Review VIII.

The Variation of Animals and Plants under Domestication. By Charles Darwin, M.A., F.R.S., &c. Two volumes. With illustrations. 1868. Pp. 843.

When the excitement caused by the publication in 1859 of the celebrated book on "The Origin of Species" had, to some extent, had time to subside, and the true character of Mr. Darwin's brilliant theory was beginning to be more clearly recognised, it was soon perceived that no final decision could be expressed on its merits, until the promised evidence on which the theory was based had been fairly and attentively examined. An interval of two or three years was at first supposed, by the author, to be sufficient to enable him to complete the work, of which he had been urged to publish this now well-known Abstract; but owing, as we notice with regret, to continued ill-health, only half of the anxiously expected and long delayed evidence has been

placed before us, and it is further to be regretted that the most important facts are those which are still unavoidably withheld, for "it was the consideration of these facts," writes Mr. Darwin, "which first led me to take up the present subject;" and "I hope," he subsequently adds, "that the reader will pause before coming to any final and hostile conclusion on the theory of natural selection. It is the facts and views to be hereafter given which have convinced me of the truth of the theory." Consequently, the all-important question of the origin of species by means of natural selection, which, strictly speaking, requires for its answer a complete biography of the organic world, can at present be considered only with reference to the variation of animals and plants under domestication.

No date has been, nor perhaps can, consistently with the unfavorable state of Mr. Darwin's health, be fixed for the publication of the remaining portion of this grandly planned work, on which so much of the success of the theory has been admitted to depend. We have for the present been briefly informed that the author proposes in a second work to discuss the variability of organic beings in a state of nature, and it will be shown that variations occurring under these circumstances are greatly dependent on geographical distribution. An attempt will be made also to show that whilst it is the large and flourishing genera which include the greatest number of varying species, those species which are the most variable are also the most widely distributed. But the main subject of this promised work will be the conversion of varieties into species consequent on an ever-recurring struggle for existence. For as the author has already stated in his introductory work, the normal condition of the organic world is war; and as the strongest in the battle of life must, as a rule, ultimately prevail, and the weakest fail, it will, consequently, be found that the establishment of distinctly defined species has been due to the preservation of favored individuals by the gradual extinction of those intermediate varieties which do not possess corresponding advantages in structure and instinct. In a third and concluding work, this principle of natural selection is to be tested by examining how far it will give a fair explanation of the facts adduced. The evidence of geology will be cited to prove that new species have come in gradually one by one, and that "the succession of many distinct species of the same genus throughout the long series of geological formations seems to have been unbroken or continuous." The development of the present from the past and extinct inhabitants of the world will be shown to be in accordance with the theory of descent with modification by means of natural selection; and it will be urged that the facts on which

this theory is based "have as yet received no explanation on the theory of independent creations." Whilst the great principle of inheritance at corresponding periods of life; the retention of rudimentary and useless parts; and the remarkable fact revealed in embryonic growth of the similarity of members of the same great class in the earlier stages of development—in consequence of which the embryo, for instance, of a mammal, bird, reptile, and fish, is barely distinguishable—can admit of being satisfactorily explained, according to Mr. Darwin, only by the theory of natural selection.

The first of the two volumes before us is almost exclusively occupied with illustrations of the extent to which variation under domestication has been observed; and not only has Mr. Darwin exhibited rare power and indefatigable zeal in observing and recording facts, but, moreover, the vast accumulation of evidence which he has gathered from almost every available source is much in favour of his assertion that varieties should be regarded as incipient species. It would be impossible within the limits of our proposed review of this valuable work, to notice the successive variations which have been observed in the different races of animals and plants since they were first domesticated by man. Their history is for the most part very defective, and as regards many of those animals which are known to have been domesticated from a very early period, such as horses, dogs, cattle, sheep, and some other quadrupeds, there are no records of the date at which their subjection began, even in those cases in which the genealogy can be traced, with some degree of probability, to animals at present existing in the wild state; whilst in other cases there is evidence which would lead us to infer that the ancestral type, from which the domesticated varieties have been derived, has become extinct. The history of the horse, for example, is lost in antiquity; and the evidence of its domestication, from remains found in the Swiss lake-dwellings, has been traced with that of the sheep, the pig, and some other animals, as far back as the latter part of the stone period; to which it would, perhaps, be difficult at present to assign a correct date.

The observations on the domestic varieties of the dog display an extensive acquaintance with the literature of the subject, and are rich in interesting facts, many of which will probably be new to some of his readers. Although fully persuaded that there has been a large amount of variation under domestication, Mr. Darwin is strongly in favour of the multiple origin of domestic dogs, and he suggests that the larger dogs may be descended from the larger wolves; the smaller and lighter dogs from jackals; and that the slim Abyssinian *canis simensis*, with

its elongated muzzle, may be regarded as the origin of the greyhound. It has been very generally observed that the wolf and the dog in some countries are so closely allied, that it is not unfrequently difficult to distinguish between them; and, although climate and the various external conditions of life, which constitute endemic influence, may, by equally affecting both animals, account in some degree for this approximation in their form and character, yet it is impossible to accept such external conditions as a sufficient explanation of all the facts observed. A very close resemblance of this kind has been noted between the more northern Esquimaux dogs and the grey wolves of the Arctic circle; between the Hare Indian dog and the Prairie wolf; and between the black wolf-dog of the Indians in Florida and the wolves of that country. The half domestic dogs of Asia and Egypt are very similar to jackals; and it appears that even the peculiarly offensive odour of the jackal may be imparted to a dog by simply feeding it on raw flesh.

It is equally unknown whether the different breeds of domestic cats, like our domestic dogs, are descended from several distinct species or not. The best authorities on the subject seem to be in favour of a multiple origin, and their opinion is to some extent supported by the fact that distant countries possess distinct races of these household pets. Among the curious varieties which have occurred under domestication we can only stop to notice the tailless cats of the Isle of Man, which occur also elsewhere; a breed of Chinese cats with drooping ears; and the inherited peculiarity of lynx-like tufts of hairs on the ears of some cats in England and also in India.

