

## CHAPTER X.

PLANTS *continued*—FRUITS—ORNAMENTAL TREES—FLOWERS.

FRUITS—GRAPES—VARY IN ODD AND TRIFLING PARTICULARS.—MULBERRY—THE ORANGE GROUP—SINGULAR RESULTS FROM CROSSING.—PEACH AND NECTARINE—BUD VARIATION—ANALOGOUS VARIATION—RELATION TO THE ALMOND.—APRICOT.—PLUMS—VARIATION IN THEIR STONES.—CHERRIES—SINGULAR VARIETIES OF.—APPLE.—PEAR.—STRAWBERRY—INTERBLENDING OF THE ORIGINAL FORMS.—GOOSEBERRY—STEADY INCREASE IN SIZE OF THE FRUIT—VARIETIES OF.—WALNUT.—NUT.—CUCURBITACEOUS PLANTS—WONDERFUL VARIATION OF.

ORNAMENTAL TREES—THEIR VARIATION IN DEGREE AND KIND—ASH-TREE—SCOTCH-FIR—HAWTHORN.

FLOWERS—MULTIPLE ORIGIN OF MANY KINDS—VARIATION IN CONSTITUTIONAL PECULIARITIES—KIND OF VARIATION.—ROSES—SEVERAL SPECIES CULTIVATED.—PANSY.—DAHLIA.—HYACINTH—HISTORY AND VARIATION OF.

*The Vine (Vitis vinifera).*—THE best authorities consider all our grapes as the descendants of one species which now grows wild in western Asia, which grew wild during the Bronze age in Italy,<sup>1</sup> and which has recently been found fossil in a tufaceous deposit in the south of France.<sup>2</sup> Some authors, however, entertain much doubt about the single parentage of our cultivated varieties, owing to the number of semi-wild forms found in Southern Europe, especially as described by Clemente<sup>3</sup> in a forest in Spain; but as the grape sows itself freely in Southern Europe, and as several of the chief kinds transmit their characters by seed,<sup>4</sup> whilst others are extremely variable, the existence of many different escaped forms could hardly fail to occur in countries where this plant has been cultivated from the remotest antiquity. That the vine varies much when propagated by seed, we may infer from the largely increased number of varieties since the earlier historical records. New hot-house varieties are

<sup>1</sup> Heer, 'Pflanzen der Pfahlbauten,' 1866, s. 28.

<sup>2</sup> Alph. De Candolle, 'Géograph. Bot.,' p. 872; Dr. A. Targioni-Tozzetti, in 'Jour. Hort. Soc.,' vol ix. p. 133. For the fossil vine found by Dr. G. Planchon, see 'Nat. Hist. Review,' 1865, April, p. 224. See also the valuable works of M. de

Saporta on the 'Tertiary Plants of France.'

<sup>3</sup> Godron, 'De l'Espèce,' tom. ii. p. 100.

<sup>4</sup> See an account of M. Vibert's experiments, by Alex. Jordan, in 'Mém. de l'Acad. de Lyon,' tom. ii. 1852, p. 108.

produced almost every year; for instance,<sup>5</sup> a golden-coloured variety has been recently raised in England from a black grape without the aid of a cross. Van Mons<sup>6</sup> reared a multitude of varieties from the seed of one vine, which was completely separated from all others, so that there could not, at least in this generation, have been any crossing, and the seedlings presented "les analogues de toutes les sortes," and differed in almost every possible character both in the fruits and foliage.

The cultivated varieties are extremely numerous; Count Odart says that he will not deny that there may exist throughout the world 700 or 800, perhaps even 1000 varieties, but not a third of these have any value. In the catalogue of fruit cultivated in the Horticultural Gardens of London, published in 1842, 99 varieties are enumerated. Wherever the grape is grown many varieties occur: Pallas describes 24 in the Crimea, and Burnes mentions 10 in Cabool. The classification of the varieties has much perplexed writers, and Count Odart is reduced to a geographical system; but I will not enter on this subject, nor on the many and great differences between the varieties. I will merely specify a few curious and trifling peculiarities, all taken from Odart's highly esteemed work,<sup>7</sup> for the sake of showing the diversified variability of this plant. Simon has classed grapes into two main divisions, those with downy leaves, and those with smooth leaves, but he admits that in one variety, namely the Rebazo, the leaves are either smooth, or downy; and Odart (p. 70) states that some varieties have the nerves alone, and other varieties their young leaves, downy, whilst the old ones are smooth. The Pedro-Ximenes grape (Odart, p. 397) presents a peculiarity by which it can be at once recognised amongst a host of other varieties, namely, that when the fruit is nearly ripe the nerves of the leaves or even the whole surface becomes yellow. The Barbera d'Asti is well marked by several characters (p. 426), amongst others, "by some of the leaves, and it is always the lowest on the branches, suddenly becoming of a dark red colour." Several authors in classifying grapes have founded their main divisions on the berries being either round or oblong; and Odart admits the value of this character; yet there is one variety, the Maccabeo (p. 71), which often produces small round, and large oblong, berries in the same bunch. Certain grapes called Nebbiolo (p. 429) present a constant character, sufficient for their recognition, namely, "the slight adherence of that part of the pulp which surrounds the seeds to the rest of the berry, when cut through transversely." A Rhenish variety is mentioned (p. 228) which likes a dry soil; the fruit ripens well, but at the moment of maturity, if much rain falls, the berries are apt to rot; on the other hand, the fruit of a Swiss variety (p. 243) is valued for well sustaining prolonged humidity. This latter

<sup>5</sup> 'Gardener's Chronicle,' 1864, p. 488. p. 290.

<sup>6</sup> 'Arbres Fruitiers,' 1836, tom. ii.

<sup>7</sup> Odart, 'Ampelographie Universelle,' 1849.

variety sprouts late in the spring, yet matures its fruit early; other varieties (p. 362) have the fault of being too much excited by the April sun, and in consequence suffer from frost. A Styrian variety (p. 254) has brittle foot-stalks, so that the clusters of fruit are often blown off; this variety is said to be particularly attractive to wasps and bees. Other varieties have tough stalks, which resist the wind. Many other variable characters could be given, but the foregoing facts are sufficient to show in how many small structural and constitutional details the vine varies. During the vine disease in France certain old groups of varieties<sup>8</sup> have suffered far more from mildew than others. Thus "the group of Chasselas, so rich in varieties, did not afford a single fortunate exception;" certain other groups suffered much less; the true old Burgundy, for instance, was comparatively free from disease, and the Carminat likewise resisted the attack. The American vines, which belong to a distinct species, entirely escaped the disease in France; and we thus see that those European varieties which best resist the disease must have acquired in a slight degree the same constitutional peculiarities as the American species.

*White Mulberry (Morus alba).*—I mention this plant because it has varied in certain characters, namely, in the texture and quality of the leaves, fitting them to serve as food for the domesticated silkworm, in a manner not observed with other plants; but this has arisen simply from such variations in the mulberry having been attended to, selected, and rendered more or less constant. M. de Quatrefages<sup>9</sup> briefly describes six kinds cultivated in one valley in France: of these the *amourouso* produces excellent leaves, but is rapidly being abandoned because it produces much fruit mingled with the leaves: the *antofino* yields deeply cut leaves of the finest quality, but not in great quantity: the *claro* is much sought for because the leaves can be easily collected: lastly, the *roso* bears strong hardy leaves, produced in large quantity, but with the one inconvenience, that they are best adapted for the worms after their fourth moult. MM. Jacquemet-Bonnefont, of Lyon, however, remark in their catalogue (1862) that two sub-varieties have been confounded under the name of the *roso*, one having leaves too thick for the caterpillars, the other being valuable because the leaves can easily be gathered from the branches without the bark being torn.

In India the mulberry has also given rise to many varieties. The Indian form is thought by many botanists to be a distinct species; but as Royle remarks,<sup>10</sup> "so many varieties have been produced by cultivation that it is difficult to ascertain whether they

<sup>8</sup> M. Bouchardat, in 'Comptes Rendus,' Dec. 1st, 1851, quoted in 'Gardener's Chron.,' 1852, p. 435. See also C. V. Riley on the manner in which some few of the varieties of the American Labruscan Vine escape the attacks of the Phylloxera: 'Fourth

Annual Report on the Insects of Missouri,' 1872, p. 63, and 'Fifth Report,' 1873, p. 66.

<sup>9</sup> 'Etudes sur les Maladies actuelles du Ver à Soie,' 1859, p. 321.

<sup>10</sup> 'Productive Resources of India,' p. 130.

all belong to one species ;” they are, as he adds, nearly as numerous as those of the silkworm.

*The Orange Group.*—We here meet with great confusion in the specific distinction and parentage of the several kinds. Galesio,<sup>11</sup> who almost devoted his life-time to the subject, considers that there are four species, namely, sweet and bitter oranges, lemons, and citrons, each of which has given rise to whole groups of varieties, monsters, and supposed hybrids. One high authority<sup>12</sup> believes that these four reputed species are all varieties of the wild *Citrus medica*, but that the shaddock (*Citrus decumana*), which is not known in a wild state, is a distinct species; though its distinctness is doubted by another writer “of great authority on such matters,” namely, Dr. Buchanan Hamilton. Alph. De Candolle,<sup>13</sup> on the other hand—and there cannot be a more capable judge—advances what he considers sufficient evidence of the orange (he doubts whether the bitter and sweet kinds are specifically distinct), the lemon, and citron, having been found wild, and consequently that they are distinct. He mentions two other forms cultivated in Japan and Java, which he ranks undoubted species; he speaks rather more doubtfully about the shaddock, which varies much, and has not been found wild; and finally he considers some forms, such as Adam’s apple and the bergamotte, as probably hybrids.

I have briefly abstracted these opinions for the sake of showing those who have never attended to such subjects, how perplexing they are. It would, therefore, be useless for my purpose to give a sketch of the conspicuous differences between the several forms. Besides the ever-recurrent difficulty of determining whether forms found wild are truly aboriginal or are escaped seedlings, many of the forms, which must be ranked as varieties, transmit their characters almost perfectly by seed. Sweet and bitter oranges differ in no important respect except in the flavour of their fruit, but Galesio<sup>14</sup> is most emphatic that both kinds can be propagated by seed with absolute certainty. Consequently, in accordance with his simple rule, he classes them as distinct species; as he does sweet and bitter almonds, the peach and nectarine, &c. He admits, however, that the soft-shelled pine-tree produces not only soft-shelled but some hard-shelled seedlings, so that a little greater force in the power of inheritance would, according to this rule, raise a soft-shelled pine-tree into the dignity of an aboriginally created species. The positive assertion made by Macfayden<sup>15</sup> that

<sup>11</sup> ‘Traité du Citrus,’ 1811. ‘Teoria della Riproduzione Vegetale,’ 1816. I quote chiefly from this second work. In 1839 Galesio published in folio ‘Gli Agrumi dei Giard. Bot. di Firenze,’ in which he gives a curious diagram of the supposed relationship of all the forms.

<sup>12</sup> Mr. Bentham, ‘Review of Dr. A. Targioni-Tozzetti,’ ‘Journal of Hort. Soc.,’ vol. ix. p. 133.

<sup>13</sup> ‘Géograph. Bot.,’ p. 863.

<sup>14</sup> ‘Teoria della Riproduzione,’ pp. 52–57.

<sup>15</sup> Hooker’s ‘Bot. Misc.,’ vol. i. p. 302; vol. ii. p. 111.

the pips of sweet oranges produced in Jamaica, according to the nature of the soil in which they are sown, either sweet or bitter oranges, is probably an error; for M. Alph. De Candolle informs me that since the publication of his great work he has received accounts from Guiana, the Antilles, and Mauritius, that in these countries sweet oranges faithfully transmit their character. Galesio found that the willow-leaved and the Little China oranges reproduced their proper leaves and fruit; but the seedlings were not quite equal in merit to their parents. The red-fleshed orange, on the other hand, fails to reproduce itself. Galesio also observed that the seeds of several other singular varieties all reproduced trees having a peculiar physiognomy, partly resembling their parent-forms. I can adduce another case: the myrtle leaved orange is ranked by all authors as a variety, but is very distinct in general aspect: in my father's greenhouse, during many years, it rarely yielded any fruit, but at last produced one; and a tree thus raised was identical with the parent-form.

Another and more serious difficulty in determining the rank of the several forms is that, according to Galesio,<sup>16</sup> they largely intercross without artificial aid; thus he positively states that seeds taken from lemon-trees (*C. lemonum*) growing mingled with the citron (*C. medica*), which is generally considered as a distinct species, produced a graduated series of varieties between these two forms. Again, an Adam's apple was produced from the seed of a sweet orange, which grew close to lemons and citrons. But such facts hardly aid us in determining whether to rank these forms as species or varieties; for it is now known that undoubted species of *Verbascum*, *Cistus*, *Primula*, *Salix*, &c., frequently cross in a state of nature. If indeed it were proved that plants of the orange tribe raised from these crosses were even partially sterile, it would be a strong argument in favour of their rank as species. Galesio asserts that this is the case; but he does not distinguish between sterility from hybridism and from the effects of culture; and he almost destroys the force of this statement by another,<sup>17</sup> namely, that when he impregnated the flowers of the common orange with the pollen taken from undoubted varieties of the orange, monstrous fruits were produced, which included "little pulp, and had no seeds, or imperfect seeds."

In this tribe of plants we meet with instances of two highly remarkable facts in vegetable physiology: Galesio<sup>18</sup> impregnated an orange with pollen from a lemon, and the fruit borne on the mother tree had a raised stripe of peel like that of a lemon both in colour and taste, but the pulp was like that of an orange and included only imperfect seeds. The possibility of pollen from one variety or species directly affecting the fruit produced by another variety of species, is a subject which I shall fully discuss in the following chapter.

<sup>16</sup> 'Teoria della Riproduzione,' p. 53.

<sup>17</sup> Galesio, 'Teoria della Riproduzione,' p. 69.

<sup>18</sup> Ibid. p. 67.

The second remarkable fact is, that two supposed hybrids<sup>19</sup> (for their hybrid nature was not ascertained), between an orange and either a lemon or citron, produced on the same tree leaves, flowers, and fruit of both pure parent-forms, as well as of a mixed or crossed nature. A bud taken from any one of the branches and grafted on another tree produces either one of the pure kinds or a capricious tree reproducing the three kinds. Whether the sweet lemon, which includes within the same fruit segments of differently flavoured pulp,<sup>20</sup> is an analogous case, I know not. But to this subject I shall have to recur.

I will conclude by giving from A. Risso<sup>21</sup> a short account of a very singular variety of the common orange. It is the "*citrus aurantium fructu variabili*," which on the young shoots produces rounded-oval leaves spotted with yellow, borne on petioles with heart-shaped wings; when these leaves fall off, they are succeeded by longer and narrower leaves, with undulated margins, of a pale-green colour embroidered with yellow, borne on footstalks without wings. The fruit whilst young is pear-shaped, yellow, longitudinally striated, and sweet; but as it ripens, it becomes spherical, of a reddish-yellow, and bitter.

*Peach and Nectarine (Amygdalus persica)*. The best authorities are nearly unanimous that the peach has never been found wild. It was introduced from Persia into Europe a little before the Christian era, and at this period few varieties existed. Alph. De Candolle,<sup>22</sup> from the fact of the peach not having spread from Persia at an earlier period, and from its not having pure Sanscrit or Hebrew names, believes that it is not an aboriginal of Western Asia, but came from the *terra incognita* of China. The supposition, however, that the peach is a modified almond which acquired its present character at a comparatively late period, would, I presume, account for these facts; on the same principle that the nectarine, the offspring of the peach, has few native names, and became known in Europe at a still later period.

