## THE ACTION OF LIGHT ON PLANTS.

The phenomena which the prolonged action of sunlight produces on vegetation in high latitudes are recorded by M. J. A. Broch in a work recently published.

The farther we go eastward from the Gulf Stream the more severe is the climate, even though the degree of latitude be the same. Thus Scandinavia and Finland possess an exceptionally mild climate, considering their high polar altitude. Indeed, barley and oats will ripen in the most northern districts of Norway, Sweden, and Finland, and immense forests are met with; while in Iceland, Greenland, and the polar confines of Russia and America, the earth is barren and sterile, and there are eternal snows. The cause of these advantageous climatic conditions is to be attributed to the enormous mass of warm water and hot air which the Gulf Stream brings down from the equatorial region to the coast of Norway, and which it approaches between 60° and 61° of latitude. This circumstance, together with the difference in the geological formation of the various northern countries of Europe, naturally lead to certain dissimilarities in the respective climates of these countries. The isothermal line passing through the places whose mean temperature is zero—skirting in Norway the chain of mountains and the sea coast from the North Cape, embracing also the central part of that country between the 60th and 63d parallels—begins in Finland at the 66th degree of latitude and rises rapidly to the north, forming a curve which incloses the elevated lands of the interior between the Gulf of Bothnia and the Arctic Sea, so that not only the countries situated south of that parallel, but also those which slope toward the Arctic Ocean and are submitted to the salutary influence of the Gulf Stream, have a mean temperature above zero. Of all the countries situated in the same latitude as Finland, the Scandinavian peninsula alone enjoys a milder climate. European Russia is much colder, and the climate of Asiatic Russia still severer. With regard to the action of prolonged solar light on the vegetation common to all those countries, Dr. Schübler, of the University of Christiana, has demonstrated that the seed of corn or other plants obtained from the northern regions ripens more quickly than that produced in the more southern countries. In the regions of the extreme north, where grain crops are uncertain in their yield, the seed corn of the north is always used in preference to any other. It is not less true that the various kinds of grain and vegetables cultivated in the northern regions yield better and are much richer in carbo-hydrates than the varieties cultivated more to the south. The color, moreover, is deeper—a phenomenon which applies also to all trees and plants. Foreign botanists visiting Norway and the other countries of the extreme north, in summer, are astonished at the fresh dark green of the foliage, and the bright colors of those flowers which grow both in northern and southern climes; and as this richness of color increases regularly with the latitude, trees and plants have at first been considered as new varieties. The leaves of trees grown in the north are larger even when the seed has been brought from more southern countries. M. Schübler has likewise proved that the aroma of all kinds of plants and fruits, both wild and cultivated, increases as the north is approached. Ordinary vegetables and herbs grown in high latitudes have a far more aromatic taste than those grown in southern countries. The caraway is an example of this fact; grown at Christiana, it contains 5·8 per cent of volatile oil, while that cultivated in Germany and Central Russia contains only from 4 to 4·8 per cent. But this large development of aromatic essence is not always considered an advantage; for instance, the tobacco plant grown in Norway or other northern countries contains, it is said, too much nicotine. In proportion, however, as the aroma increases with the latitude the saccharine substance diminishes; the berries and fruits of the north are less sweet than those which are cultivated or grown wild in the more southern parts of those countries. Consequently, while Norway, as well as Sweden, and even Finland, produces the most delicious apples, the pears are not sufficiently sweet. These facts, as well as the rapid growth of vegetation in the northern regions, are attributed to the prolonged action of solar light. Indeed, at Christiana, at the summer solstice, the sun remains below the horizon only 5 hours 17 minutes; at Trondhjem, 3 hours 34 minutes. At Bodöe, the chief town in Nordland, the sun does not descend below the horizon from June 2 to July 11; at Tromsöe, from May 20 to July 24; at Hammerfest, the chief town of Finmark, from May 15 to July 29. On the other hand, the center of the sun does not appear above the horizon at Bodöe from December 14 to December 28; at Tromsöe, from November 25 till January 16; and at Hammerfest, from November 20 to January 21. It is not surprising that barley, potatoes, and many other plants and vegetables ripen in the most northern latitudes, seeing that they are exposed to a considerable amount of heat during two or three months of the year. In those regions where the sun hardly descends below the horizon in summer, there is no night, only a short twilight; and the growing plant, therefore, enjoys permanently and without interruption the heat and light which it requires.

