

**Evolution,
Old & New**

[Pg ii]

"The want of a practical acquaintance with Natural History leads the author to take an erroneous view of the bearing of his own theories on those of Mr. Darwin.—*Review of 'Life and Habit,' by Mr. A. R. Wallace, in 'Nature,' March 27, 1879.*

"Neither lastly would our observer be driven out of his conclusion, or from his confidence in its truth, by being told that he knows nothing at all about the matter. He knows enough for his argument; he knows the utility of the end; he knows the subserviency and adaptation of the means to the end. These points being known, his ignorance concerning other points, his doubts concerning other points, affect not the certainty of his reasoning. The consciousness of knowing little need not beget a distrust of that which he does know."

Paley's '*Natural Theology*,' chap. i.

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Evolution, Old & New

Or the Theories of Buffon, Dr. Erasmus Darwin and Lamarck,
as compared with that of Charles Darwin

by

Samuel Butler

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Great Britain*

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NOTE

The demand for a new edition of "Evolution, Old and New," gives me an opportunity of publishing Butler's latest revision of his work. The second edition of "Evolution, Old and New," which was published in 1882 and re-issued with a new title-page in 1890, was merely a re-issue of the first edition with a new preface, an appendix, and an index. At a later date, though I cannot say precisely when, Butler revised the text of the book in view of a future edition. The corrections that he made are mainly verbal and do not, I think, affect the argument to any considerable extent. Butler, however, attached sufficient importance to them to incur the expense of having the stereotypes of more than fifty pages cancelled and new stereotypes substituted. I have also added a few entries to the index, which are taken from a copy of the book, now in my possession, in which Butler made a few manuscript notes.

R. A. STREATFEILD.

October, 1911.

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AUTHOR'S PREFACE TO THE SECOND EDITION

Since the proof-sheets of the Appendix to this book left my hands, finally corrected, and too late for me to be able to recast the first of the two chapters that compose it, I hear, with the most profound regret, of the death of Mr. Charles Darwin.

It being still possible for me to refer to this event in a preface, I hasten to say how much it grates upon me to appear to renew my attack upon Mr. Darwin under the present circumstances.

I have insisted in each of my three books on Evolution upon the immensity of the service which Mr. Darwin rendered to that transcendently important theory. In "Life and Habit," I said: "To the end of time, if the question be asked, 'Who taught people to believe in Evolution?' the answer must be that it was Mr. Darwin." This is true; and it is hard to see what palm of higher praise can be awarded to any philosopher.

I have always admitted myself to be under the deepest obligations to Mr. Darwin's works; and it was with the greatest reluctance, not to say repugnance,[Pg viii] that I became one of his opponents. I have partaken of his hospitality, and have had too much experience of the charming simplicity of his manner not to be among the readiest to at once admire and envy it. It is unfortunately true that I believe Mr. Darwin to have behaved badly to me; this is too notorious to be denied; but at the same time I cannot be blind to the fact that no man can be judge in his own case, and that after all Mr. Darwin may have been right, and I wrong.

At the present moment, let me impress this latter alternative upon my mind as far as possible, and dwell only upon that side of Mr. Darwin's work and character, about which there is no difference of opinion among either his admirers or his opponents.

April 21, 1882.

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PREFACE.

Contrary to the advice of my friends, who caution me to avoid all appearance of singularity, I venture upon introducing a practice, the expediency of which I will submit to the judgment of the reader. It is one which has been adopted by musicians for more than a century—to the great convenience of all who are fond of music—and I observe that within the last few years two such distinguished painters as Mr. Alma-Tadema and Mr. Hubert Herkomer have taken to it. It is a matter for regret that the practice should not have been general at an earlier date, not only among painters and musicians, but also among the people who write books. It consists in signifying the number of a piece of music, picture, or book by the abbreviation "Op." and the number whatever it may happen to be.

