105 Ink, permanent. The following is from the Records of Science, translated from the Annales de Chemie. Mr. Braconnot, of Nancy has published a receipt for ink, which he says answers extremely well in Botanic Gardens, and in open or wet situations where names are required to be preserved permanently. Take of

Verdigris,......1 part.	Soot,............ ½ part.
Sal ammonia, 1 part.	Water,......... 10 parts.

Mix the powder in a glass or porcelain mortar, adding at first one part of water, in order to mix them well, then add the remainder of the water. Shake the ink well from time to time. When it is to be used we must write with it upon a plate of zinc, and after some days it becomes hard, and cannot be obliterated by atmospherical influence or by rubbing. The ink may be tinged by any color, by substituting for the soot or lamp black some mineral colouring matter. Zinc Tallies are easily procured, as this metal is now rolled into thin sheets for covering buildings, and other uses, in lieu of lead; it being both lighter and cheaper; and not liable to decay by oxidation.

106 Marble to preserve. It has long beeen matter of regret, that polished marble cannot be fully exposed in our northern latitude without immediate injury and ultimate destruction. But for this circumstance white marble would prove a valuable adjunct to the buildings and embellishments of the first class of ornamental gardens. Some experiments have lately been made and explained in evidence, before the committee of arts and manufactures, by Mr. John Henny, from which their is every probability that a coating may be so applied to marble as to preserve it for a great length of time. Wax is the substance used, and this he believes to be almost indistructable under atmospheric influence alone. He has tried in on the frieze of the Athenæum, Hyde Park Corner, with complete success. A piece of polished marble was first submitted to experiment. A little melted wax was applied to a part of it, with a camel-hair pencil, and the marble warmed till it absorded the wax. After being exposed during a whole winter, the polish on the unprotected part was destroyed, but where the wax had been applied it was uninjured. If the wax be dissolved in turpentine it penetrates to a greater depth into the marble, but this was thought unnecessary, as the wax alone was observed to sink into it to the

depth of one-sixteenth of an inch. It is indispensable that the marble be made warm, therefore large statues, or architectural ornaments, which cannot be moved to a fire, must have heat applied to them, by the use of hot irons. Thus, by beginning the work at the top it may be gradually warmed, and the wax would run downwards over the marble, and be conveniently exposed to the heat. Whilst warm the superfluous wax is wiped off the surface, which is left with the appearance of beautiful old marble. White wax is recommended, as least liable to change colour. We think that advantage may be taken of this hint, and that wax may be employed in the protection of ornamental castings and sculpture, which have been executed in various soft materials. We hope that some of our friends will immediately put it to the test.

107 Damping off. Many herbaceous plants that will endure any degree of frost, without injury, are frequently lost, in mild winters, by what is technically called damping off; occasioned by the humidity of our atmosphere This may, to a considerable extent, be prevented, by raising a mound of sand, a few inches high, over their crowns, upon the surface of the soil. This should be done in November, and be removed in spring, just before the young shoots reach the surface; the danger being over as soon as vegetation has fairly commenced.

108 Growth of plants. This subject is so full of interest, and also of admiration, to the contemplative mind, that when treated perspicuously and concisely, as we find it treated by Dr. Turner, it becomes important as well, morally, as scientifically. He says, "While a plant differs from an animal, in exhibiting no signs of perception or voluntary motion, and in possessing no stomach to serve as a receptacle for its food, there exists between them a close analogy both of parts and functions; which, though not discerned at first, becomes striking on a nearer examination. The stem and branches act as a frame work or skeleton for the support and protection of the parts necessary to the life of the individual. The root serves the purpose of a stomach by imbibing nutritious juices from the soil, and thus supplying the plant with materials for its growth. The sap or circulating fluid, composed of water, holding in solution saline, extractive, mucilaginous, saccharine, and other soluble substances, rises upwards through the wood in a distinct system of tubes called the common

vessels, which correspond in their office to the lacteals and pulmonary arteries of animals, and are distributed in minute ramifications over the surface of the leaves. In its passage through this organ, which may be termed the lungs of a plant, the sap is fully exposed to the agency of light and air, experiences a change by which it is more completely adapted to the wants of the vegetable economy, and then descends through the inner layer of the bark in another system of tubes called the proper vessels, yielding in its course all the juices and principles peculiar to the plant. This leads to the consideration of the

109 CHEMICAL CHANGES IN PLANTS. The chemical changes which take place during the circulation of the sap are in general of such a complicated nature, and so much under the control of the vital principle, as to elude the sagacity of the chemist. One part of the subject, however, namely, the reciprocal agency of the atmosphere and growing vegetables on each other, falls within the reach of chemical enquiry, and has accordingly been investigated by several philosophers. For the leading facts relative to what is called the respiration of plants, or the chemical changes which the leaves of growing vegetables produce on the atmosphere, we are indebted to Priestly and Igenhousz, the former of whom discovered that plants absorb carbonic acid from the air, under certain circumstances, and emit oxygen in return; and the latter ascertained that this change occurs only during exposure to the direct rays of the sun. When a healthy plant, the roots of which are supplied with proper nourishment, is exposed to the direct solar beams in a given quantity of atmospheric air the carbonic acid after a certain interval is removed, and an equal volume of oxygen is substituted for it. If a fresh portion of carbonic acid is supplied, the same result will ensue. In like manner, Sennebier and Woodhouse observed that when the leaves of a plant are immersed in water, and exposed to the rays of the sun, oxygen gas is disengaged. That the evolution of oxygen in this experiment is accompanied with a proportional absorption of carbonic acid, is proved by employing water, deprived of carbonic acid by boiling, in which case little or no oxygen is procured. Such are the changes induced by plants when exposed to sunshine; but in the dark an opposite effect ensues. Carbonic acid gas is not absorbed under these circumstances, nor is oxygen gas evolved;

but, on the contrary, oxygen disappears, and carbonic acid gas is evolved. In the dark, therefore, vegetables deteriorate rather than purify the air, producing the same effect as the respiration of animals." An ingenious explanation, supported by experiments, of the cause of these opposite effects, has been offered by Professor Burnet, which appears satisfactory. He considers that the influence of vegetation on the atmosphere is owing not to one, but to two functions, that is to the

110 Digestion and Respiration of Plants. Respiration is believed to proceed at all times as in animals, without intermission, and its uniform effect is the production of carbonic acid; while the former takes place only under the influence of light, and gives rise to evolution of oxygen gas, and the abstraction of carbonic acid. A plant exposed to sunshine, purifies the air by absorbing carbonic acid from the atmosphere, as well as that emitted by its own respiration, and emits oxygen gas in return. In the dark, digestion is at a stand, and respiration continuing without intermission, carbonic acid accumulates. From several of the preceding facts, it is supposed that the oxygen emitted by plants, while under the influence of light, is derived from the carbonic acid which they absorb, and that the carbon of that gas is applied to the purposes of nutrition. Consistently with this view it has been observed that plants do not thrive when kept in an atmosphere of pure oxygen; and it was found by Dr. Percival and Mr. Henry, that the presence of a little carbonic acid is even favourable to their growth, Saussure, who examined this subject minutely, ascertained that plants grow better in an atmosphere which contains about one-twelfth of carbonic acid than in common air, provided they are exposed to sunshine. But if that gas be present in a greater proportion, its influence is prejudicial: in an atmosphere consisting of one-half of its volume of carbonic acid, the plants perished in seven days; and they did not vegetate at all when that gas was in the proportion of two-thirds. In the shade the presence of carbonic acid is always detrimental. He likewise observed that the presence of oxygen is necessary, in order that a plant should derive benefit from admixture with carbonic acid. Saussure is of opinion that plants derive a large quantity of their carbon from the carbonic acid of the atmosphere, an opinion which receives great weight from the two following comparative

experiments. On causing a plant to vegetate in pure water, supplied with common air and exposed to light, the carbon of the plant increased in quantity; but when supplied with common air in a dark situation, it even lost a portion of the carbon which it had previously possessed.

111 LIGHT, ITS EFFECTS ON PLANTS. Light is necessary to the colour of plants. The experiments of Sennebier and Mr. Gough have shown that the green colour of the leaves is not developed, except when they are in a situation to absorb oxygen and give out carbonic acid. Though the experiments of different philosophers agree as to the influence of vegetation on the air in sunshine and during the night, very different opinions have been expressed both as to the phenomena occasioned by diffused daylight, and concerning the total effect produced by plants on the constitution of the atmosphere. Priestly found that air vitiated by combustion, or the respiration of animals, and left in contact for several days and nights with a sprig of mint, was gradually restored to its original purity; and hence he inferred that the oxygen gas, consumed during these and various other processes, is restored to the mass of the atmosphere by the agency of growing vegetables. This doctrine was confirmed by the researches of Ingenhousz and Saussure, who found that the quantity of oxygen evolved from plants by day exceeds that of carbonic acid emitted during the night; and Davy arrived at the same conclusions as Priestley. But an opposite opinion has been supported by Mr. Ellis, who from an extensive series of experiments, contrived with much sagacity, inferred that growing plants give out oxygen only in direct sunshine, while at all other times they absorb it; that when exposed to the ordinary vicissitudes of sunshine and shade, light and darkness, they form more carbonic acid in the period of a day and night, than they destroy; and, consequently, that the general effect of vegetation on the atmosphere is the same as that produced by animals. The recent experiments of Dr. Daubeny appear decisive of this question. He has convinced himself that in fine weather a plant consisting chiefly of leaves and stems, if confined in the same portion of air night and day, and duly supplied with carbonic acid gas during the sunshine, will go on adding to the proportion of oxygen present, so long as it continues healthy, at least up to a certain point, the slight diminution of oxygen and increase of carbonic acid which take

place during the night, bearing no considerable ratio to the degree in which the opposite effect occurs by day. He accounts for the discordance between his own results and those of Mr. Ellis, by his having carefully removed the plants from the experimenting jar immediately they began to suffer from the heat or confinement, and conducted the experiments on a larger and more suitable scale.

112 FOOD OF PLANTS. The chief source from which plants derive the materials for their growth, is the soil. However various the composition of the soil, it consists essentially of two parts, so far as its solid constituents are concerned. One is a certain quantity of earthy matters, such as siliceous earth, clay, lime, and sometimes magnesia; and the other is formed from the remains of animal and vegetable substances, which, when mixed with the former, constitute common mould. A mixture of this kind, moistened by rain, affords the proper nourishment of plants. The water, percolating through the mould, dissolves the soluble salts with which it comes in contact, together with the gaseous, extractive, and other matters which are formed during the decomposition of the animal and vegetable remains. In this state it is readily absorbed by the roots and conveyed as sap to the leaves, where it undergoes a process of assimilation. But though this is the natural process by which plants obtain the greater part of their nourishment, and without which they do not arrive at perfect maturity, they may live, grow, and even increase in weight, when wholly deprived of nutrition from this source. Thus in the experiment of Saussure, already described, sprigs of peppermint were found to vegetate in distilled water; and it is well known that many plants grow when merely suspended in the air. In the hot-houses of the botanical garden of Edinburgh, for example, there are two plants, species of the fig tree, the ficus australis and ficus elastica, the latter of which, as Dr. Graham asserts, has been suspended for ten, and the former for nearly sixteen years, during which time they have continued to send out shoots and leaves. Before scientific men had learned to appreciate the influence of atmospheric air on vegetation, the increase of carbonaceous matter, which occurs in some of these instances, was supposed to be derived from water, an opinion naturally suggested by the important offices performed by this fluid in the vegetable economy. Without

108 to 112 from Dr. Turner's Elements of Chemistry.

water plants speedily wither and dic. It gives the soft parts that degree of succulence necessary for the performance of their functions;—it affords two elements, oxygen and hydrogen, which either as water, or under some other form, are contained in all vegetable products;—and, lastly, the roots absorb from the soil those substances only, which are dissolved or suspended in water. So carefully, indeed, has nature provided against the chance of deficient moisture, that the leaves are endowed with a property both of absorbing aqueous vapour directly from the atmosphere, and of lowering their temperature during the night by radiation so as to cause a deposition of dew upon their surface, in consequence of which, during the driest seasons and in the warmest climates, they frequently continue to convey this fluid to the plant, when it can no longer be obtained in sufficient quantity from the soil. But necessary as water is to vegetable life, it cannot yield to plants a principle which it does not possess. The carbonaceous matter which accumulates in plants, under the circumstances, above mentioned, may, with every appearance of justice, be referred to the atmosphere; since we know that carbonic acid exists there, and that growing vegetables have the property of taking carbon from that gas.