Andrew Knight,<sup>23</sup> from finding that a seedling-tree, raised from a sweet almond fertilised by the pollen of a peach, yielded fruit quite like that of a peach, suspected that the peach-tree is a modified almond; and in this he has been followed by various authors.<sup>24</sup> A first-rate peach, almost globular in shape, formed of soft and sweet

<sup>19</sup> Galesio, 'Teoria della Riproduzione,' pp. 75, 76.

<sup>20</sup> 'Gardener's Chronicle,' 1841, p. 613.

<sup>21</sup> 'Annales du Muséum,' tom. xx. p. 188.

<sup>22</sup> 'Géograph. Bot.,' p. 882.

<sup>23</sup> 'Transactions of Hort. Soc.,' vol. iii. p. 1, and vol. iv. p. 396, and note to p. 370. A coloured drawing is given of this hybrid.

<sup>24</sup> 'Gardener's Chronicle,' 1856, p. 532. A writer, it may be presumed Dr. Lindley, remarks on the perfect series which may be formed between the almond and the peach. Another high authority, Mr. Rivers, who has had such wide experience, strongly suspects ('Gardener's Chronicle,' 1863, p. 27) that peaches, if left to a state of nature, would in the course of time retrograde into thick-fleshed almonds.

pulp, surrounding a hard, much furrowed, and slightly flattened stone, certainly differs greatly from an almond, with its soft, slightly furrowed, much flattened, and elongated stone, protected

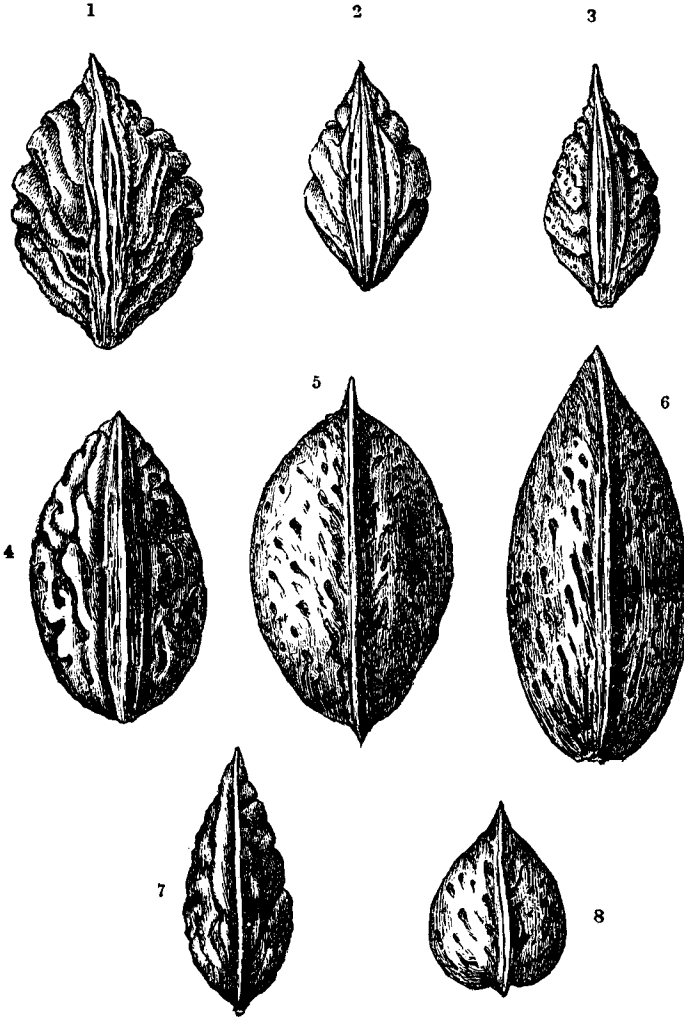


Fig. 42.—Peach and Almond Stones, of natural size, viewed edgeways. 1. Common English peach. 2. Double, crimson-flowered, Chinese Peach. 3. Chinese Honey Peach. 4. English Almond. 5. Barcelona Almond. 6. Malaga Almond. 7. Soft-shelled French Almond. 8. Smyrna Almond.

by a tough, greenish layer of bitter flesh. Mr. Bentham<sup>25</sup> has particularly called attention to the stone of the almond being so much more flattened than that of the peach. But in the several varieties

<sup>25</sup> 'Journal of Hort. Soc., vol. ix. p. 168.

of the almond, the stone differs greatly in the degree to which it is compressed, in size, shape, strength, and in the depth of the furrows, as may be seen in the accompanying drawing (Nos. 4 to 8) of such kinds as I have been able to collect. With peach-stones also (Nos. 1 to 3) the degree of compression and elongation is seen to vary; so that the stone of the Chinese Honey-peach (fig. 3) is much more elongated and compressed than that of the (No. 8) Smyrna almond. Mr. Rivers, of Sawbridgeworth, to whom I am indebted for some of the specimens above figured, and who has had such great horticultural experience, has called my attention to several varieties which connect the almond and the peach. In France there is a variety called the Peach-Almond, which Mr. Rivers formerly cultivated, and which is correctly described in a French catalogue as being oval and swollen, with the aspect of a peach, including a hard stone surrounded by a fleshy covering, which is sometimes eatable.<sup>26</sup> A remarkable statement by M. Luizet has recently appeared in the 'Revue Horticole,'<sup>27</sup> namely, that a Peach-almond, grafted on a peach, bore, during 1863 and 1864, almonds alone, but in 1865 bore six peaches and no almonds. M. Carrière, in commenting on this fact, cites the case of a double-flowered almond which, after producing during several years almonds, suddenly bore for two years in succession spherical fleshy peach-like fruits, but in 1865 reverted to its former state and produced large almonds.

Again, as I hear from Mr. Rivers, the double-flowering Chinese peaches resemble almonds in their manner of growth and in their flowers; the fruit is much elongated and flattened, with the flesh both bitter and sweet, but not uneatable, and it is said to be of better quality in China. From this stage one small step leads us to such inferior peaches as are occasionally raised from seed. For instance, Mr. Rivers sowed a number of peach-stones imported from the United States, where they are collected for raising stocks, and some of the trees raised by him produced peaches which were very like almonds in appearance, being small and hard, with the pulp not softening till very late in the autumn. Van Mons<sup>28</sup> also states that he once raised from a peach-stone a peach having the aspect of a wild tree, with fruit like that of the almond. From inferior peaches, such as these just described, we may pass by small transitions, through clingstones of poor quality, to our best and most melting kinds. From this gradation, from the cases of sudden variation above recorded, and from the fact that the peach has not been found wild, it seems to me by far the most probable view, that

<sup>26</sup> Whether this is the same variety as one lately mentioned ('Gard. Chron.' 1865, p. 1154) by M. Carrière under the name of *persica intermedia*, I know not; this variety is said to be intermediate in nearly all its characters between the almond and peach; it

produces during successive years very different kinds of fruit.

<sup>27</sup> Quoted in 'Gard. Chron.' 1866, p. 800.

<sup>28</sup> Quoted in 'Journal de la Soc. Imp. d'Horticulture,' 1855, p. 238.



the peach is the descendant of the almond, improved and modified in a marvellous manner.

One fact, however, is opposed to this conclusion. A hybrid, raised by Knight from the sweet almond by the pollen of the peach, produced flowers with little or no pollen, yet bore fruit, having been apparently fertilised by a neighbouring nectarine. Another hybrid, from a sweet almond by the pollen of a nectarine, produced during the first three years imperfect blossoms, but afterwards perfect flowers with an abundance of pollen. If this slight degree of sterility cannot be accounted for by the youth of the trees (and this often causes lessened fertility), or by the monstrous state of the flowers, or by the conditions to which the trees were exposed, these two cases would afford a good argument against the peach being the descendant of the almond.

Whether or not the peach has proceeded from the almond, it has certainly given rise to nectarines, or smooth peaches, as they are called by the French. Most of the varieties, both of the peach and nectarine, reproduce themselves truly by seed. Galesio<sup>29</sup> says he has verified this with respect to eight races of the peach. Mr. Rivers<sup>30</sup> has given some striking instances from his own experience, and it is notorious that good peaches are constantly raised in North America from seed. Many of the American sub-varieties come true or nearly true to their kind, such as the white-blossom, several of the yellow-fruited freestone peaches, the blood clingstone, the heath, and the lemon clingstone. On the other hand, a clingstone peach has been known to give rise to a freestone.<sup>31</sup> In England it has been noticed that seedlings inherit from their parents flowers of the same size and colour. Some characters, however, contrary to what might have been expected, often are not inherited; such as the presence and form of the glands on the leaves.<sup>32</sup> With respect to nectarines, both cling and freestones are known in North America to reproduce themselves by seed.<sup>33</sup> In England the new white nectarine was a seedling of the old white, and Mr. Rivers<sup>34</sup> has recorded several similar cases. From this strong tendency to inheritance, which both peach and nectarine trees exhibit,—from certain slight constitutional differences<sup>35</sup> in their nature,—and from the great difference in their fruit both in appearance and flavour, it is not surprising, notwithstanding that the trees differ in no other respects and cannot even

<sup>29</sup> 'Teoria della Riproduzione Vegetale,' 1816, p. 86.

<sup>30</sup> 'Gardener's Chronicle,' 1862, p. 1195.

<sup>31</sup> Mr. Rivers, 'Gardener's Chron.,' 1859, p. 774.

<sup>32</sup> Downing, 'The Fruits of America,' 1845, pp. 475, 489, 492, 494, 496. See also F. Michaux, 'Travels in N. America' (Eng. transl.), p.

228. For similar cases in France see Godron, 'De l'Espèce,' tom. ii. p. 97.

<sup>33</sup> Brickell's 'Nat. Hist. of N. Carolina,' p. 102, and Downing's 'Fruit Trees,' p. 505.

<sup>34</sup> 'Gardener's Chronicle,' 1862, p. 1196.

<sup>35</sup> The peach and nectarine do not succeed equally well in the same soil: see Lindley's 'Horticulture,' p. 351.

be distinguished, as I am informed by Mr. Rivers, whilst young, that they have been ranked by some authors as specifically distinct. Galesio does not doubt that they are distinct; even Alph. De Candolle does not appear perfectly assured of their specific identity: and an eminent botanist has quite recently<sup>36</sup> maintained that the nectarine "probably constitutes a distinct species."

Hence it may be worth while to give all the evidence on the origin of the nectarine. The facts in themselves are curious, and will hereafter have to be referred to when the important subject of bud-variation is discussed. It is asserted<sup>37</sup> that the Boston nectarine was produced from a peach-stone, and this nectarine reproduced itself by seed.<sup>38</sup> Mr. Rivers states<sup>39</sup> that from stones of three distinct varieties of the peach he raised three varieties of nectarine; and in one of these cases no nectarine grew near the parent peach-tree. In another instance Mr. Rivers raised a nectarine from a peach, and in the succeeding generation another nectarine from this nectarine.<sup>40</sup> Other such instances have been communicated to me, but they need not be given. Of the converse case, namely, of nectarine-stones yielding peach-trees (both free and clingstones), we have six undoubted instances recorded by Mr. Rivers; and in two of these instances the parent nectarines had been seedlings from other nectarines.<sup>41</sup>

With respect to the more curious case of full-grown peach-trees suddenly producing nectarines by bud-variation (or sports as they are called by gardeners), the evidence is superabundant; there is also good evidence of the same tree producing both peaches and nectarines, or half-and-half fruit; by this term I mean a fruit with the one-half a perfect peach, and the other half a perfect nectarine.

Peter Collinson in 1741 recorded the first case of a peach-tree producing a nectarine,<sup>42</sup> and in 1766 he added two other instances. In the same work, the editor, Sir J. E. Smith, describes the more remarkable case of a tree in Norfolk which usually bore both perfect nectarines and perfect peaches; but during two seasons some of the fruit were half and half in nature.

Mr. Salisbury in 1808<sup>43</sup> records six other cases of peach-trees producing nectarines. Three of the varieties are named; viz., the Alberge, Belle Chevreuse, and Royal George. This latter tree seldom failed to produce both kinds of fruit. He gives another case of a half-and-half fruit.

At Radford in Devonshire<sup>44</sup> a clingstone peach, purchased as

<sup>36</sup> Godron, 'De l'Espèce,' tom. ii., 1859, p. 97.

<sup>37</sup> 'Transact. Hort. Soc.,' vol. vi. p. 394.

<sup>38</sup> Downing's 'Fruit Trees,' p. 502.

<sup>39</sup> 'Gardener's Chronicle,' 1862, p. 1195.

<sup>40</sup> 'Journal of Horticulture,' Feb. 5th, 1866, p. 102.

<sup>41</sup> Mr. Rivers, in 'Gardener's

Chron.,' 1859, p. 774, 1862, p. 1195; 1865, p. 1059; and 'Journal of Hort.,' 1866, p. 102.

<sup>42</sup> 'Correspondence of Linnæus,' 1821, pp. 7, 8, 70.

<sup>43</sup> 'Transact. Hort. Soc.,' vol. i. p. 103.

<sup>44</sup> Loudon's 'Gardener's Mag.,' 1826, vol. i. p. 471.

the Chancellor, was planted in 1815, and in 1824, after having previously produced peaches alone, bore on one branch twelve nectarines; in 1825 the same branch yielded twenty-six nectarines, and in 1826 thirty-six nectarines, together with eighteen peaches. One of the peaches was almost as smooth on one side as a nectarine. The nectarines were as dark as, but smaller than, the Elruge.

At Beccles a Royal George peach<sup>45</sup> produced a fruit, "three parts of it being peach and one part nectarine, quite distinct in appearance as well as in flavour." The lines of division were longitudinal, as represented in the woodcut. A nectarine-tree grew five yards from this tree.

Professor Chapman states<sup>46</sup> that he has often seen in Virginia very old peach-trees bearing nectarines.

A writer in the 'Gardener's Chronicle' says that a peach-tree planted fifteen years previously<sup>47</sup> produced this year a nectarine between two peaches; a nectarine-tree grew close by.

In 1844<sup>48</sup> a Vanguard peach-tree produced, in the midst of its ordinary fruit, a single red Roman nectarine.

Mr. Calver is stated<sup>49</sup> to have raised in the United States a seedling peach which produced a mixed crop of both peaches and nectarines.

Near Dorking<sup>50</sup> a branch of the Téton de Vénus peach, which reproduces itself truly by seed,<sup>51</sup> bore its own fruit "so remarkable for its prominent point, and a nectarine rather smaller but well formed and quite round."

The previous cases all refer to peaches suddenly producing nectarines, but at Carclew<sup>52</sup> the unique case occurred, of a nectarine-tree, raised twenty years before from seed and never grafted, producing a fruit half peach and half nectarine; subsequently bore a perfect peach.

To sum up the foregoing facts; we have excellent evidence of peach-stones producing nectarine-trees, and of nectarine-stones producing peach-trees,—of the same tree-bearing peaches and nectarines,—of peach-trees suddenly producing by bud-variation nectarines (such nectarines reproducing nectarines by seed), as well as fruit in part nectarine and in part peach,—and, lastly, of one nectarine-tree first bearing half-and-half fruit, and subsequently true peaches. As the peach came into existence before the nectarine, it might have been expected from the law of reversion that nectarines would have given birth by bud-variation or by seed to peaches, oftener than peaches to nectarines; but this is by no means the case.

<sup>45</sup> Loudon's, 'Gardener's Mag.,' 1828, p. 53.

<sup>46</sup> *Ibid.*, 1830, p. 597.

<sup>47</sup> 'Gardener's Chronicle,' 1841, p. 617.

<sup>48</sup> 'Gardener's Chronicle,' 1844, p. 589.

<sup>49</sup> 'Phytologist,' vol. iv. p. 299.