No work can be judged intelligently unless not only the author's relations to his surroundings, but also the relation in which the work stands to the life and other works of the author, is understood and borne in mind; nor do I know any way of conveying this information at a glance, comparable to that which I now borrow from musicians. When we see the number against a work of Beethoven, we need ask no further to be informed concerning the general character of the[Pg x] music. The same holds good more or less with all composers. Handel's works were not numbered—not at least his operas and oratorios. Had they been so, the significance of the numbers on Susanna and Theodora would have been at once apparent, connected as they would have been with the number on Jephthah, Handel's next and last work, in which he emphatically

repudiates the influence which, perhaps in a time of self-distrust, he had allowed contemporary German music to exert over him. Many painters have dated their works, but still more have neglected doing so, and some of these have been not a little misconceived in consequence. As for authors, it is unnecessary to go farther back than Lord Beaconsfield, Thackeray, Dickens, and Scott, to feel how much obliged we should have been to any custom that should have compelled them to number their works in the order in which they were written. When we think of Shakespeare, any doubt which might remain as to the advantage of the proposed innovation is felt to disappear.

My friends, to whom I urged all the above, and more, met me by saying that the practice was doubtless a very good one in the abstract, but that no one was particularly likely to want to know in what order my books had been written. To which I answered that even a bad book which introduced so good a custom would not be without value, though the value might lie in the custom, and not in the book itself; whereon, seeing that I was obstinate, they left me, and interpreting their doing so into at any rate a modified approbation of my design, I have carried it into practice.[Pg xi]

The edition of the 'Philosophie Zoologique' referred to in the following volume, is that edited by M. Chas. Martins, Paris, Librairie F. Savy, 24, Rue de Hautefeuille, 1873.

The edition of the 'Origin of Species' is that of 1876, unless another edition be especially named.

The italics throughout the book are generally mine, except in the quotations from Miss Seward, where they are all her own.

I am anxious also to take the present opportunity of acknowledging the obligations I am under to my friend Mr. H. F. Jones, and to other friends (who will not allow me to mention their names, lest more errors should be discovered than they or I yet know of), for the invaluable assistance they have given me while this work was going through the press. If I am able to let it go before the public with any comfort or peace of mind, I owe it entirely to the carefulness of their supervision.

I am also greatly indebted to Mr. Garnett, of the British Museum, for having called my attention to many works and passages of which otherwise I should have known nothing.

March 31, 1879.

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CHAPTER XXI.

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EVOLUTION, OLD AND NEW

CHAPTER I.

STATEMENT OF THE QUESTION. CURRENT OPINION ADVERSE TO TELEOLOGY.

Of all the questions now engaging the attention of those whose destiny has commanded them to take more or less exercise of mind, I know of none more interesting than that which deals with what is called teleology—that is to say, with design or purpose, as evidenced by the different parts of animals and plants.

The question may be briefly stated thus:—

Can we or can we not see signs in the structure of animals and plants, of something which carries with it the idea of contrivance so strongly that it is impossible for us to think of the structure, without at the same time thinking of contrivance, or design, in connection with it?

It is my object in the present work to answer this question in the affirmative, and to lead my reader to agree with me, perhaps mainly, by following the history[Pg 2] of that opinion which is now supposed to be fatal to a purposive view of animal and vegetable organs. I refer to the theory of evolution or descent with modification.

Let me state the question more at large.

When we see organs, or living tools—for there is no well-developed organ of any living being which is not used by its possessor as an instrument or tool for the effecting of some purpose which he considers or has considered for his advantage—when we see living tools which are as admirably fitted for the work required of them, as is the carpenter's plane for planing, or the blacksmith's hammer and anvil for the hammering of iron, or the tailor's needle for sewing, what conclusion shall we adopt concerning them?

Shall we hold that they must have been designed or contrived, not perhaps by mental processes indistinguishable from those by which the carpenter's saw or the watch has been designed, but still by processes so closely resembling these that no word can be found to express the facts of the case so nearly as the word "design"? That is to say, shall we imagine that they were arrived at by a living mind as the result of scheming and contriving, and thinking (not without occasional mistakes) which of the courses open to it seemed best fitted for the occasion, or are we to regard the apparent connection between such an organ, we will say, as the eye, and the sight which is

affected by it, as in no way due to the design or plan of a living intelligent being, but as caused simply by the accumulation, one upon another, of an almost infinite series of small pieces of good fortune?[Pg 3]

In other words, shall we see something for which, as Professor Mivart has well said, "to us the word 'mind' is the least inadequate and misleading symbol," as having given to the eagle an eyesight which can pierce the sun, but which, in the night is powerless; while to the owl it has given eyes which shun even the full moon, but find a soft brilliancy in darkness? Or shall we deny that there has been any purpose or design in the fashioning of these different kinds of eyes, and see nothing to make us believe that any living being made the eagle's eye out of something which was not an eye nor anything like one, or that this living being implanted this particular eye of all others in the eagle's head, as being most in accordance with the habits of the creature, and as therefore most likely to enable it to live contentedly and leave plenitude of offspring? And shall we then go on to maintain that the eagle's eye was formed little by little by a series of accidental variations, each one of which was thrown for, as it were, with dice?