With respect to the variations of the domestic horse and the domestic ass, the most interesting and suggestive fact which has been noted is the occasional and well-marked tendency in them to the occurrence of stripes. On this subject of striping, Mr. Darwin is well known to have bestowed very close and thoughtful attention; and it is chiefly, as we shall presently have occasion to notice more fully, on the occurrence of cross-stripes or bars in the wings and tail of the domestic pigeon, that he has relied in his argument to prove that our various breeds of pigeons are all descended from the wild rock-pigeon or *columba livia*. The appearance of stripes in the horse does not, however, according to Mr. Darwin,

"Afford nearly such good evidence of their descent from a single primitive stock as in the case of the pigeon, because no certainly wild horse is known as a standard of comparison; because the stripes, when they do appear, are variable in character; because there is far from sufficient evidence of the appearance of the stripes from the crossing of distinct breeds; and lastly, because all the species of the

genus Equus have the special stripe, and several have shoulder and leg stripes. Nevertheless, the similarity in the most distinct breeds in their general range of colour, in their dappling, and in the occasional appearance, especially in duns, of leg-stripes and of double or triple shoulder-stripes, taken together, indicate the probability of the descent of all the existing races from a single, dun-coloured, more or less striped, primitive stock, to which our horses still occasionally revert." (vol. i, p. 61.)

The domesticated quadrupeds usually bred for food, including pigs, cattle, sheep, goats, and rabbits, have all received their due share of consideration; and their variations in distant countries have been carefully studied. The pig appears to have been most highly cultivated in China, where it has long been esteemed as a favorite article of food, and where its domestication is believed by an eminent Chinese scholar to go back at least 4900 years from the present time. In this country assiduous attention has been bestowed on the breeding of sheep and cattle; and the development of any valuable character has led, by means of methodical selection, to wonderful improvements in their race. But probably the most satisfactory evidence of the influence of variation in more or less effectually changing the character of any breed of quadrupeds occurs in the case of the rabbit, and Mr. Darwin has in consequence very fully described the variations observed in the several domestic breeds of this animal, all of which he is of opinion may with safety be inferred to have descended from the common wild species. It is a well established fact that the wild rabbit, if taken young, can, though with some difficulty, be domesticated: and that the domestic rabbit, when turned adrift, readily becomes feral and reverts to the ordinary grey colour. In the following account of the Himalayan breed of rabbits, Mr. Darwin has shown us how in accordance with these facts a new species may be readily developed.

"The origin of the Himalayan breed (sometimes called Chinese, or Polish, or Russian) is so curious, both in itself, and as throwing some light on the complex laws of inheritance, that it is worth giving in detail. These pretty rabbits are white, except their ears, nose, all four feet, and the upper side of the tail, which are all brownish-black; but as they have red eyes, they may be considered as albinos. I have received several accounts of their breeding perfectly true. From their symmetrical marks, they were at first ranked as specifically distinct, and were provisionally named *L. nigripes*. Some good observers thought that they could detect a difference in their habits, and stoutly maintained that they formed a new species. Their origin is now well known. A writer, in 1857, stated that he had produced Himalayan rabbits in the following manner. But it is

first necessary briefly to describe two other breeds: silver-greys or silver-sprigs generally have black heads and legs, and their fine grey fur is interspersed with numerous black and white long hairs. They breed perfectly true, and have long been kept in warrens. When they escape and cross with common rabbits, the product, as I hear from Mr. Wyrley Birch, of Wretham Hall, is not a mixture of the two colours, but about half take after the one parent, and the other half after the other parent. Secondly, chinchillas or tame silver-greys (I will use the former name) have short, paler, mouse or slate-coloured fur, interspersed with long, blackish, slate-coloured, and white hairs. These rabbits breed perfectly true. Now, the writer above referred to had a breed of chinchillas which had been crossed with the common black rabbit, and their offspring were either blacks or chinchillas. These latter were again crossed with other chinchillas (which had also been crossed with silver-greys), and from this complicated cross Himalayan rabbits were raised. From these and other similar statements, Mr. Bartlett was led to make a careful trial in the Zoological Gardens, and he found that by simply crossing silver-greys with chinchillas he could always produce some few Himalayans; and the latter, notwithstanding their sudden origin, if kept separate, bred perfectly true.'" (vol. i, pp. 108, 109.)

It is useful, moreover, to notice that, although these Himalayans when first born are usually quite white, yet when a single black rabbit is produced in a litter, as sometimes happens, it becomes, before two months elapse, perfectly white. The constancy with which the characteristic markings are subsequently developed in this albino breed of rabbits is considered by Mr. Darwin to be indicative of long inheritance. For it has been observed that characters common to many species of a genus—and a large majority of the species of the genus Lepus have their ears and the upper surface of their tails tinted black, and retain these markings when the rest of the body in winter becomes white—"are found to resist variations, or to re-appear if lost, more persistently than the characters which are confined to the separate species." The account of the Porto Santo rabbits which are the feral descendants of a female rabbit which, with a litter of young, was turned out on the island in 1418 or 1419, is in like manner very suggestive; and Mr. Darwin very truly remarks that most naturalists would, from the well-marked variation in this breed, have ranked them as a distinct species. But far more important than variations in external appearance are the modifications in the osteological characters of these animals, which have been very closely observed. Among these changes in structure, there have been noted decrease in the comparative size and capacity, together with a comparative narrowness of the skull, from disuse of the brain under domestication; a remarkable difference in the form and size of the

occipital foramen; an alteration in the size and character of individual vertebræ; and great variation in the shape of certain parts of the scapula and of the terminal sternal bones. These extensive changes, with some other and less notable modifications in their osseous development, exhibit a degree of plasticity which, it must be admitted, we were somewhat unprepared to expect.

But however satisfactory the evidence afforded by the rabbit may appear, the stronghold of Mr. Darwin's argument in the present as in his earlier work is the well-known variability of the pigeon; and it must be frankly acknowledged that his reasoning in favour of the rock pigeon, *columba livia*, being the parent of our several domestic breeds of pigeons is throughout admirably sustained. The wonderful plasticity of the organization under domestication, to which we had occasion to refer in the case of the rabbit, is well illustrated in the varied shape of the domestic pigeon; in the great diversity of its plumage; and still more in those structural changes which affect even the number of the bones, as, for example, of the ribs and the sacral vertebræ. In addition to remarkable peculiarities of structure, there are also to be noticed in some breeds certain inherited movements, presenting singular differences in their habits, and of which the most characteristic and interesting is that of tumbling on the ground, as observed in the *Lotan or Indian ground tumblers.*

The variations of fowls and ducks; of the goose, turkey, and guinea-fowl; of the peacock and canary bird; of gold fish, hive bees, and silk moths; together with the variations of cultivated plants, have all received their share of the author's attention. But we must hasten to notice a very interesting and suggestive chapter on bud-variation, with which the first volume concludes, and which forms, as we shall presently have occasion to show, a fitting introduction to the great subject of inheritance. In this chapter, Mr. Darwin has, though, perhaps, somewhat unintentionally, succeeded in showing how very difficult and sometimes, indeed, impossible it must be, even with the vast supply of carefully observed facts at his command, to account for merely common phenomena in organic life; and, consequently, how important it is that the scientific inquirer should avoid the error of hasty generalisation. There is no portion of the work in which we have felt a deeper interest than in bud-variation; and the importance of this division of the inquiry may be inferred from the fact that the aim of the author in this chapter is to show "in how close and remarkable a manner the germ of a fertilised seed and the small cellular mass forming a bud resemble each other in function, in their powers

of inheritance with occasional reversion, and in their capacity for variation of the same general nature, in obedience to the same laws."