<sup>50</sup> 'Gardener's Chron.,' 1856, p. 531.

<sup>51</sup> Godron, 'De l'Espèce,' tom. ii. p. 97.

<sup>52</sup> 'Gardener's Chron.,' 1856, p. 531.

Two explanations have been suggested to account for these conversions. First, that the parent trees have been in every case hybrids<sup>53</sup> between the peach and nectarine, and have reverted by bud-variation or by seed to one of their pure parent forms. This view in itself is not very improbable; for the Mountaineer peach, which was raised by Knight from the red nutmeg-peach by pollen of the violette hâtive nectarine,<sup>54</sup> produces peaches, but these are said *sometimes* to partake of the smoothness and flavour of the nectarine. But let it be observed that in the previous list no less than six well-known varieties and several unnamed varieties of the peach have once suddenly produced perfect nectarines by bud variation: and it would be an extremely rash supposition that all these varieties of the peach, which have been cultivated for years in many districts, and which show not a vestige of a mixed parentage, are, nevertheless, hybrids. A second explanation is, that the fruit of the peach has been directly affected by the pollen of the nectarine: although this certainly is possible, it cannot here apply; for we have not a shadow of evidence that a branch which has borne fruit directly affected by foreign pollen is so profoundly modified as afterwards to produce buds which continue to yield fruit of the new and modified form. Now it is known that when a bud on a peach-tree has once borne a nectarine the same branch has in several instances gone on during successive years producing nectarines. The Carlew nectarine, on the other hand, first produced half-and-half fruit, and subsequently pure peaches. Hence we may confidently accept the common view that the nectarine is a variety of the peach, which may be produced either by bud-variation or from seed. In the following chapter many analogous cases of bud-variation will be given.

The varieties of the peach and the nectarine run in parallel lines. In both classes the kinds differ from each other in the flesh of the fruit being white, red, or yellow; in being clingstones or freestones; in the flowers being large or small, with certain other characteristic differences; and in the leaves being serrated without glands, or crenated and furnished with globose or reniform glands.<sup>55</sup> We can hardly account for this parallelism by supposing that each variety of the nectarine is descended from a corresponding variety of the peach; for though our nectarines are certainly the descendants of several kinds of peaches, yet a large number are the descendants of other nectarines, and they vary so much when thus reproduced that we can scarcely admit the above explanation.

The varieties of the peach have largely increased in number since the Christian era, when from two to five varieties were known;<sup>56</sup> and the nectarine was unknown. At the present time,

<sup>53</sup> Alph. De Candolle, 'Géograph. Bot.,' p. 886.

<sup>54</sup> Thompson, in Loudon's 'Encyclop. of Gardening,' p. 911.

<sup>55</sup> 'Catalogue of Fruit in Garden of

Hort. Soc.,' 1842, p. 105.

<sup>56</sup> Dr. A. Targioni-Tozzetti, 'Journal Hort. Soc.,' vol. ix. p. 167. Alph. de Candolle, 'Géograph. Bot.,' p. 885.

besides many varieties said to exist in China, Downing describes, in the United States, seventy-nine native and imported varieties of the peach; and a few years ago Lindley<sup>57</sup> enumerated one hundred and sixty-four varieties of the peach and nectarine grown in England. I have already indicated the chief points of difference between the several varieties. Nectarines, even when produced from distinct kinds of peaches, always possess their own peculiar flavour, and are smooth and small. Clingstone and freestone peaches, which differ in the ripe flesh either firmly adhering to the stone, or easily separating from it, also differ in the character of the stone itself; that of the freestones or melters being more deeply fissured, with the sides of the fissures smoother than in clingstones. In the various kinds the flowers differ not only in size, but in the larger flowers the petals are differently shaped, more imbricated, generally red in the centre and pale towards the margin: whereas in the smaller flowers the margin of the petal are usually more darkly coloured. One variety has nearly white flowers. The leaves are more or less serrated, and are either destitute of glands, or have globose or reniform glands;<sup>58</sup> and some few peaches, such as the Bruggen, bear on the same tree both globular and kidney-shaped glands.<sup>59</sup> According to Robertson<sup>60</sup> the trees with glandular leaves are liable to blister, but not in any great degree to mildew; whilst the non-glandular trees are more subject to curl, to mildew, and to the attacks of aphides. The varieties differ in the period of their maturity, in the fruit keeping well, and in hardiness,—the latter circumstance being especially attended to in the United States. Certain varieties, such as the Bellegarde, stand forcing in hot-houses better than other varieties. The flat-peach of China is the most remarkable of all the varieties; it is so much depressed towards the summit, that the stone is here covered only by roughened skin and not by a fleshy layer.<sup>61</sup> Another Chinese variety, called the Honey-peach, is remarkable from the fruit terminating in a long sharp point; its leaves are glandless and widely dentate.<sup>62</sup> The Emperor of Russia peach is a third singular variety, having deeply double-serrated leaves; the fruit is deeply cleft with one-half projecting considerably beyond the other: it originated in America, and its seedlings inherit similiar leaves.<sup>63</sup>

The peach has also produced in China a small class of trees valued for ornament, namely the double-flowered; of these, five

<sup>57</sup> 'Transact. Hort. Soc.,' vol. v. p. 554. See also Carrière, 'Description et Class. des Variétés de Pêchers.'

<sup>58</sup> 'Loudon's' 'Encyclop. of Gardening,' p. 907.

<sup>59</sup> M. Carrière, in 'Gard. Chron.,' 1865, p. 1154.

<sup>60</sup> 'Transact. Hort. Soc.,' vol. iii. p. 332. See also 'Gardener's Chronicle,'

1865, p. 271, to same effect. Also 'Journal of Horticulture,' Sept. 26th, 1865, p. 254.

<sup>61</sup> 'Transact. Hort. Soc.' vol. iv. p. 512.

<sup>62</sup> 'Journal of Horticulture,' Sept. 8th, 1853, p. 188.

<sup>63</sup> 'Transact. Hort. Soc.,' vol. vi. p. 412.

varieties are now known in England, varying from pure white, through rose, to intense crimson.<sup>64</sup> One of these varieties, called the camellia-flowered, bears flowers above 2½ inches in diameter, whilst those of the fruit-bearing kinds do not at most exceed 1½ inch in diameter. The flowers of the double-flowered peaches have the singular property<sup>65</sup> of frequently producing double or treble fruit. Finally, there is good reason to believe that the peach is an almond profoundly modified; but whatever its origin may have been, there can be no doubt that it has yielded during the last eighteen centuries many varieties, some of them strongly characterised, belonging both to the nectarine and peach form.

*Apricot (Prunus armeniaca).*—It is commonly admitted that this tree is descended from a single species, now found wild in the Caucasian region.<sup>66</sup> On this view the varieties deserve notice, because they illustrate differences supposed by some botanists to be of specific value in the almond and plum. The best monograph on the apricot is by Mr. Thompson,<sup>67</sup> who describes seventeen varieties. We have seen that peaches and nectarines vary in a strictly parallel manner; and in the apricot, which forms a closely allied genus, we again meet with variations analogous to those of the peach, as well as to those of the plum. The varieties differ considerably in the shape of their leaves, which are either serrated or crenated, sometimes with ear-like appendages at their bases, and sometimes with glands on the petioles. The flowers are generally alike, but are small in the Masculine. The fruit varies much in size, shape, and in having the suture little pronounced or absent; in the skin being smooth, or downy, as in the orange-apricot; and in the flesh clinging to the stone, as in the last-mentioned kind, or in readily separating from it, as in the Turkey-apricot. In all these differences we see the closest analogy with the varieties of the peach and nectarine. In the stone we have more important differences, and these in the case of the plum have been esteemed of specific value: in some apricots the stone is almost spherical, in others much flattened, being either sharp in front or blunt at both ends, sometimes channelled along the back, or with a sharp ridge along both margins. In the Moorpark, and generally in the Hemskirke, the stone presents a singular character in being perforated, with a bundle of fibres passing through the perforation from end to end. The most constant and important character, according to Thompson, is whether the kernel is bitter or sweet: yet in this respect we have a graduated difference, for the kernel is very bitter in Shipley's apricot; in the Hemskirke less bitter than in some other kinds; slightly bitter in the Royal; and "sweet like a hazel-nut" in the Breda, Angoumois, and others.

<sup>64</sup> 'Gardener's Chronicle,' 1857, p. 216.

<sup>65</sup> 'Journal of Hort. Soc.,' vol. ii. p. 283.

<sup>66</sup> Alph. de Candolle, 'Géograph.

Bot.,' p. 879.

<sup>67</sup> 'Transact. Hort. Soc.' (2nd series), vol. i. 1835, p. 56. See also 'Cat. of Fruit in Garden of Hort. Soc.,' 3rd edit. 1842.

In the case of the almond, bitterness has been thought by some high authorities to indicate specific difference.

In N. America the Roman apricot endures "cold and unfavourable situations, where no other sort, except the Masculine, will succeed; and its blossoms bear quite a severe frost without injury."<sup>68</sup> According to Mr. Rivers,<sup>69</sup> seedling apricots deviate but little from the character of their race: in France the Alberge is constantly reproduced from seed with but little variation. In Ladakh, according to Moorcroft,<sup>70</sup> ten varieties of the apricot, very different from each other, are cultivated, and all are raised from seed, excepting one, which is budded.

*Plums* (*Prunus insititia*).—Formerly the sloe, *P. spinosa*, was thought to be the parent of all our plums; but now this honour is

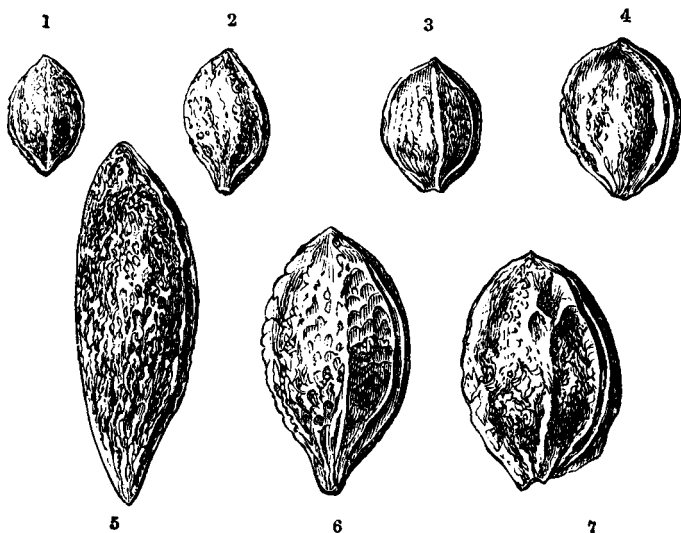


Fig. 43.—Plum Stones, of natural size, viewed laterally. 1. Bullace Plum. 2. Shropshire Damson. 3. Blue Gage. 4. Orleans. 5. Elvas. 6. Denyer's Victoria. 7. Diamond.

very commonly accorded to *P. insititia* or the bullace, which is found wild in the Caucasus and N.-Western India, and is naturalised in England.<sup>71</sup> It is not at all improbable, in accordance with some observations made by Mr. Rivers,<sup>72</sup> that both these forms, which some botanists rank as a single species, may be the parents of our domesticated plums. Another supposed parent-form, the *P. domestica*, is said to be found wild in the region of the Caucasus.

<sup>68</sup> Downing, 'The Fruits of America,' 1845, p. 157: with respect to the Alberge apricot in France, see p. 153.

<sup>69</sup> 'Gardener's Chronicle,' 1863, p. 364.

<sup>70</sup> 'Travels in the Himalayan Pro-

vinces,' vol. i. 1841, p. 295.

<sup>71</sup> See an excellent discussion on this subject in Hewett C. Watson's 'Cybele Britannica,' vol. iv. p. 80.

<sup>72</sup> 'Gardener's Chronicle,' 1865, p. 27.

Godron remarks<sup>73</sup> that the cultivated varieties may be divided into two main groups, which he supposes to be descended from two aboriginal stocks; namely, those with oblong fruit and stones pointed at both ends, having narrow separate petals and upright branches; and those with rounded fruit, with stones blunt at both ends, with rounded petals and spreading branches. From what we know of the variability of the flowers in the peach and of the diversified manner of growth in our various fruit-trees, it is difficult to lay much weight on these latter characters. With respect to the shape of the fruit, we have conclusive evidence that it is extremely variable: Downing<sup>74</sup> gives outlines of the plums of two seedlings, namely, the red and imperial gages, raised from the greengage; and the fruit of both is more elongated than that of the greengage. The latter has a very blunt broad stone, whereas the stone of the imperial gage is "oval and pointed at both ends." These trees also differ in their manner of growth: "the greengage is a very short-jointed, slow-growing tree, of spreading and rather dwarfish habit;" whilst its offspring, the imperial gage, "grows freely and rises rapidly, and has long dark shoots." The famous Washington plum bears a globular fruit, but its offspring, the emerald drop, is nearly as much elongated as the most elongated plum figured by Downing, namely, Manning's prune. I have made a small collection of the stones of twenty-five kinds, and they graduate in shape from the bluntest into the sharpest kinds. As characters derived from seeds are generally of high systematic importance, I have thought it worth while to give drawings of the most distinct kinds in my small collection; and they may be seen to differ in a surprising manner in size, outline, thickness, prominence of the ridges, and state of surface. It deserves notice that the shape of the stone is not always strictly correlated with that of the fruit: thus the Washington plum is spherical and depressed at the pole, with a somewhat elongated stone, whilst the fruit of the Goliath is more elongated, but the stone less so, than in the Washington. Again, Denyer's Victoria and Goliath bear fruit closely resembling each other, but their stones are widely different. On the other hand, the Harvest and Black Margate plums are very dissimilar, yet include closely similar stones.

The varieties of the plum are numerous, and differ greatly in size, shape, quality, and colour,—being bright yellow, green, almost white, blue, purple, or red. There are some curious varieties, such as the double or Siamese, and the Stoneless plum: in the latter the

<sup>73</sup> 'De l'Espèce,' tom. ii. p. 94. On the parentage of our plums, see also Alph. De Candolle, 'Géograph. Bot.,' p. 878. Also Targioni-Tozzetti, 'Journal Hort. Soc.,' vol. ix. p. 164. Also Babington, 'Manual of Brit. Botany,' 1851, p. 87.

<sup>74</sup> 'Fruits of America,' pp. 276,

278, 284, 310, 314. Mr. Rivers raised ('Gard. Chron.,' 1863, p. 27) from the Prune-pêche, which bears large, round, red plums on stout, robust shoots, a seedling which bears oval, smaller fruit on shoots that are so slender as to be almost pendulous.



kernel lies in a roomy cavity surrounded only by the pulp. The climate of North America appears to be singularly favourable for the production of new and good varieties; Downing describes no less than forty, of which seven of first-rate quality have been recently introduced into England.<sup>75</sup> Varieties occasionally arise having an innate adaptation for certain soils, almost as strongly pronounced as with natural species growing on the most distinct geological formations; thus in America the imperial gage, differently from almost all other kinds, "is peculiarly fitted for *dry light* soils where many sorts drop their fruit," whereas on rich heavy soils the fruit is often insipid.<sup>76</sup> My father could never succeed in making the Wine-Sour yield even a moderate crop in a sandy orchard near Shrewsbury, whilst in some parts of the same county and in its native Yorkshire it bears abundantly: one of my relations also repeatedly tried in vain to grow this variety in a sandy district in Staffordshire.