We shall most of us feel that there must have been a little cheating somewhere with these accidental variations before the eagle could have become so great a winner.

I believe I have now stated the question at issue so plainly that there can be no mistake about its nature, I will therefore proceed to show as briefly as possible what have been the positions taken in regard to it by our forefathers, by the leaders of opinion now living, and what I believe will be the next conclusion that will be adopted for any length of time by any considerable number of people.[Pg 4]

In the times of the ancients the preponderance of opinion was in favour of teleology, though impugnors were not wanting. Aristotle^[1] leant towards a denial of purpose, while Plato^[2] was a firm believer in design. From the days of Plato to our own times, there have been but few objectors to the teleological or purposive view of nature. If an animal had an eye, that eye was regarded as something which had been designed in order to enable its owner to see after such fashion as should be most to its advantage.

This, however, is now no longer the prevailing opinion either in this country or in Germany.

Professor Haeckel holds a high place among the leaders of German philosophy at the present day. He declares a belief in evolution and in purposiveness to be incompatible, and denies purpose in language which holds out little prospect of a compromise.

"As soon, in fact," he writes, "as we acknowledge the exclusive activity of the physico-chemical causes in living (organic) bodies as well as in so-called inanimate (inorganic) nature,"—and this is what Professor Haeckel holds we are bound to do if we accept the theory of descent with modification—"we concede exclusive dominion to that view of the universe, which we may designate as *mechanical*, and which is opposed to the teleological conception. If we compare all the ideas of the universe prevalent among different nations at different times, we can divide them all into two[Pg 5] sharply contrasted groups—a *causal* or *mechanical*, and a *teleological* or *vitalistic*. The latter has prevailed generally in biology until now, and accordingly the animal and vegetable kingdoms have been considered as the products of a creative power, acting for a definite purpose. In the contemplation of every organism, the unavoidable conviction seemed to press itself upon us, that such a wonderful machine, so complicated an apparatus for motion as exists in the organism, could only be produced by a power analogous to, but infinitely more powerful than the power of man in the construction of his machines."^[3]

A little lower down he continues:—

"I maintain with regard to" this "much talked of 'purpose in nature' that it has no existence but for those persons who observe phenomena in plants and animals in the most superficial manner. Without going more deeply into the matter, we can see at once that the rudimentary organs are a formidable obstacle to this theory. And, indeed, anyone who makes a really close study of the organization and mode of life of the various animals and plants, ... must necessarily come to the conclusion, that this 'purposiveness' no more exists than the much talked of 'beneficence' of the Creator."^[4]

Professor Haeckel justly sees no alternative between, upon the one hand, the creation of independent species by a Personal God—by a "Creator," in fact, who "becomes an organism, who designs a plan, reflects upon and varies this plan, and finally forms creatures according[Pg 6] to it, as a human architect would construct his building,"^[5]—and the denial of all plan or purpose whatever. There can be no question but that he is right here. To talk of a "designer" who has no tangible existence, no organism with which to think, no bodily mechanism with which to carry his purposes into effect; whose design is not design inasmuch as it has to contend with no impediments from ignorance or impotence, and who thus contrives but by a sort of make-believe in which there is no contrivance; who has a familiar name, but nothing beyond a name which any human sense has ever been able to perceive—this is an abuse of words—an attempt to palm off a shadow upon our understandings as though it were a substance. It is plain therefore that there must either be a designer who "becomes an

organism, designs a plan, &c.," or that there can be no designer at all and hence no design.

