Scientific.

The Elements.

THEIR SEVERAL DISTINCT USES.

We can never think of the elements without reflecting upon the number of distinct uses which are *consolidated* in the same substance. The *air* supplies the lungs, supports fire, conveys sound, reflects light, diffuses smells, gives rain, wafts ships, bears up birds. *Water* beside maintaining its own inhabitants, is the universal nourisher of plants, and through them of terrestial animals; is the basis of their juices and fluids: dilutes their food, quenches their thirst, floats their burthens. *Fire* warms, dissolves, enlightens; is the great promoter of vegetation and life, if not necessary to the support of both.

We might enlarge, to almost any length we pleased, upon each of these uses; but it appears to be almost sufficient to state them. The few remarks, which I judge it necessary to add, are as follow.

AIR.

Air is essentially different from earth. There appears to be no necessity for an atmosphere's investing our globe: yet it does invest it; and we see how many, how various, and how important are the purposes which it answers to every order of animated, not to say of organized, beings, which are placed upon the terrestrial surface. I think that every one of these uses will be understood upon the first mention of them, except it be that of *reflecting* light, which may be explained thus. If I had the power of seeing only by means of rays coming directly from the sun, whenever I turned my back upon the luminary, I should find myself in darkness. If I had the power of seeing by reflected light, yet by means only of light reflected from solid masses, these masses would shine, indeed, and glisten, but it would be in the dark. The hemisphere, the sky, the world, could only be *illuminated*, as it is illuminated, by the light of the sun being from all sides, and in every direction, reflected to the eye, by particles, as numerous, as thickly scattered, and as widely diffused, as are those of the air.

Another general quality of the atmosphere is, the power of evaporating fluids. The adjustments of this quality to our use is seen in its action upon the sea. In the sea, water and salt are mixed together most intimately; yet the atmosphere raises the water, and leaves the salt. Pure and fresh as drops of rain descend, they are collected from brine. If evaporation be solution, (which seems to be probable,) then the air dissolves the water, and not the salt. Upon whatever it be founded, the distinction is critical; so much so, that, when we attempt to imitate the process by art, we must regulate our distillation with great care and nicety, or, together with the water, we get the bitterness, or, at least, the distastefulness of the marine substance: and, after all, it is owing to this original elective power in the air, that we can effect the separation which we wish, by any art or means whatever.

By evaporation water is carried up into the air; by the converse of evaporation it falls down upon the earth. And how does it fall? Not by the clouds being all at once reconverted into water, and descending like a sheet; not in rushing down in columns from a spout; but in moderate drops, as from a cullender. Our watering-pots are made to imitate showers of rain. Yet, a priori, I should have thought either of the two former methods more likely to have taken place than the last.

By respiration, flame, putrefaction, air is rendered unfit for the support of animal life. By the constant operation of these corrupting principles, the whole atmosphere, if there were no restoring causes, would come at length to be deprived of its necessary degree of purity. Some of these causes seem to have been discovered, and their efficacy ascertained by experiment. And so far as the discovery has proceeded, it opens to us a beautiful and a wonderful œconomy. *Vegetation* proves to be one of them. A sprig of mint, corked up with a small portion of foul air placed in the light, renders it again capable of supporting life or flame. Here therefore is a constant circulation of benefits maintained between the two great provinces of organized nature. The plant purifies what the animal had poisoned: in return, the contaminated air is more than ordinarily nutritious to the plant. *Agitation with water* turns out to be another of these restoratives. The foulest air, shaken in a bottle with water for a sufficient length of time, recovers a great degree of its purity. Here then again, allowing for the scale upon which nature works, we see the salutary effects of *storms* and *tempests*. The yeasty waves, which confound the heaven and the sea, are doing the very thing which is done in the bottle. Nothing can be of greater importance to the living creation, than the salubrity of their atmosphere. It ought to reconcile us therefore to those agitations of the elements, of which we sometimes deplore the consequences, to know that they tend powerfully to restore to the air that purity, which so many causes are constantly impairing.

WATER.

In water, what ought not a little to be admired, are those negative qualities which constitute its *purity*. Had it been vinous, or oleaginous, or acid; had the sea been filled, or the rivers flowed, with wine or milk; fish, constituted, as they are, must have died; plants, constituted, as they are, would have withered; the lives of animals, which feed upon plants, must have perished. Its very *insipidity*, which is one of the most negative qualities, renders it the best of all menstrua. Having no taste of its own, it becomes the sincere vehicle of every other. Had there been a taste in water, be it what it might, it would have infected every thing we eat or drink, with an importunate repetition of the same flavor.