Mr. Rivers has given<sup>77</sup> a number of interesting facts, showing how truly many varieties can be propagated by seed. He sowed the stones of twenty bushels of the greengage for the sake of raising stocks, and closely observed the seedlings; all had the smooth shoots, the prominent buds, and the glossy leaves of the greengage, but the greater number had smaller leaves and thorns." There are two kinds of damson, one the Shropshire with downy shoots, and the other the Kentish with smooth shoots, and these differ but slightly in any other respect: Mr. Rivers sowed some bushels of the Kentish damson, and all the seedlings had smooth shoots, but in some the fruit was oval, in others round or roundish, and in a few the fruit was small, and, except in being sweet, closely resembled that of the wild sloe. Mr. Rivers gives several other striking instances of inheritance: thus, he raised eighty thousand seedlings from the common German Quetsche plum, and "not one could be found varying in the least, in foliage or habit." Similar facts were observed with the Petite Mirabelle plum, yet this latter kind (as well as the Quetsche) is known to have yielded some well-established varieties; but, as Mr. Rivers remarks, they all belong to the same group with the Mirabelle.

*Cherries* (*Prunus cerasus*, *avium*, &c.).—Botanists believe that our cultivated cherries are descended from one, two, four, or even more wild stocks.<sup>78</sup> That there must be at least two parent species we may infer from the sterility of twenty hybrids raised by Mr. Knight from the morello fertilized by pollen of the Elton cherry; for these hybrids produced in all only five cherries, and one alone of these

<sup>75</sup> 'Gardener's Chronicle,' 1855, p. 726.

<sup>76</sup> Downing's 'Fruit Trees,' p. 278.

<sup>77</sup> 'Gardener's Chronicle,' 1863, p. 27. Sageret, in his 'Pomologie Phys.,' p. 346, enumerates five kinds which can be propagated in France by seed:

see also Downing's 'Fruit Trees of America,' p. 305, 312, &c.

<sup>78</sup> Compare Alph. De Candolle, 'Geograph. Bot.,' p. 877; Bentham and Targioni-Tozzetti, in 'Hort. Journal,' vol. ix. p. 163; Godron, 'De l'Espèce,' tom. ii. p. 92.

contained a seed.<sup>79</sup> Mr. Thompson<sup>80</sup> has classified the varieties in an apparently natural method in two main groups by characters taken from the flowers, fruit, and leaves; but some varieties which stand widely separate in this classification are quite fertile when crossed: thus Knight's Early Black cherries is the product of a cross between two such kinds.

Mr. Knight states that seedling cherries are more variable than those of any other fruit-tree.<sup>81</sup> In the Catalogue of the Horticultural Society for 1842, eighty varieties are enumerated. Some varieties present singular characters: thus, the flower of the Cluster cherry includes as many as twelve pistils, of which the majority abort; and they are said generally to produce from two to five or six cherries aggregated together and borne on a single peduncle. In the Ratafia cherry several flower-peduncles arise from a common peduncle, upwards of an inch in length. The fruit of Gascoigne's Heart has its apex produced into a globule or drop; that of the white Hungarian Gean has almost transparent flesh. The Flemish cherry is "a very odd-looking fruit," much flattened at the summit and base, with the latter deeply furrowed, and borne on a stout, very short footstalk. In the Kentish cherry the stone adheres so firmly to the footstalk, that it could be drawn out of the flesh; and this renders the fruit well fitted for drying. The Tobacco-leaved cherry, according to Sageret and Thompson, produces gigantic leaves, more than a foot and sometimes even eighteen inches in length, and half a foot in breadth. The weeping cherry, on the other hand, is valuable only as an ornament, and, according to Downing, is "a charming little tree, with slender, weeping branches, clothed with small, almost myrtle-like foliage." There is also a peach-leaved variety.

Sageret describes a remarkable variety, *le griottier de la Toussaint*, which bears at the same time, even as late as September, flowers and fruit of all degrees of maturity. The fruit, which is of inferior quality, is borne on long, very thin footstalks. But the extraordinary statement is made that all the leaf-bearing shoots spring from old flower-buds. Lastly, there is an important physiological distinction between those kinds of cherries which bear fruit on young or on old wood; but Sageret positively asserts that a Bigarreau in his garden bore fruit on wood of both ages.<sup>82</sup>

*Apple (Pyrus malus).*—The one source of doubt felt by botanists with respect to the parentage of the apple is whether, besides *P. malus*, two or three other closely allied wild forms, namely, *P. acerba* and *præcox* or *paradisiaca*, do not deserve to be ranked as distinct

<sup>79</sup> 'Transact. Hort. Soc.,' vol. v., 1824, p. 295.

<sup>80</sup> *Ibid.*, second series, vol. i., 1835, p. 248.

<sup>81</sup> *Ibid.*, vol. ii. p. 138.

<sup>82</sup> These several statements are taken from the four following works, which may, I believe, be trusted:

Thompson, in 'Hort. Transact.,' see above; Sageret's 'Pomologie Phys.,' 1830, pp. 358, 364, 367, 379; 'Catalogue of the Fruit in the Garden of Hort. Soc.,' 1842, pp. 57, 60; Downing, 'The Fruits of America,' 1845, pp. 189, 195, 200.

species. The *P. præcox* is supposed by some authors<sup>83</sup> to be the parent of the dwarf paradise stock, which, owing to the fibrous roots not penetrating deeply into the ground, is so largely used for grafting; but the paradise stocks, it is asserted,<sup>84</sup> cannot be propagated true by seed. The common wild crab varies considerably in England; but many of the varieties are believed to be escaped seedlings.<sup>85</sup> Every one knows the great difference in the manner of growth, in the foliage, flowers, and especially in the fruit, between the almost innumerable varieties of the apple. The pips or seeds (as I know by comparison) likewise differ considerably in shape, size, and colour. The fruit is adapted for eating or for cooking in various ways, and keeps for only a few weeks or for nearly two years. Some few kinds have the fruit covered with a powdery secretion, called bloom, like that on plums; and "it is extremely remarkable that this occurs almost exclusively among varieties cultivated in Russia."<sup>86</sup> Another Russian apple, the white Astracan, possesses the singular property of becoming transparent, when ripe, like some sorts of crabs. The *api étoilé* has five prominent ridges, hence its name; the *api noir* is nearly black: the *twin cluster pippin* often bears fruit joined in pairs.<sup>87</sup> The trees of the several sorts differ greatly in their periods of leafing and flowering; in my orchard the *Court Pendu Plat* produces leaves so late, that during several springs I thought that it was dead. The Tiffin apple scarcely bears a leaf when in full bloom; the Cornish crab, on the other hand, bears so many leaves at this period that the flowers can hardly be seen.<sup>88</sup> In some kinds the fruit ripens in mid-summer; in others, late in the autumn. These several differences in leafing, flowering, and fruiting, are not at all necessarily correlated; for, as Andrew Knight has remarked,<sup>89</sup> no one can judge from the early flowering of a new seedling, or from the early shedding or change of colour of the leaves, whether it will mature its fruit early in the season.

The varieties differ greatly in constitution. It is notorious that our summers are not hot enough for the Newtown Pippin,<sup>90</sup> which

<sup>83</sup> Mr. Lowe states in his 'Flora of Madeira' (quoted in 'Gard. Chron.,' 1862, p. 215) that the *P. malus*, with its nearly sessile fruit, ranges farther south than the long-stalked *P. acerba*, which is entirely absent in Madeira, the Canaries, and apparently in Portugal. This fact supports the belief that these two forms deserve to be called species. But the characters separating them are of slight importance, and of a kind known to vary in other cultivated fruit-trees.

<sup>84</sup> See 'Journ. of Hort. Tour, by Deputation of the Caledonian Hort.

Soc.,' 1823, p. 459.

<sup>85</sup> H. C. Watson, 'Cybele Britannica,' vol. i. p. 334.

<sup>86</sup> Loudon's 'Gardener's Mag.,' vol. vi., 1830, p. 83.

<sup>87</sup> See 'Catalogue of Fruit in Garden of Hort. Soc.,' 1842, and Downing's 'American Fruit Trees.'

<sup>88</sup> Loudon's 'Gardener's Magazine,' vol. iv., 1828, p. 112.

<sup>89</sup> 'The Culture of the Apple,' p. 43. Van Mons makes the same remark on the pear, 'Arbres Fruitières,' tom. ii., 1836., p. 414.

<sup>90</sup> Lindley's 'Horticulture,' p. 116

is the glory of the orchards near New York; and so it is with several varieties which we have imported from the Continent. On the other hand, our Court of Wick succeeds well under the severe climate of Canada. The *Calville rouge de Micoud* occasionally bears two crops during the same year. The Burr Knot is covered with small excrescences, which emit roots so readily that a branch with blossom-buds may be stuck in the ground, and will root and bear a few fruit even during the first year.<sup>91</sup> Mr. Rivers has recently described<sup>92</sup> some seedlings valuable from their roots running near the surface. One of these seedlings was remarkable from its extremely dwarfed size, "forming itself into a bush only a few inches in height." Many varieties are particularly liable to canker in certain soils. But perhaps the strangest constitutional peculiarity is that the Winter Majetin is not attacked by the mealy bug or coccus; Lindley<sup>93</sup> states that in an orchard in Norfolk infested with these insects the Majetin was quite free, though the stock on which it was grafted was affected: Knight makes a similar statement with respect to a cider apple, and adds that he only once saw these insects just above the stock, but that three days afterwards they entirely disappeared; this apple, however, was raised from a cross between the Golden Harvey and the Siberian Crab; and the latter, I believe, is considered by some authors as specifically distinct.

The famous St. Valery apple must not be passed over; the flower has a double calyx with ten divisions, and fourteen styles surmounted by conspicuous oblique stigmas, but is destitute of stamens or corolla. The fruit is constricted round the middle, and is formed of five seed-cells, surmounted by nine other cells.<sup>94</sup> Not being

See also Knight on the Apple-Tree, in 'Transact. of Hort. Soc.,' vol. vi. p. 229.

<sup>91</sup> 'Transact. Hort. Soc.,' vol. i. 1812, p. 120.

<sup>92</sup> 'Journal of Horticulture,' March 13th, 1866, p. 194.

<sup>93</sup> 'Transact. Hort. Soc.,' vol. iv. p. 68. For Knight's case, see vol. vi. p. 547. When the coccus first appeared in this country, it is said (vol. ii. p. 163) that it was more injurious to crab-stocks than to the apples grafted on them. The Majetin apple has been found equally free of the coccus at Melbourne in Australia ('Gard. Chron.' 1871, p. 1065). The wood of this tree has been there analysed, and it is said (but the fact seems a strange one) that its ash contained over 50 per cent. of lime, while that of the crab exhibited not quite 23 per cent. In Tasmania Mr. Wade ('Transact.

New Zealand Institute,' vol. iv., 1871, p. 431) raised seedlings of the Siberian Bitter Sweet for stocks, and he found barely one per cent. of them attacked by the coccus. Riley shows ('Fifth Report on Insects of Missouri,' 1873, p. 87) that in the United States some varieties of apples are highly attractive to the coccus and others very little so. Turning to a very different pest, namely, the caterpillar of a moth (*Carpocapsa pomonella*), Walsh affirms ('The American Entomologist,' April, 1869, p. 160) that the maiden-blush "is entirely exempt from apple-worms." So, it is said, are some few other varieties; whereas others are "peculiarly subject to the attacks of this little pest."

<sup>94</sup> 'Mém. de la Soc. Linn. de Paris,' tom. iii., 1825, p. 164; and Seringe, 'Bulletin Bot.' 1830, p. 117.

provided with stamens, the tree requires artificial fertilisation; and the girls of St. Valery annually go to "*faire ses pommes*," each marking her own fruit with a ribbon; and as different pollen is used the fruit differs, and we here have an instance of the direct action of foreign pollen on the mother plant. These monstrous apples include, as we have seen, fourteen seed-cells; the pigeon-apple,<sup>95</sup> on the other hand, has only four, instead of, as with all common apples, five cells; and this certainly is a remarkable difference.

In the catalogue of apples published in 1842 by the Horticultural Society, 897 varieties are enumerated; but the differences between most of them are of comparatively little interest, as they are not strictly inherited. No one can raise, for instance, from the seed of the Ribston Pippin, a tree of the same kind; and it is said that the "Sister Ribston Pippin" was a white semi-transparent, sour-fleshed apple, or rather large crab.<sup>96</sup> Yet it was a mistake to suppose that with most varieties the characters are not to a certain extent inherited. In two lots of seedlings raised from two well-marked kinds, many worthless crab-like seedlings will appear, but it is now known that the two lots not only usually differ from each other, but resemble to a certain extent their parents. We see this indeed in the several sub-groups of Russetts, Sweetings, Codlins, Pearmains, Reinettes, &c.,<sup>97</sup> which are all believed, and many are known, to be descended from other varieties bearing the same names.

*Pears (Pyrus communis)*.—I need say little on this fruit, which varies much in the wild state, and to an extraordinary degree when cultivated, in its fruit, flowers, and foliage. One of the most celebrated botanists in Europe, M. Decaisne, has carefully studied the many varieties;<sup>98</sup> although he formerly believed that they were derived from more than one species, he now thinks that all belong to one. He has arrived at this conclusion from finding in the several varieties a perfect gradation between the most extreme characters; so perfect is this gradation that he maintains it to be impossible to classify the varieties by any natural method. M. Decaisne raised many seedlings from four distinct kinds, and has carefully recorded the variations in each. Notwithstanding this extreme degree of variability, it is now positively known that many kinds reproduce by seed the leading characters of their race.<sup>99</sup>

*Strawberries (Fragaria)*.—This fruit is remarkable on account of the number of species which have been cultivated, and from

<sup>95</sup> 'Gardener's Chronicle,' 1849, p. 24.

<sup>96</sup> R. Thompson, in 'Gardener's Chron.,' 1850, p. 788.

<sup>97</sup> Sageret, 'Pomologie Physiologique,' 1830, p. 263. Downing's 'Fruit Trees,' pp. 130, 134, 139, &c. Loudon's 'Gardener's Mag.,' vol. viii. p. 317. Alexis Jordan, 'De l'Origine

des diverses Variétés,' in 'Mém. de l'Acad. Imp. de Lyon,' tom. ii., 1852, pp. 95, 114. 'Gardener's Chronicle,' 1850, pp. 774, 788.

<sup>98</sup> 'Comptes Rendus,' July 6th, 1863.

<sup>99</sup> 'Gardener's Chronicle,' 1856, p. 804; 1857, p. 820; 1862, p. 1195.

their rapid improvement within the last fifty or sixty years. Let any one compare the fruit of one of the largest varieties exhibited at our Shows with that of the wild wood strawberry, or, which will be a fairer comparison, with the somewhat larger fruit of the wild American Virginian Strawberry, and he will see what prodigies horticulture has effected.<sup>100</sup> The number of varieties has likewise increased in a surprisingly rapid manner. Only three kinds were known in France, in 1746, where this fruit was early cultivated. In 1766 five species had been introduced, the same which are now cultivated, but only five varieties of *Fragaria vesca*, with some sub-varieties, had been produced. At the present day the varieties of the several species are almost innumerable. The species consist of, firstly, the wood or Alpine cultivated strawberries, descended from *F. vesca*, a native of Europe and of North America. There are eight wild European varieties, as ranked by Duchesne, of *F. vesca*, but several of these are considered species by some botanists. Secondly, the green strawberries, descended from the European *F. colina*, and little cultivated in England. Thirdly, the Hautbois, from the European *F. elatior*. Fourthly, the Scarlets, descended from *F. virginiana*, a native of the whole breadth of North America. Fifthly, the Chili, descended from *F. chiloensis*, an inhabitant of the west coast of the temperate parts both of North and South America. Lastly, the pines or Carolinas (including the old Blacks), which have been ranked by most authors under the name of *F. grandiflora* as a distinct species, said to inhabit Surinam; but this is a manifest error. This form is considered by the highest authority, M. Gay, to be merely a strongly marked race of *F. chiloensis*.<sup>101</sup> These five or six forms have been ranked by most botanists as specifically distinct; but this may be doubted, for Andrew Knight,<sup>102</sup> who raised no less than 400 crossed strawberries, asserts that the *F. virginiana*, *chiloensis* and *grandiflora* "may be made to breed together indiscriminately," and he found, in accordance with the principle of analogous variation, "that similar varieties could be obtained from the seeds of any one of them."