## Mactear's Artificial Diamonds.

Some weeks ago an item was cabled from London to our daily newspapers stating that real sparkling diamonds had been artificially made by a Glasgow gentlemen which withstood all the tests used in determining the natural stone. The *Journal of the Society of Arts* brings us the following facts concerning the alleged great discovery.

Professor Nevil Story Maskelyne, F.R.S., of the British Museum, has examined the presumed "diamonds" manufactured by Mr. James Mactear, of St. Rollox, Glasgow. The result of his examination is in a letter to the *Times*, from which the above *Journal* extracts:

"First, the diamond excels all substances in hardness. Secondly, its crystals belong to the cubic system, and should not, therefore, present the property of doubly refracting light. Frequently, however, from the influence of strain within the crystal, caused by inclosed gas bubbles or other causes, diamonds are not entirely without action on a ray of polarized light sent through them. Finally, the diamond is pure carbon, and as such, burns entirely away when heated to a sufficiently high temperature in the air, and more vividly so burns or glows away when heated in oxygen gas.

"The specimens I had to experiment upon were too light to possess appreciable weight, too small even to see unless by very good eyesight or with a lens, yet were, nevertheless, sufficiently large to answer the three questions suggested by the above properties.

"A few grains of the dust, for such the substance must be termed, were placed between a plate of topaz—a cleavage face, with its fine natural polish—and a polished surface of sapphire, and the two surfaces were carefully 'worked' over each other, with a view to the production of lines of abrasion from the particles between them. There was no abrasion. Ultimately the particles became bruised into a powder, but without scratching even the topaz. They were not diamond.

"Secondly, some particles, more crystalline in appearance than the rest, were mounted on a glass microscope slide, and examined in the microscope with polarized light. They acted each and all powerfully in the manner of a birefrangent crystal. It seemed even in one or two of them that, when they lay on their broadest surface (it scarcely be called a 'crystal face'), a principal section of the crystal was just slightly inclined to a flattish side of it in a manner that suggested its not being a crystal of either of the ortho-symmetrical systems. Be that as it may, it was not a diamond.

"Finally, I took two of these microscopic particles and exposed them to the intense heat of a table blowpipe on a bit of platinum foil. They resisted this attempt to burn them. Then, for comparison, they were placed in contact with two little particles of diamond dust exceeding them in size, and the experiment was repeated. The result was that the diamond particles glowed and disappeared, while the little particles from Glasgow were as obstinate and unacted on as before. I had previously treated the specimen I have alluded to as the first on which I experimented by making a similar attempt in a hard glass tube in a stream of oxygen, and the result was the same. Hence I conclude that the substance supposed to be artificially formed diamond is not diamond and is not carbon; and I feel as confident in the results thus obtained from a few infinitesimal particles that can hardly be measured, and could only be weighed by an assay balance of the most refined delicacy, as if the experiments had been performed on crystals of appreciable size.

"Not content with merely proving what these crystalline particles are not, I made an experiment to determine something about what they are.

"Heated on platinum foil several times with ammonium fluoride they became visibly more minute, and a slight reddish-white incrustation was seen on the foil. At the suggestion of Dr. Flight, assistant in this department, a master in the craft of the chemical analyst, these little particles were left for the night in hydrofluoric acid in a platinum capsule. This morning they have disappeared, having become dissolved in the acid, and on evaporation there is seen a slight white incrustation, on the capsule, of the residuary fluoride. I have, therefore, no hesitation in declaring Mr. Mactear's 'diamonds,' not only not to be diamonds at all, but to consist of some crystallized silicate, possibly one resembling an augite, though it would be very rash to assert anything beyond the fact that they consist of a compound of silica, possibly of more than one such compound."

Mr. Maskelyne concludes that "the problem of the permutation of carbon, from its ordinary opaque black condition into that in which it occurs in nature as the limpid crystal of diamond, is still unsolved. That it will be solved no scientific mind can doubt, though the conditions necessary may prove to be very difficult to fulfill. It is possible that carbon, like metallic arsenic, passes directly into the condition of vapor from that of a solid, and that the condition for its sublimation in the form of crystals, or its cooling into crystal-diamond from the liquid state, is one involving a combination of high temperature and high pressure present in the depths of the earth's crust, but very difficult to establish in a laboratory experiment."

