tain moisture is increased, and by a lowering of temperature decreased. Cold breezes, by lowering the temperature of the air, cause the uniform moisture to assume the appearance of clouds, and then to fall as rain. Clouds disappear or melt into thin invisible vapour in fine weather, and again appear when it is cold.—When a cloud descends on the side of a hill, it gradually enters a region of warmth or higher temperature, and disappears. One minute it seems a thick white vapour, and the next it is gone: but when a cloud ascends a hill, it enters a region of cold, and consequently being condensed, it is precipitated as a shower of rain. Hence, the old familiar rhyme—

When the clouds go up the hill,
They'll send down water to turn a mill.

Thus the atmosphere is the great field in which the varied phenomena of clouds, rainbows, meteors, and other appearances in the sky, are exhibited. As respects the phenomena of light itself, the atmosphere acts a most important part. Received in it, the rays of the sun are harmoniously diffused in all directions through it, as through a thick crystalline body, and afford light in situations which would otherwise be in darkness. The atmosphere, therefore, which an ignorant person might suppose to be nothing, is as invaluable a constituent of creation as land or water; it is a fluid essential for the existence of animals and plants; it affords a field for all kinds of meteological phenomena; it is a supporter of combustion, and an important agent in the diffusion of heat and light, and also in the transmission of sound.

Hitherto we have spoken of the atmosphere only in reference to its external character—we have now to say something respecting its composition. As already stated, the air is a compound substance. It is composed of nitrogen and oxygen gases, with a very small proportion of carbonic acid gas. Of 100 parts of pure air, reckoning by weight, about 76 are nitrogen, 23 oxygen, and 1 carbonic acid gas and watery vapour. Both as respects weight and bulk, nitrogen forms the chief ingredient of the atmosphere. This gas, which is sometimes called azote, acts chiefly as a diluent to modify the strength of the oxygen, in the same way as water is sometimes used to mix with and modify the strength of spirits. The oxygen is the essential and active part of the air. It serves to keep up combustion or burning, and the principal element required for the breathing of animals and the life of plants. In serving its many purposes, oxygen undergoes a material change, but the nitrogen which conveys it is seldom altered in character. Animal respiration changes the constitution of air; oxygen is destroyed or deposited in the blood, and carbonic acid is given out in its stead. Thus we inhale pure air, and exhale that which is foul, carbonic acid being an impure and heavy species of gas. It has been ascertained by experiments that the same proportional quantities of nitrogen, oxygen, and carbonic acid, are in the air at all heights from the ground, and that notwithstanding the perpetual consumption of oxygen and deposition of carbonic acid, the atmosphere is precisely of the same purity that it was fifty years ago.

The constant preservation of atmospheric purity is one of the grandest phenomena of nature. The purification is effected by divers processes—as, by winds, by the vast extent of ocean over whose surface is an inexhaustible reservoir of pure air, by electric agency, but chiefly by the solar rays. It was long believed by men of science that plants possessed the power of exuding oxygen, and so formed a prime agent for restoring vitiated air to purity. Later investigations, chiefly by French chemists, have made it evident that plants have no such power, unless when placed under the influence of the sun's rays, or in other words, that solar light is the grand cleanser of the atmosphere, and without which both plants and animals languish and die. With respect to plants in particular, it is ascertainted, that while inhaling oxygen and expiring carbonic acid, their leaves possess the remarkable property, in conjunction with the sun's light, of re-transforming the carbonic into oxygen. At night, when the light of day has departed, the expired carbonic acid may be detected in the neighbourhood of plants, and hence one cause of injury to health by breathing night air; but when the morning sun again bursts upon the scene, a great chemical process commences in the atmosphere—the carbonic acid is decomposed, oxygen is evolved, and all nature rejoices in a re-creation of its appropriate nourishment.

The alternate vitiation and purification is emphatically described as follows by Mr. Ellis, in an article on vegetation in the Gardener's Magazine, vol. 15: "Under a bright sunshine, the two processes by which carbonic acid is alternately formed and decomposed, go on simultaneously; and their necessary operation, in as far as regards the condition of the air, is that of counteracting each other. Hence, though both may be continually exercised in favorable circumstances, the effects of neither on the atmosphere can be ascertained by ordinary means; and, consequently, though in the experiments of De Saussure with common air, the production and decomposition of carbonic acid by plants in sunshine must have been continually going on, yet in all the analyses which he made, the air was found unchanged either in purity or volume; in other words, the processes of formation and decomposition of this acid gas exactly counterbalanced each other.

Of the two processes which have been now described (continues our authority) each may be considered as in its nature and purpose quite distinct from the other; hence their effects may be readily distinguished; neither do they necessarily interfere, when actually working together. The first or deteriorating process, in which oxygen gas is consumed, goes on at all times and in all circumstances when vegetation is active. It requires always a suitable temperature in which to display itself; and when that temperature falls below a certain point, which is very variable in regard to different plants, the process is more or less completely suspended, again to be renewed when the temperature shall again return. This conversion of oxygen into carbonic acid is as necessary to the evolution of the seed as to the growth of the plant, and is all that is required for germination; but the plant requires something more, for, if light be excluded, vegetation proceeds imperfectly, and the plant does not then acquire its proper colour, and other active properties which it ought to have. The chief organs by which the consumption of oxygen gas is effected, are the leaves, and its purpose, in great part at least, seems to be that of producing some necessary change in the sap during its transmission through those organs, on its way from the vessels of the wood to those of the inner bark, whereby it may be rendered fit for the purposes of nutrition and growth. In its nature and object, therefore, as well as in the specific change which it produces in the air, this process closely resembles the function of respiration in animals, and may thus with propriety be deemed a physiological process. The second, or purifying process, in which oxygen gas is evolved, differs in all respects from that which has just been described.—It is in a great measure independent of temperature; at least it proceeds in temperatures too low to support vegetation, provided light be present, an agent not required for germination, nor essential to vegetable developement. The organs by which this process acts on the air, are, as before, the leaves; not, however, by changing the qualities of the sap in the vessels of those organs, but by producing changes in the chromule, or colourable matter, in their cells, to which it imparts colour and other active properties. In doing this, it does not convert the oxygen gas of the air into carbonic acid, but, by decomposing that acid gas, restores to the air the identical portion of oxygen of which the former process had deprived it. The former process, carried on by the agency of the oxygen gas of the air, was essential to living action, and effected the well being of the whole plant; that exercised by the agency of light is not necessary to life, is local, not general in its operation, and is capable of proceeding in circumstances and under conditions incompatible with living action. By withdrawing the air altogether, or depriving it of oxygen gas, vegetation soon ceases throughout the whole plant; but the exclusion of light from any part of the plant affects that part only; and even the total exclusion of that agent only deprives the plant of certain properties necessary to its perfection, but not essential to its life. These differences in the processes by which oxygen gas is alternately consumed and evolved, during the vegetation of plants in sunshine, are so manifest, both in their nature and effects, as to satisfy the ascription of a name to the latter process distinct from that given to the former. It might, perhaps, be denominated the chemical process, in contradistinction to that named physiological.

It would contribute much, we think, to simplify our inquiries concerning vegetation, to bear in mind these distinctions; to consider the one process as accomplished by the agency of the air, and essential to the life and growth of the plant; the other as