Molecular Impressions by Light and Electricity.

In the last number of the London *Artisan*, we find the report of a lecture on the above subject, by Prof. Grove, delivered before the Royal Society, from which we condense a few interesting extracts.

He employed the term "molecular" as signifying particles of bodies smaller than those having *sensible* magnitude. The effects of light and electricity depend upon the molecular structure of bodies subjected to their influence. Carbon, in the form of the diamond, transmits light, but stops electricity; carbon in the form of coke or graphite, into which the diamond may be transformed by heat, transmits electricity but stops heat. All solid bodies which transmit light (being transparent) are non-conductors of electricity, while all the best conductors of electricity are opaque to light. The converse of this class of interesting facts was the principal subject of the lecture, namely, the changes produced in the molecular structure of matter by light and electricity.

Euler conceived that light may be regarded as the undulation of ordinary matter, but Dr. Young, in answer to this theory, asserted that if this were the case, all bodies should be thrown into a state of molecular vibration, by the impact of light, and this was considered a formidable argument against Euler. Recent experiments, however, especially those of M. Niepce de St. Victor, go to prove that bodies are thrown into a state of molecular undulation by light falling on them. The following experiment tests the truth of this theory:—Take an engraving which has been kept in a dark room, and expose one-half of it to the sunlight, the other half being covered with an opaque screen; then take it again into a dark room, remove the opaque screen and place the whole surface in close proximity to a sheet of sensitive photographic paper, and allow it to remain thus for some hours. It will now be found that the portion of the engraving which has been exposed to the light will have reproduced itself upon the photographic paper, while no effect has been produced by the part which was covered with the screen. Paper exposed to sunlight, then quickly placed in a covered tin case, will, when set in the dark, radiate phosphorescent force through a round aperture in the lid, and produce a circular mark on photographic paper—even impressing upon it the lines of an interposed engraving.

Last autumn, while Prof. Grove was fishing at Fontenay, he observed some patches on the skin of a trout, which he was sure were not there when it was taken out of the water. The thought struck him that the cause was exposure of some parts of the fish to the sun, other parts being covered. To determine this he took the first fresh-caught trout and placed it on the ground with a green serrated leaf on each side. After an hour's exposure the fish was examined, when the well defined image of the leaf was found on the upper exposed side, but no effect was observable on the under or sheltered side of the trout.

The effect of light is not so well understood, nor so generally recognized as it should be. Light is required for the healthy growth of animals and plants. Dark rooms are not so healthy as those exposed to light. There is an invisible phosphorescence which radiates from walls and furniture, exerting a powerful tendency to produce chemical changes greatly affecting the animate world.

Electricity also produces molecular changes in bodies exposed to its action, the most familiar of which is the conversion of atmospheric air into ozone, by a succession of electrical discharges passed through it. This is a branch of science, however, regarding which much has yet to be learned—a boundless field is still open for investigation.

American Vines and Wines.

At the meetings of the Farmers' Club held at the American Institute, this city, a few good things are sometimes elicited from a great mass of trifling matters. This was the case, we think, in a recent discussion regarding the vine culture in our country. Dr. Underhill, of Croton Point, the most famous cultivator of the grape in this region, stated that the Isabella and the Catawba—both native grapes—were the most reliable for this latitude from the Atlantic to the Pacific. The great secret, he asserted, in making a vinyard is in the preparation of the ground; it must be deeply trenched and well drained, and swamp muck makes the cheapest and best manure. He trains his vines on wires strained between posts situated twenty feet apart, and has not lost a crop in twenty years, and he has a vinyard of forty-two acres.

These views were confirmed by others present. Wm. Lawton stated that many foreign varieties of grapes had been introduced under the fallacious idea that they would flourish wherever the peach could be cultivated, but all had failed. The Isabella and Catawba were the most certain, and every farmer in our country could and should raise a plentiful supply of grapes for his own family use; three vines properly treated will afford sufficient for a large family.