Another thing in this element, not less to be admired, is the constant *round* which it travels; and by which without suffering either adulteration or waste, it is continually offering itself to the wants of the habitable globe. From the sea are exhaled those vapours which form the clouds. The clouds descend in showers, which penetrating into the crevices of the hills, supply springs. Which springs flow in little streams into the valleys; and, there uniting, becomes rivers. Which rivers, in return, feed the ocean. So there is an incessant circulation of the same fluid; and not one drop probably more or less now, than there was at the creation. A particle of water takes its departure from the surface of the sea, in order to fulfil certain important offices to the earth; and having executed the service which was assigned to it, returns to the bosom which it left.

Some have thought that we have too much water upon the globe; the sea occupying above three quarters of its whole surface. But the expanse of ocean, immense as it is, may be no more than sufficient to fertilise the earth. Or, independently of this reason, I know not why the sea may not have as good a right to its place as the land. It may proportionably support as many inhabitants; minister to as large an suggregate of enjoyment. The land only affords a habitable surface; the sea is habitable to a great depth.

FIRE.

Of fire, we have said that it *dissolves*. The only idea probably which this term raised in the reader's mind was, that of fire melting metals, resins, and some substances, fluxing ores, running glass, and assisting us in many of our operations, chymical or culinary. Now these are only uses of an occasional kind, and give us a very imperfect notion of what fire does for us. The grand importance of this dissolving power, the greater office deed of fire in the œconomy of nature, is keeping things in a state of solution, that is to say, in a state of fluidity. Were it not for the presence of heat, of a certain degree of it, all fluids would be frozen. The ocean itself would be a quarry of ice; universal nature stiff and dead.

We see therefore, that the elements bear, not only a strict relation to the constitution of organized bodies, but a ralation to each other. Water could not perform its office to the earth without air; nor exist, as water, without fire, or *heat*.

LIGHT.

Of light, (whether we regard it as of the same substance with fire, or as a different substance,) it is altogether superfluous to expatiate upon the use. No man disputes it. The observations, before, which I shall offer, respect that little which we seem to know of its constitution.

Light passes from the sun to the earth in eleven minutes; a distance, which it would take a cannon ball twenty-five years, in going over. Nothing more need be said to show the velocity of light. Urged by such a velocity, with what *force* must its particles drive against, I would not say the eye, the tenderest of animal substances, but every substance, animate or inanimate, which stands in its way? It might seem to be a force sufficient to shatter to atoms the hardest bodies.

How then is this effect, the consequence of such prodigious velocity, guarded against? By a proportionable *minuteness* of the particles of which light is composed. It is impossible for the human mind to imagine to itself any thing so small as a particle of light. But this extreme exility, though difficult to conceive, it is easy to prove. A drop of tallow, expended in the work of a farthing candle, shall shed forth rays sufficient to fill a hemisphere of a mile diameter; and to fill it so full of these rays, that an aperture not larger than the pupil of an eye, wherever it be placed within the hemisphere, shall be sure to receive some of them. What floods of light are continually poured from the sun we cannot estimate; but the immensity of the sphere which is filled with its particles, even if it reached no further than the orbit of the earth, we can in some sort compute: and we have reason to believe, that, throughout this whole region, the particles of light lie, in latitude at least, near to one another. The spissitude of the sun's rays at the earth is such, that the number which falls upon a burning glass of an inch diameter, is sufficient, when concentrated, to set wood on fire.

The tenuity and the velociety of particles of light, as ascertained by separate observations, may be said to be proportioned to each other; both surpassing our utmost stretch of comprehension; but proportioned. And it is this proportion alone, which converts a tremendous element into a welcome visitor.

It has been observed to me by a learned friend, as having often struck his mind, that if light had been made by a common artist, it would have been of one uniform *colour;* whereas, by its present composition, we have that variety of colours, which is of such infinite use to us for the distinguishing of objects; which adds so much to the beauty of the earth, and augments the stock of our innocent pleasures.

With which may be joined another reflection, viz. that considering light as compounded of rays of seven different colours, (of which there can be no doubt, because it can be resolved into these rays by simply passing it through a prism,) the constituent parts must be well mixed and blended together, to produce a fluid, so clear and colourless, as a beam of light is, when received from the sun.—*Dr. Paley.*

The Farm.

How Animals cool off.

The genus homo and the genus horse have a double privilege of refrigeration, while all other animated beings have but one. You may be surprised to learn that no other beings sweat except men and horses, and hence no other beings can cool themselves, when hot, by perspiration through the skin. The confirmation of this fact is found in the whole range of comparative anatomy, where nature has furnished examples on the most extended scale of magnitude, in the whole animal world, in the largest as well as the smallest of beings.