The term bud-variation is applied to all those sudden changes in structure or appearance which occasionally occur in full grown plants in their flower-buds or leaf-buds; and they can generally be propagated to any extent by grafting, budding, cuttings, bulbs, &c., and occasionally even by seeds. In speaking of bud-variation it must not, however, be supposed that the term should be limited altogether to plants; for Mr. Darwin is of opinion that if compound animals, such as hydras, corals, &c., had been like plants, which in many respects they closely resemble, subjected to a long course of domestication, they would have varied by buds: and he cites some cases in which varieties of the hydra and of a true coral have been propagated by budding. Among the extensive and valuable series of cases of bud-variation in plants affecting the fruit, which Mr. Darwin, evidently after much labour, has succeeded in collecting, may be cited several instances of peach trees having yielded nectarines, and one instance of a nectarine tree having yielded peaches; the case of a gooseberry-bush, described by the late Dr. Lindley, which bore at the same time four kinds of berries; and some cases of currant-bushes with red and white currants either on the same or on separate branches. Numerous illustrations are given of bud-variations in flowers, leaves, and shoots; and of subterranean bud-variations by suckers, tubers, and bulbs. Among the more noticeable of the latter group of illustrations are varieties of the common potato, produced sometimes by variation in a single bud or eye; or, as occasionally happens, by all the eyes of a tuber varying in the same manner and at the same time, so that the whole tuber assumes a new character; whilst among the variations by bulbs is to be noticed a case in which a blue variety of the hyacinth, for three successive years, gave offsets which produced white flowers with a red centre. In addition to these illustrations of bud-variations, some anomalous and apparently allied cases have been described, of which the most celebrated is that of Adam's laburnum, a form intermediate between the common and the purple laburnum, and which Mr. Darwin seems inclined to regard as a graft-hybrid, which is in accordance with the statement of M. Adam, who first raised the plant. Closely analogous, as reproductive anomalies, to this laburnum, are the cases in which the orange and the citron have been combined; as in the well known case of the Bizzarria orange, which produces at the same time leaves, flowers, and fruit, identical with the *bitter* orange and the citron of Florence; and the case of the trifacial

orange of Alexandria and Smyrna, which differs from the Bizzarria "in the *sweet* orange and citron being blended together in the same fruit, and separately produced on the same tree." In commenting on these curious anomalies in the reproduction of the laburnum and the orange, Mr. Darwin remarks that "whatever their origin may have been, the two parent species occur blended together under the form of a sterile hybrid, or reappear with their characters perfect and their reproductive organs effective; and these trees, retaining the same sportive character, can be propagated by buds." With regard to the causes of bud-variation, it is evident that many of the cases referred to are simply due to spontaneous variability; others will admit of being explained by reversion to characters which have, it may be for a considerable length of time, disappeared; and again, some bud-variations are produced by a cross. It should, moreover, be remarked that whilst variation is more commonly the result of sexual generation than of propagation by buds; yet "all the plants which have yielded bud-variations have likewise varied greatly by seed. As it is not desirable, at this stage of the inquiry, to notice more fully the several points of interest connected with this subject, it will be sufficient for the present to state that variability dependent on bud-propagation and variability dependent on sexual generation are the results of closely allied forms of reproduction, which appear to be alike subject to the same laws of inheritance; and that, consequently, the study of bud-variation is to some extent to be regarded as a transition stage in the inquiry, through which we pass from the observation of variations which may be fleeting to the consideration of the influence by which they may become fixed.

But before proceeding to investigate the nature of inheritance, which from its importance may be termed the axis round which the discussion on all other subjects connected with the inquiry revolves, it is necessary to notice an important digression "on the direct or immediate action of the male element on the mother form," which, notwithstanding any supposed relation the subject may have to that of graft-hybrids, seems to be somewhat out of place in the midst of a chapter on bud-variation; and with all due respect for the author, we cannot but express our opinion that it might with advantage be transferred as an appendix to the succeeding chapters on inheritance; since it is apparently far more closely connected with seminal reproduction than with propagation by buds. With regard to this subject, which is one of the most obscure in the physiology of reproduction, it has been shown that in the case of flowering plants when the pollen or male element of one species or variety is applied to fertilise a distinct kind, that a notable effect can by

this means be produced on the mother form, in consequence of which the succeeding flowers or fruit occasionally present an altered character. The flowers of an orange, for example, were fertilised with pollen from the lemon, and it was observed that "one fruit thus produced bore a longitudinal stripe of peel having the colour, flavour, and other characters of the lemon." One of the most remarkable, and at the same time best authenticated examples of this effect of crossing is that observed by M. Denis who fertilised the *Chamærops humilis* with pollen from the phœnix or date-palm. In reference to this case, Mr. Darwin remarks that "the fruit or drupe thus produced was twice as large as, and more elongated than that proper to the Chamærops; so that it was intermediate in these respects, as well as in texture, between the fruit of the two parents. The hybridised seeds germinated, and produced young plants likewise intermediate in character. This case is the more remarkable as the Chamærops and phœnix belong not only to distinct genera, but in the estimation of some botanists to distinct sections of the family." In animals, analogous results have been observed, and first-class breeders are so fully aware of this influence of the first male on the subsequent offspring of the same mother by other males, that they are careful to avoid deteriorating the race by any cross with a male of inferior breed. It must, we think, be acknowledged that no satisfactory explanation has at present been given of the abiding effect of a first impregnation on the subsequent progress of reproductive development, although theories of a very opposite description have been advanced to account for the effect produced; and, until more conclusive evidence has been published on the subject, we should not be disposed to agree with Mr. Darwin in ascribing it to the direct action of the male element on the reproductive organs of the female, rather than to any intervention of the crossed embryo.