James C. Provost, of Green Point, L. I., detailed his method of cultivating the grape, which is certainly quite original and different from any other described in works on this subject. His land is loam, with water only a few feet underneath the surface. His vines are trained on trellises eight feet high; from one vine trained on the end of a house he had made twenty-two gallons of wine. The singular part of his method of cultivation is to allow the vines to fall over the trellises, reach down to the ground, and take root at their extremities in the soil. Some of his vines yield so richly that they appear like a mass of fruit in the fall, from the ground to the top. He trims very sparingly, spreads the manure on the surface, never disturbs the old roots and keeps the soil very loose. From three-quarters of an acre of vines, he stated that he had made more than a thousand gallons of wine. The grapes he crushed in a roller sugar mill, and to every gallon of juice one pound of sugar was added—nothing else. It takes five gallons of the pure juice of the grape to make one of brandy.

The grape vine may be profitably cultivated on lands which cannot be employed for common agricultural purposes. In a recent letter to the Patent Office, Prof. Swallow, the State geologist of Missouri, asserts that the very extensive tracts of unproductive land in Kentucky and Tennessee, known by the appellation of "The Barrens," may be converted into fruitful vinyards. He also asserts that there are twenty million acres of land in Missouri, Kentucky, and Tennessee on which the vine will succeed as well as in France or Germany.

Chiccory Cultivation.

This plant (cichorium intybus) is called by many persons "German coffee," on account of the use to which it is so extensively applied in Germany. It is very similar to the succory often found growing wild on the slaty soils of New England, and it may be profitably cultivated for home consumption, as a great quantity of it is now sold in New York and other places, all of which is imported from Europe. It is often mixed with the ground coffee sold in stores, but the Germans buy it separate and mix it with their coffee to suit themselves. When combined with coffee it has been called an *adulteration*, but this is not a correct application of the term, because it really does not impart inferior or injurious qualities to the coffee, but is by many persons considered an improvement. It at least imparts a superior taste to inferior coffee, and as it is cheaper and held to be as healthy, it should be purchased separately and mixed with coffee in quantities to suit the tastes of those who use it as a beverage. The proportions of the two used together are one of chiccory to three of coffee.

This plant is now cultivated very extensively in France, Germany, Holland, and England. It is sown and cultivated in rows, like the carrot, and the roots are taken up early in the autumn. Farmers who cultivate it on a large scale partially dry the roots and sell them to manufacturers, who roast, grind, and pack them up for sale. Those who cultivate little patches for their own family use, store the roots in their cellars, cover them with sand, take out a few as wanted, wash, cut them in slices, roast them like coffee, and then grind them.

Antiquity of Brass.

Prof. Osborn, in a lecture before the Geographical and Statistical Society, of this city, a short time since, proved very conclusively that brass was known long before the time which the German metallurgists fix for its invention—somewhere about the thirteenth century. He arrives at his facts from the analysis of coins anterior to that date, and explains how easily brass might have been made. Copper was well known in the time of Moses, and the mixture of this with any of the zinc ores, which were abundant in the East, would produce brass. His idea is strengthened by the fact that Pliny and Strabo both mention the "cadma" earth and "calamine" stone, (both carbonates of zinc) as used in the production of brass. At the present time the best brass is made in the same way, namely, by fusing together copper, charcoal, and rocky carbonate of zinc, when the carbonate is decomposed and brass is the product of the fusion.

The Composition of Milk at Various Times of the Day.

Professor Boedeker has analyzed the milk of a healthy cow at various times of the day, with the view of determining the changes in the relative amount of its constituents. He found the solids of the evening milk (13 per cent) exceeding those of the morning's milk (10 per cent), while the water contained in the fluid was diminished from 89 per cent to 36 per cent. The fatty matters gradually increase as the day progresses. In the morning they amount to 2.17 per cent, at noon 2.63 per cent, and in the evening 5.42 per cent. This fact is important in a practical point of view; for while sixteen ounces of morning's milk will yield nearly half an ounce of butter, about double this quantity can be obtained from the evening's milk. The casein is also increased in the evening's milk from 2.24 to 2.70 per cent; but the albumen is diminished from 0.44 per cent to 0.31 per cent. Sugar is least abundant at midnight (4.19 per cent) and most plenty at noon (4.72 per cent). The per centage of the salts undergoes almost no change at any time of the day.—*Edinburgh Medical Review.*

Supposed Economy in Bread.

