ON THE

GENESIS OF SPECIES.

BY

ST. GEORGE MIVART, F. R. S.

NEW YORK:
D. APPLETON AND COMPANY,
549 & 551 BROADWAY.
1871.

TO

SIR HENRY HOLLAND, BART., M. D.,

F. R. S., D. C. L., ETC., ETC.

MY DEAR SIR HENRY:

In giving myself the pleasure to dedicate, as I now do, this work to you, it is not my intention to identify you with any views of my own advocated in it.

I simply avail myself of an opportunity of paying a tribute of esteem and regard to my earliest scientific friend—the first to encourage me in pursuing the study of Nature.

I remain,

My dear Sir Henry,

Ever faithfully yours,

ST. GEORGE MIVART.

7 NORTH BANK, REGENT'S PARK,
December 8, 1870.

CONTENTS.

CHAPTER I.

INTRODUCTORY.

CHAPTER II.

THE INCOMPETENCY OF "NATURAL SELECTION" TO ACCOUNT FOR THE INCIPIENT STAGES OF USEFUL STRUCTURES.

CHAPTER III.

THE COEXISTENCE OF CLOSELY-SIMILAR STRUCTURES OF DIVERSE ORIGIN.

CHAPTER IV.

MINUTE AND GRADUAL MODIFICATIONS.

CHAPTER V.

AS TO SPECIFIC STABILITY.

CHAPTER VI.

SPECIES AND TIME.

CHAPTER VII.

SPECIES AND SPACE.

CHAPTER VIII.

HOMOLOGIES.

CHAPTER IX.

EVOLUTION AND ETHICS.

CHAPTER X.

PANGENESIS.

CHAPTER XI.

SPECIFIC GENESIS.

CHAPTER XII.

THEOLOGY AND EVOLUTION.

LIST OF ILLUSTRATIONS.

THE GENESIS OF SPECIES.

CHAPTER I.

INTRODUCTORY.

The Problem of the Genesis of Species stated.—Nature of its Probable Solution.—Importance of the Question.—Position here defended.—Statement of the DARWINIAN THEORY.—Its Applicability to Details of Geographical Distribution; to Rudimentary Structures; to Homology; to Mimicry, etc.—Consequent Utility of the Theory.—Its Wide Acceptance.—Reasons for this, other than, and in Addition to, its Scientific Value.—Its Simplicity.—Its Bearing on Religious Questions.—*Odium Theologicum* and *Odium Antitheologicum*.—The Antagonism supposed by many to exist between it and Theology neither necessary nor universal.—Christian Authorities in favor of Evolution.—Mr. Darwin's "Animals and Plants under Domestication."—Difficulties of the Darwinian Theory enumerated.

THE great problem which has so long exercised the minds of naturalists, namely, that concerning the origin of different kinds of animals and plants, seems at last to be fairly on the road to receive—perhaps at no very distant future—as satisfactory a solution as it can well have.

But the problem presents peculiar difficulties. The birth of a "species" has often been compared with that of an "individual." The origin, however, of even an individual animal or plant (that which determines an embryo to evolve itself—as, e. g., a spider rather than a beetle, a rose-plant rather than a pear) is shrouded in obscurity. *A fortiori* must this be the case with the origin of a "species."

Moreover, the analogy between a "species" and an

"individual" is a very incomplete one. The word "individual" denotes a concrete whole with a real, separate, and distinct existence. The word "species," on the other hand, denotes a peculiar congeries of characters, innate powers and qualities, and a certain nature realized indeed in individuals, but having no separate existence, except ideally as a thought in some mind.

Thus the birth of a "species" can only be compared metaphorically, and very imperfectly, with that of an "individual."

Individuals, *as individuals*, actually and directly produce and bring forth other individuals; but no "congeries of characters," no "common nature" *as such*, can directly bring forth another "common nature," because, *per se*, it has no existence (other than ideal) apart from the individuals in which it is manifested.

The problem then is, "By what combination of natural laws does a new 'common nature' appear upon the scene of realized existence?" i. e., how is an individual embodying such new characters produced?

For the approximation we have of late made toward the solution of this problem, we are mainly indebted to the invaluable labors and active brains of Charles Darwin and Alfred Wallace.

Nevertheless, important as have been the impulse and direction given by those writers to both our observations and speculations, the solution will not (if the views here advocated are correct) ultimately present that aspect and character with which it has issued from the hands of those writers.