We have seen which of these alternatives Professor Haeckel has adopted. He holds that those who accept evolution are bound to reject all "purposiveness." And here, as I have intimated, I differ from him, for reasons which will appear presently. I believe in an organic and tangible designer of every complex structure, for so long a time past, as that reasonable people will be incurious about all that occurred at any earlier time.

Professor Clifford, again, is a fair representative of opinions which are finding favour with the majority of our own thinkers. He writes:—

"There are here some words, however, which require careful definition. And first the word purpose. A[Pg 7] thing serves a purpose when it is adapted for some end; thus a corkscrew is adapted to the end of extracting corks from bottles, and our lungs are adapted to the end of respiration. We may say that the extraction of corks is the purpose of the corkscrew, and that respiration is the purpose of the lungs, but here we shall have used the word in two different senses. A man made the corkscrew with a purpose in his mind, and he knew and intended that it should be used for pulling out corks. *But nobody made our lungs with a purpose in his mind and intended that they should be used for breathing.* The respiratory apparatus was adapted to its purpose by natural selection, namely, by the gradual preservation of better and better adaptations, and by the killing-off of the worse and imperfect adaptations."^[6]

No denial of anything like design could be more explicit. For Professor Clifford is well aware that the very essence of the "Natural Selection" theory, is that the variations shall have been mainly accidental and without design of any sort, but that the adaptations of structure to need shall have come about by the accumulation, through natural selection, of any variation that *happened* to be favourable.

It will be my business on a later page not only to show that the lungs are as purposive as the corkscrew, but furthermore that if drawing corks had been a matter of as much importance to us as breathing is, the list of our organs would have been found to comprise one corkscrew at the least, and possibly two, twenty, or ten thousand; even as we see that the trowel without which[Pg 8] the beaver cannot plaster its habitation in such fashion as alone satisfies it, is incorporate into the beaver's own body by way of a tail, the like of which is to be found in no other animal.

To take a name which carries with it a far greater authority, that of Mr. Charles Darwin. He writes:—

"It is scarcely possible to avoid comparing the eye with a telescope. We know that this instrument has been perfected by the long-continued efforts of the highest human intellects; and we naturally infer that the eye has been formed by a somewhat analogous process. But may not this inference be presumptuous? Have we any right to declare that the Creator works by intellectual powers like those of man?"^[7]

Here purposiveness is not indeed denied point-blank, but the intention of the author is unmistakable, it is to refer the wonderful result to the gradual accumulation of small accidental improvements which were not due as a rule, if at all, to anything "analogous" to design.

"Variation," he says, "will cause the slight alterations;" that is to say, the slight successive variations whose accumulation results in such a marvellous structure as the eye, are caused by—variation; or in other words, they are indefinite, due to nothing that we can lay our hands upon, and therefore certainly not due to design.

"Generation," continues Mr. Darwin, "will multiply them almost infinitely, and natural selection will pick out with unerring skill each improvement. Let this process go on for millions of years, and during each year on millions of individuals of many kinds; and[Pg 9] may we not believe that a living optical instrument might be thus formed as superior to one of glass, as the works of the Creator are to those of man?"^[8]

The reader will observe that the only skill—and this involves design—supposed by Mr. Darwin to be exercised in the foregoing process, is the "unerring skill" of natural selection. Natural selection, however, is, as he himself tells us, a synonym for the survival of the fittest, which last he declares to be the "more accurate" expression, and to be "sometimes" equally convenient.^[9] It is clear then that he only speaks metaphorically when he here assigns "unerring skill" to the fact that the fittest individuals commonly live longest and transmit most offspring, and that he sees no evidence of design in the numerous slight successive "alterations"—or variations—which are "caused by variation."

It were easy to multiply quotations which should prove that the denial of "purposiveness" is commonly conceived to be the inevitable accompaniment of a belief in evolution. I will, however, content myself with but one more—from Isidore Geoffroy St. Hilaire.

"Whoever," says this author, "holds the doctrine of final causes, will, if he is consistent, hold also that of the immutability of species; and again, the opponent of the one doctrine will oppose the other also."^[10]

Nothing can be plainer; I believe, however, that even without quotation the reader would have recognized[Pg 10] the accuracy of my contention that a belief in the purposiveness or design of animal and vegetable organs is commonly held to be incompatible with the belief that they have all been evolved from one, or at any rate, from not many original, and low, forms of life. Generally, however, as this incompatibility is accepted, it is not unchallenged. From time to time a voice is uplifted in protest, whose tones cannot be disregarded.