In passing from the consideration of what Mr. Darwin has to a very great extent succeeded in showing to be probably the origin of many at least of those organic forms which naturalists have hitherto been in the habit of describing as species, we enter a field of inquiry in which the evidence of variation under domestication no longer possesses a corresponding value. For although varieties, as Mr. Darwin states, may be called incipient species,—and all well-instructed observers would, perhaps, without hesitation, be willing to admit that through hereditary influence the otherwise transient effects of variation may often become fixed—yet it is questionable whether sufficient or indeed any conclusive evidence can be derived from this source to prove that variation will lead to higher results, and effect such a trans-

formation, that pigeons, for example, shall cease after a time to be pigeons; or that any of the remoter descendants of rabbits will ultimately be developed into quadrupeds of a higher class than themselves. A vast amount of evidence has been accumulated by Mr. Darwin to prove that varieties probably become species; and he may be considered to have so far succeeded in establishing his position, that variation can now be accepted as one of the chief sources of what have been incorrectly classified as hereditarily independent forms. But when, as already remarked, we attempt to pursue the investigation beyond the origin of the so-called species of naturalists, and apply the same argument to the origin of the higher groups in natural history, our progress, so far as variation under domestication is concerned, becomes simply a leap in the dark. This is chiefly due to the fact that the great principle of inheritance is, in many respects, unfavorable to the suggested extension of the theory, and that hybridism is altogether opposed to it. Consequently, it will be found, as the inquiry proceeds, that although by means of hereditary influence varieties may be raised to the questionable and unsettled rank of species, yet the change thus effected is more apparent than real; for, on the one side, by means of reversion, temporary characters acquired through variation may be superseded by the more permanent characters of the true species; whilst, on the other side, hybridism, by inducing sterility, opposes an impassable barrier to the formation of new, through any intermixture of old and hereditarily distinct, forms.

Before, however, we bestow any special notice on this important division of the inquiry, we have to express our satisfaction at the progress which appears to have been made in the investigation of the "wonderful nature of inheritance," since the publication in 1859 of Mr. Darwin's introductory work on the origin of species, in which it was distinctly though somewhat incorrectly asserted that "the laws governing inheritance are quite unknown." For it must be acknowledged that previous to this date considerable progress had been made in the investigation of hereditary transmission; and that some of the various influences to which an inheritance might be subject, and more especially the influence of prepotency in transmission had been very ably discussed and illustrated by M. Prosper Lucas in his great work on "Natural Inheritance." But it has been due chiefly to the recent publication in this journal of a series of papers by Mr. Sedgwick, in which the influence respectively of sex, age, and atavism on hereditary disease has been fully established, that we possess more definite information on this subject; and it is gratifying therefore to observe, in the following summary by Mr. Darwin, the extent of the change

which has been effected by these and other contributions to the literature of inheritance:—

"Finally, though much remains obscure with respect to inheritance, we may look at the following laws as fairly well established. Firstly, a tendency in every character, new and old, to be transmitted by seminal and bud generation, though often counteracted by various known and unknown causes. Secondly, reversion or atavism, which depends on transmission and development being distinct powers: it acts in various degrees and manners through both seminal and bud-variation. Thirdly, prepotency of transmission, which may be confined to one sex, or be common to both sexes of the prepotent form. Fourthly, transmission, limited by sex, generally to the same sex in which the inherited character first appeared. Fifthly, inheritance at corresponding periods of life, with some tendency to the earlier development of the inherited character. In these laws of inheritance, as displayed under domestication, we see an ample provision for the production, through variability and natural selection, of new specific forms." (vol. ii, p. 84.)

It must be freely admitted that the difficult subject of inheritance has been investigated by Mr. Darwin with much care and discrimination, and that he has succeeded in showing the extent to which the variations from the normal type, if we may be permitted to use the term, are capable of being inherited. The illustrations, more particularly of the various inherited malformations and diseases of the eye, with its accessory parts, may be referred to as very useful in assisting to prove that even the most trifling peculiarity or defect may be the heritage of a family for two, three, or more generations, and that the transmission of the inheritance varies greatly in different cases. In addition to such affections, it will be as well also to notice some cases of supernumerary fingers and toes, to which Mr. Darwin has directed special attention, on account of the occasional regrowth of these superfluous parts after amputation. The cases which have been cited in favour of this exceptional power of regrowth are—1st. That of a child with a thumb double from the first joint, and furnished with an additional nail, in which the supernumerary member was removed at the age of three years, but grew again and reproduced a nail. The newly-grown thumb in this case was again wholly removed by its socket-joint, and again grew and reproduced the nail. 2nd. A case, mentioned by Dr. Struthers, of partial regrowth of an additional thumb after amputation in a child three months old. 3rd. A similar case which was observed by the late Dr. Falconer. 4th. The following case, in which the evidence of regrowth after amputation is very complete:—

"A gentleman," writes Mr. Darwin, "who first called my attention to this subject, has given me the following facts which occurred in his own family. He himself, two brothers, and a sister, were born with an extra digit to each extremity. His parents were not affected, and there was no tradition in the family, or in the village in which the family had long resided, of any member having been thus affected. Whilst a child, both additional toes, which were attached by bones, were rudely cut off; but the stump of one grew again, and a second operation was performed in his thirty-third year. He has had fourteen children, of whom three have inherited additional digits; and one of them, when about six weeks old, was operated on by an eminent surgeon. The additional finger, which was attached by bone to the outer side of the hand, was removed at the joint; the wound healed, but immediately the digit began growing, and in about three months' time the stump was removed for the second time by the root. But it has since grown again, and is now fully a third of an inch in length, including a bone, so that it will for the third time have to be operated on." (vol. ii, pp. 14, 15.)

