THE GENESIS OF SPECIES.

CHAPTER XI.

SPECIFIC GENESIS.

Review of the Statements and Arguments of Preceding Chapters. - Cumulative Argument against Predominant Action of "Natural Selection." - Whether any thing positive as well as negative can be enunciated. - Constancy of Laws of Nature does not necessarily imply Constancy of Specific Evolution. - Possible Exceptional Stability of Existing Epoch. - Probability that an Internal Cause of Change exists. - Innate Powers must be conceived as existing somewhere or other. - Symbolism of Molecular Action under Vibrating Impulses. - Prof. Owen's Statement. - Statement of the Author's View. - It avoids the Difficulties which oppose "Natural Selection." - It harmonizes Apparently Conflicting Conceptions. - Summary and Conclusion.

HAVING now severally reviewed the principal biological facts which bear upon specific manifestation, it remains to sum up the results, and to endeavor to ascertain what, if any thing, can be said *positively*, as well as negatively, on this deeply interesting question.

In the preceding chapters it has been contended, in the first place, that no mere survival of the fittest accidental and minute variations can account for the incipient stages of useful structures, such as, e. g., the heads of flat-fishes, the baleen of whales, vertebrate limbs, the laryngeal structures of the new-born kangaroo, the pedicellariæ of Echinoderms, or for many of the facts of mimicry, and especially those last touches of mimetic perfection, where an insect not only mimics a leaf, but one worm-eaten and attacked by fungi.

Also, that structures like the hood of the cobra and the rattle of the rattlesnake seem to require another explanation.

Again, it has been contended that instances of color, as in some apes; of beauty, as in some shell-fish; and of utility, as in many orchids, are examples of conditions which are quite beyond the power of Natural Selection to originate and develop.

Next, the peculiar mode of origin of the eye (by the simultaneous and concurrent modification of distinct parts), with the wonderful refinement of the human ear and voice, has been insisted on; as also, that the importance of all these facts is intensified through the necessity (admitted by Mr. Darwin) that many individuals should be similarly and simultaneously modified in order that slightly favorable variations may hold their own in the struggle for life, against the overwhelming force and influence of mere number.

Again, we have considered, in the third chapter, the great improbability that from minute variations in all directions alone and unaided, save by the survival of the fittest, closely-similar structures should independently arise; though, on a non-Darwinian evolutionary hypothesis, their development might be expected *a priori*. We have seen, however, that there are many instances of wonderfully close similarity which are not due to genetic affinity; the most notable instance, perhaps, being that brought forward by Mr. Murphy, namely, the appearance of the same eye-structure in the vertebrate and molluscous sub-kingdoms. A curious resemblance, though less in degree, has also been seen to exist between the auditory organs of fishes and of Cephalopods. Remarkable similarities between certain placental and implacental mammals, between the bird's-head processes of Polyzoa and the pedicellariæ of Echinoderms, between Ichthyosauria and Cetacea, with very many other similar coincidences, have also been pointed out.

Evidence has also been brought forward to show that

similarity is sometimes directly induced by very obscure conditions, at present quite inexplicable, e. g., by causes immediately connected with geographical distribution; as in the loss of the tail in certain forms of Lepidoptera and in simultaneous modifications of color in others, and in the direct modification of young English oysters, when transported to the shore of the Mediterranean.

Again, it has been asserted that certain groups of organic forms seem to have an innate tendency to remarkable developments of some particular kind, as beauty and singularity of plumage in the group of birds of paradise.

It has also been contended that there is something to be said in favor of sudden, as opposed to exceedingly minute and gradual modifications, even if the latter are not fortuitous. Cases were brought forward in Chapter IV., such as the bivalve just mentioned, twenty-seven kinds of American trees simultaneously and similarly modified, also the independent production of pony breeds, and the case of the English greyhounds in Mexico, the offspring of which produced directly acclimated progeny. Besides these, the case of the Normandy pigs, of *Datura tatula*, and also of the black-shouldered peacock, have been spoken of. The teeth of the labyrinthodon, the hand of the potto, the whalebone of whales, the wings of birds, the climbing tendrils of some plants, etc., have also been adduced as instances of structures, the origin and production of which are probably due rather to considerable modifications than to minute increments.