"I have always felt," says Sir William Thomson, in his address to the British Association, 1871, "that this hypothesis" (natural selection) "does not contain the true theory of evolution, if indeed evolution there has been, in biology. Sir John Herschel, in expressing a favourable judgment on the hypothesis of zoological evolution (with however some reservation in respect to the origin of man), objected to the doctrine of natural selection on the ground that it was too like the Laputan method of making books, and that it did not sufficiently take into account a continually guiding and controlling intelligence. This seems to me a most valuable and instructive criticism. *I feel profoundly convinced that the argument of design has been greatly too much lost sight of in recent zoological speculations.* Reaction against the frivolities of teleology such as are to be found in the notes of the learned commentators on Paley's 'Natural Theology,' has, I believe, had a temporary effect in turning attention from the solid and irrefragable argument so well put forward in that excellent old book. But overpoweringly strong proofs of intelligent and benevolent design lie all around us,"^[1] &c. [Pg 11] Sir William Thomson goes on to infer that all living beings depend on an ever-acting Creator and Ruler—meaning, I am afraid, a Creator who is not an organism. Here I cannot follow him, but while gladly accepting his testimony to the omnipresence of intelligent design in almost every structure, whether of animal or plant, I shall content myself with observing the manner in which plants and animals act and with the consequences that are legitimately deducible from their action.

FOOTNOTES:

[1] See note to Mr. Darwin, Historical Sketch, &c., 'Origin of Species, p. xiii. ed. 1876, and Arist. 'Physicæ Auscultationes,' lib. ii. cap. viii. s. 2.

[2] See Phædo and Timæus.

[3] 'History of Creation,' vol. i. p. 18 (H. S. King and Co., 1876).

[4] Ibid. p. 19.

[5] 'History of Creation,' vol. i. p. 73 (H. S. King and Co., 1876).

[6]'Fortnightly Review,' new series, vol. xviii. p. 795.

[7]'Origin of Species,' p. 146, ed. 1876.

[8]'Origin of Species,' p. 146, ed. 1876.

[9]Page 49.

[10]'Vie et Doctrine scientifique d'Étienne Geoffroy St. Hilaire,' by Isidore Geoffroy St. Hilaire. Paris, 1847, p. 344.

[11]Address to the British Association, 1871.

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CHAPTER II

THE TELEOLOGY OF PALEY AND THE THEOLOGIANS.

Let us turn for a while to Paley, to whom Sir W. Thomson has referred us. His work should be so well known that an apology is almost due for quoting it, yet I think it likely that at least nine out of ten of my readers will (like myself till reminded of it by Sir W. Thomson's address) have forgotten its existence.

"In crossing a heath," says Paley, "suppose I pitched my foot against a stone, and were asked how the stone came to be there; I might possibly answer that for anything I knew to the contrary, it had lain there for ever; nor would it perhaps be very easy to show the absurdity of this answer. But suppose I had found a *watch* upon the ground, and it should be inquired how the watch happened to be in that place; I should hardly think of the answer I had before given—that for anything I knew the watch might have been always there. Yet, why should not this answer serve for the watch as well as for the stone? Why is it not as admissible in the second case as in the first? For this reason, and for no other, viz. that when we come to inspect the watch, we perceive (what we could not discover in the stone) that its several parts are framed and put together[Pg 13] for a purpose, e. g. that they are so formed and adjusted as to produce motion, and that motion so regulated as to point out the hour of the day: that if the different parts had been differently shaped from what they are, of a different size from what they are, or placed after any other manner, or in any other order, than that in which they are placed, either no motion at all would have been carried on in the machine, or none that would have answered the use which is now served by it. To reckon up a few of the plainest of these parts, and of their offices all tending to one result: we see a cylindrical box containing a coiled elastic spring, which, by its