113 Ashes of Plants. When plants are incinerated, their ashes are found to contain saline and earthy matters, the elements of which, if not the compounds themselves, are supposed to be derived from the soil. Such at least is the view deducible from the researches of Saussure, and which might have been anticipated by reasoning on chemical principles, The experiments of M. Schrader, however, lead to a different conclusion. He sowed several kinds of grain, such as barley, wheat, rye, and oats, in pure flowers of sulphur, and supplied the shoots as they grew with nothing but air, light, and distilled water. On incinerating the plants, thus treated, they yielded a greater quantity of saline and earthy matters than were originally present in the seeds. These results, supposing them accurate, may be accounted for in two ways. It may be supposed in the first place, that the foreign matters were introduced accidentally from extraneous sources, as by fine particles of dust floating in the atmosphere; or, secondly, it may be conceived, that they were derived from the sulphur, air, and water, with which the plants were supplied. If the latter opinion be adopted, we must infer

either that the vital principle, which certainly controls chemical affinity in a surprising manner, and directs this power in the production of new compounds from elementary bodies, may likewise convert one element into another; or that some of the substances, supposed by chemists to be simple, such as oxygen and hydrogen, are compounds, not of two, but of a variety of different principles. As these conjectures are without foundation, and are utterly at variance with the facts and principles of the science, I do not hesitate in adopting the more probable opinion, that the experiments of M. Schrader were influenced by some source of error which escaped detection.

114 Peat Soil. Under the name of Peat, a soil which is so frequently recommended as indispensable to the successful culture of various species of plants, is comprehended two very different kinds of earth, with numerous intermediate varieties. Some of these are totally unfit for use, without previous preparation and admixture. Heath peat is that found upon dry barren heaths, generally only a few inches thick, of a black colour, with a mixture of sand. This answers well for pot culture, either by itself or mixed with other soils. When used for beds of American plants, one-fourth part of fresh loam should be mixed with it. Bog peat is found in low marshy situations, frequently of considerable depth, without any mixture of sand. This description of peat is unfit for garden purposes, in the state in which it is originally dug from such marshy grounds. It should be laid in heaps, or rather in flat beds, to have full exposure, through an entire winter; and in such situation it will require to be frequently turned over, to sweeten and to become pulverized. When thoroughly friable, it is more valuable than heath peat, being, by the addition of sand, applicable to every purpose to which peat soil can be used, whether simply or compounded with more common soils. If peat of this description be laid over the common garden borders, to the thickness of three or four inches, and then very well worked in amongst the common earth, to the depth of 18 inches, it will be found to add greatly to its fertility, for every purpose both of the kitchen and flower garden. There is scarcely a hardy exotic, but will grow in it most luxuriantly. A description of bog peat will sometimes be met with, particularly in mining districts, of a yellowish hue, or having veins or strata, principally of such colour. This we have

found to contain a considerable portion of oxide of iron; and although reduced to powder and mixed with sand, before being used, we have seen American shrubs which had been planted in it, dwindle year after year, and ultimately die.

115 Woodlice, to Destroy. Very few hothouses or frames are entirely exempt from that troublesome little animal, the Woodlouse, the Oniscus ascellus of Linneus. When few in number the injury done by them to growing plants is trifling; we may, notwithstanding, wish the sons of Galen possessed those few for the benefit of their jaundiced patients. In common hotbeds and mushroom beds, when from overheating or other causes, they become dry, and afford convenient places for shelter and increase, Woodlice are, sometimes, so numerous as to destroy much of their crops, and have been found difficult of extirpation. By complying with the following directions this difficulty may be removed. These insects are very partial to the fleshy roots of the common white Bryony,—Bryonia dioica. If this be cut into thin slices, and allowed to become nearly dry, it makes an excellent bait for entrapping them. The Briony is conveniently used by putting one or two slices into a garden pan, or on a tile, with a little loose dry moss over it, where the insects resort. They will soon both find and feed upon the Briony root; and as the dry moss will afford them convenient shelter they will remain beneath it. These traps should be examined every morning or oftener, when the insects may be destroyed. The Bryony is found sparingly in most old hedge rows; but as the roots are difficult to discover, during winter, a root or two should be transplanted into the garden, to be ready when wanted.

116 Fossil Ferns. In a number of the Athenæum of 1835, was a notice on Fossil Ferns. As it contains an assertion somewhat at variance with our anticipations, geologically; and also a method of comparison, worth remembering, we copy it. "As it is very rare to find a fossil fern, the mere impression, generally speaking, being all that remains, a M. Gœpper has taken the impression of a number of recent ferns, in order, by comparison, to try and ascertain the fossil species with greater facility. By this method, M. Gœpper has been able to recognize more than thirty species, which are analogous to those of the present day."

117 Rafflesia Arnoldi. In the Floral Register we have figured this most extraordinary production, and its character de-

137 AUCTARIUM. 117, Trans. Lin. Soc. Vol. 13. Condensed in London's Mag. Nat. Hist. Vol. 1.

mands further notiee than we eould there bestow on it. Dr. Robert Brown has given an interesting paper on the subjeet, and the singularity of the plant demands that we should supply our readers with an aeeount of its peeuliar structure. "It is a parasite, growing in woods, on the roots and stems of those immense climbers, generally of the genus Vitis, whieh are attaehed, like eables, to the largest trees in the forest. The flower eonstitutes the whole of the plant, there being neither leaves, roots, nor a stem. It is a true parasite, growing out of another plant in the manner of the mistletoe, and not on the deeayed surfaee of plants, as the eommon fern on the trunks of old oak pollards. The breadth of a full-grown flower exeeeds three feet; and the petals, which are subrotund, measure twelve inehes from the base to the apex, and it is about a foot from the insertion of the one petal to the opposite one; what is eonsidered the neetarium would hold twelve pints; the pistils, whieh are abortive, are as large as eows' horns, and the weight of the whole is ealeulated to be about fifteen pounds. The flower, fully blown, was diseovered in a jungle, growing elose to the ground under the bushes, with a swarm of flies hovering over the neetary, and apparently laying their eggs in its substanee. The eolour of the five petals is a brick red, eovered with protuberanees of a yellowish white. The smell is that of tainted beef. The structure of Rafflesia is too imperfectly known to admit of determining its place in the natural system; but Mr. Brown is inelined to think it will be found to approaeh either to Asarinæ or Passifloreæ. Its first appearanee is that of a round nob, proeeeding from a eraek or hollow in the stem or root. This knob, when eut through, exhibits the infant flower enveloped in numerous braeteal sheaths, which sueeessively open and wither away as the flower enlarges, until, at the time of full expansion, there are but a very few remaining, whieh have somewhat the appearanee of a broken ealyx. It takes three months from the first appearanee of the bud to the full expansion of the flower. The fruit has not yet been seen by botanists, but is said by the natives, to be a many-seeded berry. The female flower differs little in appearance from the male, further than being without the anthers of the latter. The modes of union between a parasite and its supporter or stoek, vary in different genera and speeies of this class of vegetables. Some, as the mistletoe and Rafflesia, depend on the stoek for nourishment during the whole of their existence; others, as the common broom rape, are originated in the soil, and afterwards, when they have attached themselves to their stock, the original roots die; other parasites, again, are originated on the stock, and in their more advanced state produce roots of their own. In some cases the nature of the connection between the parasite and the stock is such, "as can only be explained on the supposition, that the germinating seed of the parasite excites a specific action in the stock, the result of which is the formation of a structure, either wholly or in part derived from the root, and adapted to the support and protection of the undeveloped parasite; analogous, therefore, to the production of galls by the puncture of insects." on this supposition may be explained, the connection betwcen the flower Rafflesia and the root from whence it springs.

118 Rhododendron, Grafting of. Mr. Joseph Walker of Banner Cross, near Sheffield, has succeeded in grafting the Rhododendron Alta-clerense on the ponticum. In a communication inserted in the last (74th) Number of the Gardener's Magazine, he states that having obtained a small sprig of the Rhododendron Alta-clerense from Mr. Paxton at Chatsworth, he inserted the end of it into a potatoe, and took it home. Happening, he says, to have a small plant of Rhododendron ponticum in a pot, I cut it down to about five inches above the pot, and grafted it in the whip manner with the small sprig thus procured, letting the end still remain inserted in the potatoe. I then clayed it, and put it under a hand glass in a cool vinery, where it united to the stock, and is now a healthy plant, standing out under a south wall.

119 Preserving Plants during a Voyage. Capt. R. Gillies, of the ship Hibernia, communicated the following method to Messrs. Fox; given in the Report of the Royal Cornwall Polytechnic Society. "In accordance with your wishes, I have much pleasure in describing to you the mode in which the plants brought by me from Calcutta were put up. The plants were all intended for the greenhouse in England, and, I presume, were of a delicate kind. Each plant was in a box, six inches square, by one foot in depth, filled to the top with a kind of clay; and, no doubt, well saturated with water, previously to being put into the large outer box, which contained eight of these small ones. The large box was constructed in the usual

 119, Gardener's Mag. 12, 264.

way; that is, a glazed roof about two feet high, the glass strong enough to resist the fall of a small rope, or other light body. It was hermetically closed with the common lime cement of the country, and was never opened during a voyage of five months. When we arrived in England, the plants were all in beautiful health, and had grown to the full height of the case, the leaves pressing against the glass. In dry weather, I always observed moisture within the glass, which was caused, no doubt, by the evaporation of the earth, and was again absorbed by the plants. It is difficult to account for the perfect health of the plants, without the full admission of the atmosphere; but oxygen sufficient was probably admitted, either through the pores of the wood, or otherwise. It is, however, a fact, that no water was given to them during the voyage, and that they were landed in excellent order." This reminds us of Mr. Ward's plant cases, explained at section 72.

120 Pomegranate, to flower. Under common management, the double-flowered Pomegranate rarely blossoms freely, and oftentimes not at all. Mr. David Whale, Gardener, of Winchester, in a paper inserted in the Floricultural Cabinet, No. 39. says "The double flowering kind is much more esteemed than the other in this country, for the sake of its large fine double flowers, which are of a most beautiful scarlet colour; and if the trees are well managed, and supplied with due nourishment, they will continue to produce flowers for four or five months successively, which renders it one of the most valuable flowering trees. This sort may be rendered more productive of flowers, by grafting it upon stalks of the single kind, which checks the luxuriance of the trees, and causes them to produce flowers upon almost every shoot. There have been various ways recommended to manage the pomegranate, so as to make it flower freely, and forty years' experience has taught me what I conceive to be the most successful method. I do all my pruning in the summer season; training the branches at a regular distance, of about four inches apart, in the same way as I train a plum tree; towards the latter end of June I look over the trees, and remove all the shoots that are running to wood; at which time they are young and tender, and are easily removed without the assistance of a knife. Care must be taken to leave all spurs and blossom shoots, which are easily distinguished from wood shoots. This I do about three times during the summer, and by this treatment

the tree continues to flower four or five months, making a very grand appearance, and repaying by its beauty for every care a gardener can bestow. The knife should never be used about these trees in winter, except to remove decayed branches, &c. They are easily propagated by layers or cuttings. To accomplish the first, in March, select some of the young branches for the purpose, give a little slit at a bud underneath, or they will easily strike root without slitting, and I consider that method to be the safest; lay them in the usual way, water them occasionally during the summer, and by the following autumn they will be well rooted so that they may be taken off and removed to any warm situation, to gain strength, before they are planted where they are to remain. If cuttings are required, in June, take some young tops of branches, select a warm place in the garden, place them under a hand-glass, shade them in hot weather, and by autumn they will have taken root."

