generally accepted.

Many of the most remarkable water-spouts



SHOWER OF BEETLES.



DR. RICHMANN STRUCK DEAD BY AN ELECTRICAL SHOCK.

have appeared on land, and these are frequently very destructive in their march. We have an account of one which is said to have broken in Lancashire, England, which for a distance of a mile tore up the earth to the depth of several feet, as if it had been furrowed by some gigantic plow. In the autumn of 1859 a water-spout burst near Calcutta, India, inundating a grassy plain to the extent of half a square mile to the depth of six inches; two weeks were required to drain off the water.

What is more lovely than a gentle rain? Poets have found their sweetest inspiration in its mysterious influence on the mind. Old Chaucer describes some one sleeping in a cave, while the rain pattered gently on the

leaves and grass without, and made his "sleep softer than it was." What lover of old English poetry does not recall that exquisite stanza in Spenser's *Faerie Queene*, describing the "Cave of Sleep?"

"And, more, to lulle him in his slumber soft,  
A trickling streame from high rock tumbling downe,  
And ever-drioting raine upon the loft,  
Mist with a murmuring winde, much like the sowne  
Of swarming bees, did cast him in a swowne."

But to quote half the beautiful sayings of the poets concerning rain would require a volume. To thoroughly enjoy even the most gentle summer shower one must be out of it—under cover. There is no romance in getting wet. Neither is the city the right place to enjoy a rain. To appreciate the



HARVESTERS KILLED BY LIGHTNING.

full beauty of an April shower one must be in the country, where the buds are beginning to swell on all the trees, and the meadows show bright patches of fresh green. How dismal the contrast of rain in the city! Sidewalks and street-crossings wet and muddy, innumerable drippings from eaves, spouts, and awnings, splatterings from passing vehicles, cars and omnibuses crowded with uncomfortable passengers—these are neither picturesque nor poetic suggestions. Who would not like to escape from this disagree-



CURIOUS FEAK OF LIGHTNING.

able scene and take a seat with the happy aeronaut who, above the low stratum of rain-cloud which drenches all beneath it, serenely navigates the calm region of sunshine? As we can't all keep balloons on hand for this purpose, let us be thankful for umbrellas.

Aside from the ordinary falls of rain, hail, and snow, the history of meteoric phenomena affords many instances of extraordinary showers from the sky, which have often carried terror to the minds of the ignorant and superstitious. Not to speak of "shooting-stars," or of those showers of stones, bricks, planks, pottery, which it is now known are due to the action of the whirlwinds which create water and sand spouts, there are certain singular and rare phenomena which, occurring now and then from the earliest times, have been regarded with peculiar horror and dismay. Such, for example, are the showers of blood to which Homer alludes as presaging the death of many valiant heroes, which Plutarch mentions as occurring after sanguinary battles. Many instances of blood-rain are chronicled of later date than the commencement of the Christian era. Blood is said to have fallen in Paris in the year 582, to the great terror of the inhabitants. In 1144 the same phenomenon was witnessed in several parts of Germany; and it is recorded that in March, 1181, a rain of blood continued for three days in France and Germany; during this dreadful period a luminous cross is said to have appeared in the sky. About the beginning of July, 1608, one of these pretend-

ed showers of blood occurred in Provence. The priests, either deceived themselves or wishing to impose on the credulity of the people, saw in this event the direct agency of the arch-enemy of mankind. Happily a man of sense and learning, M. Peirese, examined with great care some of the clots of blood which adhered to the walls of the church of Aix, and soon discovered that they were only the excrements of butterflies, great swarms of which had filled the air in that neighborhood for several weeks. Not a trace of blood had been found in the centre of the city, where the butterflies had not been observed. So a very commonplace discovery robbed the blood-rain of all its terrors. Colored showers have been too often observed in our own day to permit us to doubt the occurrence of the same phenomena in ancient times; the error was in attributing them to a supernatural cause. Showers of milk, of flesh, of grain, of fish, and of crosses of several colors are also mentioned in history; but for a full account and scientific explanation of these singular phenomena the reader is referred to M. Flammarion's exceedingly interesting work.

Showers of locusts, of frequent occurrence in the East, are due to the immense swarms of these nomadic insects caught by strong winds, and carried often to enormous distances through the air. Seen from a distance these swarms have the appearance of a black thunder-cloud. They conceal the sun; as far as the eye can reach they blacken the sky and cover the ground. Branches of trees crush under their weight, and grain



fields look as if an army had marched over them. Wherever they alight the whole aspect of the country becomes changed in a day. Great harvests disappear as if by magic, and brown and barren fields mark the course of their devastating march.