endeavours to relax itself, turns round the box. We next observe a flexible chain (artificially wrought for the sake of flexure) communicating the action of the spring from the box to the fusee. We then find a series of wheels the teeth of which catch in, and apply to each other, conducting the motion from the fusee to the balance, and from the balance to the pointer; and at the same time by the size and shape of those wheels so regulating the motion as to terminate in causing an index, by an equable and measured progression, to pass over a given space in a given time. We take notice that the wheels are made of brass in order to keep them from rust; the springs of steel, no other metal being so elastic; that over the face of the watch there is placed a glass, a material employed on no other part of the work, but in the room of which if there had been any other than a transparent substance, the hour could not have been observed without opening the case. This mechanism being observed, ... the inference, we[Pg 14] think, is inevitable that the watch must have had a maker; that there must have existed, *at some time, and at some place or other, an artificer* or artificers who formed it for the purpose which we find it actually to answer; who comprehended its construction and designed its use."^[12]

.....

"That an animal is a machine, is a proposition neither correctly true nor wholly false.... I contend that there is a mechanism in animals; that this mechanism is as properly such, as it is in machines made by art; that this mechanism is intelligible and certain; that it is not the less so because it often begins and terminates with something which is not mechanical; that wherever it is intelligible and certain, it demonstrates intention and contrivance, as well in the works of nature as in those of art; and that it is the best demonstration which either can afford."^[13]

There is only one legitimate inference deducible from these premises if they are admitted as sound, namely, that there must have existed "*at some time, and in some place, an artificer*" who formed the animal mechanism after much the same mental processes of observation, endeavour, successful contrivance, and after a not wholly unlike succession of bodily actions, as those with which a watchmaker has made a watch. Otherwise the conclusion is impotent, and the whole argument becomes a mere juggle of words.

"Now, supposing or admitting," continues Paley, "that we know nothing of the proper internal constitution of a[Pg 15] gland, or of the mode of its acting upon the blood; then our situation is precisely like that of an unmechanical looker-on who stands by a stocking loom, a corn mill, a carding machine, or a threshing machine, at work, the fabric and mechanism of which, as well as all that passes within, is hidden from his

sight by the outside case; or if seen, would be too complicated for his uninformed, uninstructed understanding to comprehend. And what is that situation? This spectator, ignorant as he is, sees at one end a material enter the machine, as unground grain the mill, raw cotton the carding machine, sheaves of unthreshed corn the threshing machine, and when he casts his eye to the other end of the apparatus, he sees the material issuing from it in a new state and what is more, a state manifestly adapted for its future uses: the grain in meal fit for the making of bread, the wool in rovings fit for the spinning into threads, the sheaf in corn fit for the mill. Is it necessary that this man, in order to be convinced that design, that intention, that contrivance has been employed about the machine, should be allowed to pull it to pieces, should be enabled to examine the parts separately, explore their action upon one another, or their operation, whether simultaneous or successive, upon the material which is presented to them? He may long to do this to satisfy his curiosity; he may desire to do it to improve his theoretic knowledge; ... but for the purpose of ascertaining the existence of counsel and design in the formation of the machine, he wants no such intromission or privity. The effect upon the material, the change produced in it, the utility of the[Pg 16] change for future applications, abundantly testify, be the concealed part of the machine, or of its construction, what it will, *the hand and agency of a contriver*."^[14]

This is admirably put, but it will apply to the mechanism of animal and vegetable bodies only, if it is used to show that they too must have had a contriver who has a hand, or something tantamount to one; who does act; who, being a contriver, has what all other contrivers must have, if they are to be called contrivers—a body which can suffer more or less pain or chagrin if the contrivance is unsuccessful. If this is what Paley means, his argument is indeed irrefragable; but if he does not intend this, his words are frivolous, as so clear and acute a reasoner must have perfectly well known.

Whether Paley's argument will prove a source of lasting strength to himself or no, is a point which my readers will decide presently; but I am very clear about its usefulness to my own position. I know few writers whom I would willingly quote more largely, or from whom I find it harder to leave off quoting when I have once begun. A few more passages, however, must suffice.

"I challenge any man to produce in the joints and pivots of the most complicated or the most flexible machine that ever was contrived, a construction *more artificial*" (here we have it again), "or more evidently artificial than the human neck. Two things were to be done. The head was to have the power of bending forward and backward as in the act of nodding, stooping,[Pg 17] looking upwards or downwards; and at the

same time of turning itself round upon the body to a certain extent, the quadrant, we will say, or rather perhaps a hundred and twenty degrees of a circle. For these two purposes two distinct contrivances are employed. First the head rests immediately upon the uppermost part of the vertebra, and is united to it by a hinge-joint; upon this joint the head plays freely backward and forward as far either way as is necessary or as the ligaments allow, which was the first thing required.