## THE INDUSTRIAL USES OF FISH SKINS.

Although the skin of fishes is chiefly gelatinous, and easily soluble in water, some are of a firm, strong texture and of a useful character. Up to within a few years, however, their employment for practical purposes has been rather limited, and it is only comparatively recently that attention has been more generally directed to their utilization on an extended scale. At a Maritime Exhibition held at the Westminster Aquarium in 1876, a Norway exhibitor showed a variety of tanned fish skins, among which were: tanned whale skins; upper leather made from the white fish; skins of flatfish prepared for gloves; skins of soles tanned and dressed for purses; skins of thornbacks prepared as a substitute for sandpaper; and skins of eels, dressed and dyed, suitable for braces, etc. Shoes have been made at Gloucester, Mass., from the skins of the cusk or torsk (*Brosmus volgaris*), the use of which has been patented, and an industry is said to be carried on at Colborn, Canada, with the skins of species of siluroids for glove making. In Egypt, fish skins from the Red Sea are used for soles of shoes. The skin of the losh or burbot (*Lota maculata*) is used by the people in many parts of Russia and Siberia to trim their dresses. It is also utilized by some of the Tartar tribes, as material for their summer dresses, and the bags in which they pack their animal skins. The inhabitants of the eastern coasts of the middle of Asia clothe themselves with the tanned skin of the salmon. The spring and tuberculous skins of many sharks and allied fishes are largely employed, under various trade names, for polishing woods, and for covering boxes, cases, etc. From a certain portion of the skin of the angel shark (*Squatina angelus*) the Turks make the most beautiful sea-green watch cases. Turners, ebonists, and carpenters in Europe use the rough skin of the blue dogfish (*Squalus glaucus*) like emery paper, for smoothing their work and preparing it for polishing. This shark skin is also made into shagreen. That most used at present appears to be the skin of the ray (*Hypolophus sephen*), which is very common on the Malabar coast. The house of Giraudon, Paris, makes excellent use of them for morocco and *tabletterie*. At the recent Paris Exhibition, this establishment exhibited numerous illustrations of the ornamental application of the prepared skin in large office-table inkstands, candlesticks, boxes and caskets, paper knives, reticules, card cases, photograph frames, bracelets, scent bottles, etc. The fish called *chat* (*Squalus catulus*) at Marseilles is smaller than the angel fish, and furnishes a product known as *peau de rousette*. This skin is reddish, and without spots, and of a uniform grain, flat, and only used to make cases and other articles known as shagreen. *Peau de chien de mer* is another name given to some species of *Squalus*. That found on the French coasts is known under the names of *chien marin, rousette tigrée*, etc. Turners, cabinet makers, and carpenters use the skin for scraping and smoothing their work, and it is also used for like purposes by metal workers. This skin, when worked up with the tubercles with which it is studded, takes the name of "galuchat," and is usually dyed green, to cover cases, sheaths, and boxes. Under the name of *chagrin*, these skins used to be much employed in Turkey, Syria, Tunis, and Tripoli; that made in Tripoli being considered the best. It was colored black, green, white, and red.

## The Quinealt River Salmon.

The *Transcript*, of Olympia, Washington Territory, describes a new salmon which promises to make a valuable addition to our list of food fishes.

The Quinealt River is situated midway between the mouth of the Columbia River and Cape Flattery, and empties into the Pacific Ocean, thirty-two miles north of Gray's Harbor. Salmon of one of the finest varieties visit this stream, and commence ascending the river about the 1st of March, and continue running up until the 1st of July. These fish are about 20 inches in length, 6 inches deep, and 3 inches thick, and weigh from 6 to 7 pounds each. They have very small fins and tails, and are very uniform in size and weight. Their color is a deep greenish blue on the back, with silver sides and white bellies. The meat is of a bright red color. They are extremely fat, and when put upon sticks before the fire to cook, as is the custom of the Indians, large quantities of fat drip from them. They are particularly noted for their rich and exceedingly fine flavor, and as far surpass the Columbia River Chinook silver-side as the latter does a dog salmon.