It has also been shown that certain forms which were once supposed to be especially transitional and intermediate (as, e. g., the aye-aye) are really by no means so; while the general rule, that the progress of forms has been "from the more general to the more special," has been shown to present remarkable exceptions, as e. g., Macrauchenia, the Glyptodon, and the sabre-toothed tiger (Machairodus).

Next, as to specific stability, it has been seen that there may be a certain limit to normal variability, and that if changes take place they maybe expected *a priori* to be marked and considerable ones, from the facts of the inorganic world, and perhaps also of the lowest forms of the organic world. It has also been seen that with regard to minute spontaneous variations in races, there is a rapidly increasing difficulty in intensifying them, in any one direction, by ever such careful breeding. Moreover, it has appeared that different species show a tendency to variability in special directions, and probably in different degrees, and that at any rate Mr. Darwin himself concedes the existence of an internal barrier to change when he credits the goose with "a singularly inflexible organization;" also, that he admits the presence of an *internal* proclivity to change when he speaks of "a whole organization seeming to have become plastic, and tending to depart from the parental type."

We have seen also that a marked tendency to reversion does exist, inasmuch as it sometimes takes place in a striking manner, as exemplified in the white silk fowl in England, *in spite of* careful selection in breeding.

Again, we have seen that a tendency exists in nature to eliminate hybrid races, by whatever means that elimination is effected, while no similar tendency bars the way to an indefinite blending of varieties. This has also been enforced by statements as to the prepotency of certain pollen of identical species, but of distinct races.

To all the preceding considerations have been added others derived from the relations of species to past time. It has been contended that we have as yet no evidence of minutely intermediate forms connecting uninterruptedly together undoubtedly distinct species. That while even "horse ancestry" fails to supply such a desideratum, in very strongly-marked and exceptional kinds (such as the Ichthyosauria

Chelonia, and Anoura), the absence of links is very important and significant. For if every species, without exception, has arisen by minute modifications, it seems incredible that a small percentage of such transitional forms should not have been preserved. This, of course, is especially the case as regards the marine Ichthyosauria and Plesiosauria, of which such numbers of remains have been discovered.

Sir William Thomson's great authority has been seen to oppose itself to "Natural Selection," by limiting, on astronomical and physical grounds, the duration of life on this planet to about one hundred million years. This period, it has been contended, is not nearly enough, on the one hand, for the evolution of all organic forms by the exclusive action of mere minute, fortuitous variations; on the other hand, for the deposition of all the strata which must have been deposited, if minute fortuitous variation was the manner of successive specific manifestation.

Again, the geographical distribution of existing animals has been seen to present difficulties which, though not themselves insurmountable, yet have a certain weight when taken in conjunction with all the other objections.

The facts of homology, serial, bilateral, and vertical, have also been passed in review. Such facts, it has been contended, are not explicable without admitting the action of what may most conveniently be spoken of as an *internal* power, the existence of which is supported by facts not only of comparative anatomy but of teratology and pathology also. "Natural Selection" also has been shown to be impotent to explain these phenomena, while the existence of such an internal power of homologous evolution diminishes the *a priori* improbability of an analogous law of specific origination.

All these various considerations have been supplemented by an endeavor to show the utter inadequacy of Mr. Darwin's

theory with regard to the higher psychical phenomena of man (especially the evolution of moral conceptions), and with regard to the evolution of individual organisms by the action of Pangenesis. And it was implied that if Mr. Darwin's latter hypothesis can be shown to be untenable, an antecedent doubt is thus thrown upon his other conception, namely, the theory of "Natural Selection."

A cumulative argument thus arises against the prevalent action of "Natural Selection," which, to the mind of the author, is conclusive. As before observed, he was not originally disposed to reject Mr. Darwin's fascinating theory. Reiterated endeavors to solve its difficulties have, however, had the effect of convincing him that that theory as the one or as the leading explanation of the successive evolution and manifestation of specific forms is untenable. At the same time he admits fully that "Natural Selection" acts and must act, and that it plays in the organic world a certain though a secondary and subordinate part.

The one *modus operandi* yet suggested having been found insufficient, the question arises, Can another be substituted in its place? If not, can any thing that is positive, and if any thing, what, be said as to the question of specific origination?

