



THE VARIATION OF  
ANIMALS & PLANTS UNDER  
DOMESTICATION

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# PREFACE TO THE SECOND EDITION

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DURING the seven years which have elapsed since the publication in 1868 of the first edition of this Work, I have continued to attend to the same subjects, as far as lay in my power; and I have thus accumulated a large body of additional facts, chiefly through the kindness of many correspondents. Of these facts I have been able here to use only those which seemed to me the more important. I have omitted some statements, and corrected some errors, the discovery of which I owe to my reviewers. Many additional references have been given. The eleventh chapter, and that on Pangenesis, are those which have been most altered, parts having been re-modelled; but I will give a list of the more important alterations for the sake of those who may possess the first edition of this book.



plant. It might have been expected that the tallness of the stem, the period of vegetation, and the ripening of the seed, would have been thus affected; but it is a much more surprising fact that the seeds should have undergone so rapid and great a change. As, however, flowers, with their product the seed, are formed by the metamorphosis of the stem and leaves, any modification in these latter organs would be apt to extend, through correlation, to the organs of fructification.

*Cabbage* (*Brassica oleracea*).—Every one knows how greatly the various kinds of cabbage differ in appearance. In the Island of Jersey, from the effects of particular culture and of climate, a stalk has grown to the height of sixteen feet, and “had its spring shoots at the top occupied by a magpie’s nest:” the woody stems are not unfrequently from ten to twelve feet in height, and are there used as rafters<sup>64</sup> and as walking-sticks. We are thus reminded that in certain countries plants belonging to the generally herbaceous order of the Cruciferæ are developed into trees. Every one can appreciate the difference between green or red cabbages with great single heads; Brussel-sprouts with numerous little heads; broccolis and cauliflowers with the greater number of their flowers in an aborted condition, incapable of producing seed, and borne in a dense corymb instead of an open panicle; savoys with their blistered and wrinkled leaves; and borecoles and kails, which come nearest to the wild parent-form. There are also various frizzled and lacinated kinds, some of such beautiful colours that Vilmorin in his Catalogue of 1851 enumerates ten varieties which are valued solely for ornament. Some kinds are less commonly known, such as the Portuguese Couve Tronchuda, with the ribs of its leaves greatly thickened; and the Kohlrabi or choux-raves, with their stems enlarged into great turnip-like masses above the

<sup>64</sup> Cabbage Timber, ‘Gardener’s Chron.,’ 1856, p. 744, quoted from Hooker’s ‘Journal of Botany.’ A walking-stick made from a cabbage-stalk is exhibited in the Museum at Kew.

ground; and the recently formed new race<sup>65</sup> of the choux raves, already including nine sub-varieties, in which the enlarged part lies beneath the ground like a turnip.

Although we see such great differences in the shape, size, colour, arrangement, and manner of growth of the leaves and stem, and of the flower-stems in the broccoli and cauliflower, it is remarkable that the flowers themselves, the seed-pods and seeds, present extremely slight differences or none at all.<sup>66</sup> I compared the flowers of all the principal kinds; those of the Couve Tronchuda are white and rather smaller than in common cabbages; those of the Portsmouth broccoli have narrower sepals, and smaller, less elongated petals; and in no other cabbage could any difference be detected. With respect to the seed-pods, in the purple Kohlrabi alone, do they differ, being a little longer and narrower than usual. I made a collection of the seeds of twenty-eight different kinds, and most of them were undistinguishable; when there was any difference it was excessively slight; thus, the seeds of various broccolis and cauliflowers, when seen in mass, are a little redder; those of the early green Ulm savoy are rather smaller; and those of the Breda kail slightly larger than usual, but not larger than the seeds of the wild cabbage from the coast of Wales. What a contrast in the amount of difference is presented if, on the one hand, we compare the leaves and stems of the various kinds of cabbage with their flowers, pods, and seeds, and on the other hand the corresponding parts in the varieties of maize and wheat! The explanation is obvious; the seeds alone are valued in our cereals, and their variations have been selected; whereas the seeds, seed-pods, and flowers have been utterly neglected in the cabbage, whilst many useful variations in their leaves and stems have been noticed and preserved from an extremely remote period, for cabbages were cultivated by the old Celts.<sup>67</sup>

<sup>65</sup> ‘Journal de la Soc. Imp. d’Horticulture,’ 1855, p. 254, quoted from ‘Gartenflora,’ Ap. 1855.

<sup>66</sup> Godron, ‘De l’Espèce,’ tom.

ii. p. 52; Metzger, ‘Syst. Beschreibung der Kult. Kohlarten,’ 1833, s. 6.