The Indians are very superstitious about them, and as all the catching grounds are on a reservation they have a monopoly of them. When they first commence to run it is impossible for a white man to get one for love or money, as the Indians believe it would stop the run. They are also superstitious about cutting them with a knife, and the first catch is always cut open by the old klootchmen with a sharp shell, and the heart of the salmon thrown into the fire and burned, for fear the salmon will be offended and not come into the river. Later in the season they cut them with knives and are glad to trade them to the whites. In May and June they run in endless numbers, and are as thick as herring in the sound, the water in the river at times being seemingly alive with them. The fish will not take either a fly or hook in any manner, and are only caught by the Indians in their primitive manner with weirs built across the stream, and made of poles and hazel brush. These weirs are built like all other weirs of the country, and are set at certain places in the river. The fish are taken out with dip nets, often from fifteen to twenty at a time. The weirs are made to stop all the fish ascending when fishing is going on, but are opened at other times to allow the fish to go up and spawn (a fact which white fishermen on other streams might heed to their advantage). It is supposed that they spawn in the river and do not ascend to the lake. Those engaged in propagating fish would do well to examine these salmon, as we are satisfied they would be a valuable addition to the varieties of fish now propagated by the United States Fish Commissioners and various State Commissioners. Coming early in the season, they could be put in the same streams with later salmon, and thus continue the fishing season nearly the whole year round. Their eggs can easily be obtained, and the trial, if successful, would be one of the greatest additions to fish culture ever undertaken.

### Olives in California.

Mr. Edward Cooper, of Santa Barbara, California, has 6,000 olive trees, some of them seven years old, and these produce twenty gallons of berries each on an average in a good year, and one gallon of oil is obtained from seven of berries. Trees ten years old in a good soil will average fifty gallons of berries in a good year, but sometimes will yield 150 gallons. After a good crop the trees usually take a year's rest, so that its good years alternate. The oil yield from a mature orchard is estimated by the *Alta California* at 200 gallons of oil to the acre, and of this 50 gallons may be deducted to pay for gathering the berries and making and marketing the oil. Two gallons make a case of Mr. Cooper's bottles; though most of the imported bottles hold two ounces less. According to these figures an acre will yield $900 net annually, but, in the present depressed condition of business, a mature olive orchard would probably not sell for more than $400.

After visiting Europe and studying the olive question, Mr. Cooper believes that the California olive is unsurpassed in fitness for producing a fine table oil. The small purple berry is not so nice in appearance as the large green or whitish olive of Spain, but it is like the olives in those French districts which produce the best oils of Europe. Besides, he considers it excellent for pickling, and much prefers the pickled olives of Santa Barbara to those imported from Spain. A few of these Santa Barbara olives are in market; but are said not to be compared with the Kimball olives of San Diego. Olives like the last, if they could be had in abundance, would soon leave the Spanish article without a friend.

Many persons are preparing to set out olive orchards, and there is a great demand for cuttings, which are the only resource at present; but Mr. Cooper believes that the trees grown from the seed, and budded or grafted, though slower in bearing, will be stronger, healthier, and longer lived. He thinks the roots from the cutting never equal those from the seed in symmetry and vigor of nutrition. The Federal Department of Agriculture is cultivating twenty varieties of the European olive, and will soon be ready to supply applicants with cuttings.

### MECHANICAL INVENTIONS.

Mr. James A. Robinson, of Nashville, Tenn., has patented an improvement in cylinder cocks, which consists in combining with a cylinder cock a thimble valve sliding on a stem, a loose pin passing through the stem, and a recessed rod fitted to slide in a cross mortise.

Mr. Harry Oscar Choles, of Upper Clapton, County of Middlesex, England, has patented an improved stock and die for screw threading pipes, etc. This invention has for its object, first, to prepare the pipe for the action of the screw cutting die by removing the burr, and also the hard outer surface of the pipe, this being done in advance of the screw cutting die, but at the same operation with the cutting of the screw thread, instead of at a previous operation, by means of a file, as usual; and, secondly, to feed the die along the pipe as it cuts the screw thread by means of a leading screw separate from the die, but combined with the die stock, instead of relying on the self-feeding action of the die, thereby relieving the die of this part of its work, facilitating the screw cutting operation, and insuring the formation of a perfectly true screw thread.