121 CULTURE OF CACTEÆ. In the extensive family of Cacteæ are some of the most showy plants which we possess, either for the greenhouse or for decorating a room. Amongst them we may particularly mention Cereus speciosissimus, speciosus, truncatus, Ackermanni, Jenkensonni, hybrida, all of which are of the easiest management, whether cultivated in the greenhouse, or in sitting rooms. The soil in which it was formerly considered requisite to pot these splendid plants, was that which was poor, and mixed with old lime rubbish. It has, however, of late been dicovered that rich soil, mixed with manure, is preferable. How far the same compost would suit other succulent plants has yet to be ascertained by experience. From March to November the various species of Cereus ought to have a plentiful supply of water; and occasionally they should likewise be supplied with liquid manure. During the winter months it is desirable that they be kept both cool and dry, a treatment that will induce a most abundant produce of flower buds, which will soon burst forth after they begin to receive a plentiful supply of water in March. They are readily increased by cuttings, and by grafting upon each other, a method which admits of many species being grown upon the same plant, The best stock on which the Cereus truncatus can be grafted is the Pereskia aculeata, upon which it grows more rapidly than even from its own roots. When thus grafted upon a high stock, and trained care-

139 AUCTARIUM. 121, D. Cameron.

fully in an Umbrella form, it produces a most novel and interesting appearance. Much has been done in hybridising these plants, and it is likely that many beautiful and singular varieties may yet be obtained by the same means, particularly if the subgenera Mammillaria, Melocactus, Echinocactus, Opuntia, Periskia, and Rhipsalis, will fertilize the Cereus. In other genera, seeds saved from hybrids are found to produce the greatest number of new varieties, the existing hybrids of this genus ought therefore, in artificial fertilization, to be employed as the female parent.

122 POTATOES, MOULDING UP. Much disparity of opinion occurs respecting the utility of moulding up Potatoes. Joseph Hayward, Esq. in the ninth volume of the Gardener's Magazine, objects to the practice altogether, as one not only of inutility, but of injurious tendency towards the crop. We wish that some of our friends would assist in obtaining further proofs. Mr Hayward says, "Observing that a farmer, in managing a field of potatoes alongside one of mine, did not earth them up, but simply flat-hoed the surface of the soil to clear away the weeds, while I had mine earthed up with great care, I determined on noticing the difference on taking up the crop; and, to my astonishment, he had 14 tons per acre, while I had not more than half the quantity, and his potatoes were of a more marketable quality than mine; being generally of a good size, while mine were large and small. The result induced me to question the farmer; and he told me it was a practice he had followed for many years, as he thought the earthing up was worse than labour thrown away; that, a year or two before, he had obtained 19 tons per acre by the same management. This statement put me upon considering the principles upon which such a result was founded; and it appeared to me that, by drawing up the earth over the potato, in sloping ridges, it was deprived of its due supply of moisture by the rains; for, when they fell, the water was cast into the ditches. Further, in regard to the idea that, by thus earthing up, the number of tubers is increased, the effect is quite the reverse; for experience proves that a potato placed an inch only under the surface of the earth will produce a greater number of tubers than one planted at the depth of a foot. From reasoning thus, I determined to adopt the practice: however, such is the force of prejudice, that I have

been able to make but few proselytes. A year or two since, I prevailed on a clergyman to try the practice on a strip of half an acre, running through a large field, treated in the common manner; and he told me that, on taking up the crop, he did not find much difference in the gross quantity; but that those which had not been earthed up, were more generally of a good size; not so many large and small as the other part of the field. I have no doubt, if potatoes are planted shallow, and placed wide enough apart to admit of the stems being laid down after the young potatoes are formed, and to have the earth between them thrown over five or six inches thick, so as to form a flat surface, that it would increase the crop. But this is a very different operation from that I object to."

123 Proteaceæ, Culture of. Difficulties have hitherto presented themselves in the culture of the several species of Banksia, Dryandra, and others of the Proteaceæ, which form prominent ornaments of the greenhouse. Many of these interesting plants, which have at different times been admired in the principal collections around the metropolis, are now no where to be found. One reason of this has doubtless arisen out of the management which has existed in the practice of continuing to stimulate the plants into active growth, immediately after their flowering season; the time which, in their indigenous situations, naturally constitutes their season of repose. In tropical countries the season of vegetable repose does not occur from low temperature, as in our own climate. With us a low temperature, which distinguishes our winters, depresses vegetables into torpidity and rest—a state of existence which is as requisite to vegetable as to animal life. In tropical plains, heat is perpetual, but the magnificent plants, natives of those climates, still have their season of rest; a season which the judicious cultivator will endeavour to imitate. Within the tropics the year possesses two prominent features, as in our northern latitude; but with us this arises from temperature, whilst in the tropics it arises from moisture. During the rainy season, attended as it is by intensity of heat, plants vegetate with a luxuriance, and assume a character of magnificence, of which no artificial means can afford an adequate idea. Under this increased stimulus, their flowers and fruit proceed rapidly to maturity, and by the time of its accomplishment, intense heat and drought begin to spread,

languor and inactivity, and vegetable life thus overpowered, sinks into repose. This season of drought is what the cultivator has studiously to imitate. His tropical plants should have but sufficient moisture merely to continue their existence; and thus they will be prepared, at the proper season, when water is allowed them freely, to vegetate with their natural vigour. We have been led into this comment, by an article of Sir W. J. Hooker, in the Botanical Magazine, combining a paper on the culture of these plants, communicated by Mr. J. Smith, of his Majesty's gardens at Kew. It is stated that Mr. Smith, adverting to the interesting pamphlet of Mr. Macnab, the excellent Superintendent of the Royal Botanic Garden, at Edinburgh, on the propagation and culture of Cape Heaths, which appeared in 1831, observes, that he had pursued with success for some time antecedent to that date, the same mode of treatment of Proteaceæ under his care, that is recommended in that publication, with respect to the culture of Heaths, viz. in regard to shifting the plants into fresh and larger pots; in the process of which, it is very important to afford, by means of potsherds, or fragments of half-baked pottery, a good drainage below, and especially to avoid deep potting, by placing the plant, with its ball of earth round the roots quite entire, so as to be some two or three inches above the surface of the soil at the edge of the pot, which will have the effect of carrying off any superabundant moisture from the roots to the circumference, and thus prevent the chance of water becoming stagnant round the base of the stem; by inattention to this latter circumstance, many a Banksia and Dryandra in other collections have been killed; whilst a steady regard to free drainage, to an abundant circulation of air, and a low temperature, he has succeeded in preserving many fine proteaceous plants longer than is generally effected in other gardens in the neighbourhood of London. The soil, continues this intelligent cultivator, which I use in the culture of most of the Proteaceæ, is a good fresh loam, with which, if stiff, I mix a portion of sand, so as not to admit of its being retentive of water. In time, after being potted as already directed, the main roots next the stem of the plant will become uncovered: this circumstance I regard as favourable to the health of the plant: there will be no danger of its dying suddenly, as I have known many to do, that have been buried alive,—in other words, been deeply potted!" "In the winter months, care should be taken not to saturate the earth with water, nor wet the leaves or stem more than can be avoided. In dry weather however, during the summer season, water may be freely given to the plants about sunset, and a very essential point to be observed is, that when they are placed out in the open air in groups, the sun's rays should not be allowed to fall directly on the sides of the pots, for if they are, all the feeding spongioles of the tender roots round the inner side of the pot, will assuredly be destroyed, and the life of the plant greatly endangered. Repeatedly have I known a Banksia to have been killed by the solar ray having been thus allowed to act on the side of the pot, which six months' afterwards retained so much of a life-like look—being kept yet in its pot—as to appear to the eye of a superficial observer, to be still alive, and in perfect vigour. The lowest greenhouse temperature that can judiciously be allowed, to prevent the effects of frost, is sufficient for the generality of the family now in cultivation in Britain, and no artificial heat is required for their preservation, excepting in severe frosty weather." "As the rapid upright-growing species are, if left to themselves, shorter-lived than others naturally more robust, the free use of the knife is recommended, and the growth of the plants checked, by keeping the luxuriant shoots cut back. This remark is especially applicable to those beautiful plants of the order, with simple, strait, wand-like stems, such for example as Banksia Brownii and Dryandra Serra, the former of which has been lost to several collections that could once have boasted of it, by its having been suffered to shoot up into exuberant growth, far beyond what the slender, tapering, thinly-fibred root could at all furnish sustenance. By heading these down somewhat, and thus reducing the ascending axis, or column of circulation, a more robust habit is induced, a growth of roots in their pots takes place, lateral branches are thrown out, and the plants thus treated at Kew, are now in the best possible health, with every indicative of being fully established in that garden."

124 Peas. The Fellows of the London Horticultural Society must derive satisfaction from the undoubted benefits which Horticulture and Floriculture have received from their united efforts. One of the useful practices in the Society's garden is that of

collecting Kitchen vegetables, from various sources, and cultivating them in juxtaposition, to ascertain their comparative value. This has been done with Peas, and a Report of the result appears in the fifth part of the Society's Transactions. An abridgement has been given in the Gardener's Magazine, which we shall further curtail. Mr. George Gordon the writer of the Report has given the estimate of the most superior sorts, for cultivation, under four heads, viz:

For early sowing. Early Dwarf, or Pois nain hâtif. Height about 1½ ft., and somewhat resembling Bishop's Dwarf, but is more prolific; broad, mostly containing 5 peas. It is the best of the dwarfs, as it is very prolific, and of good quality. Early Frame; also known as Best early, early single-blossomed, early double blossomed frame, early one-eyed, double dwarf frame, single frame, early dwarf frame, superfine early, Batt's early dwarf nimble, early Wilson, Young's very early, early Nicholas, Perkins's early frame, early Nana, Mason's double-blossomed, Russell's fine early, early French, dwarf Albany. About 4 ft. high, and rather slender. Pods small and round, mostly containing 5 or 6 peas. Very prolific, of excellent quality, and the earliest pea in the whole collection. The number of blossoms on this pea entirely depends on the soil and situation it is grown in. It must not be confounded with the following sort. Early Charlton; also, known as Golden Charlton, early sugar frame, late dwarf, Twesly dwarf, Hotspur, Wrench's Hotspur, double dwarf Hotspur, early Hotspur, golden Hotspur, common Hotspur, early Nicholas Hotspur, Nimble Taylor, very fine late garden, Paddington, Essex Reading, Russell's early blossomed. About 5 ft. high, and of strong growth. Pods large, broad, and rather flattened, mostly containing 6 or 7 peas. A very prolific bearer, of excellent quality, and the best pea for standing the winter in the collection. It is about a week or ten days later than the early frame, but will continue much longer in bearing, and, like the preceding, varies in appearance according to soil, situation, &c. D'Auvergne. About 5 ft. high, and rather slender. Pods very long, nearly round, much curved and tapering a good deal to the extremities, mostly containing 11 or 12 peas if well grown. A very abundant bearer, of excellent quality, and later than the early Charlton in coming into use. It is the best pea for produce, and deserves to be generally cultivated in all gardens, which it doubtless will be, when its qualities become better known.