Now, in the first place, it is of course axiomatic that the laws which conditioned the evolution of extinct and of existing species are of as much efficacy at this moment as at any preceding period, that they *tend* to the manifestation of new forms as much now as ever before. It by no means necessarily follows, however, that this tendency is actually being carried into effect, and that new species of the higher animals and plants are actually now produced. They may be so or they may not, according as existing circumstances favor, or conflict with, the action of those laws. It is possible that lowly-organized creatures may be continually evolved at the present day, the requisite conditions

being more or less easily supplied. There is, however, no similar evidence at present as to higher forms; while, as we have seen in Chapter VII., there are *a priori* considerations which militate against their being similarly evolved.

The presence of wild varieties and the difficulty which often exists in the determination of species are sometimes adduced as arguments that high forms are now in process of evolution. These facts, however, do not necessarily prove more than that some species possess a greater variability than others, and (what is indeed unquestionable) that species have often been unduly multiplied by geologists and botanists. It may be, for example, that Wagner was right, and that all the American monkeys of the genus Cebus may be reduced to a single species or to two.

With regard to the lower organisms, and supposing views recently advanced to become fully established, there is no reason to think that the forms said to be evolved were new species, but rather reappearances of definite kinds which had appeared before and will appear again under the same conditions. In the same way, with higher forms similar conditions must educe similar results, but here practically similar conditions can rarely obtain because of the large part which "descent" and "inheritance" always play in such highly-organized forms.

Still it is conceivable that different combinations at different times may have occasionally the same outcome, just as the multiplications of different numbers may have severally the same result.

There are reasons, however, for thinking it possible that the human race is a witness of an exceptionally unchanging and stable condition of things, if the calculations of Mr. Croll are valid as to how far variations in the eccentricity in the earth's orbit together with the precession of the equinoxes have produced changes in climate. Mr. Wallace has pointed

out [1] that the last 60,000 years having been exceptionally unchanging as regards these conditions, specific evolution may have been exceptionally rare. It becomes, then, possible to suppose that for a similar period stimuli to change in the manifestation of animal forms may have been exceptionally few and feeble - that is, if the conditions of the earth's orbit have been as exceptional as stated. However, even if new species are actually now being evolved as actively as ever, or if they have been so quite recently, no conflict thence necessarily arises with the view here advocated. For it by no means follows that if some examples of new species have recently been suddenly produced from individuals of antecedent species, we ought to be able to put our fingers on such cases; as Mr. Murphy well observes [2] in a passage before quoted, "If a species were to come suddenly into being in the wild state, as the Ancon sheep did under domestication, how could we ascertain the fact? If the first of a newly-born species were found, the fact of its discovery would tell nothing about its origin. Naturalists would register it as a very rare species, having been only once met with, but they would have no means of knowing whether it were the first or last of its race."

But are there any grounds for thinking that in the genesis of species an *internal* force or tendency interferes, cooperates with, and controls the action of external conditions?

It is here contended that there are such grounds, and that though inheritance, reversion, atavism, Natural Selection, etc., play a part not unimportant, yet that such an

[1] See *Nature*, March 3, 1870, p. 454. Mr. Wallace says (referring to Mr. Croll's paper in the *Phil. Mag.*), "As we are now, and have been for 60,000 years, in a period of low eccentricity, *the rate of change of species during that time may be no measure of the rate that has generally obtained in past geological epochs.*"

[2] "Habit and Intelligence," vol. i., p. 344.

internal power is a great, perhaps the main, determining agent.

It will, however, be replied that such an entity is no *vera causa*; that if the conception is accepted, it is no real explanation; and that it is merely a roundabout way of saying that the facts are as they are, while the cause remains unknown. To this it may be rejoined that for all who believe in the existence of the abstraction "force" at all, other than will, this conception of an internal force must be accepted and located somewhere - cannot be eliminated altogether; and that therefore it may as reasonably be accepted in this mode as in any other.

It was urged at the end of the third chapter that it is congruous to credit mineral species with an internal power or force. By such a power it may be conceived that crystals not only assume their external symmetry, but even repair it when injured. Ultimate chemical elements must also be conceived as possessing an innate tendency to form certain unions, and to cohere in stable aggregations. This was considered toward the end of Chapter VIII.

Turning to the organic world, even on the hypothesis of Mr. Herbert Spencer or that of Mr. Darwin, it is impossible to escape the conception of innate internal forces. With regard to the physiological units of the former, Mr. Spencer himself, as we have seen, distinctly attributes to them "an *innate* tendency" to evolve the parent-form from which they sprang. With regard to the gemmules of Mr. Darwin, we have seen, in Chapter X., with how many innate powers, tendencies, and capabilities, they must each be severally endowed, to reproduce their kind, to evolve complex organisms or cells, to exercise germinative affinity, etc.