Mr. William Birch, of Salford, county of Lancaster, Great Britain, has patented an improved machine for guiding and stretching fabrics. The object of this invention is to make an improvement in the governor described in Patent No. 198,787, and to provide means for stretching fabrics in connection therewith. The inventor uses a well balanced frame pivoted in the central line of the passing fabric, and employs in conjunction with them rollers of suitable form.

### Manganese Bronze Torpedo Boats.

Mr P. M. Parsons writes to the London *Times* with reference to the manganese bronze torpedo boat recently arrived at Portsmouth from the Thames. Mr. Parsons says that the thickness of the plates forming the skin of this boat was not 3-16 inch, but varied from No. 9 to No. 18 wire gauge, or from little more than ⅛ inch to about 1-16 inch. As regards the quivering spoken of, this only occurs when the engines are working at a certain number of revolutions, which are such as to make the pulsations of the propeller and the vibrations produced by the spring of the vessel isochronous, and this is also experienced in the steel boats when the speed is such that the two vibrations correspond. When this boat was going at the rate of 16 knots per hour, more than which speed she attained one day when Mr. Parsons was on board of her, no quivering or vibration was felt, but it set in when the speed was reduced to about 10 or 12 knots. He admits, however, that the manganese bronze plates supplied for this vessel are not quite so stiff as steel plates of the same thickness; but this occurred simply because in the contract no stipulation was made as to stiffness. The plates were supplied under the condition that they should stand the Admiralty test for steel plates, namely, a tensile strength of from 26 to 31 tons per square inch, with an elongation of not less than 20 per cent before breaking, and to bend cold to a radius twice the thickness of the plate. This test the plates stood perfectly, those taken haphazard and tested by the Admiralty Inspector giving between 29 and 30 tons breaking strain, with an elongation of from 25 to 35 per cent, and bending round cold to half the radius stipulated.

### CHINESE PORCELAIN VASE.

The large porcelain vase shown on this page is of Chinese manufacture. The body, neck, and lips of the vase are covered for the most part with a fine vine and flower scroll pattern done in polychrome, but the front portion is occupied by medallions painted with figure subjects. What the subject of the upper design is, is uncertain, though it might very well represent a high official beset by rival office seekers. But the lower picture tells its own story. Here is a grand Mogul seated at his ease, surrounded by his courtiers, watching the performance of a couple of clowns. Standing on the steps, just outside of the Mogul's court, is the master of the clowns, urging the poor fellows on to renewed exertions, while on either hand, keeping him, the master, to his work, are two courtiers, one expostulating with him kindly, and the other standing silent, with drawn sword, and a most sinister look on his face—an action more potent than words.

CHINESE PORCELAIN VASE.

This picture is a very good illustration of Chinese pictorial art. It is full of character and action. It is not fine art, considered by our canons of good drawing and perspective, but it shows more artistic perception and ability to portray the salient points of a situation than many European artists possess.

### Accident on Board the Greece.

Spontaneous combustion scores another victory over the ignorance of humanity. On Thursday last the steamer Greece arrived from Great Britain. As the cargoes this way are small or not sufficient to load the vessel entirely, the ocean steamers are bringing over sufficient coal to carry them back, either in whole or in part. In this instance there was a quantity of coal in the lower hold, and it was intended to transfer it from there to the bunkers. The coal must have been damp, and being hermetically sealed in the lowest depths of the ship's hold, there was no chance for ventilation, consequently sufficient carbonic oxide was there generated to cause an explosion upon the application of light. This was done when the men descended to the lower hold to unfasten the hatches. Five deaths have already resulted, and seven persons have suffered severe injuries. The *Coal Trade Review* thinks it is about time that vessel owners and captains became aware of the danger attached to the storage and carriage of this quality of coal (bituminous) in quantity, where it is liable to heating from any cause. Ventilating shafts at least should be made direct from the hold where stored to the outer air.