Neither, most certainly, will that solution agree in appearance or substance with the more or less crude conceptions which have been put forth by most of the opponents of Messrs. Darwin and Wallace.

Rather, judging from the more recent manifestations of

thought on opposite sides, we may expect the development of some *tertium quid*—the resultant of forces coming from different quarters, and not coinciding in direction with any one of them.

As error is almost always partial truth, and so consists in the exaggeration or distortion of one verity by the suppression of another which qualifies and modifies the former, we may hope, by the synthesis of the truths contended for by various advocates, to arrive at the one conciliating reality.

Signs of this conciliation are not wanting: opposite scientific views, opposite philosophical conceptions, and opposite religious beliefs, are rapidly tending, by their vigorous conflict, to evolve such a systematic and comprehensive view of the genesis of species as will completely harmonize with the teachings of science, philosophy, and religion.

To endeavor to add one stone to this temple of concord. to try and remove a few of the misconceptions and mutual misunderstandings which oppose harmonious action, are the aim and endeavor of the present work. This aim it is hoped to attain, not by shirking difficulties, but analyzing them, and by endeavoring to dig down to the common root which supports and unites diverging stems of truth.

It cannot but be a gain when the laborers in the three fields above mentioned, namely, science, philosophy, and religion, shall fully recognize this harmony. Then the energy too often spent in futile controversy, or withheld through prejudice, may be profitably and reciprocally exercised for the mutual benefit of all.

Remarkable is the rapidity with which an interest in the question of specific origination has spread. But a few years ago it scarcely occupied the minds of any but naturalists. Then the crude theory put forth by Lamarck, and by his English interpreter, the author of the "Vestiges of Cre-

ation," had rather discredited than helped on a belief in organic evolution—a belief, that is, in new kinds being produced from older ones by the ordinary and constant operation of natural laws. Now, however, this belief is widely diffused. Indeed, there are few drawing-rooms where it is not the subject of occasional discussion, and artisans and school-boys have their views as to the permanence of organic forms. Moreover, the reception of this doctrine tends actually, though by no means necessarily, to be accompanied by certain beliefs with regard to quite distinct and very momentous subject-matter. So that the question of the "Genesis of Species" is not only one of great interest, but also of much importance.

But though the calm and thorough consideration of this matter is at the present moment exceedingly desirable, yet the actual importance of the question itself as to its consequences in the domain of theology has been strangely exaggerated by many, both of its opponents and supporters. This is especially the case with that form of the evolution theory which is associated with the name of Mr. Darwin; and yet neither the refutation nor the demonstration of that doctrine would be necessarily accompanied by the results which are hoped for by one party and dreaded by another.

The general theory of evolution has indeed for some time past steadily gained ground, and it may be safely predicted that the number of facts which can be brought forward in its support will, in a few years, be vastly augmented. But the prevalence of this theory need alarm no one, for it is, without any doubt, perfectly consistent with strictest and most orthodox Christian theology. Moreover, it is not altogether without obscurities, and cannot yet be considered as fully demonstrated.

The special Darwinian hypothesis, however, is beset with certain scientific difficulties, which must by no means

be ignored, and some of which, I venture to think, are absolutely insuperable. What Darwinism or "Natural Selection" is, will be shortly explained; but, before doing so, I think it well to state the object of this book, and the view taken up and defended in it. It is its object to maintain the position that "Natural Selection" acts, and indeed must act, but that still, in order that we may be able to account for the production of known kinds of animals and plants, it requires to be supplemented by the action of some other natural law or laws as yet undiscovered.[1] Also, that the consequences which have been drawn from Evolution, whether exclusively Darwinian or not, to the prejudice of religion, by no means follow from it, and are in fact illegitimate.

The Darwinian theory of "Natural Selection" may be shortly stated thus:[2]

Every kind of animal and plant tends to increase in numbers in a geometrical progression.

Every kind of animal and plant transmits a general likeness, with individual differences, to its offspring.

Every individual may present minute variations of any kind and in any direction.

Past time has been practically infinite.

Every individual has to endure a very severe struggle for existence, owing to the tendency to geometrical increase of all kinds of animals and plants, while the total animal and vegetable population (man and his agency excepted) remains almost stationary.