Since Knight's time there is abundant and additional evidence<sup>103</sup> of the extent to which the American forms spontaneously cross. We owe indeed to such crosses most of our choicest existing

<sup>100</sup> Most of the largest cultivated strawberries are the descendants of *F. grandiflora* or *chiloensis*, and I have seen no account of these forms in their wild state. Methuen's Scarlet (Downing, 'Fruits,' p. 527) has "immense fruit of the largest size," and belongs to the section descended from *F. virginiana*; and the fruit of this species, as I hear from Prof. A. Gray, is only a little larger than that

of *F. vesca*, or our common wood-strawberry.

<sup>101</sup> 'Le Fraisier,' par le Comte L. de Lambertye, 1864, p. 50.

<sup>102</sup> 'Transact. Hort. Soc.,' vol. iii. 1820, p. 207.

<sup>103</sup> See an account by Prof. Decaisne, and by others in 'Gardener's Chronicle,' 1862, p. 335, and 1858, p. 172; and Mr. Barnet's paper in 'Hort. Soc. Transact.,' vol. vi. 1826, p. 170.

varieties. Knight did not succeed in crossing the European wood-strawberry with the American Scarlet or with the Hautbois. Mr. Williams of Pitmaston, however, succeeded; but the hybrid offspring from the Hautbois, though fruiting well, never produced seed, with the exception of a single one, which reproduced the parent hybrid form.<sup>104</sup> Major R. Trevor Clarke informs me that he crossed two members of the Pine class (Myatt's B. Queen and Keen's Seedling) with the wood and hautbois, and that in each case he raised only a single seedling; one of these fruited, but was almost barren. Mr. W. Smith, of York, has raised similar hybrids with equally poor success.<sup>105</sup> We thus see<sup>106</sup> that the European and American species can with some difficulty be crossed; but it is improbable that hybrids sufficiently fertile to be worth cultivation will ever be thus produced. This fact is surprising, as these forms structurally are not widely distinct, and are sometimes connected in the districts where they grow wild, as I hear from Professor Asa Gray, by puzzling intermediate forms.

The energetic culture of the Strawberry is of recent date, and the cultivated varieties can in most cases be classed under some one of the above native stocks. As the American strawberries cross so freely and spontaneously, we can hardly doubt that they will ultimately become inextricably confused. We find, indeed, that horticulturists at present disagree under which class to rank some few of the varieties; and a writer in the 'Bon Jardinier' of 1840 remarks that formerly it was possible to class all of them under some one species, but that now this is quite impossible with the American forms, the new English varieties having completely filled up the gaps between them.<sup>107</sup> The blending together of two or more aboriginal forms, which there is every reason to believe has occurred with some of our anciently cultivated productions, we see now actually occurring with our strawberries.

The cultivated species offer some variations worth notice. The Black Prince, a seedling from Keen's Imperial (this latter being a seedling of a very white strawberry, the white Carolina), is remarkable from "its peculiar dark and polished surface, and from presenting an appearance entirely unlike that of any other kind."<sup>108</sup> Although the fruit in the different varieties differs so greatly in form, size, colour, and quality, the so-called seed (which corresponds with the whole fruit in the plum) with the exception of being more or less deeply embedded in the pulp, is, according to De Jonghe,<sup>109</sup> absolutely the same in all: and this no doubt

<sup>104</sup> Transact. Hort. Soc., vol. v. 1862, p. 721.  
1824, p. 294.

<sup>105</sup> 'Journal of Horticulture,' Dec. 30th, 1862, p. 779. See also Mr. Prince to the same effect, *ibid.*, 1863, p. 418.

<sup>106</sup> For additional evidence see 'Journal of Horticulture,' Dec. 9th,

<sup>107</sup> 'Le Fraisier,' par le Comte Le de Lambertye, pp. 221, 230.

<sup>108</sup> 'Transact. Hort. Soc.,' vol. vi. p. 200.

<sup>109</sup> 'Gardener's Chron.,' 1858, p. 173.

may be accounted for by the seed being of no value, and consequently not having been subjected to selection. The strawberry is properly three-leaved, but in 1761 Duchesne raised a single-leaved variety of the European wood-strawberry, which Linnæus doubtfully raised to the rank of a species. Seedlings of this variety, like those of most varieties not fixed by long-continued selection, often revert to the ordinary form, or present intermediate states.<sup>110</sup> A variety raised by Mr. Myatt,<sup>111</sup> apparently belonging to one of the American forms presents a variation of an opposite nature, for it has five leaves; Godron and Lambertye also mention a five-leaved variety of *F. collina*.

The Red Bush Alpine strawberry (one of the *F. vesca* section) does not produce stolons or runners, and this remarkable deviation of structure is reproduced truly by seed. Another sub-variety, the White Bush Alpine, is similarly characterised, but when propagated by seed it often degenerates and produces plants with runners.<sup>112</sup> A strawberry of the American Pine section is also said to make but few runners.<sup>113</sup>

Much has been written on the sexes of strawberries; the true Hautbois properly bears the male and female organs on separate plants,<sup>114</sup> and was consequently named by Duchesne *dioica*; but it frequently produces hermaphrodites; and Lindley,<sup>115</sup> by propagating such plants by runners, at the same time destroying the males, soon raised a self-prolific stock. The other species often showed a tendency towards an imperfect separation of the sexes, as I have noticed with plants forced in a hot-house. Several English varieties, which in this country are free from any such tendency, when cultivated in rich soils under the climate of North America<sup>116</sup> commonly produce plants with separate sexes. Thus a whole acre of Keen's Seedlings in the United States has been observed to be almost sterile from the absence of male flowers; but the more general rule is, that the male plants overrun the females. Some members of the Cincinnati Horticultural Society, especially appointed to investigate this subject, report that "few varieties have the flowers perfect in both sexual organs," &c. The most successful cultivators in Ohio plant for every seven rows of "pistillata," or female plants, one row of hermaphrodites, which afford pollen for both kinds; but the hermaphrodites, owing to their expenditure in the production of pollen, bear less fruit than the female plants.

The varieties differ in constitution. Some of our best English

<sup>110</sup> Godron, 'De l'Espèce,' tom. i. p. 161.

<sup>111</sup> 'Gardener's Chron.,' 1851, p. 440.

<sup>112</sup> F. Gloede in 'Gardener's Chron.,' 1862, p. 1053.

<sup>113</sup> Downing's 'Fruits,' p. 532.

<sup>114</sup> Barnet, in 'Hort. Transact.,'

vol. vi. p. 210.

<sup>115</sup> 'Gardener's Chron.,' 1847, p. 539.

<sup>116</sup> For the several statements with respect to the American strawberries, see Downing, 'Fruits,' p. 524; 'Gardener's Chronicle,' 1843, p. 188; 1847, p. 539; 1861, p. 717.



kinds, such as Keen's Seedlings, are too tender for certain parts of North America, where other English and many American varieties succeed perfectly. That splendid fruit, the British Queen, can be cultivated but in few places either in England or France: but this apparently depends more on the nature of the soil than on the climate; a famous gardener says that "no mortal could grow the British Queen at Shrubland Park unless the whole nature of the soil was altered."<sup>117</sup> La Constantine is one of the hardiest kinds, and can withstand Russian winters, but it is easily burnt by the sun, so that it will not succeed in certain soils either in England or the United States.<sup>118</sup> The Filbert Pine Strawberry "requires more water than any other variety; and if the plants once suffer from drought, they will do little or no good afterwards."<sup>119</sup> Cuthill's Black Prince Strawberry evinces a singular tendency to mildew; no less than six cases have been recorded of this variety suffering severely, whilst other varieties growing close by, and treated in exactly the same manner, were not at all infested by this fungus.<sup>120</sup> The time of maturity differs much in the different varieties: some belonging to the wood or alpine section produce a succession of crops throughout the summer.

*Gooseberry (Ribes grossularia).*—No one, I believe, has hitherto doubted that all the cultivated kinds are sprung from the wild plant bearing this name, which is common in Central and Northern Europe; therefore it will be desirable briefly to specify all the points, though not very important, which have varied. If it be admitted that these differences are due to culture, authors perhaps will not be so ready to assume the existence of a large number of unknown wild parent-stocks for our other cultivated plants. The gooseberry is not alluded to by writers of the classical period. Turner mentions it in 1573, and Parkinson specifies eight varieties in 1629; the Catalogue of the Horticultural Society for 1842 gives 149 varieties, and the lists of the Lancashire nurserymen are said to include above 300 names.<sup>121</sup> In the 'Gooseberry Grower's Register' for 1862 I find that 243 distinct varieties have won prizes at various periods, so that a vast number must have been exhibited. No doubt the difference between many of the varieties is very small; but Mr. Thompson in classifying the fruit for the Horticultural Society found less confusion in the nomenclature of the gooseberry than of any other fruit, and he attributes this "to the great interest which the prize-growers have taken in detecting

<sup>117</sup> Mr. D. Beaton, in 'Cottage Gardener,' 1860, p. 86. See also 'Cottage Gardener,' 1855, p. 88, and many other authorities. For the Continent, see F. Gloede, in 'Gardener's Chronicle,' 1862, p. 1053.

<sup>118</sup> Rev. W. F. Radclyffe, in 'Journal of Hort.,' March 14, 1865, p.

207.

<sup>119</sup> Mr. H. Doubleday in 'Gardener's Chron.,' 1862, p. 1101.

<sup>120</sup> 'Gardener's Chronicle,' 1854, p. 254.

<sup>121</sup> Loudon's 'Encyclop. of Gardening,' p. 930; and Alph. De Candolle, 'Géograph. Bot.,' p. 910.

sorts with wrong names," and this shows that all the kinds, numerous as they are, can be recognised with certainty.

The bushes differ in their manner of growth, being erect, or spreading, or pendulous. The periods of leafing and flowering differ both absolutely and relatively to each other thus the Whitesmith produces early flowers, which from not being protected by the foliage, as it is believed, continually fail to produce fruit.<sup>122</sup> The leaves vary in size, tint, and in depth of lobes; they are smooth, downy, or hairy on the upper surface. The branches are more or less downy or spinose; "the Hedgehog has probably derived its name from the singular bristly condition of its shoots and fruit." The branches of the wild gooseberry, I may remark, are smooth, with the exception of thorns at the bases of the buds. The thorns themselves are either very small, few and single, or very large and triple; they are sometimes reflexed and much dilated at their bases. In the different varieties the fruit varies in abundance, in the period of maturity, in hanging until shrivelled, and greatly in size, "some sorts having their fruit large during a very early period of growth, whilst others are small, until nearly ripe." The fruit varies also much in colour, being red, yellow, green, and white—the pulp of one dark-red gooseberry being tinged with yellow; in flavour; in being smooth or downy,—few, however, of the Red gooseberries, whilst many of the so-called Whites, are downy; or in being so spinose that one kind is called Henderson's Porcupine. Two kinds acquire when mature a powdery bloom on their fruit. The fruit varies in the thickness and veining of the skin, and, lastly, in shape, being spherical, oblong, oval, or obovate.<sup>123</sup>

I cultivated fifty-four varieties, and, considering how greatly the fruit differs, it was curious how closely similar the flowers were in all these kinds. In only a few I detected a trace of difference in the size or colour of the corolla. The calyx differed in a rather greater degree, for in some kinds it was much redder than in others; and in one smooth white gooseberry it was unusually red. The calyx also differed in the basal part being smooth or woolly, or covered with glandular hairs. It deserves notice, as being contrary to what might have been expected from the law of correlation, that a smooth red gooseberry had a remarkably hairy calyx. The flowers of the Sportsman are furnished with very large coloured bractæ; and this is the most singular deviation of structure which I have observed. These same flowers also varied much in the number of the petals, and occasionally in the number of the stamens and pistils; so that they were semi-monstrous in structure, yet they produced plenty of fruit. Mr. Thompson remarks that in

<sup>122</sup> Loudon's 'Gardener's Magazine,' vol. iv. 1828, p. 112.

<sup>123</sup> The fullest account of the gooseberry is given by Mr. Thompson in

'Transact. Hort. Soc.,' vol. i., 2nd series, 1835, p. 218, from which most of the foregoing facts are taken.

Pastime gooseberry "extra bracts are often attached to the sides of the fruit."<sup>124</sup>

The most interesting point in the history of the gooseberry is the steady increase in the size of the fruit. Manchester is the metropolis of the fanciers, and prizes from five shillings to five or ten pounds are yearly given for the heaviest fruit. The 'Gooseberry Grower's Register' is published annually; the earliest known copy is dated 1786, but it is certain that meetings for the adjudication of prizes were held some years previously.<sup>125</sup> The 'Register' for 1845 gives an account of 171 Gooseberry Shows, held in different places during that year; and this fact shows on how large a scale the culture has been carried on. The fruit of the wild gooseberry is said<sup>1-6</sup> to weigh about a quarter of an ounce or 5 dwts., that is, 120 grains; about the year 1786 gooseberries were exhibited weighing 10 dwts., so that the weight was then doubled; in 1817 26 dwts. 17 grs. was attained; there was no advance till 1825, when 31 dwts. 16 grs. was reached; in 1830 "Teazer" weighed 32 dwts. 13 grs.; in 1841 "Wonderful" weighed 32 dwts. 16 grs.; in 1844 "London" weighed 35 dwts. 12 grs., and in the following year 36 dwts. 16 grs.; and in 1852, in Staffordshire, the fruit of the same variety reached the astonishing weight of 37 dwts. 7 grs.<sup>127</sup> or 896 grs.; that is, between seven or eight times the weight of the wild fruit. I find that a small apple, 6½ inches in circumference, has exactly this same weight. The "London" gooseberry (which in 1852 had altogether gained 333 prizes) has, up to the present year of 1875, never reached a greater weight than that attained in 1852. Perhaps the fruit of the gooseberry has now reached the greatest possible weight, unless in the course of time some new and distinct variety shall arise.

This gradual, and on the whole steady increase of weight from the latter part of the last century to the year 1852, is probably in large part due to improved methods of cultivation, for extreme care is now taken; the branches and roots are trained, composts are made, the soil is mulched, and only a few berries are left on each bush;<sup>128</sup> but the increase no doubt is in main part due to the continued selection of seedlings which have been found to be more and more capable of yielding such extraordinary fruit. Assuredly the "Highwayman" in 1817 could not have produced fruit like that of the "Roaring Lion" in 1825; nor could the "Roaring Lion," though it was grown by many persons in many places, gain the supreme triumph achieved in 1852 by the "London" Gooseberry.

<sup>124</sup> 'Catalogue of Fruits of Hort. Soc. Garden,' 3rd edit. 1842.

<sup>125</sup> Mr. Clarkson, of Manchester, on the Culture of the Gooseberry, in Loudon's 'Gardener's Magazine,' vol. iv. 1828, p. 482.

<sup>126</sup> Downing's 'Fruits of America,' p. 213.

<sup>127</sup> 'Gardener's Chronicle,' 1844, p. 811, where a table is given; and 1845, p. 819. For the extreme weights gained, see 'Journal of Horticulture,' July 26, 1864, p. 61.

<sup>128</sup> Mr. Saul, of Lancaster, in Loudon's 'Gardener's Mag.,' vol. iii. 1828, p. 421; and vol. x. 1834, p. 42.