These facts, which have been sufficiently well authenticated, require to be very carefully considered, for they have furnished Mr. Darwin with what he is evidently disposed to think is a very strong argument in favour of the human race being the remote descendants of a very inferior type in organization, far below not only every mammal and bird, but below also every existing reptile; a supernumerary digit being in fact, according to his view of the case, a finger of scorn pointing to our affinity with a fish. For although he has very justly remarked that all that can perhaps safely be said about cases of polydactylism is that they indicate "mere fluctuating monstrosity"; yet he immediately proceeds to suggest,—

"As supernumerary digits in the higher animals, from their power of regrowth, and from the number thus acquired exceeding five, partake of the nature of the digits in the lower animals; as they occur by no means rarely, and are transmitted with remarkable strength, though perhaps not more strongly than some other anomalies; and as with animals which have fewer than five digits, when an additional one appears it is generally due to the development of a visible rudiment; we are led in all cases to suspect, that, although no actual rudiment can be detected, yet that a latent tendency to the formation of an additional digit exists in all mammals, including man. On this view, as we shall more plainly see in the next chapter when discussing latent tendencies, we should have to look at the whole case as one of reversion to an enormously remote, lowly-organised, and multidigitate progenitor." (vol. ii, pp. 16, 17.)

In reply to this overstrained suggestion it should be remarked, in the first place, that the regrowth of supernumerary digits is a

very exceptional fact in the human race, for out of an immense number of cases in which an operation for their removal has been performed, and that, too, chiefly, as it is important to notice, at a very early period of life, there are very few examples of any reappearance of these abnormal structures; and, secondly, that in the exceptional cases in which regrowth after amputation has been observed, there is no evidence to show that such regrowth was connected with any exceptionally early period of life at which the operation was performed; and consequently it cannot rightly be regarded as an indication of the power of reproducing lost parts analogous to what has been assumed, but on insufficient evidence, to occur occasionally in the embryonic condition. For although Mr. Darwin is disposed to infer "that supernumerary digits in man retain to a certain extent an embryonic condition, and that they resemble in this respect the normal digits and limbs in the lower vertebrate classes;" yet it is evident that, since these supernumerary structures undergo development which is to a great extent parallel with the development of the rest of the body, they must, so far as growth and regrowth are concerned, acquire a less embryonic character as age advances. Consequently, instead of having our attention directed to any indication of the power of reproducing lost parts in connection with the limbs of a fœtus, as contrasted with the fact that "the normal digits in *adult* man and other mammals, in birds, and in true reptiles, have no power of regrowth," evidence should have been forthcoming to show that the regrowth of supernumerary digits, which have been surgically removed, has been more commonly observed when the amputation has been performed immediately after birth than when it has been delayed to a later period of life. The difficulty attending any extension of the theory, such as that suggested by an exceptional power of regrowth in a few cases of polydactylism, so far, indeed, from becoming less, seems rather to increase as we proceed; and a careful study of the comparative effects of variation on analogous structures in different animals will sometimes conclusively prove that, in attempting to explain such variations, it has been found necessary, so to speak, to shift the ground. As an illustration of the difficulty which it is thus often necessary to encounter, let us examine the evidence which has been adduced in favour of the spontaneous origin of webbed feet.

The first and most obvious principle involved in the occurrence through variability of webbed feet is that of utility; and consequently Mr. Darwin has attributed considerable importance to the fact that in some land animals which have become aquatic in their habits, such as the Newfoundland-dog and the English

otter-hound, there is a decidedly increased development of skin between the toes. He particularly observed in two Newfoundland-dogs that when the toes were stretched apart and viewed on the under side, that "the skin extended in a nearly straight line between the outer margins of the balls of the toes; whereas in two terriers, of distinct sub-breeds, the skin viewed in the same manner was deeply scooped out;" and a friend, who examined for him the feet of two English otter-hounds, found that the skin in this situation was more developed than in other hounds; and it appears also that there is a dog peculiar to Canada, which has "half-webbed feet, and is fond of water." From the fact that the skin between the toes in these animals is usually more developed than in those dogs which are not accustomed to swim, Mr. Darwin has argued "that as aquatic animals which belong to quite different orders have webbed feet, there can be no doubt that this structure would be serviceable to dogs that frequent the water."

"How inexplicable," exclaims Mr. Darwin in his introductory remarks, "is the similar pattern of the hand of a man, the foot of a dog, the wing of a bat, the flipper of a seal, on the doctrine of independent acts of Creation! how simply explained on the principle of the natural selection of successive slight variations in the diverging descendants from a single progenitor! So it is, if we look at the structure of an individual animal or plant, when we see the fore and hind limbs, the skull and vertebræ, the jaws and legs of a crab, the petals, stamens, and pistils of a flower built on the same type or pattern." (vol. i, p. 11.)

But the occurrence of such a variation as that referred to above in aquatic dogs, even if it could be shown to be permanently established—and at present the evidence in its favour is insufficiently supported by Mr. Darwin's examination of two Newfoundland-dogs, by a friend's examination of two otter-hounds, and by Mr. Greenhow's observations, published in 1833, on the Canadian dog—must not be supposed to be due simply to their acquired habit of frequenting the water, for webbing of the feet is far from being an uncommon variation in animals which never acquire aquatic habits. Numerous cases have been observed of the hereditary occurrence of this variation in the human race; but we are not acquainted with any evidence in favour of its being a more frequent occurrence in the members of those families which have been for centuries aquatic by profession than in others who from constantly living inland have scarcely had the opportunity of even entering the water. On the contrary, it might be urged that, from the frequency with which webbing of the fingers and toes, with other digital variations, prevails as

an hereditary peculiarity amongst the inhabitants of inland and especially of mountain districts, quite independent of any aquatic habits, it cannot be regarded as a utilitarian variation in the human race.

The same argument against this supposed origin of webbed feet will apply to the occurrence of the variation in those birds which in like manner have no tendency to become aquatic in their habits; such, for example, as in certain breeds of pigeons, in which it is customarily associated with feathered feet; and it seems to be very important to notice this exceptional fact in the pigeon, as it is opposed not only to the argument founded on utility, but opposed also to the argument which Mr. Darwin has elsewhere employed with much skill in favour of reversion to a primitive type; for as a very large proportion of the feathered races are water birds with webbed feet and bare legs, the conjoined anomaly of webbed and feathered feet in pigeons is opposed to the supposition that they can have descended, through the rock-pigeon, from a webbed footed progenitor. It is well known that, from a very early period in the history of the present inquiry, special attention has been bestowed by Mr. Darwin on a case of hereditary peculiarity in some breeds of pigeons, which have the two outer toes partially connected by skin when their legs are feathered. At first this fact is said to have been utterly inexplicable; but it is now understood to be dependent, not on its utility, as in dogs, for no webbed-footed pigeons have been observed, or have even tried to swim, but on the law of correlated variation of homologous parts. For these two toes in the pigeon, which correspond with the third and fourth toes in man, acquire feathers on becoming partially webbed, because they are, it is urged by Mr. Darwin, homologous to structures in the pigeon's wing representing the third and fourth digits, which are both feathered and completely united by skin. Now, it is important to notice, with reference to this peculiarity in the pigeon, that in other birds, such as marsh- and water-fowl, which possess either a partial or a complete webbing between the toes, as a constant because, as we have hitherto been accustomed to assume, it is in their case a normal development, there is no feathering of the legs or feet, notwithstanding the fact that birds which are thus normally webbed footed, instead of presenting elsewhere any general deficiency of feathers, have usually a very dense plumage. Hence it would not be otherwise than allowable to suppose that the law of homologous affinity, which prevails to a very great extent in normal development, is somewhat exceptionally associated in this case of peculiarity in the pigeon, with the law of correlated variability which occupies a pre-eminent position in Mr. Darwin's argument on the origin