If then (as was before said at the end of Chapter VIII.) such innate powers must be attributed to chemical atoms, to mineral species, to gemmules, and to physiological units,

it is only reasonable to attribute such to each individual organism.

The conception of such internal and latent capabilities is somewhat like that of Mr. Galton, before mentioned, according to which the organic world consists of entities, each of which is, as it were, a spheroid with many facets on its surface, upon one of which it reposes in stable equilibrium. When by the accumulated action of incident forces this equilibrium is disturbed, the spheroid is supposed to turn over until it settles on an adjacent facet once more in stable equilibrium.

The internal tendency of an organism to certain considerable and definite changes would correspond to the facets on the surface of the spheroid.

It may be objected that we have no knowledge as to how terrestrial, cosmical, and other forces, can affect organisms so as to stimulate and evolve these latent, merely potential forms. But we have had evidence that such mysterious agencies *do* affect organisms in ways as yet inexplicable, in the very remarkable effects of geographical conditions which were detailed in the third chapter.

It is quite conceivable that the material organic world may be so constituted that the simultaneous action upon it of all known forces, mechanical, physical, chemical, magnetic, terrestrial, and cosmical, together with other as yet unknown forces which probably exist, may result in changes which are harmonious and symmetrical, just as the internal nature of vibrating plates causes particles of sand scattered over them to assume definite and symmetrical figures when made to oscillate in different ways by the how of a violin being drawn along their edges. The results of these combined internal powers and external influences might be represented under the symbol of complex series of vibrations (analogous to those of sound or light) forming a most complex harmony or a display of most varied colors. In such

a way the reparation of local injuries might be symbolized as a filling up and completion of an interrupted rhythm. Thus also monstrous aberrations from typical structure might correspond to a discord, and sterility from crossing be compared with the darkness resulting from the interference of waves of light.

Such symbolism will harmonize with the peculiar reproduction, before mentioned, of heads in the body of certain annelids, with the facts of serial homology, as well as those of bilateral and vertical symmetry. Also, as the atoms of a resonant body may be made to give out sound by the juxtaposition of a vibrating tuning-fork, so it is conceivable that the physiological units of a living organism may be so influenced by surrounding conditions (organic and other) that the accumulation of these conditions may upset the previous rhythm of such units, producing modifications in them - a fresh chord in the harmony of Nature - a new species!

But it may be again objected that to say that species arise by the help of an innate power possessed by organisms is no explanation, but is a reproduction of the absurdity, *l'opium endormit parcequ'il a une vertu soporifique*. It is contended, however, that this objection does not apply, even if it be conceded that there is that force in Molière's ridicule which is generally attributed to it. [3] Much, however, might be said in opposition to more than one of that brilliant dramatist's smart philosophical epigrams, just as to the theological ones of Voltaire, or to the biological one of that other Frenchman who for a time discredited

[3] "If any one were to contend that beside the opium there existed a real distinct objective entity, "its soporific virtue,", he would be open to ridicule indeed. But the constitution of our minds is such that we cannot but distinguish ideally a thing from its even essential attributes and qualities. The joke is sufficiently amusing, however, regarded as the solemn enunciation of a mere truism.

a cranial skeletal theory by the phrase "Vertèbre pensante." [4]

In fact, however, it is a real explanation of how a man lives to say that he lives independently, on his own income, instead of being supported by his relatives and friends. In the same way, there is fully as real a distinction between the production of new specific manifestations entirely *ab externo*, and by the production of the same through an innate force and tendency, the determination of which into action is occasioned by external circumstances.

To say that organisms possess this innate power, and that by it new species are from time to time produced, is by no means a mere assertion that they *are* produced, and in an unknown mode. It is the negation of that view which deems external forces alone sufficient, and at the same time the assertion of something positive, to be arrived at by the process of *reductio ad absurdum*.

All physical explanations result ultimately in such conceptions of innate power, or else in that of will-force. The far-famed explanation of the celestial motions ends in the conception that every particle of matter has the innate power of attracting every other particle directly as the mass, and inversely as the square of the distance.

We are logically driven to this positive conception if we do not accept the view that there is no force but volition, and that all phenomena whatever are the immediate results of the action of intelligent and self-conscious will.