"But then the rotatory motion is thus unprovided for; therefore, secondly, to make the head capable of this a further mechanism is introduced, not between the head and the uppermost bone of the neck, where the hinge is, but between that bone and the next underneath it. It is a mechanism resembling a tenon and mortise. This second or uppermost bone but one has what the anatomists call a process, viz. a projection somewhat similar in size and shape to a tooth, which tooth, entering a corresponding hollow socket in the bone above it, forms a pivot or axle, upon which that upper bone, together with the head which it supports, turns freely in a circle, and as far in the circle as the attached muscles permit the head to turn. Thus are both motions perfect without interfering with each other. When we nod the head we use the hinge-joint, which lies between the head and the first bone of the neck. When we turn the head round, we use the tenon and mortise, which runs between the first bone of the neck and the second. We see the same contrivance and the same principle employed in the frame or mounting of a telescope. It [Pg 18] is occasionally requisite that the object end of the instrument be moved up and down as well as horizontally or equatorially. For the vertical motion there is a hinge upon which the telescope plays, for the horizontal or equatorial motion, an axis upon which the telescope and the hinge turn round together. And this is exactly the mechanism which is applied to the action of the head, nor will anyone here doubt of the existence of counsel and design, except it be by that debility of mind which can trust to its own reasonings in nothing."^[15]

.....

"The patella, or knee-pan, is a curious little bone; in its form and office unlike any other bone in the body. It is circular, the size of a crown-piece, pretty thick, a little convex on both sides, and covered with a smooth cartilage. It lies upon the front of the knee, and the powerful tendons by which the leg is brought forward pass through it (or rather make it a part of their continuation) from their origin in the thigh to their insertion in the tibia. It protects both the tendon and the joint from any injury which either might suffer by the rubbing of one against the other, or by the pressure of unequal surfaces. It also gives to the tendons a very considerable mechanical advantage by altering the line of their direction, and by advancing it farther out of the centre of motion; and this upon the principles of the resolution of force, upon which

all machinery is founded. These are its uses. But what is most observable in it is that it appears to be supplemental, as it[Pg 19] were, to the frame; added, as it should almost seem, afterwards; not quite necessary, but very convenient. It is separate from the other bones; that is, it is not connected with any other bones by the common mode of union. It is soft, or hardly formed in infancy; and is produced by an ossification, of the inception or progress of which no account can be given from the structure or exercise of the part."^[16]

It is positively painful to me to pass over Paley's description of the joints, but I must content myself with a single passage from this admirable chapter.

"The joints, or rather the ends of the bones which form them, display also in their configuration another use. The nerves, blood-vessels, and tendons which are necessary to the life, or for the motion of the limbs, must, it is evident in their way from the trunk of the body to the place of their destination, travel over the moveable joints; and it is no less evident that in this part of their course they will have from sudden motions, and from abrupt changes of curvature, to encounter the danger of compression, attrition, or laceration. To guard fibres so tender against consequences so injurious, their path is in those parts protected with peculiar care; and that by a provision in the figure of the bones themselves. The nerves which supply the fore arm, especially the inferior cubital nerves, are at the elbow conducted by a kind of covered way, between the condyle, or rather under the inner extuberances, of the bone which composes the upper part of the arm. At the knee the extremity of the thigh-bone is divided by[Pg 20] a sinus or cliff into two heads or protuberances; and these heads on the back part stand out beyond the cylinder of the bone. Through the hollow which lies between the hind parts of these two heads, that is to say, under the ham, between the ham strings, and within the concave recess of the bone formed by the extuberances on either side; in a word, along a defile between rocks pass the great vessels and nerves which go to the leg. Who led these vessels by a road so defended and secured? In the joint at the shoulder, in the edge of the cup which receives the head of the bone, is a notch which is covered at the top with a ligament. Through this hole thus guarded the blood-vessels steal to their destination in the arm instead of mounting over the edge of the concavity."^[17]

.....