of species; for he has impressively assured us that "of all the laws governing variability, that of correlation is the most important." On proceeding to investigate this subject still further, it will be found that there are many breeds of birds in which, as a result of variability under domestication, the legs and toes become feathered without any corresponding development of skin between the toes. The feather-footed canaries and the feather-legged bantams may be referred to as notable examples of this fact; and with respect more especially to this interesting breed of bantams it may be stated that the leg-feathers, which grow from the outside of the leg, and generally from the two outer toes, have sometimes been observed to exceed even the wing-feathers in length, showing that there may be an excessive development of feathers in this situation apart from any corresponding development of interdigital skin; whilst on the other side there are cases in which exactly the reverse of this has been observed in other breeds of the fowl, such, for example, as occurs in the case of the golden-spangled Polish fowls which are bare legged, and in which the skin between the toes is said, by Mr. Tegetmeyer and other authorities on the subject, to be much developed. It still remains to be noticed that, as in the bird's wing, the second digit is only rudimentary, and the first and fifth digits are wholly aborted, the two remaining digits, which are completely webbed, represent the third and fourth toes in the foot; and that, consequently, the limited development of web-skin in the foot is strictly homologous to that in the wing. Hence "the whole leg tends," says Mr. Darwin, "to assume the structure of the wing." On referring, however, to cases of abnormal development of inter-digital skin in other animals, it will be found that there is occasionally a preference shown for this digital interspace, apart from any abortion of the first, second, and fifth digits in the anterior limbs, and altogether independent of any connection with the development of feathers; and that in cases of inter-digital webbing in man, to which we will now more particularly refer, this preference may be exhibited in the hands and feet, either separately or together. Mr. Canton has recorded a case of symmetrical webbing of the third and fourth toes, in a man who had four sons with precisely the same peculiarity, and four daughters who were exempt from it. Dr. Dickie, of Alloa, has recorded a case of webbing of the corresponding fingers, without any webbing of the toes, which was observed to be hereditary for more than six generations; and it is to be noticed, in this case, that the defect was on many occasions unsymmetrically limited to one and apparently the same hand, and that unlike, also, the preceding case, it occurred "more frequently amongst the females than the

males;" whilst a case has come under our own observation of partial webbing of the ring and middle fingers and corresponding toes in some members of a family, in which, for five generations, there had been noticed congenital absence of the terminal phalangeal bones and nails of the little fingers and little toes. With reference to such cases, it should be further remarked that, although a certain degree of preference in abnormal development is thus sometimes exhibited for this digital interspace, yet an equally well-marked limitation to one or more of the other digital interspaces has been occasionally, though, perhaps, less frequently observed in other cases; as, for example, in a case which has been lately brought under our notice, in which the webbing was limited to the interspace between the second and third toes of the right foot in a boy whose maternal great uncle had precisely the same malformation. Many other illustrations of such limitation of inter-digital webbing have been recorded, or have come under our notice; but it will be sufficient to refer at once to the fact that the development of abnormal webbing is not always restricted, even in pigeons, to the third and fourth digital interspace, for Mr. Darwin informs us that he had in his possession "a spot and a nun with the skin extending for a space of a quarter of an inch from the fork between the two *inner* toes" (vol. i, p. 160); and from these birds there might, in accordance with the recognised principles of inheritance, have been bred a race of pigeons with webbing between the two *inner* instead of between the two *outer* toes.

But even if it could have been satisfactorily shown that structural advance in the organization had resulted from variation, it would still be incumbent on the author of this theory to prove that, when from any cause a retrograde change occurs in the development of an animal which has been thus progressively improved, intermediate and newly-formed species and genera are not, as a rule, liable to be altogether passed over when reversion occurs, so as to permit of the degraded descendant being reduced to a rank peculiar to one epoch only, and that often exceptionally remote, in its past history; for if the intermediate species and genera are in any way entitled to their position and their name, there is no need for the reversion to extend to a period always anterior to their development. In the following remarks on the influence of reversion in inheritauce we shall endeavour to show that the facts which have been observed by Mr. Darwin are not favorable to the theory which he has proposed.

Reversion, or the principle on which depends the reappearance of characters which have been lost sight of or forgotten through being suppressed for one or more generations, and

which occupies a very prominent position in the present inquiry, has often been referred to by many writers as a very curious and a very mysterious phenomenon; but it has not, at least until late years, received much scientific attention. Mr. Darwin, as might be expected, has been fully aware of its great significance in relation to his theory of the origin of species; and he has accordingly investigated very closely the various forms under which it may occur, and the various causes on which it may depend. One of the most common, and, as regards the supposed origin of species, one also of the most important of these forms of reversion, is that resulting from a cross in which the offspring presents the characters proper to either pure parent form. "As a general rule," Mr. Darwin informs us, "crossed offspring in the first generation are nearly intermediate between their parents; but the grandchildren and succeeding generations continually revert, in a greater or less degree, to one or both of their progenitors." This influence of crossing in leading to reversion has become endowed with peculiar interest, in consequence of its effects in the celebrated case of the pigeon having been instrumental in first directing Mr. Darwin's attention to its usefulness in determining the parent forms of our several domesticated breeds of animals; and it is deserving of notice that in the following evidence respecting the origin of the domesticated pigeon, which has been given in detail, he carefully disclaims the merit of having been the first to recognise its effect in causing reversion to the parent rock-pigeon, or *Columba livia*.