A few instances are on record where the common beetle has descended in showers, like the locust, covering great regions of country, and devouring every green thing. Figuiet relates that on the 18th of May, 1832, a shower of beetles assailed a diligence near the village of Talmontier, France, with such violence that the horses became furious and unmanageable.

Electrical experiments are said to date back at least as far as the time of Numa Pompilius, who appears to have been acquainted with the affinity of lightning for points, and with the properties of iron as a conductor of the dangerous fluid; but the first experiments which were turned to practical account were those made by Benjamin Franklin, in 1752. His discoveries, communicated to European savants, gave a fresh impulse to the investigation of the subject, and his experiments were repeated, with the same success, in every country of the Old World. These experiments were not unattended with danger, although but one fatal accident to a savant is recorded. Dr. Richmann, a member of the St. Petersburg Academy of Sciences, had constructed an electrical conductor, leading from the roof of his house into his cabinet, to enable him to measure every day the strength of the atmospheric electricity. On the 6th of August, 1753, a little more than a year after Franklin made his celebrated experiment with the kite, during the prevalence of a heavy thunder-storm, Dr. Richmann incautiously approached the apparatus. As he bent over it a ball of fire was seen by his assistant to flash toward him from the point of the conductor, striking him on the forehead, and laying him dead on the floor.

Within the last half century the study of electricity has been eagerly pursued, with what magnificent results is known to all. The electric telegraph, which links all nations together, and the electrotype process, so useful in many branches of art, are among the most important of these results. But when we come to inquire what it is, we are still comparatively in the dark. Electricity is a *force*, with the nature of which, as with that of heat, of light, of attraction, we are still ignorant. This force produces certain effects, the study of which constitutes this branch of physical science. It is known that electricity is a subtle fluid, susceptible of accumulation, condensation, and rarefaction; that it can be discharged from one body to another, and traverse immense distances with inconceivable rapidity, superior to that of light; that this fluid has two

modes of existence, two modes of manifestation, which we distinguish by calling the one positive, the other negative. The terrestrial globe and the atmosphere are two grand reservoirs of electricity, between which occur perpetual changes of decomposition and reconstruction, which, in animal and vegetable life, play a rôle complementary to the work of heat and of humidity. Humboldt calls electricity the life or soul of the world, a mysterious force whose nature, like spirit, must always remain a matter of speculation only.

Many are the marvelous freaks and jests played by electricity, sometimes ending in tragedy. Among the most remarkable is that of striking a person dead, and leaving him in the exact position occupied at the moment the shock was given, just as if he were still alive, and yet so thoroughly consumed as to be nothing but a mass of cinders. Thus we are told that at Vic-sur-Aisne, France, in 1833, three soldiers sought refuge from a violent thunder-storm under a linden-tree. Some peasants, seeing them stand motionless long after the storm had passed, and receiving no response to a pleasant salutation, touched them on the shoulder. The bodies instantly crumbled to fine ashes! Yet the moment before there was no evidence that the lightning had touched them. Their clothing was not torn, and their faces wore a natural appearance. The following remarkable circumstance was witnessed by Pastor Butler: On the 27th of July, 1691, ten harvesters took refuge under a hedge on the approach of a thunder-storm. The lightning struck and killed four of them, who remained as if suddenly petrified. One of them was just putting a bit of tobacco in his mouth, another was fondling a little dog on his knee with one hand and feeding him with the other. M. Cardan relates that eight harvesters, taking their noonday repast under a maple-tree during a thunder-storm, were killed by one stroke of lightning. When approached by their companions, after the storm had cleared away, they seemed to be still at their repast. One was raising a glass to drink, another was in the act of taking a bit of bread, a third was reaching out his hand to a plate. There they sat as if petrified, in the exact position in which death surprised them.

The following harmless freak of electricity is recorded by Flammarion. On the 10th of September, 1845, during a violent thunder-storm, a house in the village of Salagnac, France, was struck by lightning. A large ball of fire descended the chimney, and rolled across the floor of a room in which sat a child and three women. No one was hurt. It then rolled out through the centre of the kitchen, passing close to the feet of a young peasant, and disappeared through a crevice in the wall. Its erratic course ended in the pig-

sty, the harmless occupant of which it despitefully slew, without setting on fire the straw on which the creature lay.