We have seen that the notion of sudden changes - saltatory actions in Nature - has received countenance from Prof. Huxley. [5] We must conceive that these jumps are orderly, and according to law, inasmuch as the whole cosmos

[4] Noticed by Prof. Owen in his "Archetype," p. 76. Recently it has been attempted to discredit Darwinism in France by speaking of it as "*de la science mousseuse*!"

[5] "Lay Sermons," p. 342.

is such. Such orderly evolution harmonizes with a teleology derived, not indeed from external Nature directly, but from the mind of man. On this point, however, more will be said in the next chapter. But, once more, if new species are not manifested by the action of external conditions upon minute indefinite individual differences, in what precise way may we conceive that manifestation to have taken place?

Are new species now evolving, as they have been from time to time evolved? If so, in what way and by what conceivable means?

In the first place, they must be produced by natural action in preëxisting material, or by supernatural action.

For reasons to be given in the next chapter, the second hypothesis need not be considered.

If, then, new species are and have been evolved from preëxisting material, must that material have been organic or inorganic?

As before said, additional arguments have lately been brought forward to show that individual organisms *do* arise from a basis of *in*-organic material only. As, however, this at the most appears to he the case, if at all, only with the lowest and most minute organisms exclusively, the process cannot be observed, though it may perhaps be fairly inferred.

We may therefore, if for no other reason, dismiss the notion that highly-organized animals and plants can be suddenly or gradually built up by any combination of physical forces and natural powers acting externally and internally upon and in merely inorganic material as a base.

But the question is, How have the highest kinds of animals and plants arisen? It seems impossible that they can have appeared otherwise than by the agency of antecedent organisms not greatly different from them.

A multitude of facts, ever increasing in number and im-

portance, all point to such a mode of specific manifestation.

One very good example has been adduced by Prof. Flower in the introductory lecture of his first Hunterian Course. [6] It is the reduction in size, to a greater or less degree, of the second and third digits of the foot in Australian marsupials, and this, in spite of the very different form and function of the foot in different groups of those animals.

A similarly significant evidence of relationship is afforded by processes of the zygomatic region of the skull in certain edentates existing and extinct.

Again, the relation between existing and recent faunas of the different regions of the world, and the predominating (though by no means exclusive) march of organization, from the more general to the more special point in the same direction.

Almost all the facts brought forward by the patient industry of Mr. Darwin in support of his theory of "Natural Selection," are of course available as evidence in favor of the agency of preëxisting and similar animals in specific evolution.

Now the new forms must be produced by changes taking place in organisms in, after, or before their birth, either in their embryonic, or toward or in their adult, condition.

Examples of strange births are sufficiently common, and they may arise either from direct embryonic modifications or apparently from some obscure change in the parental action. To the former category belong the hosts of instances of malformation through arrest of development, and perhaps generally monstrosities of some sort are the result of such affections of the embryo. To the second category belong all cases of hybridism, of cross-breed, and in all probability

[6] Introductory Lecture of February 14, 1870, pp. 24-30, Figs. 1-4. (Churchill & Sons.)

the new varieties and forms, such as the memorable one of the black-shouldered peacock. In all these cases we do not have abortions or monstrosities, but more or less harmonious forms, often of great functional activity, endowed with marked viability and generative prepotency, except in the case of hybrids, when we often find even a more marked generative impotency.

It seems probable therefore that new species may arise from some constitutional affection of parental forms - an affection mainly, if not exclusively, of their generative system. Mr. Darwin has carefully collected [7] numerous instances to show how excessively sensitive to various influences this system is. He says: [8] "Sterility is independent of general health, and is often accompanied by excess of size, or great luxuriance," and, "No one can tell, till he tries, whether any particular animal will breed under confinement, or any exotic plant seed freely under culture." Again, "When a new character arises, whatever its nature may be, it generally tends to be inherited, at least in a temporary, and sometimes in a most persistent manner." [9] Yet the obscure action of conditions will alter characters long inherited, as the grandchildren of Aylesbury ducks removed to a distant part of England, completely lost their early habit of incubation, and hatched their eggs at the same time with the common ducks of the same place." [10]

Mr. Darwin quotes Mr. Bartlett as saying: "It is remarkable that lions breed more freely in travelling collections than in the zoological gardens; probably the constant excitement and irritation produced by moving from place to place, or change of air, may have considerable influence in the matter." [11]

[7] "'See especially "Animals and Plants under Domestication," vol. ii., chap. xviii. [8] "Origin of Species," 5th edit., pp. 323, 324.