"My attention," writes Mr. Darwin, "was first called to this subject, and I was led to make numerous experiments, by MM. Boitard and Corbié having stated that, when they crossed certain breeds, pigeons, coloured like the wild C. livia, or the common dovecot, namely, slaty-blue, with double black wing-bars, sometimes chequered with black, white loins, the tail barred with black, with the outer feathers edged with white, were almost invariably produced. The breeds which I crossed, and the remarkable results attained, have been fully described in the sixth chapter. I selected pigeons, belonging to true and ancient breeds, which had not a trace of blue or any of the above specific marks; but when crossed, and their mongrels recrossed, young birds were continually produced, more or less plainly coloured slaty-blue, with some or all of the proper characteristic marks. I may recall to the reader's memory one case, namely, that of a pigeon, hardly distinguishable from the wild Shetland species, the grandchild of a red-spot, white fantail, and two black barbs, from any of which, when purely-bred, the production of a pigeon coloured like the wild *C. livia* would have been almost a prodigy." (vol. ii, p. 40).

Similar experiments have been made with fowls, ducks, rabbits, cattle, horses, asses, and other animals, and the results

obtained have corresponded with those observed in the pigeon; the offspring having exhibited the characteristic colour and markings of what was, in each case, either known or might reasonably be assumed to be the wild species. Even instincts which had been lost were by this means recovered; such as the lost instinct of incubation in those breeds of fowls known as "everlasting layers." Whilst in other animals the primitive wildness of disposition, which had for generations been lost through long-continued domestication, with many other characteristic qualities of the feral state, were by this means restored.

In attempting to account for this reversion to characters which have in many cases been long extinct, Mr. Darwin has assumed that they are capable of remaining latent in the organization for an indefinitely prolonged period, and throughout an almost unlimited succession of generations; and in his remarkable theory of pangenesis,[1] to which we may again have occasion to refer, the marvellous manner in which these alleged latent peculiarities of structure,—for variations both in

[1] In "the provisional hypothesis of pangenesis," which occupies a concluding chapter of the work, Mr. Darwin has assumed that the whole organisation, in the sense of every atom or unit, reproduces itself; and its importance may be inferred from the fact that it has been designed to explain the various forms of reproduction, sexual and asexual; the development and growth of animals and plants; the changes induced in them by variability; and the great principles of inheritance. Mr. Darwin seems to have been led or rather forced to adopt this theory, which appears to be founded on Mr. Herbert Spencer's theory of physiological units, chiefly in consequence of the difficulty or impossibility of otherwise explaining the various forms of inheritance, and especially those which result from the peculiar principle of reversion, which he regards as the most wonderful of all. "In every living creature," he remarks, "a host of lost characters lie ready to be evolved under proper conditions," their evolution being dependent on the awakened action of dormant gemmules; and when such gemmules, derived, it may be, from some remote progenitor, are present in sufficient number to gain the ascendancy, they cause the reappearance of long-lost characters. Each of these gemmules is supposed to represent with exactness the organic unit which was its immediate progenitor, and from which it has been developed by a process analogous to that of budding, and, consequently, analogous to that form of reproduction in which all other forms may, strictly speaking, be merged; and as each individual animal or plant reproduces its kind, so each integral cell or unit, of which the animal or plant is composed, does the same. In like manner also the ordinary distinction between growth and development, in which the former is limited to mere increase in size, and the latter is employed to denote change of structure, is lost, as it were, in the unity of the process by which the work is accomplished. For, in accordance with this theory, every part of the child, as of the adult, generates the same part for the next generation, and consequently "the child, strictly speaking, does not grow into the man, but includes germs which slowly and successively become developed and form the man." Inheritance, which "must be looked upon as merely a form of growth, like the self-division of a lowly-organized unicellular plant," is essentially dependent on a gemmule attaining its full size; and the distinction between the various forms of inheritance, direct, atavic, and collateral, is simply due to the occasionally uncertain and unequal influence of time on their development. In a typical case of direct inheritance the development of gemmules in the offspring would be coincident with the age of a progenitor of the same sex at their birth; and this is probably the

colour and marking are essentially due to structural peculiarities in development—can be accumulated within an inappreciably small compass has been very fully illustrated. It will be sufficient, however, at this stage of the inquiry to state that reversion, according to Mr. Darwin's theory of pangenesis means the evolution of characters which have always been present in a material form, though for a time present in so rudimentary a condition and on so microscopic a scale as to be absolutely beyond our power of detection: and in order that the theory should be made, as far as possible, consistent throughout, it has moreover been assumed that since organic forms may have hereditarily descended from one primeval form, so each of the descendants may be supposed to retain many, if not all of the structural peculiarities which have characterised every stage of their descent; and that although a progressively larger number of these characters become latent in each successive generation, and some may ultimately disappear altogether, and become irrevocably lost, yet in their latent condition they are always ready to be evolved under circumstances favourable to their development. Hence, as there could have been originally no distinction of sex, it has been assumed that even those outward distinctions which now characterise the males and females of

prevailing influence, when associated with that of sex, not only in cases of normal development, in which it would be potent to secure unity of form in the remotest descendants, but also in those cases of abnormal development in which peculiarities and defects are developed in the parents and in the children at a corresponding age. Whilst in a typical case of reversion in which, for example, the inheritance is transmitted from a grandfather, through the medium of a daughter, to a grandson, the gemmules in the intermediate generation are dormant and remain so till they have passed into the fertilized ovum, when their development, as in a typical case of direct inheritance, becomes simply, or perhaps it would be more correct to say chiefly, a question of time. For the gemmules in the grandson continue dormant till he has attained the age at which in his grandfather they were produced, and then their development may be said to begin. In the remoter forms of reversion, in which should be included some at least of the cases of collateral inheritance, the gemmules will continue dormant throughout all the intermediate generations; and it would be impossible to assign any limit to the time during which gemmules might thus remain undeveloped; "but there is no reason to suppose," Mr. Darwin writes, "that all dormant gemmules would be transmitted and propagated for ever," since it is obvious that in the organism which forms their little world they would necessarily have the same difficulty to contend with as that which in the outer world leads to the struggle for existence, and consequently undeveloped gemmules instead of remaining dormant may perish. Finally it may be remarked that whilst, like the occasional and perhaps progressive extinction of race amongst animals and plants, the death of gemmules must be supposed to involve the total loss of any peculiar character in the organization, which had simply disappeared during the time that such gemmules were dormant, since some of the vast number of those which perish leave no descendents, yet there are others which must possess a pedigree of incalculable extent; for if they have been hereditarily derived from the primordial form from which every living thing has been supposed to descend, they are the still surviving representatives of organic units which were coeval with the very earliest dawn of organic life upon the earth.