*Walnut (Juglans regia).*—This tree and the common nut belong to a widely different order from the foregoing fruits, and are therefore here noticed. The walnut grows wild on the Caucasus and in the Himalaya, where Dr. Hooker<sup>129</sup> found the fruit of full size, but “as hard as a hickory-nut.” It has been found fossil, as M. de Saporta informs me, in the tertiary formation, of France.

In England the walnut presents considerable differences, in the shape and size of the fruit, in the thickness of the husk, and in the thinness of the shell; this latter quality has given rise to a variety called the thin-shelled, which is valuable, but suffers from the attacks of tit-mice.<sup>130</sup> The degree to which the kernel fills the shell varies much. In France there is a variety called the Grape or cluster-walnut, in which the nuts grow in “bunches of ten, fifteen, or even twenty together.” There is another variety which bears on the same tree differently shaped leaves, like the heterophyllous hornbeam; this tree is also remarkable from having pendulous branches, and bearing elongated, large, thin-shelled nuts.<sup>131</sup> M. Cardan has minutely described<sup>132</sup> some singular physiological peculiarities in the June-leaving variety, which produces its leaves and flowers four or five weeks later than the common varieties; and although in August it is apparently in exactly the same state of forwardness as the other kinds, it retains its leaves and fruit much later in the autumn. These constitutional peculiarities are strictly inherited. Lastly, walnut-trees, which are properly monoicous, sometimes entirely fail to produce male flowers.<sup>133</sup>

*Nuts (Corylus avellana).*—Most botanists rank all the varieties under the same species, the common wild nut.<sup>134</sup> The husk, or involucre, differs greatly, being extremely short in Barr’s Spanish, and extremely long in filberts, in which it is contracted so as to prevent the nut falling out. This kind of husk also protects the nut from birds, for titmice (*Parus*) have been observed<sup>135</sup> to pass over filberts, and attack cobs and common nuts growing in the same orchard. In the purple-filbert the husk is purple, and in the frizzled-filbert it is curiously lacinated; in the red-filbert the pellicle of the kernel is red. The shell is thick in some varieties, but is thin in Cosford’s-nut, and in one variety is of a bluish colour. The nut itself differs much in size and shape, being ovate and compressed in filberts, nearly round and of great size in cobs and

<sup>129</sup> ‘Himalayan Journals,’ 1854, vol. ii. p. 334. Moorcroft (‘Travels,’ vol. ii. p. 146) describes four varieties cultivated in Kashmir.

<sup>130</sup> ‘Gardener’s Chronicle,’ 1850, p. 723.

<sup>131</sup> Paper translated in Loudon’s ‘Gardener’s Mag.,’ 1829, vol. v. p. 202.

<sup>132</sup> Quoted in ‘Gardener’s Chron.,’

1849, p. 101.

<sup>133</sup> ‘Gardener’s Chronicle,’ 1847, pp. 541 and 558.

<sup>134</sup> The following details are taken from the ‘Catalogue of Fruits, 1842, in Garden of Hort. Soc.,’ p. 103; and from Loudon’s ‘Encyclop. of Gardening,’ p. 943.

<sup>135</sup> ‘Gardener’s Chron.,’ 1860, p. 956.

Spanish nuts, oblong and longitudinally striated in Cosford's, and obtusely four-sided in the Downton Square nut.

*Cucurbitaceous plants.*—These plants have been for a long period the opprobrium of botanists; numerous varieties have been ranked as species, and, what happens more rarely, forms which now must be considered as species have been classed as varieties. Owing to the admirable experimental researches of a distinguished botanist, M. Naudin,<sup>136</sup> a flood of light has recently been thrown on this group of plants. M. Naudin, during many years, observed and experimented on above 1200 living specimens, collected from all quarters of the world. Six species are now recognised in the genus *Cucurbita*; but three alone have been cultivated and concern us, namely, *C. maxima* and *pepo*, which include all pumpkins, gourds, squashes, and the vegetable marrow, and *C. moschata*. These three species are not known in a wild state; but Asa Gray<sup>137</sup> gives good reason for believing that some pumpkins are natives of N. America.

These three species are closely allied, and have the same general habit, but their innumerable varieties can always be distinguished, according to Naudin, by certain almost fixed characters; and what is still more important, when crossed they yield no seed, or only sterile seed; whilst the varieties spontaneously intercross with the utmost freedom. Naudin insists strongly (p. 15), that, though these three species have varied greatly in many characters, yet it has been in so closely an analogous manner that the varieties can be arranged in almost parallel series, as we have seen with the forms of wheat, with the two main races of the peach, and in other cases. Though some of the varieties are inconstant in character, yet others, when grown separately under uniform conditions of life, are, as Naudin repeatedly (pp. 6, 16, 35) urges, “*douées d'une stabilité presque comparable à celle des espèces les mieux caractérisées.*” One variety, l'Orangin (pp. 43, 63), has such prepotency in transmitting its character, that when crossed with other varieties a vast majority of the seedlings come true. Naudin, referring (p. 47) to *C. pepo*, says that its races “*ne diffèrent des espèces véritables qu'en ce qu'elles peuvent s'allier les unes aux autres par voie d'hybridité, sans que leur descendance perde la faculté de se perpétuer.*” If we were to trust to external differences alone, and give up the test of sterility, a multitude of species would have to be formed out of the varieties of these three species of *Cucurbita*. Many naturalists at the present day lay far too little stress, in my opinion, on the test of sterility; yet it is not improbable that distinct species of plants after a long course of cultivation and variation may have their mutual sterility eliminated, as we have every reason to believe has occurred with domesticated animals. Nor, in the case of plants under cultivation, should we be justified

<sup>136</sup> ‘*Annales des Sc. Nat. Bot.*’ 4th series, vol. vi. 1856, p. 5.

<sup>137</sup> ‘*American Journ. of Science,*’ 2nd ser. vol. xxiv. 1857, p. 442.

in assuming that varieties never acquire a slight degree of mutual sterility, as we shall more fully see in a future chapter when certain facts are given on the high authority of Gärtner and Kölreuter.<sup>138</sup>

The forms of *C. pepo* are classed by Naudin under seven sections, each including subordinate varieties. He considers this plant as probably the most variable in the world. The fruit of one variety (pp. 33, 46) exceeds in value that of another by more than two thousand fold! When the fruit is of very large size, the number produced is few (p. 45); when of small size, many are produced. No less astonishing (p. 33) is the variation in the shape of the fruit, the typical form apparently is egg-like, but this becomes either drawn out into a cylinder, or shortened into a flat disc. We have also an almost infinite diversity in the colour and state of surface of the fruit, in the hardness both of the shell and of the flesh, and in the taste of the flesh, which is either extremely sweet, farinaceous, or slightly bitter. The seeds also differ in a slight degree in shape, and wonderfully in size (p. 34), namely, from six or seven to more than twenty-five millimètres in length.

In the varieties which grow upright or do not run and climb, the tendrils, though useless (p. 31), are either present or are represented by various semi-monstrous organs, or are quite absent. The tendrils are even absent in some running varieties in which the stems are much elongated. It is a singular fact that (p. 31) in all the varieties with dwarfed stems, the leaves closely resemble each other in shape.

Those naturalists who believe in the immutability of species often maintain that, even in the most variable forms, the characters which they consider of specific value are unchangeable. To give an example from a conscientious writer,<sup>139</sup> who, relying on the labours of M. Naudin, and referring to the species of *Cucurbita*, says, "au milieu de toutes les variations du fruit, les tiges, les feuilles, les calices, les corolles, les étamines restent invariables dans chacune d'elles." Yet M. Naudin, in describing *Cucurbita pepo* (p. 30), says, "Ici, d'ailleurs, ce ne sont pas seulement les fruits qui varient, c'est aussi le feuillage et tout le port de la plante. Néanmoins, je crois qu'on la distinguera toujours facilement des deux autres espèces, si l'on veut ne pas perdre de vue les caractères

<sup>138</sup> Gärtner, 'Bastarderzeugung,' 1849, s. 87, and s. 169 with respect to Maize; on *Verbascum*, *ibid.*, ss. 92 and 181; also his 'Kenntniß der Befruchtung,' s. 137. With respect to

*Nicotiana*, see Kölreuter, 'Zweite Forts.,' 1764, s. 53; though this is a somewhat different case.

<sup>139</sup> 'De l'Espèce,' par M. Godron, tom. ii. p. 64.

différentiels que je m'efforce de faire ressortir. Ces caractères sont quelquefois peu marqués : il arrive même que plusieurs d'entre eux s'effacent presque entièrement, mais il en reste toujours quelques-uns qui remettent l'observateur sur la voie." Now let it be noted what a difference, with regard to the immutability of the so-called specific characters this paragraph produces on the mind, from that above quoted from M. Godron.

I will add another remark : naturalists continually assert that no important organ varies ; but in saying this they unconsciously argue in a vicious circle ; for if an organ, let it be what it may, is highly variable, it is regarded as unimportant, and under a systematic point of view this is quite correct. But as long as constancy is thus taken as the criterion of importance, it will indeed be long before an important organ can be shown to be inconstant. The enlarged form of the stigmas, and their sessile position on the summit of the ovary, must be considered as important characters, and were used by Gasparini to separate certain pumpkins as a *distinct genus* ; but Naudin says (p. 20), these parts have no constancy, and in the flowers of the Turban varieties of *C. maxima* they sometimes resume their ordinary structure. Again, in *C. maxima*, the carpels (p. 19) which form the turban project even as much as two-thirds of their length out of the receptacle, and this latter part is thus reduced to a sort of platform ; but this remarkable structure occurs only in certain varieties, and graduates into the common form in which the carpels are almost entirely enveloped within the receptacle. In *C. moschata* the ovarium (p. 50) varies greatly in shape, being oval, nearly spherical, or cylindrical, more or less swollen in the upper part, or constricted round the middle, and either straight or curved. When the ovarium is short and oval the interior structure does not differ from that of *C. maxima* and *pepo*, but when it is elongated the carpels occupy only the terminal and swollen portion. I may add that in one variety of the cucumber (*Cucumis sativus*) the fruit regularly contains five carpels instead of three.<sup>140</sup> I

<sup>140</sup> Naudin, in 'Annal. des Sc. Nat.,' 4th ser. Bot. tom. xi. 1859, p. 28.

presume that it will not be disputed that we here have instances of great variability in organs of the highest physiological importance, and with most plants of the highest classificatory importance.

Sageret<sup>141</sup> and Naudin found that the cucumber (*C. sativus*) could not be crossed with any other species of the genus; therefore no doubt it is specifically distinct from the melon. This will appear to most persons a superfluous statement; yet we hear from Naudin<sup>142</sup> that there is a race of melons, in which the fruit is so like that of the cucumber, "both externally and internally, that it is hardly possible to distinguish the one from the other except by the leaves." The varieties of the melon seem to be endless, for Naudin after six years' study had not come to the end of them: he divides them into ten sections, including numerous sub-varieties which all intercross with perfect ease.<sup>143</sup> Of the forms considered by Naudin to be varieties, botanists have made thirty distinct species! "and they had not the slightest acquaintance with the multitude of new forms which have appeared since their time." Nor is the creation of so many species at all surprising when we consider how strictly their characters are transmitted by seed, and how wonderfully they differ in appearance: "Mira est quidem foliorum et habitus diversitas, sed multo magis fructuum," says Naudin. The fruit is the valuable part, and this, in accordance with the common rule, is the most modified part. Some melons are only as large as small plums, others weigh as much as sixty-six pounds. One variety has a scarlet fruit! Another is not more than an inch in diameter, but sometimes more than a yard in length, "twisting about in all directions like a serpent." It is a singular fact that in this latter variety many parts of the plant, namely, the stems, the footstalks of the female flowers, the middle lobe of the leaves, and especially the ovarium, as well as the mature fruit, all show a strong tendency to become elongated. Several varieties of the melon are interesting from assuming the characteristic features of distinct species and even of distinct though allied genera: thus the serpent-melon has some resemblance to the fruit of *Trichosanthes anguina*; we have seen that other varieties closely resemble cucumbers; some Egyptian varieties have their seeds attached to a portion of the pulp, and this is characteristic of certain wild forms. Lastly, a variety of melon from Algiers is

<sup>141</sup> 'Mèmoire sur les Cucurbitacées,' 1826, pp. 6, 24.

<sup>142</sup> 'Flore des Serres,' Oct. 1861, quoted in 'Gardener's Chronicle,' 1861, p. 1135. I have often consulted and taken some facts from M. Naudin's

Memoir on Cucumis in 'Annal. des Sc. Nat.,' 4th series, Bot. tom. xi. 1859, p. 5.

<sup>143</sup> See also Sageret's 'Mèmoire,' p. 7.



remarkable from announcing its maturity by "a spontaneous and almost sudden dislocation," when deep cracks suddenly appear, and the fruit falls to pieces; and this occurs with the wild *C. momordica*. Finally, M. Naudin well remarks that this "extraordinary production of races and varieties by a single species and their permanence when not interfered with by crossing, are phenomena well calculated to cause reflection."

#### USEFUL AND ORNAMENTAL TREES.

TREES deserve a passing notice on account of the numerous varieties which they present, differing in their precocity, in their manner of growth, their foliage, and bark. Thus of the common ash (*Fraxinus excelsior*) the catalogue of Messrs. Lawson of Edinburgh includes twenty-one varieties, some of which differ much in their bark; there is a yellow, a streaked reddish-white, a purple, a wart-barked and a fungous-barked variety.<sup>144</sup> Of hollies no less than eighty-four varieties are grown alongside each other in Mr. Paul's nursery.<sup>145</sup> In the case of trees, all the recorded varieties, as far as I can find out, have been suddenly produced by one single act of variation. The length of time required to raise many generations, and the little value set on the fanciful varieties, explains how it is that successive modifications have not been accumulated by selection; hence, also, it follows that we do not here meet with sub-varieties subordinate to varieties, and these again subordinate to higher groups. On the Continent, however, where the forests are more carefully attended to than in England, Alph. De Candolle<sup>146</sup> says that there is not a forester who does not search for seeds from that variety which he esteems the most valuable.

Our useful trees have seldom been exposed to any great change of conditions; they have not been richly manured, and the English kinds grow under their proper climate. Yet in examining extensive beds of seedlings in nursery-gardens considerable differences may be generally observed in them; and whilst touring in England I have been surprised at the amount of difference in the appearance of the same species in our hedgerows and woods. But as plants vary so much in a truly wild state, it would be difficult for even a skilful botanist to pronounce whether, as I believe to be the case, hedgerow trees vary more than those growing in a primeval forest. Trees when planted by man in woods or hedges do not grow where they would naturally be able to hold their place against a host of competitors, and are therefore exposed to conditions not strictly natural: even this slight change would probably suffice to cause seedlings raised from such trees to be variable. Whether or not our half-wild English trees, as a general rule, are more

<sup>144</sup> Loudon's 'Arboretum et Fruticetum,' vol. ii. p. 1217. 1096.

<sup>146</sup> 'Géograph. Bot.,' p. 1096.

<sup>145</sup> 'Gardener's Chronicle,' 1866, p.

variable than trees growing in their native forests, there can hardly be a doubt that they have yielded a greater number of strongly-marked and singular variations of structure.