FOR LATE SOWING. KNIGHT'S DWARF MARROW. English Synonymes: Dwarf Knight's, Knight's new dwarf. About 3½ ft. or 4 ft. high, very much resembling the dwarf white marrow, but of stronger growth. Pods broad, and rather flat, containing 5 or 6 peas. Of excellent quality, and very prolific. The seed wrinkled when ripe. KNIGHT'S TALL MARROW. Ridé hâtif, ridé tardif, ridé. English Synonymes: Knight's late. About 6½ ft. high, and of very strong growth. Pods large and broad, containing 8 or 9 peas. Of excellent quality and later than the preceding by a week. Peas, when ripe, shrivel very much, and are remarkably sweet. This pea is the best of all the tall ones for late sowing in summer. TALL GREEN MARROW. English Synonymes: Green tall, new large green, imperial green. About 7 ft. high, and of very strong growth. Pods large, broad, and rather flat, containing 8 or 9 peas. Of excellent quality, late, and very prolific. Peas, when ripe, of a yellowish green colour. CROWN PEA. English Synonymes: American crown, rose or crown. About 5½ ft. high, of very strong growth, with the blossoms in tufts at the extremity, somewhat like a crown, from which it derives its name. Pods, small, round, and straight, containing 5 or 6 peas. A very abundant bearer, of good quality, and very good for summer use.

SUGAR PEAS, (not to be sown before the first of March) EARLY MAY SUGAR. English Synonymes: Early Dutch, early sugar, dwarf Dutch sugar. About 4 ft. high and very slender. Pods, small, round, and straight, containing 6 or 7 peas. Of good quality, but only a moderate bearer. This is the earliest pea in the collection, but is very tender, and will not do to sow before the beginning of March. LARGE CROOKED SUGAR. English Synonymes: New pea, sugar pea, broad sword, early Spanish. About 6 feet high and very strong. Pods very large, broad, and much twisted, containing 9 peas. Peas large and prominent in the pods. Of excellent quality, very productive and the best in its class. VILMORIN'S SUGAR. About 6½ feet high, and of slender growth. Pods, small, round, and straight, containing 7 or 8 peas, which as in all the other sugar peas, are very prominent, even when quite young. Of excellent quality, and the greatest bearer in this class. It was received from M. Vilmorin as an "espèce de pois très-excellent." TAMARIND PEA. English Synonyme: Late dwarf sugar. About 4 ft. high, and of robust growth. Pods large, broad, and much curved, containing 9 or 10 Peas. Of excellent quality and a very abundant bearer. The pods are from 4 in. to 5 in. long, and are produced the latest in this class.

DWARF BLUE PEAS FOR SUMMER USE. DWARF IMPERIAL. English Synonymes: Blue imperial, dwarf green imperial, new improved imperial, new improved dwarf imperial, new dwarf imperial, new long-podded imperial, Sumatra, green nonpareil, dwarf blue prolific, blue scymitar, sabre, blue sabre, new sabre, dwarf sabre. About 4 ft. high, and of strong growth. Pods large, long, and rather flat, much pointed and containing 8 or 9 peas. Of excellent quality, a good bearer, and one of the best peas for summer, as it is very late in coming into use. BLUE PRUSSIAN. Nain vert petit, nain royal, gros vert de Prusse. English Synonymes: Dwarf blue Prussian, royal Prussian blue, fine long-podded dwarf, Prussian prolific, early Dutch green, green Prussian. About 3½ ft. high, and of strong growth. Pods long and rather round, containing 8 peas. This is so well known, that it is quite useless for me to say anything about its good qualities. It is undoubtedly the best for summer use, and one of the greatest bearers. WHITE PRUSSIAN. English Synonymes: Prolific or poor man's profit, prolific, tall Prussian, dwarf white Prussian, new dwarf Norman, royal dwarf, royal prolific, dwarf Tewsley, Stowe pea. About 4 ft. high, and very robust. Pods broad, long, and rather flat, containing 7 or 8 peas, which are large and white. Of good quality, and, like the blue Prussian, an excellent summer pea, and very prolific. This is the best sort for general cultivation, and well deserves the name of poor man's profit; but it will not remain so long in bearing as the blue Prussian. GROOM'S SUPERB DWARF BLUE. About 18 in. high, and of robust growth. Pods large, broad, and rather flat, containing 8 or 9 peas. Of excellent quality, a very abundant bearer, and a few days later than the blue Prussian, of which it seems a distinct dwarf variety. Raised by Mr. H. Groom, of Walworth, who sent seeds of it to the garden in 1831. This deserves general cultivation, as it requires no sticking, and produces more on the same space of ground than any other dwarf sort.

125 Cropping a Garden. As we have just copied directions which we hope will be useful in enabling the cultivator of the kitchen garden to select from amongst the numerous sorts of peas those which will prove most useful for the purposes required; we shall now extract from the same source a few general directions to be observed in cropping a garden. "The object to be obtained by a system of cropping is that of procuring the greatest quantity, and the best quality, of the desired kind of produce, at the least possible expense of labour, time, and manure; and, in order that this object may be effectually obtained, there are certain principles which ought to be adopted as guides. The chief of these is to be derived from a knowledge of what specific benefit or injury every culinary plant does to the soil, with reference to any other culinary plant. It ought to be known whether particular plants injure the soil by exhausting it of particular principles; or whether, as has been lately conjectured by De Candolle, and as some think proved, the soil is rendered unfit for the growth of the same or any allied species, by excretions from the roots of plants; while the same excretions, acting in the way of manure, add to the fitness of the soil for the production of other species. The prevailing opinion, as every one knows, has long been, that plants exhaust the soil, generally, of vegetable food; particularly of that kind of food which is peculiar to the species growing on it for the time being. For example, both potatoes and onions exhaust the soil generally; while the potato deprives it of something which is necessary to insure the reproduction of good crops of potatoes; and the onion of something which is necessary for the reproduction of large crops of onions. According to the theory of De Candolle both crops exhaust the soil generally, and both render it unfit for the repetition of the particular kind of crop: but this injury, according to his hypothesis, is not effected by depriving the soil of the particular kind of nutriment requisite for the particular kind of species; but by excreting into it substances peculiar to the species with which it has been cropped, which substances render it unfit for having these crops repeated. Both these theories, or rather perhaps hypotheses, are attended with some difficulty in the case of plants which remain a great many years on the same soil; as, for example, perennial-rooted herbaceous plants and trees. The difficulty, however, is got over in

143 AUCTARIUM. 125, Gard. Mag. Vol. 12, 476.

both systems: by the first, or old, theory, the annual dropping and decay of the foliage is said to supply at once general nourishment and particular nourishment; and by the second, or new, theory, the same dropping of the leaves by the general nourishment which it supplies, is said to neutralize the particular excretions. It must be confessed, that it is not very obvious how general nourishment, dropped on the surface of the soil, can neutralize the excrementitious matter, deposited many feet beneath the surface; as in the case of long-rooted herbaceous plants, like the saintfoin, lucern, &c.; and deep-rooting trees, such as the oak, &c. Nevertheless, we find that these plants will remain a longer period on the same soil than others, the roots of which never go to any great depth beneath the surface; such as the fibrous rooted grasses, the strawberry, &c., and the pine and fir tribe. We mention these things to show, that though it is not yet determined which is the true theory, yet that the fact of plants injuring, or diminishing the fertility of the soil, both generally and particularly, does not admit of a doubt. In the absence of principles founded on whichever of these hypotheses may be true, recourse is obliged to be had to rules drawn from the experience and observation of those who believe in the old theory. These rules, as adopted by the best gardeners, are as follows:—Crops of plants belonging to the same natural order or tribe, or to the natural order and tribe most nearly allied to them, should not follow each other. Thus, turnips should not follow any of the cabbage tribe, sea-kale, or horseradish; nor peas, beans. Plants which draw their nourishment chiefly from the surface of the soil should not follow each other, but should alternate with those which draw their nourishment in great part from the subsoil. Hence carrots and beets should not follow each other; nor onions and potatoes. Plants which draw a great deal of nourishment from the soil should succeed, or be succeeded by, plants which draw less nourishment. Hence, a crop grown for its fruit, such as the pea; or for its roots or bulbs, such as the potato or the onion; should be followed by such as are grown solely for their leaves, such as the common borecole, the cellery, the lettuce, &c. Plants which remain for several years on the soil, such as strawberries, asparagus, &c., should not be succeeded by other plants which remain a long time on the soil, but by crops of short duration;

and the soil should be continued under such crops for as long a period as it remained under a permanent crop. Hence, in judiciously cropped gardens, the strawberry compartment is changed every three or four years, till it has gone the circuit of all the compartments; and asparagus beds, sea-kale, &c., are renewed on the same principles. Plants, the produce of which is collected during summer, should be succeeded by those of which the produce is chiefly gathered in winter or spring. The object of this rule is, to prevent too active and exhausting crops from following each other in succession. Other rules or principles may be drawn from the nature of the plants themselves; such as some requiring an extraordinary proportion of air, light, shade, moisture, &c.: or from the nature of the changes intended to be made on them by cultivation, such as blanching, succulency, magnitude, &c. In a good soil it is highly advantageous to pursue the mixed or simultaneous mode of cropping, which is founded on the principles, that most plants, when germinating, and for some time afterwards, thrive best in the shade; and that tall-growing plants, which require to receive the light on each side, should be sown or planted, at some distance from each other. Hence, tall-growing peas are sown in rows, 10 ft. or 12 ft. apart; and between them are planted rows of the cabbage tribe; and, again, between these are sown rows of spinach, lettuce, or radishes, &c. Hence, also, beans are planted in the same rows with potatoes or with cabbages (an old practice in the cottage-gardens of Scotland); and so on. The great object in this kind of cropping, is, to have crops on the ground, in different stages of growth; so that, the moment the soil and the surface are released from one crop, another may be in an advanced state, and ready, as it were, to supply its place. For this purpose, whenever one crop is removed, its place ought to be instantly supplied by plants adapted for producing another crop of the proper nature to succeed it. For example, where rows of tall marrow-fat peas have rows of broccoli between them, then, the moment the peas are removed, a trench for celery may be formed where each row of peas stood; and between the rows of brocoli, in the places where lettuces were produced early in the season, may be sown drills of winter spinach.

126 Hydrangea, blue-flowering. A value has been attached to the blue flowering variety of the Hydrangea hortensis, from

its being less commonly seen in collections than the rose coloured. Its value has been further enhanced by the mystification of culture and supposed difficulty in obtaining flowers of that colour, This may, probably, be done by various processes. The colour is not, however, likely to continue beyond one season, when the means used to obtain it have been by any ingredients, given in a liquid state; unless the application be repeated every year. A fine blue colour may be obtained by growing the plants entirely in good heath mould. This may be done by potting young-rooted cuttings in that soil, or by removing all the soil from old plants, and repotting them with heath mould. The blue colour is generally obtained in the first season, to a certainty in the second, and will continue as long as that soil is used. It would be an interesting subject for investigation to ascertain how the colour is changed by the use of heath mould, as it does not appear to have the same effect upon other plants. As the Hydrangea is hardy the change may be produced by planting them out amongst the American plants. Various ingredients have been added to common soil to effect the same purpose; these we intend to notice in a future number.

127 Artichokes, to improve. Running small pieces of lath, or splinters of any wood through the flower stems, within 4 in. of the flower or head, at right angles to the stem, and keeping the wound open, retards the opening of the flower, and makes the head nearly double the ordinary size." This is a German practice, and seems to operate, like ringing trees, by impeding the return of the sap, and so stagnating it in the head.