[9] "Animals and Plants under Domestication," vol. ii., p. 2.

[10] Ibid., p. 25. [11] Ibid., p. 151.

Mr. Darwin also says: "There is reason to believe that insects are affected by confinement like the higher animals," and he gives examples. [12]

Again, he gives examples of change of plumage in the linnet, bunting, oriole, and other birds, and of the temporary modification of the horns of a male deer during a voyage. [13]

Finally, he adds that these changes cannot be attributed to loss of health or vigor, "when we reflect how healthy, long-lived, and vigorous many animals are under captivity, such as parrots, and hawks when used for hawking, chetahs when used for hunting, and elephants. The reproductive organs themselves are not diseased; and the diseases from which animals in menageries usually perish, are not those which in any way affect their fertility. No domestic animal is more subject to disease than the sheep, yet it is remarkably prolific. . . . It would appear that any change in the habits of life, whatever these habits may be, if great enough, tends to affect in an inexplicable manner the powers of reproduction."

Such, then, is the singular sensitiveness of the generative system.

As to the means by which that system is affected, we see that a variety of conditions affect it; but as to the modes in which they act upon it, we have as yet little if any clew.

We have also seen the singular effects (in tailed Lepidoptera, etc.) of causes connected with geographical distribution, the mode of action of which is as yet quite inexplicable; and we have also seen the innate tendency which there appears to be in certain groups (birds of paradise, etc.) to develop peculiarities of a special kind.

It is, to say the least, probable that other influences exist, terrestrial and cosmical, as yet unnoted. The gradually

[12] "Animals and Plants under Domestication," vol. ii., p. 157.

[13] Ibid., p. 158.

accumulating or diversely combining actions of all these on highly-sensitive structures, which are themselves possessed of internal responsive powers and tendencies, may well result in occasional repeated productions of forms harmonious and vigorous, and differing from the parental forms in proportion to the result of the combining or conflicting action of all external and internal influences.

If, in the past history of this planet, more causes ever intervened, or intervened more energetically than at present, we might *a priori* expect a richer and more various evolution of forms more radically differing than any which could be produced under conditions of more perfect equilibrium. At the same time, if it be true that the last few thousand years have been a period of remarkable and exceptional uniformity as regards this planet's astronomical relations, there are then some grounds for thinking that organic evolution may have been exceptionally depressed during the same epoch.

Now, as to the fact that sudden changes and sudden developments have occurred, and as to the probability that such changes are likely to occur, evidence was given in Chapter IV.

In Chapter V. we also saw that minerals become modified suddenly and considerably by the action of incident forces - as, e. g., the production of hexagonal tabular crystals of carbonate of copper by sulphuric acid, and of long rectangular prisms by ammonia, etc.

We have thus a certain antecedent probability that if changes are produced in specific manifestation through incident forces, these changes will be sensible and considerable, not minute and infinitesimal.

Consequently, it is probable that new species have appeared from time to time with comparative suddenness, and that they still continue so to arise if all the conditions necessary for specific evolution now obtain.

This probability will be increased if the observations of Dr. Bastian are confirmed by future investigation. According to his report, when the requisite conditions were supplied, the transformations which appeared to take place (from very low to higher organisms) were sudden, definite, and complete.

Therefore, if this is so, there must probably exist in higher forms a similar tendency to such change. That tendency may indeed be long suppressed, and ultimately modified by the action of heredity - an action which would increase in force with the increase in the perfection and complexity of the organism affected. Still we might expect that such changes as do take place would be also sudden, definite, and complete.

Moreover, as the same causes produce the same effects, several individual parent-forms must often have been similarly and simultaneously affected. That they should be so affected – at least that several similarly-modified individuals should simultaneously arise - has been seen to be a generally necessary circumstance for the permanent duration of such new modifications.

It is also conceivable that such new forms may be endowed with excessive constitutional strength and viability, and with generative prepotency, as was the case with the black-shouldered peacock in Sir J. Trevelyan's flock. This flock was entirely composed of the common kind, and yet the new form rapidly developed itself, "*to the extinction of the previously-existing breed*." [14]

Indeed, the notion accepted by both Mr. Darwin and Mr. Herbert Spencer, and which is plainly the fact (namely, that changes of conditions and incident forces, within limits, augment the viability and fertility of individuals), harmonizes well with the suggested possibility as to an augmented viability and prepotency in new organic forms evolved by

[14] "Animals and Plants under Domestication," vol. i. p. 291.

peculiar consentaneous actions of conditions and forces, both external and internal.