Twenty-six pounds and thirteen ounces of good bread have been made from fourteen pounds of flour and one and a half pounds of rice by the following method:—Tie up the rice in a thick linen bag, allowing it ample room to swell, boil for three or four hours until it becomes a smooth paste; mix this while warm with the flour, adding the usual quantity of yeast and salt; allow the dough to rise near the fire, and divide into loaves. It is affirmed, on high authority, that flour thus treated will yield fifty per cent more bread than by the ordinary method, but it will not give one particle more nourishment than when made by the ordinary method.

Complaint.—The editor of the San Diego (Cal.) *Herald* complains that he does not receive the Scientific American, and expresses the fear that we are not acting "on the square" with him. Now we beg to assure Brother Ames that we have been sending our paper to him for a long time, and we cannot account for its non-appearance in his sanctum unless it be that some "scientific thief" is on the alert for the weekly dish which we intend for our editorial friend. Really it is vexing, and we will do all we can to correct the fault. It cannot, however, be laid to our door.

Laboratory—No. 4.

Affinity Illustrated.—The affinity or power of uniting one substance with another is so great, that, were it not for living plants and animals, each element of the world would soon seek out its fondest ally, and these being united, there would quickly be an end to any further chemical change of matter on the face of the earth. The vital power, however, of living plants and animals is constantly undoing what the inorganic or non-vital materials are ever consummating; the very few native or natural elements that are found by man show how this power has already done its work. Man never finds iron, phosphorus, potassium, carbon, and a host of other materials, in their primitive state, but always combined with some other of the elements; and it is his ingenuity and chemical knowledge which break them up and separate them, giving us iron for the plowshare, phosphorus for the match, and many other necessaries of civilized life. The laws of affinity are best illustrated by the events of every-day life, such as the burning of a candle, the decay of wood, the change of lime into chalk, and the rusting of iron. Tallow at the ordinary temperature has but little affinity for the oxygen in the air; it has, however, sufficient affinity for it, and gradually changes or becomes, as we say, rancid. The higher the temperature the greater is this affinity. If tallow be thrown on to hot iron, as in a frying pan, then a further change is noticed in the powerful odorous bodies produced. At a burning heat, however, the affinity of the oxygen of the air and the components of the tallow is so great that the whole disappears in invisible gases. Wood shows a similar action, according to the temperature it is exposed to. If air, wood, and water be exposed together, their natural affinities are sufficient to sap "the heart of oak" in five years; and if heated to the combustion point, this change takes place in a few minutes. If we make a paste of lime and water, and spread it on a tile, and then expose it to the air, in less than a month the carbonic acid which is in the air will unite with the lime and produce chalk. Now if vinegar be poured on this chalk an effervescence is produced by the escape of the carbonic acid; the vinegar (acetic acid) having a greater affinity for the lime than the carbonic acid, throws out the latter. Iron stone as it is dug from the mine is little else than rust (or oxyd) of iron—that is, oxygen from the air united with the metal. The smelter's business is to make the oxygen in the metallic rust unite with the coal, which it readily does at a furnace heat, and thus he shows us how he can break up that affinity which has hidden the bright metal from mortal gaze since the world began. The want of the knowledge of the laws of affinity betokens savage life; on the contrary, a thorough comprehension of affinity indicates a high state of civilization.

Where the Canary Birds come from.

There is an association in Philadelphia, composed of about thirty Germans, who aim at improving the breed of canary birds, and last month they published their thirteenth annual report. From that it appears that the bird sales in Philadelphia are confined to Germans, and amount to $40,000 annually, and three-quarters of that sum is derived from the sale of canaries. The common or original canary is of the least value, and sells at about $2 apiece; the improved kinds bring from $8 to $10 apiece, and are from Central Europe. The great majority of these birds are obtained from Belgium, where they are bred in houses by the peasants, who raise them as a pastime. They are what are called "long" and "short" breeds. Birds of the long breed are procured from Brussels, Antwerp and Dietz, where they sometimes obtain extravagant prices. Their cost depends upon the color and shape, the pure golden yellow being the most esteemed. They are only used for the purpose of breeding, and oftentimes sell for $30 a pair. The short breed is raised by the people of the Hartz mountains. Next to the Belgian, the French bird is most prized.