128 Roses, culture of. In a well-arranged catalogue of Roses by T. Rivers, jun. of Sawbridgeworth, are some useful observations on this universally admired genus. As a few of the ideas are original, we shall give them further publicity. He says, "I still think, that, in unfavourable soils, Roses require being removed, and their roots trimmed every third or fourth year. In cold clayey soils, the best compost for them is rotten manure and pit sand; in warm dry soils, cool loam in lieu of sand; annual pruning which is quite essential, should always be done in October, or in March; but October pruning will be found greatly advantageous as the Rose will then prepare itself during the remainder of the autumn, for vigorous growth in spring. The families of roses are now so well defined, that each ought to

127, Gard. Mag. Vol. 11, 41.

have its department. A clump of Hybrids for their gorgeous colours in June and July; of Perpetuals, for their fragrance in the cold autumnal months; of Noisettes, for their elegance and abundance of flowers; of Scotch Roses, for their precocity and humble growth; in short all require separate culture to have them in perfection; but this of course will only apply to flower gardens rather extensive. Climbing Roses for pillars should be planted in a very rich soil, as they will then put forth strong central branches, of eight or ten feet in length. These, when fastened to the stakes, will furnish a plentiful supply of lateral blooming shoots for many seasons. Climbing Roses, to cover a sloping bank, as their flexible branches can be pegged to the ground in any direction, is perhaps a new idea. Thus trained they will form a beautiful carpet of foliage and flowers, the dark crimson and white varieties blending with peculiar elegance. I also hope to give more zest to Rose culture, in suggesting that all the Perpetual, Isle de Bourbon, and Noisette Roses, from their vigorous habits and tendency to flower, may be made fine objects for ornamenting the Hall, &c., during the autumnal months. For this purpose they should be put into large pots and well furnished with surface manure and plenty of water in summer; their blossoms ought also to be cut off just before expansion. The crimson perpetual Rose has also been forced in France with fine effect. The pots should be plunged in the natural soil to the rims, a deep frame placed over them, and the heat kept up with linings of hot manure, giving air as required. This fine autumnal Rose when thus forced and blooming in March or April is most beautiful: its too short flower stalks are lengthened by this mode of culture, adding to the elegance of the plant. Its flowers are erect, unlike many other forced Roses, and lose none of their colour or fragrance. For all these purposes Roses should be "worked" on the Dog Rose stock, as its vigorous and easily excitable habit are quite necessary, in fact with the exception of the Climbing Roses (to be grown as climbers,) and a few others, this stock is the only medium by which many choice Roses can be brought to perfection. My system of cultivating the Tea Scented Rose, by budding on it and sheltering in winter, has succeeded admirably.

129 TEA SCENTED ROSES. Of these Mr. Rivers observes, they are China Roses, having a strong odour of tea, they are seminal

varieties of the blush tea scented Rose, (Rosa Indica odorata) and of Rosa ochroleuca, or the yellow China Rose. They are more delicate than the common China Roses, as to cold in Winter, and also in their flowers, as they seem to require the warm dewy nights of August and September to bring them to perfection. In hot weather, in June and July they are very fleeting, as their flowers are large and of a delicate texture, soon fading in sunny weather. They require careful cultivation, and must have a raised border against a south, south-east, or west wall. This border should be a compost of rotten manure, or leaves, light loam and sand, equal parts, and raised about eighteen inches above the surface. When grown as low Standards, they are surpassingly beautiful; but they should be taken up in November, and their roots laid in mould, in a shed, as our sharp winters would injure them, so as to prevent their blooming in perfection if left exposed.

130 Moss Roses. Mr. Rivers publishes a List of twenty-four varieties of Moss Roses, and says, one step further towards a dark crimson Moss is made in the "Rouge de Luxembourg," which is very beautiful, and a most luxúriant grower. Most of the varieties prefer a cool soil, though Mossy de Meaux is perhaps an exception, as it seems to flourish better in light dry soils. The White Moss unless budded on the dog Rose, (Rosa canina) will not in general grow well; its sickly appearance in some situations may be often traced to its being worked on some improper stock. If on its own roots in rich soils, it will often change to pale blush. All are well adapted for Standards; but to have them in perfection in warm dry situations, in March, put round each stem, on the surface of the soil, the fourth of a barrowful of manure; on this, place flints or moss, to take of its unsightly appearance, and make a little ornamental mound. This treatment will keep the soil cool, and make them bloom in a most superior manner, even in situations previously thought to be most ungenial to their culture. The manure should be spread on the surface in November, and lightly forked in. We should add that the List of Roses published by Messrs. Rivers and Son, of Sawbridgeworth, Herts, is by far the most complete and best digested which has come under our notice. The Roses are classed in a popular method, and the colour, form, and character of the flower of each is mentioned.

131 Poisons; their Action on Vegetables. Dr. Harlan, in his Medical and Physical Researches, 1835, has stated the effects of numerous experiments which he made to ascertain the effects of poisons on living vegetables. As the subject is one of importance, we copy the following interesting facts. "The application of certain poisons to plants and flowers, in order to destroy noxious insects and larvæ is not unfrequently recommended; and doubts have been expressed as to the injury that might occur to the plants themselves by such treatment. It has even been positively asserted, that the destruction of the plant is the necessary consequence of the application of certain vegetable poisons in some instances. I have been led to the present investigation by perusing a notice of experiments of a similar nature, by M. Marcaire Princep, a professor of botany at Geneva, in the Bulletin des Sciences Naturelles for March, 1830, of which the following is an extract: "The experiments detailed in this memoir, have for their object to prove that the juices or extracts of plants, poisonous to animals, are equally so to the vegetables from which they are obtained. Thus M. Marcaire Princep has succeeded in killing branches, and even entire individual plants of the datura stramonium, hyoscyamus niger, and momordica elaterium, by plunging them into distilled water, charged with the juices and extracts of these plants, or even by watering them with this narcotic water. M. Goeppert of Breslau, has published in the annals of Poggendorff, an account of experiments from which he derived very different results." But neither of these authors extended his experiments to the introduction of poisons into the substance of the plants. I first confined myself to a repetition of the experiments of M. Princep, but obtained results entirely at variance with his. I now determined to pursue the subject on a more extensive scale. In the garden of the Philadelphia Alms-house Infirmary, I selected a number of young and thriving plants, and assisted by the gardener and several of the resident physicians, I applied the following named poisons, as hereafter specified, taking care to wound the bark of the perennial, and the interior parts of the annual plants, so that the poison should be directly applied to the wounded sap-vessels. The poisons used were, the extracts of stramonium. belladonna, and cicuta; the essential oil of nicotiana tabacum, diluted hydrocyanic acid, and oxydum arsenici.

 131, Lancet, No. 665.

"Experiment 1. September 18th. A strong thick solution of the extract of belladonna and cicuta, (German manufactory) was introduced into the bark and pith of different stems of the stramonium. 2. Extract of belladonna introdueed into the stem of the palma Christi. 3. Powdered white oxyd of arsenic was freely spread about the root of a young palma Christi, and the plant was watered. 4. Arsenic introdueed into the stalks of two young tobacco plants, near the roots. 5. Two young stramonium plants were selected: arsenic was introduced into the stalks and stems of one, and spread about the root of the other, and the plant watered. 6. Dilute hydrocyanic acid introduced into an iucisiou made in the stalk of a stramonium. 7. Dilute hodrocyanic acid poured on the root of lady-slipper. 8. Strong oil of tobaeco introduced into the stalk of palma Christi. 9. The same into the stalk of stramonium. 10. The same into the stalk of a young tobacco plant. 11. The same into a branch of the fig-tree. 12. The same placed freely round the root of a young pear-tree, the earth being loosened and watered. 13. The same placed round the root of palma Christi. 14. The same introduced into the stalk of euphorbia sericea. 15. Arsenic freely spread round the root of the mimosa sensitiva—exposed to the rain and dews."

"Some of these experiments were frequently repeated with great eare. The same result universally followed in every instance. Not one plant, shrub, or flower, displayed signs of the least injury from the various applieations of the different poisons; some, indeed, appeared to thrive better for the attentions whieh were rendered them. Some of the experiments were subsequently repeated at my request, by Mr. John Carr, at Bartram's Botanic Gardeu, with extracts of belladonna, and cicuta, aud oil of tobacco. These additional experiments, performed by a skilful practical botanist, eonfirmed the observations previously made: hence, we are permitted to conclude, first, that the experiments detailed by Professor Princep are erroneous. Second, that substances which act as lethal poisons to animal life, are not so to vegetables. We cannot but admire the wisdom, order, and harmony of creation! fixed to the earth by immutable laws, plants and flowers would have soon ceased to exist, had their susceptibilities, like those of animals, rendered them liable to the agency of poisons, to contact with which they are exposed.

Dr. Featherstonhaugh adds the following testimonial: "We had the satisfaction of assisting, during the present month, together with Professor Del Rio, at a repetition of curious experiments on vegetable substances, with vegetable and mineral poisons, conducted by Dr. Harlan, assisted by Dr. Moore, in the garden of the Philadelphia Alms-house Infirmary. Each of the poisons were separately introduced into the circulation of individual plants, by incisions made in the stems, under the leaves, and by similar, separate applications of them to their roots; by infusions, and by powder also, in the case of arsenic. In some instances the poisons were placed round the roots only, viz. corrosive sublimate, arsenic, sp. turpentine, and oil of tobacco. In none of these instances was any of the plants poisoned. One of the young geraniums faded after constant impregnation, for three days, of the earth about its roots, but this is evidently attributable to its soil being rendered unfit for the support of vegetable life. We must therefore adhere to the reasonable opinion, that plants have the property of segregating from the soil or atmosphere those principles which are proper for their healthy state, and of rejecting those which are injurious to their organization. If plants yield to the deleterious influence of those principles which are injurious to other organized bodies, it is because—as in the case of the young geranium—they cannot appropriate those salutary principles, upon which their existence depends, and which enables them to excercise their natural functions, one of which is, to reject that which is injurious to them. We speak now of the circulation of plants, and not of the mechanical application of poison to their parts. Oil of turpentine applied several days to the bark of many trees, and especially the linden tree, will soften and eventually destroy the part; but the experiments tried with the balsamina, or lady-slipper, the palma Christi, the cabbage, and tobacco plant, whose roots were liberally supplied with spirits of turpentine, prove that it did not affect them through their circulation."

We do not entertain a single doubt of the correctness of Dr. Harlan's statement of experiments, here set forth; but, judging from these alone, we cannot admit the justice of the Doctor's conclusion—namely "That the experiments detailed by Professor Princep are erroneous." As far as Dr. Harlan has detailed HIS experiments they cannot be taken as a total disproof of those of Professor Princep. The one applied his poison to the surface of the leaves, which may be said to be the lungs of a plant; the other to its roots and wood. We hope that some of our friends will extend these interesting enquiries, and favour us with the result, that we may publish it for the gratification of our readers.

132 Brugmansia suaveolens. It is not generally known that Brugmansia suaveolens, a plant very generally called Datura arborea, is nearly hardy, and that it flourishes, and becomes so magnificent a plant, in the borders, during summer. To give assistance and encouragement to the culture of this plant, we will copy a communication of Mr. Spence to the Gardener's Magazine, Vol. 12, 589. "About the first of June, I turned the Brugmansia out of the pot, and planted it in the open border, with its ball entire; giving plenty of water at the time, and occasionally repeating it at the root, and likewise over the top. This, I think, it is best to do in the morning, as the plant is not then so liable to flag throughout the day. About a month after this, the roots having extended a considerable distance from the stem, I allowed the plant to flag a little, by withholding water; and then with a spade I cut all round close to the old ball; but first had a quantity of rotten dung ready to be worked down with the spade to the bottom of the roots. After working in the dung, I gave the ground a good watering, in order to moisten the ground down to where the moisture was most wanted, instead of letting it remain to be dried up on the surface. In a week after this, the plant had made thousands of young roots, which found plenty of food close at home. This treatment I repeated twice in the season, the last time cutting the roots one inch farther from the ball, than the first time. This does not injure the plant; on the contrary, it is surprising to see how it will grow immediately after the operation: and another advantage of cutting off the roots is, that the plant is easily repotted in the autumn; provided the diameter of the space included within the last cutting be a little less than the pot for which it is intended. By the above treatment, this plant (without including the flowers that were on it in May) has, from the middle of August to the end of September, expanded 1050 flowers, each of which measures 50 square inches; so that it has produced in six weeks, 52,500 square inches of flowers. The height of this

plant is six feet, its diameter ten and a half feet, and its age four years. We have two more, nearly as good; and two others one year old, which have opened 100 flowers each. In the morning and evening, the fragrance of these flowers scented the air to the distance of 60 yards. An engraving of the Brugmansia sanguinea, will shortly appear in the Botanist.