[1] In the last edition of the "Origin of Species" (1869) Mr. Darwin himself admits that "Natural Selection" has not been the exclusive means of modification, though he still contends it has been the most important one.

[2] See Mr. Wallace's recent work, entitled "Contributions to the Theory of Natural Selection," where, at p. 302, it is very well and shortly stated.

Thus, every variation of a kind tending to save the life of the individual possessing it, or to enable it more surely to propagate its kind, will in the long-run be preserved, and will transmit its favorable peculiarity to some of its offspring, which peculiarity will thus become intensified till it reaches the maximum degree of utility. On the other hand, individuals presenting unfavorable peculiarities will be ruthlessly destroyed. The action of this law of "Natural Selection" may thus be well represented by the convenient expression, "survival of the fittest."[3]

Now, this conception of Mr. Darwin's is, perhaps, the most interesting theory, in relation to natural science, which has been promulgated during the present century. Remarkable, indeed, is the way in which it groups together such a vast and varied series of biological[4] facts, and even paradoxes, which it appears more or less clearly to explain, as the following instances will show. By this theory of "Natural Selection," light is thrown on the more singular facts relating to the geographical distribution of animals and plants; for example, on the resemblance between the past and present inhabitants of different parts of the earth's surface. Thus in Australia remains have been found of creatures closely allied to kangaroos and other kinds of pouched beasts, which in the present day exist nowhere but in the Australian region. Similarly in South America, and nowhere else, are found sloths and armadillos, and in that same part of the world have been discovered bones of animals different indeed from existing sloths and armadillos, but yet much more nearly related to them than to any other kinds whatever. Such coincidences between the existing and antecedent geographical distribution of forms are nu-

[3] "Natural Selection" is happily so termed by Mr. Herbert Spencer in his "Principles of Biology."

[4] Biology is the science of life. It contains zoology, or the science of animals, and botany, or that of plants.

merous. Again, "Natural Selection" serves to explain the circumstance that often in adjacent islands we find animals closely resembling, and appearing to represent, each other; while, if certain of these islands show signs (by depth of surrounding sea or what not) of more ancient separation, the animals inhabiting them exhibit a corresponding divergence.[5] The explanation consists in representing the forms inhabiting the islands as being the modified descendants of a common stock, the modification being greatest where the separation has been the most prolonged.

"Rudimentary structures" also receive an explanation by means of this theory. These structures are parts which are apparently functionless and useless where they occur, but which represent similar parts of large size and functional importance in other animals. Examples of such "rudimentary structures" are the fœtal teeth of whales, and of the front part of the jaw of ruminating quadrupeds. These fœtal structures are minute in size, and never cut the gum, but are reabsorbed without ever coming into use, while no other teeth succeed them or represent them in the adult condition of those animals. The mammary glands of all male beasts constitute another example, as also does the wing of the apteryx—a New Zealand bird utterly incapable of flight, and with the wing in a quite rudimentary condition (whence the name of the animal). Yet this rudimentary wing contains bones which are miniature representatives of the ordinary wing-bones of birds of flight. Now, the presence of these useless bones and teeth is explained if they may be considered as actually being the inherited diminished representatives of parts of large size and functional importance in the remote ancestors of these various animals.

[5] For very interesting examples, see Mr. Wallace's "Malay Archipelago."

Again, the singular facts of "homology" are capable of a similar explanation. "Homology" is the name applied to the investigation of those profound resemblances which have so often been found to underlie superficial differences between animals of very different form and habit. Thus man, the horse, the whale, and the bat, all have the pectoral limb, whether it be the arm, or fore-leg, or paddle, or wing, formed on essentially the same type, though the number and proportion of parts may more or less differ. Again, the butterfly and the shrimp, different as they are in appearance and mode of life, are yet constructed on the same common plan, of which they constitute diverging manifestations. No *a priori* reason is conceivable why such similarities should be necessary, but they are readily explicable on the assumption of a genetic relationship and affinity between the animals in question, assuming, that is, that they are the modified descendants of some ancient form—their common ancestor.