The remarkable series of changes noted by Dr. Bastian were certainly not produced by external incident forces *only*, but by these acting on a peculiar *materia*, having special properties and powers. Therefore, the changes were induced by the consentaneous action of internal and external forces. [15] In the same way, then, we may expect changes in higher forms to be evolved by similar united action of internal and external forces.

One other point may here be alluded to. When the remarkable way in which structure and function simultaneously change, is borne in mind; when those numerous instances in which Nature has supplied similar wants by similar means, as detailed in Chapter III., are remembered; when also all the wonderful contrivances of orchids, of mimicry, and the strange complexity of certain instinctive actions are considered - then the conviction forces itself on many minds that the organic world is the expression of an intelligence of some kind. This view has been well advocated by Mr. Joseph John Murphy, in his recent work so often here referred to.

This intelligence, however, is evidently not altogether such as ours, or else has other ends in view than those most obvious to us. For the end is often attained in singularly roundabout ways, or with a prodigality of means which seems out of all proportion with the result: not with the simple action directed to one end which generally marks human activity.

Organic Nature then speaks clearly to many minds of the action of an intelligence resulting, on the whole and in the main, in order, harmony, and beauty, yet of an intelligence the ways of which are not such as ours.

[15] Though hardly necessary, it may be well to remark that the views here advocated in no way depend upon the truth of the doctrine of Spontaneous Generation.

This view of evolution harmonizes well with theistic conceptions; not, of course, that this harmony is brought forward as an argument in its favor generally, but it will have weight with those who are convinced that Theism reposes upon solid grounds of reason as *the* rational view of the universe. To such it may be observed that, thus conceived, the Divine action has that slight amount of resemblance to, and that wide amount of divergence from, what human action would be, which might be expected *a priori* - might he expected, that is, from a Being whose nature and aims are utterly beyond our power to imagine, however faintly, but whose truth and goodness are the fountain and source of our own perceptions of such qualities.

The view of evolution maintained in this work, though arrived at in complete independence, yet seems to agree in many respects with the views advocated by Prof. Owen in the last volume of his "Anatomy of Vertebrates," under the term "derivation." He says: [16] "Derivation holds that every species changes in time, by virtue of inherent tendencies thereto. 'Natural Selection' holds that no such change can take place without the influence of altered external circumstances. [17] 'Derivation' sees among the effects of the innate tendency to change irrespective of altered circumstances, a manifestation of creative power in the variety and beauty of the results; and, in the ultimate forthcoming of a being susceptible of appreciating such beauty, evidence of the preordaining of such relation of power to the appreciation. 'Natural Selection' acknowledges that if ornament or beauty, in itself, should be a purpose in creation, it would be absolutely fatal to it as a hypothesis."

"'Natural Selection' sees grandeur in the view of life,

[16] Vol. iii., p. 808.

[17] This is hardly an exact representation of Mr. Darwin's view. On his theory, if a favorable variation happens to arise (the external circumstances remaining the same), it will yet be preserved.

with its several powers, having been originally breathed by the Creator into a few forms or into one. 'Derivation' sees therein a narrow invocation of a special miracle and an unworthy limitation of creative power, the grandeur of which is manifested daily, hourly, in calling into life many forms, by conversion of physical and chemical into vital modes of force, under as many diversified conditions of the requisite elements to be so combined."

The view propounded in this work allows, however, a greater and more important part to the share of external influences, it being believed by the author, however, that these external influences equally with the internal ones are the results of one harmonious action underlying the whole of Nature, organic and inorganic, cosmical, physical, chemical, terrestrial, vital, and social.

According to this view, an internal law presides over the actions of every part of every individual, and of every organism as a unit, and of the entire organic world as a whole. It is believed that this conception of an internal innate force will ever remain necessary, however much its subordinate processes and actions may become explicable:

That by such a force, from time to time, new species are manifested by ordinary generation just as *Pavo nigripennis* appeared suddenly, these new forms not being monstrosities but harmonious self-consistent wholes. That thus, as specific distinctness is manifested by obscure sexual conditions, so in obscure sexual modifications specific distinctions arise.