The principle here acted upon by Mr. Spence, that of shortening the roots to induce the production of laterals, or additional feeders, and then increasing their supply of nutritive matter, is one that deserves the attention of all Horticulturists. This principle may be applied by numerous methods, which will readily present themselves to the minds of practical men. Judging of the principle, theoretically, (for we have not practical knowledge on the subject) we may as reasonably anticipate advantages to accrue, in many instances, from pruning the roots of a plant, as from shortening its branches.

133 Filberts; Planting. So little attention is usually paid to the management of Filbert Bushes, that we think an article on the subject in the Auctarium may be useful to very many of our readers. More plain and practical directions we have not met with, than are given by Mr. Rogers in his Fruit Cultivator, a little work of real merit,—a practical guide; to which we are indebted for the following instructions. The cultivation of the Filbert in England is but little regarded, excepting in the county of Kent, where hundreds of acres testify that it forms a prominent branch of rural economy. The most favourable land for a plantation seems to be a light loam on a dry gravelly subsoil; with proper attention, however, the Filbert will succeed on almost any soil or situation. It should be observed that too rich a soil is not favourable to its productiveness; hence it is not requisite that manure be supplied to the ground in which it is planted. Winter, or very early in spring, is the season for making plantations. "The young plants which are chosen by the Maidstone growers are such as have been raised from layers, and which have been lined or bedded out in the nursery for two or three years. The plantations in Kent are either in single rows, or in entire quarters or fields. The plants are put in at eight or ten feet distances, more or less, according to the quality of the soil. Six hundred and eighty plants are required for an acre, at eight feet distances every way; at ten feet distances,

four hundred and thirty-five; and at twelve feet distances, three hundred and two trees will be required."

134 FILBERTS; EARLY PRUNING. "It may be matter of wonder, but so it happens, that the generality of gardeners know little or nothing about pruning Filbert Trees. The art has never been studied either by masters or men; and it is remarkable, that this branch of the pruner's art should have been brought to perfection by the untaught, unlettered Kentish peasant—without books—without master, save experience—without mistress, save Nature herself! It is curious too, that this art has been engrossed by the labourers in the central parts of the county, and without its being followed in other parts of the kingdom. The principle of the Kentish pruners appears to be this: to check and control the natural growth, and thereby bring forth the fruit-bearing principle in greater force and energy. After training the tree to a dwarfed habit, they allow it to expend its strength in no other way than in the production of flowers and fruit. The Filbert is naturally only a shrub, or small tree, and the cultivator makes it still less, for his convenience in pruning and gathering the fruit. That style of pruning which is found the best for the currant, is also the best for the Filbert. Each plant should have one strong upright shoot, of not less than three feet in height, this being necessary in order to the future form of the head; and this, early in the spring, after the trees have been put out in their final stations, is cut down to about eighteen inches from the ground. This height will admit of a clear stem of twelve inches below, and which part must be at first and ever afterwards kept free from shoots, as well as suckers from the root. This deprivation of shoots and suckers will cause the buds left at the top to push with greater vigour. If eight strong shoots be produced in the first summer, they must be carefully preserved, as that number is required to form the head; but if less than this number come forth, then two or three of the strongest (or the whole if necessary) must be shortened back to half their length at the next pruning, in order to obtain the requisite number. The sufficient number of branches being obtained, if not in the first, certainly after the second pruning, they are to be carefully preserved and trained outwards and upwards; at first nearly horizontal, but curving gradually upward at the point. The easiest mode of doing this is by using

a hoop of the proper size plaeed within the shoots, and to whieh the latter are tied in star-like order, and at equal twelve-inch distanees. Such a laterally eurving position may be mueh assisted and caused by a eareful pruner, always cutting at an outside bud, whieh, when grown sufficiently far outwards, naturally turn up to form the permanent branehes. The points of the branches are allowed to rise to the height of six feet, but never higher; and the middle of the tree is always kept free from shoots and branehes, so that a well-trained head resembles a large bowl."

135 Filberts; Productive pruning. "The subsequent management of the trees, both while gaining the desired form, and after having gained it, eonsists in preserving all the short spurs whieh will be produeed on the branches, and eutting away or shortening the laterals whieh every year rise from the same. The management of these laterals is of great consequenee. If they exeeed the length of six inehes, they may be eut baek to a few buds; but if less, they should be preserved, as their points are generally fruitful. The grand object with the pruner is to have the branehes thiekly beset with fruitful spurs, and whieh are only reduced in length, when, after a few years' growth, they beeome too distant from the braneh, when they are eut baek to a healthy spur behind. If any part of the braneh beeomes aeeidentally naked, a strong shoot from the bottom may be led up, and managed so as to fill up the vaeaney. When Filbert Trees are thus managed, and have arrived at their full volume in width and height, they may be kept in the same state for many years—say twenty or thirty—by the knife only, and with the requisite skill in using it. The praetical example set us by the Maidstone pruners confirms two very essential prineiples in the art of gardening, viz. that by eounteraeting the natural tendeneies of a plant, it may be dwarfed, and by thus dwarfing, making it more fruitful. The Filbert Tree is so constituted, that it is ever extending itself by throwing up a multiplieity of suekers, whieh exhaust the bearing branehes and render them sterile; but denying the plant its tendeney to inerease itself by suckers, promotes its energy to inerease itself by seeds."

136 Plants, Slips, and Flowers to revive. Most persons have heard of Camphor water as a stimulant to faded plants

and flowers, but as we have not registered the method of using it, we will now do so. The directions of M. de Droste are to "dissolve camphor to saturation in alcohol, adding the former until it remains solid at the bottom of the latter; a sufficient quantity of rain or river water is then to have the alcoholic solution added to it, in the proportion of four drops to one ounce of water. As the camphor comes in contact with the water, it will form a thin solid film, which is to be well beaten up with the water: for a short time the camphor will float in the water in small flocculi, but will ultimately combine with the fluid and disappear. Plants which have been removed from the earth, and have suffered by a journey or otherwise, should be plunged into this camphorated water, so that they may be entirely covered: in about two, or at most three hours, the contracted leaves will expand again; the young faded and dependent shoots will erect themselves, and the dried bark will become smooth and full. That being effected, the plant is to be placed in good earth, copiously watered with rain or river water, and protected from the too powerful action of the sun, until the roots have taken good hold of the ground. When large plants, as trees, are to be revived, their roots are to be plunged into the camphorated water for three hours; the trunk and even the head of the tree being frequently wetted with the same water, so as to retain them in a properly moistened state. But it is always best, if possible, to immerse the whole of the plant. Shoots, sprigs, slips, and roots, are to be treated in a similar manner. If plants thus treated are not restored in four hours, their death may be considered as certain, for they cannot be recalled to life by any artificial means. They should, consequently, never be left more than four hours in the camphorated bath; because the exciting action of the camphor, when it is continued for a longer period, may injure the plants, instead of doing good to them. It is not necessary to say that the final prosperity of the plants, thus re-animated by the camphorated water, must depend upon the particular properties of the former, the state of their roots, and the pains that are taken with them. The camphor produces no other effect than to restore life to plants nearly dead: after that, all proceeds according to the ordinary laws, and their ultimate state must be left to art and nature." It should not be forgotten that a hand-glass placed over faded seedlings, or other young plants which have been removed, will assist greatly in recovering them and making them strike root afresh. We may add, that flowers in nosegays will continue much longer in beauty, if the water in which they are kept be changed daily; and at each change a small piece of the lower end of the stem, which has rested in the water, be cut off.

137 Electricity, its influence on Vegetation. Mr. Pine, of Maidstone, in a letter on this interesting subject, inserted in No. 692 of the Mechanics' Magazine, says, "We have endeavoured to trace a relation between the structure and functions of plants, and the properties of the surrounding elements, favouring the conclusion that electricity is the grand agent by which the several processes of vegetation are carried forward. Air, water, and solar light, have respectively been viewed as conveying electric influence to the vegetable kingdom. The predominant influence of each of these elements appears to take place in the order just mentioned; and the dry winds of March, the copious rains of April, and bright sunshine of May, appear to exhibit this succession in a general view, while the mingled and varying states of the weather show the almost continual necessity of their mingled operation in different degrees. It may here be observed by the way, that whereas the vital principle in animals is maintained by means of a portion of the atmosphere which is uniformly supplied at all seasons, and is administered to all the more perfect kinds in the exact proportion which is requisite to preserve the uniformity of their heat and vitality; that of vegetables depending on the vicissitudes of the seasons, and even on the variations of the weather, is subject to the like vicissitudes and variations. To me it appears, that in reality they both depend upon the same subtile fluid as emanating from the sun; but whereas, plants derive it in an uncombined state from the floating winds, the condensing vapours, and the direct rays of the sun; animals imbibe it by means of the peculiar organisation of the lungs in those more copious and uniform supplies which their more elevated nature requires, by a chemical decomposition of oxygen in those organs. But this important branch of inquiry cannot be pursued in this place. I now wish to offer a few remarks on the progress of vegetation under the influence of the several elements. 1st. The electric influence of the air in producing the first ex-

 136, Qrly. Jl. of Science, n. s. 1, 499.