That remarkable series of changes which animals undergo before they attain their adult condition, which is called their process of development, and during which they more or less closely resemble other animals during the early stages of the same process, has also great light thrown on it from the same source. The question as to the singularly complex resemblances borne by every adult animal and plant to a certain number of other animals and plants—resemblances by means of which the adopted zoological and botanical systems of classification have been possible—finds its solution in a similar manner, classification becoming the expression of a genealogical relationship. Finally, by this theory—and as yet by this alone—can any explanation be given of that extraordinary phenomenon which is metaphorically termed *mimicry*. Mimicry is a close and striking, yet superficial resemblance borne by some animal or plant to some other, perhaps very different, animal or plant. The

"walking leaf" (an insect belonging to the grasshopper and cricket order) is a well-known and conspicuous instance of the assumption by an animal of the appearance of a vegetable structure (see illustration on p. 47); and the bee, fly, and spider orchids, are familiar examples of a converse resemblance. Birds, butterflies, reptiles, and even fish, seem to bear in certain instances a similarly striking resemblance to other birds, butterflies, reptiles, and fish, of altogether distinct kinds. The explanation of this matter which "Natural Selection" offers, as to animals, is that certain varieties of one kind have found exemption from persecution in consequence of an accidental resemblance which such varieties have exhibited to animals of another kind, or to plants; and that they were thus preserved, and the degree of resemblance was continually augmented in their descendants. As to plants, the explanation offered by this theory might, perhaps, be, that varieties of plants, which presented a certain superficial resemblance in their flowers to insects, have thereby been helped to propagate their kind, the visit of certain insects being useful or indispensable to the fertilization of many flowers.

We have thus a whole series of important facts which "Natural Selection" helps us to understand and coördinate. And not only are all these diverse facts strung together, as it were, by the theory in question; not only does it explain the development of the complex instincts of the beaver, the cuckoo, the bee, and the ant, as also the dazzling brilliancy of the humming-bird, the glowing tail and neck of the peacock, and the melody of the nightingale; the perfume of the rose and the violet, the brilliancy of the tulip and the sweetness of the nectar of flowers; not only does it help us to understand all these, but serves as a basis of future research and of inference from the known to the unknown, and it guides the investigator to the discovery of new facts which, when ascertained, it

seems also able to coördinate.[6] Nay, "Natural Selection" seems capable of application not only to the building up of the smallest and most insignificant organisms, but even of extension beyond the biological domain altogether, so as possibly to have relation to the stable equilibrium of the solar system itself, and even of the whole sidereal universe. Thus, whether this theory be true or false, all lovers of natural science should acknowledge a deep debt of gratitude to Messrs. Darwin and Wallace, on account of its practical utility. But the utility of a theory by no means implies its truth. What do we not owe, for example, to the labors of the Alchemists? The emission theory of light, again, has been pregnant with valuable results, as still is the Atomic theory, and others which will readily suggest themselves.

With regard to Mr. Darwin (with whose name, on account of the noble self-abnegation of Mr. Wallace, the theory is in general exclusively associated), his friends may heartily congratulate him on the fact that he is one of the few exceptions to the rule respecting the non-appreciation of a prophet in his own country. It would be difficult to name another living laborer in the field of physical science who has excited an interest so wide-spread, and given rise to so much praise, gathering round him, as he has done, a chorus of more or less completely acquiescing disciples, themselves masters in science, and each the representative of a crowd of enthusiastic followers.

Such is the Darwinian theory of "Natural Selection," such are the more remarkable facts which it is potent to

[6] See Müller's work, "Für Darwin," lately translated into English by Mr. Dallas. Mr. Wallace also predicts the discovery, in Madagascar, of a hawk-moth with an enormously-long proboscis, and he does this on account of the discovery there of an orchid with a nectary from ten to fourteen inches in length. See *Quarterly Journal of Science*, October, 1867, and "Natural Selection," p. 275.

explain, and such is the reception it has met with in the world. A few words now as to the reasons for the very wide-spread interest it has awakened, and the keenness with which the theory has been both advocated and combated.

The important bearing it has on such an extensive range of scientific facts, its utility, and the vast knowledge and great ingenuity of its promulgator, are enough to account for the heartiness of its reception by those learned in natural history. But quite other causes have concurred to produce the general and higher degree of interest felt in the theory besides the readiness with which it harmonizes with biological facts. These latter could only be appreciated by physiologists, zoologists, and botanists; whereas the Darwinian theory, so novel and so startling, has found a cloud of advocates and opponents beyond and outside the world of physical science.