vertebrate animals must, to a great extent, be looked upon as unreal; for every male, according to Mr. Darwin, possesses in a latent condition all the secondary sexual characters of the female; and every female in like manner, possesses those of the male. When a hen, for example, which has ceased laying, assumes the plumage, the spurs, and the voice of the cock, there is in her case simply the evolution of characters which continued dormant "as long as her ovaria continued to act;" whilst, on the other side, a male bird which has ceased, or has been unable to exercise the reproductive function peculiar to its sex, acquires the secondary sexual characters of the female bird. In accordance, therefore, with this doctrine of latent characters, all vertebrate animals may be said to be unequally developed hermaphrodites, which have lineally descended from a primitively unisexual, or as it would perhaps be more correct to say, asexual form; and that the distinctions of sex, like all other distinctions in organic nature, are merely the result of divergence of character from natural variation in the intermediate generations.

Now if we again turn our attention to the case of the pigeon, we find that it has been very confidently alleged that the combined influence of domestication and methodical selection has had the effect of establishing such complete divergence of character that naturalists would be justified in grouping the various domesticated forms of the pigeon not only as distinct species, but in distinct genera: and it must, we think, be admitted that as the organization of the pigeon under domestication has been wonderfully plastic, that it would be allowable so far as regards structural change, to make such distinctions. But when after thus provisionally assuming that not only species but genera may, in consequence of the anatomical changes which have been effected in their structural relationship to each other, be regarded as the natural results of variation and selection, we pass, as we must do at once, to the consideration of the extent to which such changes are accompanied, as they should be if the argument on the origin of species be sound, by corresponding changes in the physiological relationship of these artificially formed species and genera to each other, we immediately meet with two great obstacles, which seem to be capable of arresting all further progress in the inquiry; their importance being derived from the fact that they are essentially connected with the reproduction of species. One of these obstacles is hybridism associated with sterility from intercrossing in the feral state, and the other is reversion associated with increased fertility from the intercrossing of domestic breeds. It has been already noticed that one of the most interesting, and, at the same time, one of the most

common effects of variation under domestication is that observed in the secondary sexual characters which properly belong to the species, and which sometimes either partially or wholly disappear. In some of these cases the masculine characters are transferred to the female, and in others the female acquires the characters and attributes of the male. It is useful to refer again to these variations in secondary sexual characters at this stage of the inquiry, as a frequent effect of domestication for they will, in some degree, prepare us for the results obtained from the crossing of species artificially formed through the influence of variation under domestication, as contrasted with those obtained from the crossing of true species, in relation to hybridism in the latter, and to reversion in the former case.

With reference to the subject of hybridism in general, Mr. Darwin appears to be fully convinced, "that the sterility which almost invariably follows the union of distinct species depends exclusively on difference in their sexual constitution." In the application of this important observation to domestic breeds of animals, which often present differences of structure fully entitling them, it is said, to be grouped as distinct species, and sometimes even as distinct genera, it is evident that before we can proceed any further in the investigation, it has become necessary to inquire why, in the midst of these remarkable variations of structures should the reproductive system in the different breeds, for example, of the domestic pigeon, be specially exempt from any analogous change. For if, as it has been lately urged by one of Mr. Darwin's ablest supporters, the descendants of the wild rock-pigeon have varied so greatly that they ought to be grouped into at least five distinct genera, containing in all 150 distinct species, it must be allowed either that domestication, whilst it promotes variation in general structure, checks in some peculiar manner any tendency to variation in the reproductive organs themselves; or, that the transformation of varieties into species, and of species into genera has not, through the influence of variation under domestication, been really effected. With respect to any special exemption from variation in the reproductive organs of the domesticated breeds of the pigeon, it should not be supposed that they remain altogether unchanged; but, on the contrary, it may be allowed, especially as the secondary sexual characters usually and readily admit of being varied under domestication, that they not only increase or diminish in size simultaneously with any important increase or diminution in the size of the body generally, but that they may also vary in other ways to a greater or less extent; just in the same way that variations of structure amounting to well-marked defects, which are not unfrequently hereditary, occur in

the reproductive organs of the human race, without impairing or checking reproduction. Variation of structure, however great it may be in certain cases in which the organisation has been rendered unusually plastic by long continued domestication utterly fails therefore in the domestic pigeon to represent those structural changes in development on which specific and generic distinctions should be based; notwithstanding the fact, of which it would be impossible to overrate the importance, that the apparent variation in the domestic breeds of the pigeon is generally speaking greater than in the several members of the Columbidæ in the feral state. Hence it has been candidly admitted by Mr. Darwin that whilst, on the one side, there is "perfect or increased fertility" in the several domesticated breeds of the pigeon when inter-crossed; that, on the other side, "hardly a single well-ascertained instance is known of hybrids between two true species of pigeons being fertile, *inter se*, or even when crossed with one of their pure parents." It would, therefore, appear reasonable to conclude that as the variation accumulated under domestication disappears very quickly under the influence of reversion developed by intercrossing, the extinction of intermediate varieties, on which great stress has been laid, and which ought effectually to have secured the isolation of these breeds, should be regarded as a very questionable fact, since there is no interruption or arrest in the backward course or reversion to the ancestral type. For if, in methodical selection, there has been any general extinction of intermediate varieties, the hereditary influence of reversion does not appear to have recognised the occurrence; otherwise, the ancestral form, revealed by crossing, instead of being always that of the wild-rock pigeon, would be frequently, if not usually, a later-formed species; and it would, moreover, be allowable to hope that on some occasions, the reversion, like the occurrence of a supernumerary finger exhibiting piscine affinity in our own race, would extend back not only beyond the *C. livia*, but beyond also the ancestral form of all the Columbidæ to that of the first animal which wore feathers. As there is no such evidence of variation in the reversion of the pigeon, either to an older or to a newer species than the *C. livia*, but, on the contrary, a steady determination to stop in the backward course only when this particular species, which represents the feral ancestor of all domesticated pigeons, has been revealed, it must consequently be admitted that the five genera, and the 150 distinct breeds of the domestic pigeon, are not entitled to any higher rank than that of brevet species; and that there is, at present, no sufficient evidence to warrant the supposition that time will confirm their promotion, so as to entitle them hereafter to the rank of true species.