citement and spring of vegetation, appears to depend much on the partial absence of its influences under the forms of condensing vapour, and of solar light; as these, by employing the electric fluid in the processes of growth and maturation, would direct large quantities of it from that which is all-essential in the first instance. Hence, our March commences with a total destitution of leaves in all the more foliagenous species of trees, while the annuals among herbs have disappeared. The only vegetative remains of these respective kinds are contained in the buds protruding from the trees, and the seeds which lie concealed in the soil. Thus a large proportion of those rays, which, as the season advances, are employed in the two subsequent processes of vegetation, are reserved to impart electricity to the air, as the instrument of producing the first excitement in the yet closed germs. As a farther preparation,—during the winter, now at its termination, the vapours exhaled into the atmosphere in the preceding summer are gradually condensed, and conveyed into the earth in the forms of rain, snow, and hail, by which means that extraordinary dryness, which distinguishes the early spring, and is remarked by agriculturists for its salutary effects, is in part produced; and in part, probably, by the rarifying influence of the increasing rays, causing the lower strata of our climate to ascend and give place to the denser and yet drier air rushing in from regions into which fewer vapours had been exhaled, and from which they had been more completely removed by a more condensing temperature. These winds are, moreover, of use in removing all particles of moisture, together with other impurities from the exterior of plants, and from the surface of the soil; so that nothing may be left to be acted upon by the electric influence, but the buds, seeds, and emerging shoots. When the winds have sufficiently performed their office of dessiccation, that of vegetative excitement and germination seems speedily to commence. The glancing rays of the early season of the year are evidently more favourable to their accumulation in the atmosphere than the more direct rays of the advancing season; and from this cause in conjunction with those above stated, a much larger proportion of them will be lodged in the air, or resting upon it, reaching to some distance upward, than at a later season. The electric matter accumulating in the higher strata, will propel it downward, and probably at once force a portion of it into the earth, and cause a partial state of negation of it upon its surface; which being followed by a powerful rush upward, as the temperature and rarefaction of the contiguous air increases, must give a great impulse to the seeds and shoots, and act as the immediate cause of germination. As the first incitement to the seeds contained in the soil may thus be produced, so that of the buds of trees must be greatly promoted by the electricity of the rushing winds. That the electricity is much more intense during the cold dry winds of March, in a clear atmosphere, than at any other season, I have been assured by Mr. Sturgeon to be the result of his numerous experiments, in conformity with the few observations which I have made. It may be worth while, however, to observe, that the conclusion had presented itself from the above considerations previously to his favouring me with this information; so that theory and experiment have in this respect coincided, without the one being biassed by the other. That a negative state of the seed and the soil in which it is deposited, in respect to the atmosphere, is peculiarly favourable to germination, while it is much promoted by electricity in general, appears from the following experiment. I sowed some mustard seed on the 20th of April in similar soils, one electrified positively, a second negatively, and a third in its ordinary state. In four days the electrified plants appeared, but those negatively electrified were the most advanced; those not electrified did not appear till two days later. On the 12th of May the plants in a negative state had grown to $2\frac{3}{4}$ inches; those in a positive state to $2\frac{1}{4}$ inches; those not electrified to $1\frac{1}{8}$ inches; the electrified plants were strong and flourishing in proportion. I am here induced to recite the particulars which I received from a medical electrician, of which a general mention has been made. A narcissus plant which was in a very languishing state, being placed in the room in which his powerful electric machine was kept in frequent action, soon began to exhibit signs of extraordinary vigour. It grew to the height of thirty-six inches, and was stout and luxuriant in proportion. Some branches of the moss rose and various other flowers placed in water on the mantle of his room, retained their colours while the seeds were forming, during five weeks, and at last dropped off without assuming a withered appearance. A turk's-cap lily drooped during several hours of the night when the action of the machine was suspended, but resumed its vigour, and again stood erect under its renewed action. These particulars, on the general correctness of which I have every reason to rely, are admirably illustrative of the principle, that a relative state of negation in the source of vegetation from beneath, as compared with the positive state of the atmosphere, though without any absolute addition to the quantity of electric matter, is a most material requisite to its origin and progress. The general high temperature of the room no doubt aided considerably in the process. I lately observed, that whereas sprigs of plants inserted in water, from which the carbonic acid has been expelled by boiling, appear to perish nearly as rapidly as if they had been destitute of moisture: when the water is impregnated with an additional quantity of this gas they retain their vigour. It appears, therefore, highly probable that this gas is essential, or greatly conducive, to the rise of the sap, in consequence of the affinity of its oxygen with the positive electricity of the atmosphere, while its carbon is separated from it and deposited in the leaf, or conveyed into the substance of the plant. The electricity of the air, as distinguished from that of vapours and of solar light, has chiefly occupied the above remarks. My endeavour has been to show that the solar fluid is economised in it, to the exclusion, in a great degree, of the action of vapours and of the direct rays of light upon the shooting and expanding leaf, for the purpose of imparting the first excitement to the germ. The process of nutrition, in connection with an increased supply of electric matter, as the principle of vitality now becomes indispensable, and is accordingly administered in abundance.

138 Flies to exclude from Houses. It seems to have been known to the ancients that the common House Fly (Musca domestica) may be deterred from entering apartments simply by extending a network of white thread before the openings of the room. The Italians sometimes adopt this plan, and for fruit houses, or even for wall trees, it may probably be of essential service. It is further stated in the Transactions of the Entomological Society, I, p. 4, that "if small nails be fixed all round the window frame, at the distance of about an inch from each other, and threads be then stretched across both vertically and horizontally, the apparatus will be equally effectual in ex-

cluding the flies;" but that "the light should enter the room on one side of it only; for if there be a thorough light, either from an opposite or side window, the flies pass through the net without scruple."

139 Olive Tree. Olea Europæa. Few vegetables have been so repeatedly noticed and enthusiastically described by the ancient writers as the olive tree. In all ages it seems to have been adopted as the emblem of benignity and peace. It is frequently mentioned in the Bible: the ancient Greeks were well acquainted with it; and several products of it were employed in medicine by Hippocrates. Pliny is most diffuse in his account of it. Notwithstanding that the olive is now so common in the southern parts of Europe, it is supposed by many to have been derived from Asia. Pliny tells us on the authority of Fenestella, that there were no olive trees in Italy, Spain, and Africa, in the reign of Tarquinius Priscus, in the 173rd year from the foundation of the city of Rome. The Phœnicians are said to have introduced the olive tree into France 680 years before Christ. It is a tree which grows slowly, and may live for centuries; indeed there are some plantations of it in Italy which are supposed to have existed in the time of Pliny. Its ordinary height is from twenty to thirty feet. The wood is hard and is employed in cabinet-work. The leaves stand in pairs on short petioles; they are lanceolate acute, on the upper side of a dark green, on the under, whitish. Countries like Provence and Languedoc, where the olive is extensively cultivated, have a dull and monotonous appearance, from the whitish character of the foliage. Mr. Sharpe in the 48th letter from Italy, says he was wretchedly disappointed to find the hue of this tree resembling our hedges when covered with dust. The flowers are small and white; they form axillary compound racemes. The fruit is an elliptical dark bluish green drupe, which incloses a very hard kernel (pyrena) in which there is usually only one ovule, the others having become abortive. The products of this species necessary to be noticed are the following.

140 Products of the Olive Tree. Resin. The older writers speak of an exudation from olive trees, and which Dioscorides describes as the tears of the Æthiopic olive. In modern times it has been improperly termed olive gum. It was formerly employed in medicine. Olive Leaves. The leaves of the olive tree have

 139, to 142, Medical Gazette, vol. 20, p. 375.

been analysed by Pallas, who, among other products, found tannin and gallic acid. They have been employed externally, as astringents and antiseptics; internally, as tonies in intermittents. FRUIT. The preserved olives which are so admired as a dessert, are the green unripe fruit deprived of part of their bitterness by soaking them in water, and then preserved in an aromatised solution of salt. Several varieties are met with in commerce, but the most common is the small French, and the large Spanish olive. Olives à la picholine have been soaked in a solution of lime or alkali. OIL. The olive is certainly remarkable as a fruit, from the eircumstance of its sarcocarp abounding in a bland, fixed oil, whieh is readily obtained by expression. The process for curing it is somewhat modified in different countries, but its principle is in all essentially the same.

141 PREPARATION OF OLIVE OIL. In Spain the olives are pressed by conical iron rollers, elevated above the stage or floor, round which they move on two little margins to prevent the kernel being injured, the oil from which is said to have an unpleasant flavour. Spanish olive oil, however, is inferior to other kinds, from the circumstance of the time which elapses between the gathering and the grinding of the olives. This arises from the number of mills not being in proportion to the quantity of fruit to be ground; so that the olives are placed in heaps to wait their turn, and in consequenee often undergo decomposition. An excellent account of the manufacture of French olive oil is given by Duhamel du Monceau, in his "Traité des Arbres Fruitiers." The finest oil is procured by bruising the fruit in the mill immediately they are gathered, and then submitting the paste to pressure. The first product has a greenish tint, and is termed virgin oil. The eake or mare is removed from the press, broken up with the hand, moistened with boiling water, and repressed. The products are water, and oil of a second quality: these separate by standing. The eake which is left is termed grignon, and is employed by some as fuel; others, however, ferment it, and by the aid of boiling water obtain a very inferior oil, called gorgon, which is employed either for soap-making or burning in lamps. With the view of inercasing the quantity of oil, some persons allow the olives to undergo incipient fermentation, which breaks down the parenchyma of the fruit before they are pressed; but the quality of the oil is thereby injured. Gui-

beurt tells us that it is a yellow, mild, agreeable oil, and is much used for the table. Recently-drawn olive oil deposits by standing, a white fibrous matter, which the ancients employed in medicine under the name of amurca. In commerce we meet with several varieties of olive oil of unequal quality. A very fine kind (Florence oil) is brought from Florence in flasks, which are surrounded by a kind of net-work formed by the leaves of a monocotyledonous plant, and packed in what are called in commerce half chests. Lucca oil is imported in jars, holding nineteen gallons each. We have, besides, Gallipoli, Sicily, and Spanish oil: they are of inferior quality. According to Sieuve, 100 lbs. of olives yield about 32 lbs. of oil; 21 of which come from the pericarp, 4 from the seed, and 7 from the woody matter of the nut. That obtained from the pericarp is of the finest quality. Olive oil is an unctuous fluid, of a yellow or greenish yellow colour, having little or no odour, and a mild taste. It is lighter than water; readily dissolves in æther, but is very slightly soluble only in alcohol. With alkalies it forms soaps. The Castile soap employed in medicine is made with this oil and soda: it is essentially a mixture of oleate and margarate of soda. Olive oil combines with the oxyde of lead to form the well known emplastrum plumbi or eleomargarate of lead. By exposure to air this oil readily becomes rancid.

142 Adulteration of Olive Oil. Olive oil is said to be sometimes adulterated with poppy oil, though I believe such an occurrence to be rare in this country. Four methods, however, have been proposed for detecting the fraud; and as they have reference to some characteristic properties of olive oil, they deserve notice. The first is the beading: if we shake pure olive oil in a phial half filled with it, the surface of the oil soon becomes smooth by repose; whereas when poppy oil is present, a number of air bubbles (or beads, as they are termed) remain. The second method is by congelation,—olive oil more readily congealing than poppy oil. The third method is that founded on the conducting power of the oil for electricity, and effected by an instrument called an electrical diagometer. This consists of one of Zamboni's dry piles and a feebly magnetized needle moving freely on a pivot. The electricity developed by the pile is made to produce a deviation in the direction of the needle; but when any substance is interposed between the needle and the

pile, the deviation is less in proportion to the bad conducting power of the interposed substance. Now the conducting power of olive oil is, according to Rosseau, 675 times worse than other vegetable oils; but the addition of two drops of poppy or beech nut oil to $154\frac{44}{100}$ grains of olive oil is sufficient to quadruple the conducting power of the latter. The fourth method is by nitrate of mercury. If recently made nitrate of mercury (prepared by dissolving six parts of mercury in 7·5 parts of nitric acid, sp. gr. 1·36) be mixed with twelve times its weight of pure olive oil, and the mixture strongly agitated, the whole mass becomes solid in the course of a few hours. With poppy or other oils, the nitrate of mercury does not form a solid compound, and therefore when they are mixed with olive oil, we judge of their presence and quantity by the degree and quickness of the solidification of the suspected oil. I have already discussed the theory of the process. In this country the employment of olive oil for the table is limited, when we compare it with the extensive and important uses made of it in some other more southern countries. Thus in Spain it is consumed as a substitute for butter.

143 Insects, destruction of. At the last meeting of the Horticultural Society, a communication was read from Mr. Ingram, of Southampton, on a simple an efficacious method of destroying the red spider, green fly, thrip, and scale, and other insects obnoxious to vegetation, without any injury to the plant. It consisted merely in placing the plants within a frame well closed, and putting between the pots laurel leaves well bruised. After remaining in this state for about an hour it will be found that all the two former insects are destroyed, and the plants must then be removed to a warm place, but a long exposure to the vapour of the leaves for about eight hours is found necessary for the removal of the thrip and scale. For a house, 20 feet long by 12 feet wide, two bushels of leaves are found sufficient, which may be bruised inside; the roof and sides are to be kept close with matting, and the night time is considered best for the purpose of the experiment. The effects are to be attributed to the hydrocyanic acid evolved from the leaves, which agrees with a recommendation made by Mr. Waterhouse, at a late meeting of the Entomological Society, for the destruction of insects in the canvas of pictures or wood of the frames, and in old books, &c., similar to the plan he employs in destroying insects in spe-

143, Athenæum, No. 510.

cimens of natural history. It consists in introducing a few drops of prussic acid into a box closed as tightly as possible, and placing therein the infested article, when the destruction of insects will be very quick, as will be seen from their falling down to the bottom of the box, which has sometimes been quite covered with them, although a small quantity only of the acid has been employed.