In the first place, it was inevitable that a great crowd of half-educated men and shallow thinkers should accept with eagerness the theory of "Natural Selection," or rather what they think to be such (for few things are more remarkable than the way in which it has been misunderstood), on account of a certain characteristic it has in common with other theories; which should not be mentioned in the same breath with it, except, as now, with the accompaniment of protest and apology. We refer to its remarkable simplicity, and the ready way in which phenomena the most complex appear explicable by a cause for the comprehension of which laborious and persevering efforts are not required, but which may be represented by the simple phrase "survival of the fittest." With nothing more than this, can, on the Darwinian theory, all the most intricate facts of distribution and affinity, form and color, be accounted for; as well the most complex instincts and the most admirable adjustments, such as those of the human

eye and ear. It is in great measure, then, owing to this supposed simplicity, and to a belief in its being yet easier and more simple than it is, that Darwinism, however imperfectly understood, has become a subject for general conversation, and has been able thus widely to increase a certain knowledge of biological matters; and this excitation of interest, in quarters where otherwise it would have been entirely wanting, is an additional motive for gratitude on the part of naturalists to the authors of the new theory. At the same time it must be admitted that a similar "simplicity"—the apparently easy explanation of complex phenomena—also constitutes the charm of such matters as hydropathy and phrenology, in the eyes of the unlearned or half-educated public. It is indeed *the* charm of all those seeming "short-cuts" to knowledge, by which the labor of mastering scientific details is spared to those who yet believe that without such labor they can attain all the most valuable results of scientific research. It is not, of course, for a moment meant to imply that its "simplicity" tells at all against "Natural Selection," but only that the actual or supposed possession of that quality is a strong reason for the wide and somewhat hasty acceptance of the theory, whether it be true or not.

In the second place, it was inevitable that a theory appearing to have very grave relations with questions of the last importance and interest to man, that is, with questions of religious belief, should call up an army of assailants and defenders. Nor have the supporters of the theory much reason, in many cases, to blame the more or less unskilful and hasty attacks of adversaries, seeing that those attacks have been in great part due to the unskilful and perverse advocacy of the cause on the part of some of its adherents. If the *odium theologicum* has inspired some of its opponents, it is undeniable that the *odium antitheologicum* has possessed not a few of its supporters.

It is true (and in appreciating some of Mr. Darwin's expressions it should never be forgotten) that the theory has been both at its first promulgation and since vehemently attacked and denounced as unchristian, nay, as necessarily atheistic; but it is not less true that it has been made use of as a weapon of offence by irreligious writers, and has been again and again, especially in Continental Europe, thrown, as it were, in the face of believers, with sneers and contumely. When we recollect the warmth with which what he thought was Darwinism was advocated by such a writer as Prof. Vogt, one cause of his zeal was not far to seek—a zeal, by-the-way, certainly not "according to knowledge;" for few conceptions could have been more conflicting with true Darwinism than the theory he formerly maintained, but has since abandoned, viz., that the men of the Old World were descended from African and Asiatic apes, while, similarly, the American apes were the progenitors of the human beings of the New World. The cause of this palpable error in a too eager disciple one might hope was not anxiety to snatch up all or any arms available against Christianity, were it not for the tone unhappily adopted by this author. But it is unfortunately quite impossible to mistake his meaning and intention, for he is a writer whose offensiveness is gross, while it is sometimes almost surpassed by an amazing shallowness. Of course, as might fully be expected, he adopts and reproduces the absurdly trivial objections to absolute morality drawn from differences in national customs.[7] And he seems to have as little conception of the distinction between "formally" moral actions and those which are only "materially" moral, as of that between the *verbum mentale* and the *verbum oris*. As an example of his onesidedness, it may be remarked that he compares the skulls of the

[7] "Lectures on Man," translated by the Anthropological Society, 1864, p. 229.

American monkeys (*Cebus apella* and *C. albifrons*) with the intention of showing that man is of several distinct species, because skulls of different men are less alike than are those of these two monkeys; and he does this regardless of how the skulls of domestic animals (with which it is far more legitimate to compare races of men than with wild kinds), e. g., of different dogs or pigeons, tell precisely in the opposite direction. Regardless also of the fact that perhaps no genus of monkeys is in a more unsatisfactory state as to the determination of its different kinds than the genus chosen by him for illustration. This is so much the case that J. A. Wagner (in his supplement to Schreber's great work on Beasts) at first included all the kinds in a single species.