<sup>67</sup> Regnier, ‘De l’Économie Publique des Celtes,’ 1818, p. 438.



It would be useless to give a classified description<sup>68</sup> of the numerous races, sub-races, and varieties of the cabbage; but it may be mentioned that Dr. Lindley has lately proposed<sup>69</sup> a system founded on the state of development of the terminal and lateral leaf-buds. Thus: I. All the leaf-buds active and open, as in the wild-cabbage, kail, &c. II. All the leaf-buds active, but forming heads, as in Brussel-sprouts, &c. III. Terminal leaf-bud alone active, forming a head as in common cabbages, savoys, &c. IV. Terminal leaf-bud alone active, and open, with most of the flowers abortive and succulent, as in the cauliflower and broccoli. V. All the leaf-buds active and open, with most of the flowers abortive and succulent, as in the sprouting-broccoli. This latter variety is a new one, and bears the same relation to common broccoli, as Brussel-sprouts do to common cabbages; it suddenly appeared in a bed of common broccoli, and was found faithfully to transmit its newly acquired and remarkable characters.

The principal kinds of cabbage existed at least as early as the sixteenth century,<sup>70</sup> so that numerous modifications of structure have been inherited for a long period. This fact is the more remarkable as great care must be taken to prevent the crossing of the different kinds. To give proof of this: I raised 233 seedlings from cabbages of different kinds, which had purposely been planted near each other, and of the seedlings no less than 155 were plainly deteriorated and mongrelized; nor were the remaining 78 all perfectly true. It may be doubted whether many permanent varieties have been formed by intentional or accidental crosses; for such crossed plants are found to be very inconstant. One kind, however, called "Cottager's Kail," has lately been produced by crossing common kail and Brussel-sprouts, recrossed with purple broccoli,<sup>71</sup> and is said to be true; but plants raised by me were not nearly so constant in character as any common kind of cabbage.

Although most of the kinds keep true if carefully pre-

<sup>68</sup> See the elder De Candolle, in 'Transact. of Hort. Soc.,' vol. v.; and Metzger, 'Kohlarten,' &c.

<sup>69</sup> 'Gardener's Chronicle,' 1859, p. 992.

<sup>70</sup> Alph. De Candolle, 'Géograph. Bot.,' pp. 842 and 989.

<sup>71</sup> 'Gardener's Chron.,' Feb. 1858, p. 128.

served from crossing, yet the seed-beds must be yearly examined, and a few seedlings are generally found false; but even in this case the force of inheritance is shown, for, as Metzger has remarked<sup>72</sup> when speaking of Brussel-sprouts, the variations generally keep to their "unter art," or main race. But in order that any kind may be truly propagated there must be no great change in the conditions of life; thus cabbages will not form heads in hot countries, and the same thing has been observed with an English variety grown during an extremely warm and damp autumn near Paris.<sup>73</sup> Extremely poor soil also affects the characters of certain varieties.

Most authors believe that all the races are descended from the wild cabbage found on the western shores of Europe; but Alph. De Candolle<sup>74</sup> forcibly argues, on historical and other grounds, that it is more probable that two or three closely allied forms, generally ranked as distinct species, still living in the Mediterranean region, are the parents, now all commingled together, of the various cultivated kinds. In the same manner as we have often seen with domesticated animals, the supposed multiple origin of the cabbage throws no light on the characteristic differences between the cultivated forms. If our cabbages are the descendants of three or four distinct species, every trace of any sterility which may originally have existed between them is now lost, for none of the varieties can be kept distinct without scrupulous care to prevent inter-crossing.

The other cultivated forms of the genus *Brassica* are descended, according to the view adopted by Godron and Metzger,<sup>75</sup> from two species, *B. napus* and *rapa*; but according to other botanists from three species; whilst others again strongly suspect that all these forms, both wild and cultivated, ought to be ranked as a single species. *Brassica napus* has given rise to two large groups, namely, Swedish turnips (believed to be of hybrid origin)<sup>76</sup> and

<sup>72</sup> 'Kohlarten,' s. 22.

<sup>73</sup> Godron, 'De l'Espèce,' tom. ii. p. 52; Metzger, 'Kohlarten,' s. 22.

<sup>74</sup> 'Géograph. Bot.,' p. 840.

<sup>75</sup> Godron, 'De l'Espèce,' tom.

ii. p. 54; Metzger, 'Kohlarten,' s. 10.