### Phosphorescence in the Caribbean Sea.

Mr. Alexander Agassiz, in his recent "Report on American Dredgings in the Caribbean Sea," states that in the roadstead, under the lee of the islands, there is little pelagic life to be found, and consequently the phosphorescence is far less brilliant than in the Gulf of Mexico. Yet occasionally the masses of *Ctenophora* (a species of *Mnemiopsis*) swimming at different depths, produce a very striking illumination; sudden flashes of light suddenly appearing as if coming from great balls of fire floating a short distance beneath the surface. The most striking phosphorescent phenomena were produced by a small annelid, allied to Syllis, which moved over the surface of the water with great rapidity, performing the most remarkable gyrations and tracing its path, which remained phosphorescent for a short time, by a brilliant line of light. Among the deep water forms several of the species of *Gorgonia* and *Antipathes* (especially *Rüsea*) showed a bright bluish phosphorescence when coming up in the trawl. One ophiurian also, like one of the Mediterranean species mentioned by Panceri, was exceedingly phosphorescent, emitting along the whole length of its arms, at the joints, a brilliant bluish-green light.

### Astronomical Notes.

OBSERVATORY OF VASSAR COLLEGE.

The computations in the following notes are by students of Vassar College. Although merely approximate, they will enable the observer to recognize the planets. M. M.

POSITIONS OF PLANETS FOR FEBRUARY, 1880.

#### Mercury.

On February 1 Mercury rises at 6h. 59m. A.M., and sets at 4h. 17m. P.M.

On February 29 Mercury rises at 7h. 11m. A.M., and sets at 6h. 50m. P.M.

In the latter part of February Mercury may be seen after sunset a few degrees north of the point of sunset.

On February 28 Mercury will be seen near Jupiter in the evening twilight.

#### Venus.

Venus will be brilliant in the morning throughout the month of February, although rising later and coming more nearly into daylight.

On February 1 Venus rises at 4h. 49m. A.M., on February 29 at 5h. 9m. A.M.

On the morning of February 7 Venus will be seen in conjunction with the thin crescent moon; Venus is about 2° north of the moon in declination.

#### Mars.

Mars will be the most conspicuous of the evening planets. Its great declination gives it a very high altitude at meridian passage; on February 29 its altitude in this latitude is nearly 72°.

On February 1 Mars rises at 11h. 21m. A.M., and comes to meridian at 6h. 40m. P.M., at an altitude of 69°.

On February 29 Mars rises at 10h. 14m. A.M., and sets at 1h. 16m. of the next morning.

Mars will be seen to be among the bright stars of Taurus; on February 9 it will be 2° south of the star Eta Tauri.

The moon will be seen to approach Mars on the evening of February 17.

#### Jupiter.

On February 1 Jupiter rises at 8h. 47m. A.M. and sets at 7h. 59m. P.M.

On February 29 Jupiter sets at 6h. 42m. P.M.

Jupiter is two nearly in the direction of the sun for good observations.

#### Saturn.

Saturn as well as Jupiter sets early in February, and it is getting so far off that even large telescopes will not show the smallest satellites.

Saturn sets on February 1 at 10h. 7m. P.M., and on February 29 at 8h. 31m. P.M.

#### Uranus.

Uranus is in its best position during February.

On February 1 Uranus rises at 7h. 19m., and sets at 8h. 26m. of the next morning.

On February 29 Uranus rises at 5h. 22m. P.M., and sets at 6h. 33m. of the next day.

Uranus is moving away from Lambda Leonis toward Rho Leonis, and on February 29 it has nearly the declination of this star and follows it in right ascension.

A glass of two inches aperture will show the disk of Uranus.

#### Neptune.

On February 1 Neptune rises at 10h. 57m. A.M., and sets at 12h. 31m. A.M., of the next day.

On February 29 Neptune rises at 9h. 8m. A.M., and sets at 10h. 43m. P.M.

Neptune is among the small stars of Aries.

#### Occultations.

The "American Nautical Almanac" gives the Washington time, February 16, 11h. 30m. P.M. for the disappearance of Epsilon Arietis, a multiple star, by occultation, or by the moon's passing across it. As the moon will not have reached the first quarter the stars will seem to touch the dark limb and disappear at once; this is always an interesting phenomenon to observe, and is valuable for a determination of longitude. With an ordinary telescope the stars will appear as one.

#### Sun Spots.

The spots on the sun have been very few for several years. At this time (January 15) two large spots are passing out of sight, in consequence of the motion of the sun on its axis, and a group of some 18 or 20 small ones has made more than half its passage across. These will probably be seen again in February. The large ones should be easily seen somewhat advanced upon the disk on the first day of February.