As to the strength of his prejudice and his regrettable coarseness, one quotation will be enough to display both. Speaking of certain early Christian missionaries, he says:[8] "It is not so very improbable that the new religion, before which the flourishing Roman civilization relapsed into a state of barbarism, should have been introduced by people in whose skulls the anatomist finds simious characters so well developed, and in which the phrenologist finds the organ of veneration so much enlarged. I shall, in the meanwhile, call these simious narrow skulls of Switzerland 'Apostle skulls,' as I imagine that in life they must have resembled the type of Peter the Apostle, as represented in Byzantine-Nazarene art."

In face of such a spirit, can it be wondered at that disputants have grown warm? Moreover, in estimating the vehemence of the opposition which has been offered, it should be borne in mind that the views defended by religious writers are, or should be, all-important in their eyes. They could not be expected to view with equanimity the destruction in many minds of "theology, natural and revealed,

[8] "Lectures on Man," p. 378.

psychology, and metaphysics;" nor to weigh with calm and frigid impartiality arguments which seemed to them to be fraught with results of the highest moment to mankind, and therefore imposing on their consciences strenuous opposition as a first duty. Cool, judicial impartiality in them would have been a sign perhaps of intellectual gifts, but also of a more important deficiency of generous emotion.

It is easy to complain of the onesidedness of many of those who oppose Darwinism in the interest of orthodoxy; but not at all less patent is the intolerance and narrow-mindedness of some of those who advocate it, avowedly or covertly, in the interest of heterodoxy. This hastiness of rejection or acceptance, determined by ulterior consequences believed to attach to "Natural Selection," is unfortunately in part to be accounted for by some expressions and a certain tone to be found in Mr. Darwin's writings. That his expressions, however, are not always to be construed literally is manifest. His frequent use metaphorically of the expressions, "contrivance," for example, and "purpose," has elicited, from the Duke of Argyll and others, criticisms which fail to tell against their opponent, because such expressions are, in Mr. Darwin's writings merely figurative—metaphors, and nothing more.

It may be hoped, then, that a similar looseness of expression will account for passages of a directly opposite tendency to that of his theistic metaphors.

Moreover, it must not be forgotten that he frequently uses that absolutely theological term, "the Creator," and that he has retained in all the editions of his "Origin of Species" an expression which has been much criticised. He speaks "of life, with its several powers, having been originally breathed by the Creator into a few forms, or into one."[9] This is merely mentioned in justice to Mr. Darwin, and by no means because it is a position which this

[9] See 5th edit., 1869, p. 579.

book is intended to support. For, from Mr. Darwin's usual mode of speaking, it appears that by such divine action he means a supernatural intervention, whereas it is here contended that throughout the whole process of physical evolution—the first manifestation of life included—*supernatural* action is assuredly not to be looked for.

Again, in justice to Mr. Darwin, it may be observed that he is addressing the general public, and opposing the ordinary and common objections of popular religionists, who have inveighed against "Evolution" and "Natural Selection" as atheistic, impious, and directly conflicting with the dogma of creation.

Still, in so important a matter, it is to be regretted that he did not take the trouble to distinguish between such merely popular views and those which repose upon some more venerable authority. Mr. John Stuart Mill has replied to similar critics, and shown that the assertion that his philosophy is irreconcilable with theism is unfounded; and it would have been better if Mr. Darwin had dealt in the same manner with some of his assailants, and shown the futility of certain of their objections when viewed from a more elevated religious stand-point. Instead of so doing, he seems to adopt the narrowest notions of his opponents, and, far from endeavoring to expand them, appears to wish to indorse them, and to lend to them the weight of his authority. It is thus that Mr. Darwin seems to admit and assume that the idea of "creation" necessitates a belief in an interference with, or dispensation of, natural laws, and that "creation" must be accompanied by arbitrary and unorderly phenomena. None but the crudest conceptions are placed by him to the credit of supporters of the dogma of creation, and it is constantly asserted that they, to be consistent, must offer "creative fiats" as explanations of physical phenomena, and be guilty of numerous other such absurdities. It is impossible, therefore, to acquit Mr. Darwin of at least

a certain carelessness in this matter; and the result is, he has the appearance of opposing ideas which he gives no clear evidence of having ever fully appreciated. He is far from being alone in this, and perhaps merely takes up and reiterates, without much consideration, assertions previously assumed by others. Nothing could be further from Mr. Darwin's mind than any, however small, intentional misrepresentation; and it is therefore the more unfortunate that he should not have shown any appreciation of a position opposed to his own other than that gross and crude one which he combats so superfluously—that he should appear, for a moment, to be one of those, of whom there are far too many, who first misrepresent their adversary's view and then elaborately refute it; who, in fact, erect a doll utterly incapable of self-defence, and then, with a flourish of trumpets and many vigorous strokes, overthrow the helpless dummy they had previously raised.