Here we must take leave of M. Flammarion and his entertaining and instructive book, in which the reader will find a vast amount of curious and valuable information concerning the air and atmospheric phenomena, enlivened with pleasant anecdotes drawn from the experience of travelers and observers, and with a great number of wood-engravings and chromos of exquisite delicacy and finish.

### MY TRAMP.

**A** RAP. When one has been in the habit of living a good deal alone, as I have done, one gets to know the various neighborly hands that do duty on the old knocker. There is the pompous village doctor, the hurried postman, the friendly gossip, the patient old gray-haired pastor. But it could be none of these at this hour of the night. This rap that I heard below was a strange one—a feeble, indecisive sound, as though the intruder were half inclined to turn away, after all. It startled me, however, being all alone in the house, old Betsey, my sole servant, having gone off to visit her sister. I hesitated on the stairs a moment, only a moment—possibly I might be wanted at the mill, or some neighbor might be sick—and without further delay I went down and unbolted the door. The old-fashioned stoop, with its suggestive benches on either side, lay solitary and silent in the moonlight; the garden path, weedly overgrown since father's death, and sentinelled here and there with ragged hollyhock, lay quiet and dew-laden. No one was to be seen.

I stood an instant waiting, then shut the door and slowly returned up stairs. But somehow the house felt empty and chill now. I could not gather back the delicious sense of rest and idle reverie which that rap had disturbed, and I remembered, for the first time, that there was not a soul within sound of my voice. But what was there to be afraid of in the old house—the quiet old house where my father and mother had lived and died? Nobody ever intruded on my solitude; and I had the old mill for company. I looked out of the window now, and saw its wrinkled, time-worn face brooding shadowy in the moonlight. It looked such an ancient, familiar friend, that old mill, in which my father had worked so many years. Its rickety bridge, its great wheel, its gurgling water, I had known them ever since a child. I could hear even at this distance in the night silence the rush of the mill-stream, swollen by the spring rains; and glancing away down the dim ridges of hillock and meadow, I caught the twinkle of a light in the window. Good old Mr. Lowell,

the Quaker owner, was probably there making up his accounts. Perhaps he had sent for me, and the messenger had got out of patience with my delay. I often helped him with his accounts, as my father had done before me. Having worked in the mill so long, I sometimes got a little extra pay for this, and for looking after the rest of the girls. Pleasant times we girls had in the old paper-mill, after all, for Mr. Lowell kept it running in leisurely fashion, and we had many a half-holiday that never was counted against us. Only in the fall and spring there was a "drive," and Mr. Lowell staid late looking over his neglected accounts.

I was still standing with the window-curtain held back in my hand, when I was roused by another rap at the door. I lost not a minute this time, but hurried courageously down the creaking stairway, withdrew the bolts, and looked out heroically. A man stood in the doorway a little apart, in the shadow, as if shrinking from too sudden observation. His face was not clearly visible, being shaded by a wide-brimmed felt hat, but a pair of strange black eyes glanced covertly out from under it. The eyes seemed to mean much; they sent a shiver through me.

"What do you want?" I said, abruptly.

"I—I am looking for Farmer Darby."

Then I felt sure there was something wrong, for Farmer Darby lived down on the other road, a couple of miles away. I told the man so, curtly enough, and prepared to shut the door. The slow and unsteady step with which he turned away added to my suspicion: drunk, no doubt; one of those "tramps" with which the country was infested lately, ready to beg or steal, or do any thing but earn an honest living.

I was framing some means of convincing him there were men about the place, when he turned as he staggered down the steps.

"I am sorry to have scared you, mistress," he said.

Scared me!—me, with a reputation for courage the country round.

"I shouldn't have knocked a second time, only seeing the light."

He walked slowly down the path to the gate, and I saw his shadow moving unsteadily along on the moon-lit road. I watched till he came to the great gnarled oak at the corner of the clover field, and then disappeared. He went no further. I was certain of that.

Was he watching the place to do it a mischief? Those black eyes of his had an incendiary look. I was full of pluck or alarm, I scarcely know which. I slipped softly down the steps, and following the path inside the fence, made my way through the wet grass till I reached the bars over which that old oak spread its scared and crooked boughs. Furtively from the tangle of shrubs and elder brush I looked out. There lay