<sup>76</sup> Gardener's Chron. and Agricult. Gazette, 1856, p. 729. See, more especially, *ibid.*, 1868, p. 275:



Colzas, the seeds of which yield oil. *Brassica rapa* (of Koch) has also given rise to two races, namely, common turnips and the oil-giving rape. The evidence is unusually clear that these latter plants, though so different in external appearance, belong to the same species; for the turnip has been observed by Koch and Godron to lose its thick roots in uncultivated soil; and when rape and turnips are sown together they cross to such a degree that scarcely a single plant comes true.<sup>77</sup> Metzger by culture converted the biennial or winter rape into the annual or summer rape,—varieties which have been thought by some authors to be specifically distinct.<sup>78</sup>

In the production of large, fleshy, turnip-like stems, we have a case of analogous variation in three forms which are generally considered as distinct species. But scarcely any modification seems so easily acquired as a succulent enlargement of the stem or root—that is, a store of nutriment laid up for the plant's own future use. We see this in our radishes, beet, and in the less generally known "turnip-rooted" celery, and in the finocchio, or Italian variety of the common fennel. Mr. Buckman has lately proved by his interesting experiments how quickly the roots of the wild parsnip can be enlarged, as Vilmorin formerly proved in the case of the carrot.<sup>79</sup>

This latter plant, in its cultivated state, differs in scarcely any character from the wild English carrot, except in general luxuriance and in the size and quality of its roots; but ten varieties, differing in the colour, shape, and quality

the writer asserts that he planted a variety of cabbage (*B. oleracea*) close to turnips (*B. rapa*) and raised from the crossed seedlings true Swedish turnips. These latter plants ought, therefore, to be classed with cabbages or turnips, and not under *B. napus*.

<sup>77</sup> 'Gardener's Chron. and Agricult. Gazette,' 1855, p. 730.

<sup>78</sup> Metzger, 'Kohlarten,' s. 51.

<sup>79</sup> These experiments by Vilmorin have been quoted by many writers. An eminent botanist, Prof. Decaisne, has lately expressed

doubts on the subject from his own negative results, but these cannot be valued equally with positive results. On the other hand, M. Carrière has lately stated ('Gard. Chronicle,' 1865, p. 1154), that he took seed from a wild carrot, growing far from any cultivated land, and even in the first generation the roots of his seedlings differed in being spindle-shaped, longer, softer, and less fibrous than those of the wild plant. From these seedlings he raised several distinct varieties.

of the root, are cultivated in England and come true by seed.<sup>80</sup> Hence with the carrot, as in so many other cases, for instance with the numerous varieties and sub-varieties of the radish, that part of the plant which is valued by man, falsely appears alone to have varied. The truth is that variations in this part alone have been selected; and the seedlings inheriting a tendency to vary in the same way, analogous modifications have been again and again selected, until at last a great amount of change has been effected.

With respect to the radish, M. Carrière, by sowing the seed of the wild *Raphanus raphanistrum* in rich soil, and by continued selection during several generations, raised many varieties, closely like the cultivated radish (*R. sativus*) in their roots, as well as the wonderful Chinese variety, *R. caudatus*: (see 'Journal d'Agriculture pratique,' t. i., 1869, p. 159; also a separate essay, 'Origine des Plantes Domestiques,' 1869). *Raphanus raphanistrum* and *sativus* have often been ranked as distinct species, and owing to differences in their fruit even as distinct genera; but Professor Hoffman ('Bot. Zeitung,' 1872, p. 482) has now shown that these differences, remarkable as they are, graduate away, the fruit of *R. caudatus* being intermediate. By cultivating *R. raphanistrum* during several generations (ibid., 1873, p. 9), Professor Hoffman also obtained plants bearing fruits like those of *R. sativus*.

*Pea (Pisum sativum)*.—Most botanists look at the garden-pea as specifically distinct from the field-pea (*P. arvense*). The latter exists in a wild state in Southern Europe; but the aboriginal parent of the garden-pea has been found by one collector alone, as he states, in the Crimea.<sup>81</sup> Andrew Knight crossed, as I am informed by the Rev. A. Fitch, the field-pea with a well-known garden variety, the Prussian pea, and the cross seems to have been perfectly fertile. Dr. Alefeld has recently studied<sup>82</sup> the genus

<sup>80</sup> Loudon's 'Encyclop. of Gardening,' p. 835.

<sup>81</sup> Alph. De Candolle, 'Géograph. Bot.,' 960. Mr. Bentham ('Hort. Journal,' vol. ix. 1855, p. 141) believes that garden and field peas

belong to the same species, and in this respect he differs from Dr. Targioni.

<sup>82</sup> 'Botanische Zeitung,' 1860, s. 204.