This is what many do who more or less distinctly oppose theism in the interests, as they believe, of physical science; and they often represent, among other things, a gross and narrow anthropomorphism as the necessary consequence of views opposed to those which they themselves advocate. Mr. Darwin and others may perhaps be excused if they have not devoted much time to the study of Christian philosophy; but they have no right to assume or accept without careful examination, as an unquestioned fact, that in that philosophy there is a necessary antagonism between the two ideas, "creation" and "evolution," as applied to organic forms.

It is notorious and patent to all who choose to seek, that many distinguished Christian thinkers have accepted and do accept both ideas, i. e., both "creation" and "evolution."

As much as ten years ago, an eminently Christian writer observed: "The creationist theory does not necessitate the

perpetual search after manifestations of miraculous powers and perpetual 'catastrophes.' Creation is not a miraculous interference with the laws of Nature, but the very institution of those laws. Law and regularity, not arbitrary intervention, was the patristic ideal of creation. With this notion, they admitted without difficulty the most surprising origin of living creatures, provided it took place by *law*. They held that when God said, 'Let the waters produce,' 'Let the earth produce,' He conferred forces on the elements of earth and water, which enabled them naturally to produce the various species of organic beings. This power, they thought, remains attached to the elements throughout all time." [10] The same writer quotes St. Augustine and St. Thomas Aquinas, to the effect that, "in the institution of Nature we do not look for miracles, but for the laws of Nature." [11] And, again, St. Basil,[12] speaks of the continued operation of natural laws in the production of all organisms.

So much for writers of early and mediæval times. As to the present day, the author can confidently affirm that there are many as well versed in theology as Mr. Darwin is in his own department of natural knowledge, who would not be disturbed by the thorough demonstration of his theory. Nay, they would not even be in the least painfully affected at witnessing the generation of animals of complex organization by the skilful artificial arrangement of natural forces, and the production, in the future, of a fish, by means analogous to those by which we now produce urea.

And this because they know that the possibility of such phenomena, though by no means actually foreseen, has yet

[10] *The Rambler*, March, 1860, vol. xii., p. 372.

[11] "In primâ institutione naturæ non quæritur miraculum, sed quid natura rerum habeat, ut Augustinus dicit, lib. ii., sup. Gen. and lit. c. l." (St. Thomas, Sum. I^ae. lxvii. 4, ad 3.)

[12] "Hexaem." Hom. ix., p. 81.

been fully provided for in the old philosophy centuries before Darwin, or even before Bacon, and that their place in the system can be at once assigned them without even disturbing its order or marring its harmony.

Moreover, the old tradition in this respect has never been abandoned, however much it may have been ignored or neglected by some modern writers. In proof of this it may be observed that perhaps no post-mediæval theologian has a wider reception among Christians throughout the world than Suarez, who has a separate section [13] in opposition to those who maintain the distinct creation of the various kinds—or substantial forms—of organic life.

But the consideration of this matter must be deferred for the present, and the question of evolution, whether Darwinian or other, be first gone into. It is proposed, after that has been done, to return to this subject (here merely alluded to), and to consider at some length the bearing of "Evolution," whether Darwinian or non-Darwinian, upon "Creation and Theism."

Now we will revert simply to the consideration of the theory of "Natural Selection" itself.

Whatever may have hitherto been the amount of acceptance that this theory has met with, all, I think, anticipated that the appearance of Mr. Darwin's large and careful work on "Animals and Plants under Domestication" could but further increase that acceptance. It is, however, somewhat problematical how far such anticipations will be realized. The newer book seems to add after all but little in support of the theory, and to leave most, if not all, its difficulties exactly where they were. It is a question, also, whether the hypothesis of "Pangenesis" [14] may not be

[13] Suarez, Metaphysica. Edition Vivés. Paris, 1868. Vol. I. Disputatio xv., § 2.