That these "jumps" are considerable in comparison with the minute variations of "Natural Selection" - are in fact sensible steps, such as discriminate species from species.

That the latent tendency which exists to these sudden evolutions is determined to action by the stimulus of external conditions.

That "Natural Selection" rigorously destroys mon-

strosities, and abortive and feeble attempts at the performance of the evolutionary process.

That "Natural Selection" removes the antecedent species rapidly when the new one evolved is more in harmony with surrounding conditions.

That "Natural Selection" favors and develops useful variations, though it is impotent to originate them or to erect the physiological barrier which seems to exist between species.

By some such conception as this, the difficulties here enumerated, which beset the theory of "Natural Selection" pure and simple, are to be got over.

Thus, for example, the difficulties discussed in the first chapter - namely, those as to the origins and first beginnings of certain structures - are completely evaded.

Again, as to the independent origin of closely-similar structures, such as the eyes of the Vertebrata and cuttlefishes, the difficulty is removed if we may adopt the conception of an innate force similarly directed in each case, and assisted by favorable external conditions.

Specific stability, limitation to variability, and the facts of reversion, all harmonize with the view here put forward. The same may be said with regard to the significant facts of homology, and of organic symmetry; and our consideration of the hypothesis of Pangenesis in Chapter X., has seemed to result in a view as to innate powers which accords well with what is here advocated.

The evolutionary hypothesis here advocated also serves to explain all those remarkable facts which were stated in the first chapter to be explicable by the theory of Natural Selection, namely, the relation of existing to recent faunas and floras; the phenomena of homology and of rudimentary structures; also the processes gone through in development; and lastly, the wonderful facts of mimicry.

Finally, the view adopted is the synthesis of many dis-

tinct and, at first sight, conflicting conceptions, each of which contains elements of truth, and all of which it appears to be able more or less to harmonize.

Thus it has been seen that "Natural Selection" is accepted. It acts and must act, though alone it does not appear capable of fulfilling the task assigned to it by Mr. Darwin.

Pangenesis has probably also much truth in it, and has certainly afforded valuable and pregnant suggestions, but unaided and alone it seems inadequate to explain the evolution of the individual organism.

Those three conceptions of the organic world which may be spoken of as the teleological, the typical, and the transmutationist, have often been regarded as mutually antagonistic and conflicting.

The genesis of species as here conceived, however, accepts, locates, and harmonizes all the three.

Teleology concerns the ends for which organisms were designed. The recognition, therefore, that their formation took place by an evolution not fortuitous, in no way invalidates the acknowledgment of their final causes if on other grounds there are reasons for believing that such final causes exist.

Conformity to type, or the creation of species according to certain "divine ideas," is in no way interfered with by such a process of evolution as is here advocated. Such "divine ideas" must be accepted or declined upon quite other grounds than the mode of their realization, and of their manifestation in the world of sensible phenomena.

Transmutationism (an old name for the evolutionary hypothesis), which was conceived at one time to be the very antithesis to the two preceding conceptions, harmonizes well with them if the evolution be conceived to be orderly and designed. It will in the next chapter be shown to be completely in harmony with conceptions, upon the acceptance

of which " final causes" and "divine ideal archetypes" alike depend.

Thus then, if the cumulative argument put forward in this book is valid, we must admit the insufficiency of " Natural Selection" both on account of the residuary phenomena it fails to explain, and on account of certain other phenomena which seem actually to conflict with that theory. We have seen that though the laws of Nature are constant, yet some of the conditions which determine specific change may be exceptionally absent at the present epoch of the world's history; also that it is not only possible, but highly probable, that an internal power or tendency is an important if not the main agent in evoking the manifestation of new species on the scene of realized existence, and that in any case, from the facts of homology, innate internal powers to the full as mysterious must anyhow be accepted, whether they act in specific origination or not. Besides all this, we have seen that it is probable that the action of this innate power is stimulated, evoked, and determined by external conditions, and also that the same external conditions, in the shape of "Natural Selection," play an important part in the evolutionary process: and finally, it has been affirmed that the view here advocated, while it is supported by the facts on which Darwinism rests, is not open to the objections and difficulties which oppose themselves to the reception of "Natural Selection," as the exclusive or even as the main agent in the successive and orderly evolution of organic forms in the *genesis of species*.