In manner of growth, we have weeping or pendulous varieties of the willow, ash, elm, oak, and yew, and other trees; and this weeping habit is sometimes inherited, though in a singularly capricious manner. In the Lombardy poplar, and in certain fastigate or pyramidal varieties of thorns, junipers, oaks, &c., we have an opposite kind of growth. The Hessian oak,<sup>147</sup> which is famous from its fastigate habit and size, bears hardly any resemblance in general appearance to a common oak; "its acorns are not sure to produce plants of the same habit; some, however, turn out the same as the parent-tree." Another fastigate oak is said to have been found wild in the Pyrenees, and this is a surprising circumstance; it generally comes so true by seed, that De Candolle considered it as specifically distinct.<sup>148</sup> The fastigate Juniper (*J. suecica*) likewise transmits its character by seed.<sup>149</sup> Dr. Falconer informs me that in the Botanic Gardens at Calcutta the great heat caused apple-trees to become fastigate; and we thus see the same result following from the effects of climate and from some unknown cause.<sup>150</sup>

In foliage we have variegated leaves which are often inherited; dark purple or red leaves, as in the hazel, barberry, and beech, the colour in these two latter trees being sometimes strongly and sometimes weakly inherited;<sup>151</sup> deeply-cut leaves; and leaves covered with prickles, as in the variety of the holly well called *ferox*, which is said to reproduce itself by seed.<sup>152</sup> In fact, nearly all the peculiar varieties evince a tendency, more or less strongly marked, to reproduce themselves by seed.<sup>153</sup> This is to a certain extent the case, according to Bosc,<sup>154</sup> with three varieties of the elm, namely, the broad-leaved, lime-leaved, and twisted elm, in which latter the fibres of the wood are twisted. Even with the heterophyllous hornbeam (*Carpinus betulus*), which bears on each twig leaves of two shapes, "several plants raised from seed all retained "the same peculiarity."<sup>155</sup> I will add only one other remarkable case of variation in foliage, namely, the occurrence of two sub-varieties of the ash with simple instead of pinnated leaves, and

<sup>147</sup> 'Gardener's Chron.,' 1842, p. 36.

<sup>148</sup> Loudon's 'Arboretum et Fruticetum,' vol. iii. p. 1731.

<sup>149</sup> *Ibid.*, vol. iv. p. 2489.

<sup>150</sup> Godron ('De l'Espèce,' tom. ii. p. 91) describes four varieties of Robinia remarkable from their manner of growth.

<sup>151</sup> 'Journal of a Horticultural Tour, by Caledonian Hort. Soc.,' 1823, p. 107. Alph. De Candolle, 'Géo-

graph. Bot.,' p. 1083. Verlot, 'Sur la Production des Variétés,' 1865; p. 55 for the Barberry.

<sup>152</sup> Loudon's 'Arboretum et Fruticetum,' vol. ii. p. 508.

<sup>153</sup> Verlot, 'Des Variétés,' 1865, p. 92.

<sup>154</sup> Loudon's 'Arboretum et Fruticetum,' vol. iii. p. 1376.

<sup>155</sup> 'Gardener's Chronicle,' 1841, p. 687.

which generally transmit their character by seed.<sup>156</sup> The occurrence, in trees belonging to widely different orders, of weeping and fastigate varieties, and of trees bearing deeply cut, variegated, and purple leaves, shows that these deviations of structure must result from some very general physiological laws.

Differences in general appearance and foliage, not more strongly marked than those above indicated, have led good observers to rank as distinct species certain forms which are now known to be mere varieties. Thus, a plane-tree long cultivated in England was considered by almost every one as a North American species: but is now ascertained by old records, as I am informed by Dr. Hooker, to be a variety. So, again, the *Thuja pendula* or *filiformis* was ranked by such good observers as Lambert, Wallich, and others, as a true species; but it is now known that the original plants, five in number, suddenly appeared in a bed of seedlings, raised at Mr. Loddige's nursery, from *T. orientalis*; and Dr. Hooker has adduced excellent evidence that at Turin seeds of *T. pendula* have reproduced the parent form, *T. orientalis*.<sup>157</sup>

Every one must have noticed how certain individual trees regularly put forth and shed their leaves earlier or later than others of the same species. There is a famous horse-chesnut in the Tuileries which is named from leafing so much earlier than the others. There is also an oak near Edinburgh which retains its leaves to a very late period. These differences have been attributed by some authors to the nature of the soil in which the trees grow; but Archbishop Whately grafted an early thorn on a late one, and *vice versâ*, and both grafts kept to their proper periods, which differed by about a fortnight, as if they still grew on their own stocks.<sup>158</sup> There is a Cornish variety of the elm which is almost an evergreen, and is so tender that the shoots are often killed by the frost; and the varieties of the Turkish oak (*Q. cerris*) may be arranged as deciduous, sub-evergreen, and evergreen.<sup>159</sup>

*Scotch Fir (Pinus sylvestris)*.—I allude to this tree as it bears on the question of the greater variability of our hedgerow trees compared with those under strictly natural conditions. A well-informed writer<sup>160</sup> states that the Scotch fir presents few varieties in its native Scotch forests; but that it "varies much in figure and foliage, and in the size, shape, and colour of its cones, when several generations have been produced away from its native locality." There is little doubt that the highland and lowland varieties differ in the value of their timber, and that they can be propagated truly

<sup>156</sup> Godron, 'De l'Espèce,' tom. ii. p. 89. In Loudon's 'Gardener's Mag.,' vol. xii., 1836, p. 371, a variegated bushy ash is described and figured, as having simple leaves; it originated in Ireland.

<sup>157</sup> 'Gardener's Chron.,' 1863, p. 575.

<sup>158</sup> Quoted from Royal Irish Academy in 'Gardener's Chron.,' 1841, p. 767.

<sup>159</sup> Loudon's 'Arboretum et Fruticetum:' for Elm, see vol. iii. p. 1376; for Oak, p. 1846.

<sup>160</sup> 'Gardener's Chronicle,' 1846, p. 822.

by seed; thus justifying Loudon's remark, that "a variety is often "of as much importance as a species, and sometimes far more so."<sup>161</sup> I may mention one rather important point in which this tree occasionally varies; in the classification of the Coniferæ, sections are founded on whether two, three, or five leaves are included in the same sheath; the Scotch fir has properly only two leaves thus enclosed, but specimens have been observed with groups of three leaves in a sheath.<sup>162</sup> Besides these differences in the semi-cultivated Scotch fir, there are in several parts of Europe natural or geographical races, which have been ranked by some authors as distinct species.<sup>163</sup> Loudon<sup>164</sup> considers *P. pumilio*, with its several sub-varieties, as *mughus*, *nana*, &c., which differ much when planted in different soils, and only come "tolerably true from seed," as alpine varieties of the Scotch fir; if this were proved to be the case, it would be an interesting fact as showing that dwarfing from long exposure to a severe climate is to a certain extent inherited.

The *Hawthorn* (*Cratægus oxyacantha*) has varied much. Besides endless slighter variations in the form of the leaves, and in the size, hardness, fleshiness, and shape of the berries, Loudon<sup>165</sup> enumerates twenty-nine well-marked varieties. Besides those cultivated for their pretty flowers, there are others with golden-yellow, black, and whitish berries; others with woolly berries, and others with recurved thorns. Loudon truly remarks that the chief reason why the hawthorn has yielded more varieties than most other trees, is that nurserymen select any remarkable variety out of the immense beds of seedlings which are annually raised for making hedges. The flowers of the hawthorn usually include from one to three pistils; but in two varieties, named *monogyne* and *sibirica*, there is only a single pistil; and d'Asso states that the common thorn in Spain is constantly in this state.<sup>166</sup> There is also a variety which is apetalous, or has its petals reduced to mere rudiments. The famous Glastonbury thorn flowers and leaf towards the end of December, at which time it bears berries produced from an earlier crop of flowers.<sup>167</sup> It is worth notice that several varieties of the hawthorn, as well as of the lime and juniper, are very distinct in their foliage and habit whilst young, but in the course of thirty or forty years become extremely like each other;<sup>168</sup> thus reminding us of the well-known fact that the deodar, the cedar of Lebanon, and

<sup>161</sup> 'Arboretum et Fruticetum,' vol. iv. p. 2150.

<sup>162</sup> 'Gardener's Chron.,' 1852, p. 693.

<sup>163</sup> See 'Beiträge zur Kenntniss Europäischer Pinus-arten von Dr. Christ: Flora, 1864.' He shows that in the Ober-Engadin *P. sylvestris* and *montana* are connected by intermediate links.

<sup>164</sup> 'Arboretum et Fruticetum,' vol. iv. pp. 2159 and 2189.

<sup>165</sup> *Ibid.*, vol. ii. p. 830; Loudon's 'Gardener's Mag.,' vol. vi. 1830, p. 714.

<sup>166</sup> Loudon's 'Arboretum et Fruticetum,' vol. ii. p. 834.

<sup>167</sup> Loudon's 'Gardener's Mag.,' vol. ix. 1833, p. 123.

<sup>168</sup> *Ibid.*, vol. xi. 1835, p. 503.

that of the Atlas, are distinguished with the greatest ease whilst young, but with difficulty when old.

#### FLOWERS.

I SHALL not for several reasons treat the variability of plants which are cultivated for their flowers alone at any great length. Many of our favourite kinds in their present state are the descendants of two or more species crossed and commingled together, and this circumstance alone would render it difficult to detect the difference due to variation. For instance, our Roses, Petunias, Calceolarias, Fuchsias, Verbenas, Gladioli, Pelargoniums, &c., certainly have had a multiple origin. A botanist well acquainted with the parent-forms would probably detect some curious structural differences in their crossed and cultivated descendant; and he would certainly observe many new and remarkable constitutional peculiarities. I will give a few instances, all relating to the Pelargonium, and taken chiefly from Mr. Beck,<sup>169</sup> a famous cultivator of this plant: some varieties require more water than others; some are "very impatient of the knife if too greedily used in making cuttings;" some, when potted, scarcely "show a root at the outside of the ball of the earth;" one variety requires a certain amount of confinement in the pot to make it throw up a flower-stem; some varieties bloom well at the commencement of the season, others at the close; one variety is known,<sup>170</sup> which will stand "even pine-apple top and bottom heat, without looking any more drawn than if it had stood in a common greenhouse; and Blanche Fleur seems as if made on purpose for growing in winter, like many bulbs, and to rest all summer." These odd constitutional peculiarities would enable a plant in a state of nature to become adapted to widely different circumstances and climates.

Flowers possess little interest under our present point of view, because they have been almost exclusively attended to and selected for their beautiful colour, size, perfect outline, and manner of growth. In these particulars hardly one long-cultivated flower can be named which has not varied greatly. What does a florist care for the shape and structure of the organs of fructification, unless, indeed, they add to the beauty of the flower? When this is the case, flowers become modified in important points; stamens and pistils may be converted into petals, and additional petals may be developed, as in all double flowers. The process of gradual selection by which flowers have been rendered more and more double, each step in the process of conversion being inherited, has been recorded in several instances. In the so-called double flowers of the Compositæ, the corollas of the central florets are greatly modified, and the modifications are likewise inherited. In the columbine

<sup>169</sup> 'Gardener's Chron.,' 1845, p. 623.

<sup>170</sup> D. Beaton, in 'Cottage Gar-

dener,' 1860, p. 377. See, also Mr. Beck, on the habits of Queen Mab, in 'Gardener's Chronicle,' 1845, p. 226.

(*Aquilegia vulgaris*) some of the stamens are converted into petals having the shape of nectaries, one neatly fitting into the other; but in one variety they are converted into simple petals.<sup>171</sup> In the "hose in hose" primulæ, the calyx becomes brightly coloured and enlarged so as to resemble a corolla; and Mr. W. Wooler informs me that this peculiarity is transmitted; for he crossed a common polyanthus with one having a coloured calyx,<sup>172</sup> and some of the seedlings inherited the coloured calyx during at least six generations. In the "hen-and-chicken" daisy the main flower is surrounded by a brood of small flowers developed from buds in the axils of the scales of the involucre. A wonderful poppy has been described, in which the stamens are converted into pistils; and so strictly was this peculiarity inherited that, out of 154 seedlings, one alone reverted to the ordinary and common type.<sup>173</sup> Of the cock's-comb (*Celosia cristata*), which is an annual, there are several races in which the flower-stem is wonderfully "fasciated" or compressed; and one has been exhibited<sup>174</sup> actually eighteen inches in breadth. Peloric races of *Gloxinia speciosa* and *Antirrhinum majus* can be propagated by seed, and they differ in a wonderful manner from the typical form both in structure and appearance.

A much more remarkable modification has been recorded by Sir William and Dr. Hooker<sup>175</sup> in *Begonia frigida*. This plant properly produces male and female flowers on the same fascicles; and in the female flowers the perianth is superior; but a plant at Kew produced, besides the ordinary flowers, others which graduated towards a perfect hermaphrodite structure; and in these flowers the perianth was inferior. To show the importance of this modification under a classificatory point of view, I may quote what Prof. Harvey says, namely, that had it "occurred in a state of nature, and had a botanist collected a plant with such flowers, he would not only have placed it in a distinct genus from *Begonia*, but would probably have considered it as the type of a new natural order." This modification cannot in one sense be considered as a monstrosity, for analogous structures naturally occur in other orders, as with Saxifragæ and Aristolochiaceæ. The interest of the case is largely added to by Mr. C. W. Crocker's observation that seedlings from the *normal* flowers produced plants which bore, in about the same proportion as the parent-plant, hermaphrodite flowers having inferior perianths. The hermaphrodite flowers fertilised with their own pollen were sterile.

If florists had attended to, selected, and propagated by seed other

<sup>171</sup> Moquin-Tandon, 'Éléments de Tératologie,' 1841, p. 213.

<sup>172</sup> See also 'Cottage Gardener,' 1860, p. 133.

<sup>173</sup> Quoted by Alph. de Candolle, 'Bibl. Univ.,' November 1862, p. 58.

<sup>174</sup> Knight, 'Transact. Hort. Soc.,'

vol. iv. p. 322.

<sup>175</sup> 'Botanical Magazine,' tab. 5160, fig. 4; Dr. Hooker, in 'Gardener's Chron.,' 1860, p. 190; Prof. Harvey, in 'Gardener's Chron.,' 1860, p. 145; Mr. Crocker, in 'Gardener's Chron.,' 1861, p. 1092.

modifications of structure besides those which are beautiful, a host of curious varieties would certainly have been raised; and they would probably have transmitted their characters so truly that the cultivator would have felt aggrieved, as in the case of culinary vegetables, if his whole bed had not presented a uniform appearance. Florists have attended in some instances to the leaves of their plant, and have thus produced the most elegant and symmetrical patterns of white, red, and green, which, as in the case of the pelargonium, are sometimes strictly inherited.<sup>176</sup> Any one who will habitually examine highly-cultivated flowers in gardens and greenhouses will observe numerous deviations in structure; but most of these must be ranked as mere monstrosities, and are only so far interesting as showing how plastic the organisation becomes under high cultivation. From this point of view such works as Professor Moquin-Tandon's 'Tératologie' are highly instructive.

*Roses.*—These flowers offer an instance of a number of forms generally ranked as species, namely, *R. centifolia*, *gallica*, *alba*, *damascena*, *spinosissima*, *bracteata*, *indica*, *semperflorens*, *moschata*, &c., which have largely varied and been intercrossed. The genus *Rosa* is a notoriously difficult one, and, though some of the above forms are admitted by all botanists to be distinct species, others are doubtful; thus, with respect to the British forms, Babington makes seventeen, and Bentham only five species. The hybrids from some of the most distinct forms—for instance, from *R. indica*, fertilised by the pollen of *R. centifolia*—produce an abundance of seed; I state this on the authority of Mr. Rivers,<sup>177</sup> from whose work I have drawn most of the following statements. As almost all the aboriginal forms brought from different countries have been crossed and re-crossed, it is no wonder that Targioni-Tozzetti, in speaking of the common roses of the Italian gardens, remarks that "the native country and precise form of the wild type of most of them are involved in much uncertainty."<sup>178</sup> Nevertheless, Mr. Rivers in referring to *R. indica* (p. 68) says that the descendants of each group may generally be recognized by a close observer. The same author often speaks of roses as having been a little hybridised; but it is evident that in very many cases the differences due to variation and to hybridisation can now only be conjecturally distinguished.