[14] "Pangenesis" is the name of the new theory proposed by Mr. Darwin, in order to account for various obscure physiological facts, such,

found rather to encumber than to support the theory it was intended to subserve. However, the work in question treats only of domestic animals, and probably the next instalment will address itself more vigorously and directly to the difficulties which seem to us yet to bar the way to a complete acceptance of the doctrine.

If the theory of Natural Selection can be shown to be quite insufficient to explain any considerable number of important phenomena connected with the origin of species, that theory, as *the* explanation, must be considered as provisionally discredited.

If other causes than Natural (including sexual) Selection can be proved to have acted—if variation can in any cases be proved to be subject to certain determinations in special directions by other means than Natural Selection, it then becomes probable, *a priori*, that it is so in others, and that Natural Selection depends upon, and only supplements, such means, which conception is opposed to the pure Darwinian position.

Now it is certain, *a priori*, that variation is obedient to some law, and therefore that "Natural Selection" itself must be capable of being subsumed into some higher law; and it is evident, I believe, *a posteriori*, that Natural Selection is, at the very least, aided and supplemented by some other agency.

Admitting, then, organic and other evolution, and that new forms of animals and plants (new species, genera, etc.)

e. g., as the occasional reproduction, by individuals, of parts which they have lost; the appearance in offspring of parental, and sometimes of remote ancestral, characters, etc. It accounts for these phenomena by supposing that every creature possesses countless indefinitely-minute organic atoms, termed "gemmules," which atoms are supposed to be generated in every part of every organ, to be in constant circulation about the body, and to have the power of reproduction. Moreover, atoms from every part are supposed to be stored in the generative products.

have from time to time been evolved from preceding animals and plants, it follows, if the views here advocated are true, that this evolution has not taken place by the action of "Natural Selection" *alone*, but through it (among other influences) aided by the concurrent action of some other natural law or laws, at present undiscovered; and probably that the genesis of species takes place partly, perhaps mainly, through laws which may be most conveniently spoken of as special powers and tendencies existing in each organism; and partly through influences exerted on each by surrounding conditions and agencies organic and inorganic, terrestrial and cosmical, among which the "survival of the fittest" plays a certain but subordinate part.

The theory of "Natural Selection" may (though it need not) be taken in such a way as to lead men to regard the present organic world as formed, so to speak, *accidentally*, beautiful and wonderful as is confessedly the hap-hazard result. The same may perhaps be said with regard to the system advocated by Mr. Herbert Spencer, who, however, also relegates "Natural Selection" to a subordinate *rôle*. The view here advocated, on the other hand, regards the whole organic world as arising and going forward in one harmonious development similar to that which displays itself in the growth and action of each separate individual organism. It also regards each such separate organism as the expression of powers and tendencies not to be accounted for by "Natural Selection" alone, or even by that together with merely the direct influence of surrounding conditions.

The difficulties which appear to oppose themselves to the reception of "Natural Selection" or "the survival of the fittest," as the one explanation of the origin of species, have no doubt been already considered by Mr. Darwin. Nevertheless, it may be worth while to enumerate them, and to state the considerations which appear to give them weight; and there is no doubt but that a naturalist

so candid and careful as the author of the theory in question, will feel obliged, rather than the reverse, by the suggestion of all the doubts and difficulties which can be brought against it.

What is to be brought forward may be summed up as follows:

That "Natural Selection" is incompetent to account for the incipient stages of useful structures.

That it does not harmonize with the coexistence of closely-similar structures of diverse origin.

That there are grounds for thinking that specific differences may be developed suddenly instead of gradually.

That the opinion that species have definite though very different limits to their variability is still tenable.

That certain fossil transitional forms are absent, which might have been expected to be present.

That some facts of geographical distribution supplement other difficulties.

That the objection drawn from the physiological difference between "species" and "races" still exists unrefuted.

That there are many remarkable phenomena in organic forms upon which "Natural Selection" throws no light whatever, but the explanations of which, if they could be attained, might throw light upon specific origination.

Besides these objections to the sufficiency of "Natural Selection," others may be brought against the hypothesis of "Pangenesis," which, professing as it does to explain great difficulties, seems to do so by presenting others not less great—almost to be the explanation of *obscurum per obscurius.*