In all the pachydermata, or thick-skinned animals, except the horse, are found no pores in the skin that exhale heat by perspiration, the envelope on all these animals being only a secreting surface, like others of the internal surface of the body. All the cleft-feet species, including those presenting feet with toes rounded and unprovided with claws, the elephant, rhinoceros, bison, mammoth, mastadon, buffalo, ox, swine, deer, as well as the lion, tiger, bear, wolf, fox, birds, squirrels, dormouses, opossum, raccoon, all alike offer the same examples as the dog, that they have no other means of cooling themselves when hot except through the medium of the lungs, by espiration.

The farmer drives his oxen, in the summer heat, with great care, and when they open their mouths and thrust out their tongues, and pant to exhale the heat generated be exercise, if he does not stop their motion, they die with the heat that accumulates within them. His hogs, too, must be driven with more care, and if they are allowed to grow fat in hot weather, they often die, panting in a state of repose, when in the shade.

All these animals, with the exception of the elephant and rhinoceros, are covered with hair and fur, or feathers and down, which varies with the climate.

The fur and down tribe throw off their rich covering at the approach of spring and revel with their fellows in the summer's sun, and, as the autumn returns, they are re-furnished with their furs and down, in anticipation of the winter's frost.

In health, these animals have a large deposit of fat beneath the skin; fat is a mixture of two or more ingredients, which differ from each other in consistency—in most instances, they are stearine and margarine, along with a liquid oleine; as the weather cools, these oils and fat condense, and as they solidify, they become non-conductors of heat, and as the heat accumulates beneath the skin, it generates the delicate furs and down for winter's use; and in the spring, as the temperature rises, the oleine becomes volatile, and sheds them again for the summer's heat; so that this simple law for the generation of heat, in animal, as in vegetable life, is graduated by the fluctuations of the season, and the revolutions of time. The familiar example of the dog, who generates his heat at the expense of his substance, as he increases his speed, and having no pores in his skin, he multiplies his respiration in the ratio of motion, as the only means of keeping himself cool, and having no perspiration to check, he plunges into water with impunity, and returns refreshed, when men and horses submerged in a similar condition, would suddenly check perspiration, and if they survived the shock, it would be to die with acute or chronic inflammation.—*Dr. F. Vanderburgh's Address before the N. Y. Acad. of Medicine.*

Disposition of the Horse.

Horses differ as much in their dispositions as men, while some are gentle, inteligent, and capable of learning almost any thing, others are dull, stupid, stubborn, and headstrong, it being almost impossible to teach them any thing but to kick and bite. A horse that is proud and high-spirited would suit a man that is such, much better than one that is dull and phlegmatic; while on the contrary, a dull, stupid man would prefer a horse like himself, or, at any rate, he would not have him long, before he would become like himself. The disposition of a horse may be known by the shape of his head. A horse with the eyes wide apart, prominent and round, and with the bones elevated between and above the eyes, and wide between the ears, is kind and courageous, gentle, tractable, and fond of being caressed; easy to teach to perform feats, readily understanding the wants of his master, and always ready to comply with them. Some horses are naturally timid and shy; all such horses are narrow between the ears, like the rabbit and the deer, and dangerous and difficult to manage, and therefore should never be selected for general purposes.

I had once a horse as the above described, which, as some one says, "could do every thing but talk: his wide-set ears, his speaking eyes, and his nose, like velvet, being brought into continual requisition to express his meaning. My business lying across the country and by bad roads, it was only necessary for me to lay the rein upon his neck—he would take me through them; and during the worst nights of weather that were ever known, amid thunder, lightning, rain and hail, some one says, and wish yourself at home—it was only necessary to lie upon his neck, as and you were soon there.

Time for Heifers Calving.—A late English writer considers it a matter of great importance that heifers should be so managed as to have their first calf late in spring, when there is an abundance of succulent food, inducing a large supply of milk. This is much better than to have them come in early in spring, when they have dry food only. The habit at first formed is apt to remain with them, and, if they commence by giving a good supply of milk, they are apt to be good milkers afterward.

To Prepare Hung Beef.—An English method is as follows: This is preserved either with or without smoke. Hang up the beef three or four days, till it becomes tender, but take care it does not begin to spoil; then salt it in the usual way, either by dry salting or by brine, with bay salt, brown sugar and saltpetre, with a little pepper and allspice; afterwards roll it tight in a cloth, and hang it up in a warm, not a hot place, for a fortnight or more, till it is sufficiently hard. If required to have a little of the smoky flavor it may be hung in a chimney corner, or smoked in any other way. It will keep a long time.

Power should not be employed to do wrong, but to punish the doers of wrong.

Public men should have public minds, or private ends will be served at the public cost.