The species have varied both by seed and by bud; such modified buds being often called by gardeners sports. In the following chapter I shall fully discuss this latter subject, and shall show that bud-variations can be propagated not only by grafting and budding, but often by seed. Whenever a new rose appears with any peculiar character, however produced, if it yields seed, Mr. Rivers

<sup>176</sup> Alph. de Candolle, 'Géograph. Bot.,' p. 1083; 'Gardener's Chron.' 1861, p. 433. The inheritance of the white and golden zones in Pelargonium largely depends on the nature of the soil. See D. Beaton, in 'Journal of

Horticulture,' 1861, p. 64.

<sup>177</sup> 'Rose Amateur's Guide,' T. Rivers, 1837, p. 21.

<sup>178</sup> 'Journal Hort. Soc.,' vol. ix., 1855, p. 182.

(p. 4) fully expects it to become the parent-type of a new family. The tendency to vary is so strong in some kinds, as in the Village Maid (Rivers, p. 16), that when grown in different soils it varies so much in colour that it has been thought to form several distinct kinds. Altogether the number of kinds is very great: thus M. Desportes, in his Catalogue for 1829, enumerates 2562 as cultivated in France; but no doubt a large proportion of these are merely nominal.

It would be useless to specify the many points of difference between the various kinds, but some constitutional peculiarities may be mentioned. Several French roses (Rivers, p. 12) will not succeed in England; and an excellent horticulturist<sup>179</sup> remarks, that "Even in the same garden you will find that a rose that will do nothing under a south wall will do well under a north one. That is the case with Paul Joseph here. It grows strongly and blooms beautifully close to a north wall. For three years seven plants have done nothing under a south wall." Many roses can be forced, "many are totally unfit for forcing, among which is General Jacqueminot."<sup>180</sup> From the effects of crossing and variation Mr. Rivers enthusiastically anticipates (p. 87) that the day will come when all our roses, even moss-roses, will have evergreen foliage, brilliant and fragrant flowers, and the habit of blooming from June till November. "A distant view this seems, but perseverance in gardening will yet achieve wonders," as assuredly it has already achieved wonders.

It may be worth while briefly to give the well-known history of one class of roses. In 1793 some wild Scotch roses (*R. spinosissima*) were transplanted into a garden;<sup>181</sup> and one of these bore flowers slightly tinged with red, from which a plant was raised with semi-monstrous flowers, also tinged with red; seedlings from this flower were semi-double, and by continued selection, in about nine or ten years, eight sub-varieties were raised. In the course of less than twenty years these double Scotch roses had so much increased in number and kind, that twenty-six well-marked varieties, classed in eight sections, were described by Mr. Sabine. In 1841<sup>182</sup> it is said that three hundred varieties could be procured in the nursery-gardens near Glasgow; and these are described as blush, crimson, purple, red, marbled, two-coloured, white, and yellow, and as differing much in the size and shape of the flower.

*Pansy or Heartsease (Viola tricolor, &c.).*—The history of this flower seems to be pretty well known; it was grown in Evelyn's garden in 1687; but the varieties were not attended to till 1810-1812, when Lady Monke, together with Mr. Lee, the well-known nursery-

<sup>179</sup> The Rev. W. F. Radclyffe, in 'Journal of Horticulture,' March 14, 1865, p. 207.

<sup>180</sup> 'Gardener's Chronicle,' 1831, p. 46.

<sup>181</sup> Mr. Sabine, in 'Transact. Hort. Soc.,' vol. iv. p. 285.

<sup>182</sup> 'An Encyclop. of Plants,' by J. C. Loudon, 1841, p. 443.



man, energetically commenced their culture; and in the course of a few years twenty varieties could be purchased.<sup>183</sup> At about the same period, namely in 1813 or 1814, Lord Gambier collected some wild plants, and his gardener, Mr. Thomson, cultivated them, together with some common garden varieties, and soon effected a great improvement. The first great change was the conversion of the dark lines in the centre of the flower into a dark eye or centre, which at that period had never been seen, but is now considered one of the chief requisites of a first-rate flower. In 1835 a book entirely devoted to this flower was published, and four hundred named varieties were on sale. From these circumstances this plant seemed to me worth studying, more especially from the great contrast between the small, dull, elongated, irregular flowers of the wild pansy, and the beautiful, flat, symmetrical, circular, velvet-like flowers, more than two inches in diameter, magnificently and variously coloured, which are exhibited at our shows. But when I came to enquire more closely, I found that, though the varieties were so modern, yet that much confusion and doubt prevailed about their parentage. Florists believe that the varieties<sup>184</sup> are descended from several wild stocks, namely, *V. tricolor*, *lutea*, *grandiflora*, *amœna*, and *altaica*, more or less intercrossed. And when I looked to botanical works to ascertain whether these forms ought to be ranked as species, I found equal doubt and confusion. *Viola altaica* seems to be a distinct form, but what part it has played in the origin of our varieties I know not; it is said to have been crossed with *V. lutea*. *Viola amœna*<sup>185</sup> is now looked at by all botanists as a natural variety of *V. grandiflora*; and this and *V. sudetica* have been proved to be identical with *V. lutea*. The latter and *V. tricolor* (including its admitted variety *V. arvensis*) are ranked as distinct species by Babington, and likewise by M. Gay,<sup>186</sup> who has paid particular attention to the genus; but the specific distinction between *V. lutea* and *tricolor* is chiefly grounded on the one being strictly and the other not strictly perennial, as well as on some other slight and unimportant differences in the form of the stem and stipules. Bentham unites these two forms; and a high authority on such matters, Mr. H. C. Watson,<sup>187</sup> says that, "while *V. tricolor* passes into *V. arvensis* on the one side, it approximates so much towards *V. lutea* and *V. Curtisii* on the other side, that a distinction becomes scarcely more easy between them."

Hence, after having carefully compared numerous varieties, I

<sup>183</sup> Loudon's 'Gardener's Magazine,' vol. xi. 1835, p. 427; also 'Journal of Horticulture,' April 14, 1863, p. 275.

<sup>184</sup> Loudon's 'Gardener's Magazine,' vol. viii. p. 575: vol. ix. p. 689.

<sup>185</sup> Sir J. E. Smith, 'English Flora,' vol. i. p. 306. H. C. Watson, 'Cybele Britannica,' vol. i. 1847, p. 181.

<sup>186</sup> Quoted from 'Annales des Sciences,' in the Companion to the 'Bot. Mag.,' vol. i. 1835, p. 159.

<sup>187</sup> 'Cybele Britannica,' vol. i. p. 173. See also Dr. Herbert on the changes of colour in transplanted specimens, and on the natural variations of *V. grandiflora*, in 'Transact. Hort. Soc.' vol. iv. p. 19.

gave up the attempt as too difficult for any one except a professed botanist. Most of the varieties present such inconstant characters, that when grown in poor soil, or when flowering out of their proper season, they produced differently coloured and much smaller flowers. Cultivators speak of this or that kind as being remarkably constant or true; but by this they do not mean, as in other cases, that the kind transmits its character by seed, but that the individual plant does not change much under culture. The principle of inheritance, however, does hold good to a certain extent even with the fleeting varieties of the Heartsease, for to gain good sorts it is indispensable to sow the seed of good sorts. Nevertheless, in almost every large seed-bed a few, almost wild seedlings reappear through reversion. On comparing the choicest varieties with the nearest allied wild forms, besides the difference in the size, outline, and colour of the flowers, the leaves sometimes differ in shape, as does the calyx occasionally in the length and breadth of the sepals. The differences in the form of the nectary more especially deserve notice; because characters derived from this organ have been much used in the discrimination of most of the species of *Viola*. In a large number of flowers compared in 1842 I found that in the greater number the nectary was straight; in others the extremity was a little turned upwards, or downwards, or inwards, so as to be completely hooked; in others, instead of being hooked, it was first turned rectangularly downwards, and then backwards and upwards; in others, the extremity was considerably enlarged; and lastly, in some the basal part was depressed, becoming, as usual, laterally compressed towards the extremity. In a large number of flowers, on the other hand, examined by me in 1856 from a nursery-garden in a different part of England, the nectary hardly varied at all. Now M. Gay says that in certain districts, especially in Auvergne, the nectary of the wild *V. grandiflora* varies in the manner just described. Must we conclude from this that the cultivated varieties first mentioned were all descended from *V. grandiflora*, and that the second lot, though having the same general appearance, were descended from *V. tricolor*, of which the nectary, according to M. Gay, is subject to little variation? Or is it not more probable that both these wild forms would be found under other conditions to vary in the same manner and degree, thus showing that they ought not to be ranked as specifically distinct?

The *Dahlia* has been referred to by almost every author who has written on the variation of plants, because it is believed that all the varieties are descended from a single species, and because all have arisen since 1802 in France, and since 1804 in England.<sup>188</sup> Mr. Sabine remarks that "it seems as if some period of cultivation had been required before the fixed qualities of the native plant gave

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<sup>188</sup> Salisbury, in 'Transact. Hort. Soc.,' vol. i. 1812, pp. 84, 92. A semi-double variety was produced in Madrid in 1790.

way and began to sport into those changes which now so delight us."<sup>189</sup> The flowers have been greatly modified in shape from a flat to a globular form. Anemone and ranunculus-like races,<sup>190</sup> which differ in the form and arrangement of the florets, have arisen; also dwarfed races, one of which is only eighteen inches in height. The seeds vary much in size. The petals are uniformly coloured or tipped or striped, and present an almost infinite diversity of tints. Seedlings of fourteen different colours<sup>191</sup> have been raised from the same plant; yet, as Mr. Sabine has remarked, "many of the seedlings follow their parents in colour." The period of flowering has been considerably hastened, and this has probably been effected by continued selection. Salisbury, writing 1808, says that they then flowered from September to November; in 1828 some new dwarf varieties began flowering in June;<sup>192</sup> and Mr. Grieve informs me that the dwarf purple Zelinda in his garden is in full bloom by the middle of June and sometimes even earlier. Slight constitutional differences have been observed between certain varieties: thus, some kinds succeed much better in one part of England than in another;<sup>193</sup> and it has been noticed that some varieties require much more moisture than others.<sup>194</sup>

Such flowers as the carnation, common tulip, and hyacinth, which are believed to be descended, each from a single wild form, present innumerable varieties, differing almost exclusively in the size, form, and colour of the flowers. These and some other anciently cultivated plants which have been long propagated by offsets, pipings, bulbs, &c., become so excessively variable, that almost each new plant raised from seed forms a new variety, "all of which to describe particularly," as old Gerarde wrote in 1597, "were to roll Sisyphus's stone, or to number the sands."

*Hyacinth (Hyacinthus orientalis).*—It may, however, be worth while to give a short account of this plant, which was introduced into England in 1596 from the Levant.<sup>195</sup> The petals of the original flower, says Mr. Paul, were narrow, wrinkled, pointed, and of a flimsy texture; now they are broad, smooth, solid, and rounded. The erectness, breadth, and length of the whole spike, and the size of the flowers, have all increased. The colours have been intensified and diversified. Gerarde, in 1597, enumerates four, and Parkinson,

<sup>189</sup> 'Transact. Hort. Soc.,' vol. iii., 1820, p. 225.

<sup>190</sup> Loudon's 'Gardener's Mag.,' vol. vi., 1830, p. 77.

<sup>191</sup> Loudon's 'Encyclop. of Gardening,' p. 1035.

<sup>192</sup> 'Transact. Hort. Soc.,' vol. i. p. 91; and Loudon's 'Gardener's Mag.,' vol. iii., 1828, p. 179.

<sup>193</sup> Mr. Wildman, in 'Gardener's Chron.,' 1843, p. 87. 'Cottage Gardener,' April 8, 1856, p. 33.

<sup>194</sup> M. Faivre has given an interesting account of the successive variations of the Chinese primrose, since its introduction into Europe about the year 1820: 'Revue des Cours Scientifiques,' June, 1869, p. 428.

<sup>195</sup> The best and fullest account of this plant which I have met with is by a famous horticulturist, Mr. Paul, of Waltham, in the 'Gardener's Chronicle,' 1864, p. 342.

in 1629, eight varieties. Now the varieties are very numerous, and they were still more numerous a century ago. Mr. Paul remarks that "it is interesting to compare the Hyacinths of 1629 with those of 1864, and to mark the improvement. Two hundred and thirty-five years have elapsed since then, and this simple flower serves well to illustrate the great fact that the original forms of nature do not remain fixed and stationary, at least when brought under cultivation. While looking at the extremes, we must not, however, forget that there are intermediate stages which are for the most part lost to us. Nature will sometimes indulge herself with a leap, but as a rule her march is slow and gradual." He adds that the cultivator should have "in his mind an ideal of beauty, for the realisation of which he works with head and hand." We thus see how clearly Mr. Paul, an eminently successful cultivator of this flower, appreciates the action of methodical selection.

In a curious and apparently trustworthy treatise, published at Amsterdam<sup>196</sup> in 1768, it is stated that nearly 2,000 sorts were then known; but in 1864 Mr. Paul found only 700 in the largest garden at Haarlem. In this treatise it is said that not an instance is known of any one variety reproducing itself truly by seed: the white kinds, however, now<sup>197</sup> almost always yield white hyacinths, and the yellow kinds come nearly true. The hyacinth is remarkable from having given rise to varieties with bright blue, pink, and distinctly yellow flowers. These three primary colours do not occur in the varieties of any other species; nor do they often all occur even in the distinct species of the same genus. Although the several kinds of hyacinths differ but slightly from each other except in colour, yet each kind has its own individual character, which can be recognised by a highly educated eye; thus the writer of the Amsterdam treatise asserts (p. 43) that some experienced florists, such as the famous G. Voorhelm, seldom failed in a collection of above twelve hundred sorts to recognise each variety by the bulb alone! This same writer mentions some few singular variations: for instance, the hyacinth commonly produces six leaves, but there is one kind (p. 35) which scarcely ever has more than three leaves; another never more than five; whilst others regularly produce either seven or eight leaves. A variety, called *la Coryphée*, invariably produces (p. 116) two flower-stems, united together and covered by one skin. The flower-stem in another kind (p. 128) comes out of the ground in a coloured sheath, before the appearance of the leaves, and is consequently liable to suffer from frost. Another variety always pushes a second flower-stem after the first has begun to develop itself. Lastly, white hyacinths with red, purple, or violet centres (p. 129) are the most liable to rot. Thus,

<sup>196</sup> 'Des Jacinthes, de leur Anatomie, Reproduction, et Culture.' Amsterdam, 1768.

<sup>197</sup> Alph. de Candolle, 'Géograph. Bot.,' p. 1082

the hyacinth, like so many previous plants, when long cultivated and closely watched, is found to offer many singular variations.

In the two last chapters I have given in some detail the range of variation, and the history, as far as known, of a considerable number of plants, which have been cultivated for various purposes. But some of the most variable plants, such as Kidney-beans, Capsicum, Millets, Sorghum, &c., have been passed over; for botanists are not at all agreed which kinds ought to rank as species and which as varieties; and the wild parent-species are unknown.<sup>198</sup> Many plants long cultivated in tropical countries, such as the Banana, have produced numerous varieties; but as these have never been described with even moderate care, they are here also passed over. Nevertheless, a sufficient, and perhaps more than sufficient, number of cases have been given, so that the reader may be enabled to judge for himself on the nature and great amount of variation which cultivated plants have undergone.

<sup>198</sup> Alph. de Candolle, 'Géograph. Bot.,' p. 983.