144 Truffle, observations on. Although the edible Truffle (Tuber cibarium) is indigenous to several parts of England, it is very little known; and the tables of the opulent are usually supplied with it, somtimes at an exorbitant price, from the continent. It is universally admitted to be far superior to the mushroom, or other of the fungi; notwithstanding this, we believe that no successful attempt to cultivate it in England has been made, a circumstance which should stimulate gardeners to surmount the difficulty, if any really exist. The Germans have preceded us in their attention to this subject, and two of their works have been lately translated by F. Mascall, Esq. From these Mr. Loudon has given a long article in his Gardener's Magazine, to which we are indebted for the following concise extracts. Much is said on the subject of training dogs, and even pigs to discover the truffle in its native habitat, but our more immediate object is to invite attention to its culture in situations where it may be collected without such aid. With connoisseurs the Truffle is said to be in higher estimation than the pine-apple amongst fruit, or the oyster amongst bivalves, therefore it may be presumed that persons who possess favourable situations for their growth will gladly avail themselves of instructions for their culture, either to enhance the pleasures of the table or as a source of profit.

145 Truffle; a description of. It is of a round form, more or less approaching to that of a sphere, or of an egg, or sometimes kidney-shaped, and somewhat rough with protuberances. The colour of the surface is, when it is young, whitish; but in those that are full grown, it is either blackish or a deep black. The colour of the inside is whitish, with dark blue and white, grey, reddish, light brown, or dark brown veins, of the thickness of a horse-hair, which are usually variously entangled, and which form a kind of net-work, or mat. Between the veins are numerous cavities, filled with a great deal of mucilage and small

solid grains. These scarcely visible glands were formerly said to be the seeds or germs of the young Truffles. The less the inside of the truffle is coloured by dark veins, the more tender and delicious is its flesh, The blackish external rind is hard, and very rough, by means of fine fissures, grains, and protuberances; and forms, with its small facets, which are almost hexagonal, an appearance by which it somewhat resembles the fir-apples of the larch. Whilst the Truffle is young, its smell resembles that of putrid plants, or of moist vegetable earth. When it first approaches the point of time at which it has attained its full growth, it diffuses an agreeable smell which is peculiar to it, resembling that of musk, but which lasts only a few days; it then becomes stronger, and the nearer the fungus is to its death and its dissolution, which speedily ensues, so much the more unpleasant is its smell. Whilst young, the flesh is watery, and its taste is insipid: when fully formed, its firm flesh, which is like the kernel of the almond and the nut, has an extremely aromatic and delicious taste; but as soon as the fungus begins to decay, and worms and putrescence to attack it, its taste is bitter and disagreeable. Wherever Truffles are produced, there they are to be found the whole year through, from the beginning of spring till late in autumn; but in the greatest plenty from towards the end of the month of August to the latter end of October. They thrive extremely, like all fungi, in warm moist autumns, and are then most delicious. After warm continuing showers, they are found nearer the surface of the soil, sometimes so high that they form little hemispherical mounds of earth, in which small clefts are produced by the sun's rays. If the soil is loose, and dry weather succeeds, the earth which was raised up falls down, and the Truffle is seen half-uncovered. Nevertheless, these Truffles are of small value, as they are generally either dead or worm eaten. The favourite habitat of Truffles is a somewhat moist light wood-soil, which is defended from the immediate effect of the burning rays of the sun by large oak trees, standing at a distance from each other, but is not deprived, by thick bushes, of the free access of currents of air. Where, in woods, there are places bare of timber trees, and with but few bushes, or covered with pollarded wood that does not stand thick, they thrive under an oak, beech, whitethorn, and even under a fruit tree, and sometimes attain the weight of from a pound to a pound and a half: this unusual size, however, is only met with in moist warm grounds. Here they lie nearer the surface of the soil. The drier the soil is, the deeper they are produced in it; but are usually so much the smaller: to this the vicinity of springs is the sole exception.

146 TRUFFLE, CULTIVATION OF. Upon the first production of the Truffle its size is scarcely perceivable; as it proceeds in its growth, the earth that is around it is pressed together and pushed off. On this account the Truffle can prosper in none but a loose soil. If the soil is everywhere equally loose, the Truffle assumes a globular form; but this is changed if there is on one side a greater opposition than on the other; as, for instance, by a root or a stone. Hence the different forms of the tubers may be explained. Where the soil is most moist, whether above or under the Truffle, there it will either rise up or sink deeper. In laying out Truffle beds a distinction must be made between wood land and garden land. The former needs not much preparation, and promises a surer profit than garden land, with which must be artificially mixed those species of earth that, in the former, have for several years been accumulated by nature. He, therefore, who can take for new Truffle beds wood land, especially that which for centuries has produced the above mentioned trees, spares both time and expense. But whether the Truffle plantation be made in a wood or a garden, the first requisite is a somewhat moist soil in a low situation. The ground itself, however, must not contain any sharp or sour component parts, but must be mellow and fertile. Least of all are adapted to the purpose, situations in the neighbourhood of morasses or turf moors; and especially those low situations the subsoil of which is full of saline or sour matter. This is easily known by the reeds, horsetail, (Equisetum,) coarse kinds of grass, and mosses, which grow upon their surface, and, whether green or dry, are rejected by cattle and sheep, or only eaten by them from excessive hunger. He who has no such mellow soil, in a depressed situation, upon his property, may most easily form it by art in the neighbourhood of springs, or at the foot of a rising ground; but the first plantation is thereby proportionally rendered more expensive. The ground designed for the cultivation of Truffles must, in the first place, be dug out from four feet to five feet deep, and be lined at the bottom, and on the

sides with a stratum of clay or very fat loam of a foot thick, that the spring water which is conducted to it may not strain through and run off. If the subsoil be loam or clay, the thickness of the stratum of clay to be placed upon it may be diminished; but, if it be a dry sand, it must be more than a foot thick. This artificial depression is then filled with earth artificially prepared, and now the spring, or small brook is turned upon it. Truffles certainly require a moist soil, but they cannot endure boggy ground or standing water; a ditch, must, therefore, be cut to carry away all superfluous water. This ditch is either opened or shut accordingly as a superfluity or want of water renders necessary. But if, in very hot dry summers, the supply of water should itself fail, the Truffle beds must be sufficiently moistened with pure river water. This is the expedient to which recourse must be had in dry situations, that neither possess a spring, nor a small brook for watering a plantation of Truffles. Since only small beds, and not large fields, are taken for the cultivation of Truffles, the greatest care may be taken in the preparatory steps, the expense of which will however, never be so considerable as to be much felt by the landed proprietor. A calcareous or chalky marl forms the groundwork of all artificial mixtures of soils for the cultivation of the Truffle. When this is to be had in the neighbourhood, it is mixed with the fourth part of iron sandstone. If this marl be not in the environs, then finely-beaten calcareous stone or beaten chalk must supply its place: to this must be added from the fourth to the third part of ferruginous sand, and the whole mixed together as uniformly as possible. With this artificial calcareous marl the Truffle bed (which has been dug out from two and a half feet to three feet deep) is filled up a foot high, in the place of the natural earth. It is advantageous when the pit, which is dug out for that purpose, before it is filled with the new soil, is lined on the sides and bottom with unburnt calcareous stone. By this means not only will mice, and several kinds of worms, be prevented from establishing themselves in the new Truffle beds, and preparing to destroy the young germs of the Truffles, but sudden heavy rains will be prevented from occasioning an injurious mixture of the different kinds of earth. Where calcareous stone is not to be had, sandstone may be used instead of it, especially if it contains iron; or, at all events, either other natural stones, or artificial ones, made by the hands of men, may be made use of. The bottom of the pit must not, however, be paved so as to be water tight, in order that the water may sink into the subsoil, and not cause an injurious bog, instead of the moist depression that is intended. If, when the pit is dug out, a compact soil is met with, for example, a loamy bottom, the paving of the bottom of the pit is superfluous: it would obstruct the binding of the under strata with the new-laid bottom of the truffle plantation. It sometimes happens, that, in digging out the pit, a bed of clay is met with, which is impervious to water. In such a case, it is better to leave the place and choose another, than instead of raising Truffles, only to make a small bog. All the above preparations are necessary for wood lands, and for plantations in large gardens and English shrubberies; but the further filling up of the pit is different for each place. In woods the soil contains much vegetable matter; but that is not enough, especially when an artificial mixture of earths is undertaken. In order to obtain a very nutritious vegetable earth, let pure cow dung be carried into heaps in the spring, and left to fall into earth in the course of the summer. That is best which is collected as fresh as possible on pastures and commons. That it may not lose its nutritious matter through drought and heat, the heaps must be made in a shady place, be turned from time to time, and, in dry weather be often moistened. In autumn when the leaves fall from the trees, a fourth or fifth part of this earth is to be added to the natural wood soil; and of fallen oak leaves, or, if these are not to be had, of fallen hornbeam leaves, as much in bulk as half the mixture amounts to: the whole must then be carefully mixed together. The pit is to be completely filled with the mixture, which is to be covered with a layer of oak leaves, of from four inches to six inches thick. A wood soil, with much vegetable earth from oak trees, requires a smaller addition of oak leaves, than a soil that contains less of it. The pit, when filled, is to be covered over with a thick layer of leaves, the scattering of which may be prevented by some earth taken from the mixture being spread over them, or by small branches of oak being laid upon them, and secured by stones. Such a cover of leaves is of great service to the planting of Truffles; since by the moisture of the winter the most efficacious matter is extracted from it, and communicated to the soil beneath. For this reason, a new cover must be laid upon it every autumn. Early in the following spring, the uppermost layer being exhausted by the air, is to be taken away; but the under and moist one lightly dug in, or, which is still better, raked flat, lest the tender germs of the Truffles should be injured or destroyed; but when the Truffle plantation is first made, the whole cover must be deeply dug down. Every previous preparation is thus made for the cultivation of Truffles. We now come to the mode of causing them to be produced. Since they are neither sown, nor, like animals, propagated by eggs and young ones, the only thing that remains for us to do is, to cause the soil to produce Truffles. If Truffles are to be transplanted from one situation to another, and to be promoted to be the ancestors of their species, the greatest precautions must be taken lest they die on the journey, and become useless. This is the greatest difficulty to be encountered in the planting of Truffles, and thus the plantation may easily fail. Truffles, at their full growth, must not be chosen for transplanting: at that time their vital powers are too feeble; they are then too near dying to cause the production of their species in their new situation. They are as little able to bear the violent removal from their ancient situation, and transplantation into a new one, as an old tree. Equally injurious is the planting of tender Truffle germs or very small Truffles. These also cannot be taken from their parental earth, and abandoned to their new situation, without being exposed to the hazard of dying. Let, therefore, Truffles of a middle size, and in the full possession of their vital powers be chosen for transplanting. They should be taken up on a showery day, or at least a cloudy one, in such a manner as that they may remain completely enveloped in a ball of earth, and be as little as possible exposed to the access of the air. If the earth is very loose, so as not to hold firmly together; or if, through previous drought, it had lost its natural viscidity, which it has not fully recovered again through the last rain; the place where the Truffles are must have a great deal of water poured over it a few hours before they are taken up. The fungi then will be easily taken up, together with the earth about them, and put into a wooden case, which must be filled with moist wood earth, from the place of growth of the Truffles, and closely fas-

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