"What contrivance can be more mechanical than the following, viz.: a slit in one tendon to let another tendon pass through it? This structure is found in the tendons which move the toes and fingers. The long tendon, as it is called in the foot, which bends the first joint of the toe, passes through the short tendon which bends the

second joint; which course allows to the sinews more liberty and a more commodious action than it would otherwise have been capable of exerting. There is nothing, I believe, in a silk or cotton mill, in the belts or straps or ropes by which the motion is communicated from one part of the machine to another that is more artificial, or more evidently so, than this perforation.

"The next circumstance which I shall mention under[Pg 21] this head of muscular arrangement, is so decidedly a mark of intention, that it always appeared to me to supersede in some measure the necessity of seeking for any other observation upon the subject; and that circumstance is the tendons which pass from the leg to the foot being bound down by a ligament at the ankle, the foot is placed at a considerable angle with the leg. It is manifest, therefore, that flexible strings passing along the interior of the angle, if left to themselves, would, when stretched, start from it. The obvious" (and it must not be forgotten that the preventive *was* obvious) "preventive is to tie them down. And this is done in fact. Across the instep, or rather just above it, the anatomist finds a strong ligament, under which the tendons pass to the foot. The effect of the ligament as a bandage can be made evident to the senses, for if it be cut the tendons start up. The simplicity, yet the clearness of this contrivance, its exact resemblance to established resources of art, place it amongst the most indubitable manifestations of design with which we are acquainted."

Then follows a passage which is interesting, as being the earliest attempt I know of to bring forward an argument against evolution, which was, even in Paley's day, called "Darwinism," after Dr. Erasmus Darwin its propounder.^[18] The argument, I mean, which is drawn from the difficulty of accounting for the[Pg 22] incipency of complex structures. This has been used with greater force by the Rev. J. J. Murphy, Professor Mivart, and others, against that (as I believe) erroneous view of evolution which is now generally received as Darwinism.

"There is also a further use," says Paley, "to be made of this present example, and that is as it precisely contradicts the opinion, that the parts of animals may have been all formed by what is called appetency, i. e. endeavour, perpetuated and imperceptibly working its effect through an incalculable series of generations. We have here no endeavour, but the reverse of it; a constant resistency and reluctance. The endeavour is all the other way. The pressure of the ligament constrains the tendons; the tendons react upon the pressure of the ligament. It is impossible that the ligament should ever have been generated by the exercise of the tendons, or in the course of that exercise, forasmuch as the force of the tendon perpendicularly resists the fibre which confines it, and is constantly endeavouring not to form but to rupture and displace the threads of which the ligament is composed."^[19]

This must suffice.

"True theories," says M. Flourens, inspired by a passage from Fontenelle, which he proceeds to quote, "true theories make themselves," they are not made, but are born and grow; they cannot be stopped from insisting upon their vitality by anything short of intellectual violence, nor will a little violence only suffice to kill them. "True theories," he continues,[Pg 23] "are but the spontaneous mental coming together of facts, which have combined with one another by virtue only of their own natural affinity."^[20]

When a number of isolated facts, says Fontenelle, take form, group themselves together coherently, and present the mind so vividly with an idea of their interdependence and mutual bearing upon each other, that no matter how violently we tear them asunder they insist on coming together again; then, and not till then, have we a theory.

Now I submit that there is hardly one of my readers who can be considered as free from bias or prejudice, who will not feel that the idea of design—or perception by an intelligent living being, of ends to be obtained and of the means of obtaining them—and the idea of the tendons of the foot and of the ligament which binds them down, come together so forcibly, that no matter how strongly Professors Haeckel and Clifford and Mr. Darwin may try to separate them, they are no sooner pulled asunder than they straightway fly together again of themselves.

I shall argue, therefore, no further upon this head, but shall assume it as settled, and shall proceed at once to the consideration that next suggests itself.

FOOTNOTES:

^[12]'Natural Theology,' ch. i. § 1.

^[13]Ch. vii.

^[14]Ch. vii.

^[15]'Natural Theology,' ch. viii.

^[16]'Natural Theology,' ch. viii.

^[17]'Natural Theology,' ch. viii.

^[18]"What!" says Coleridge, in a note on Stillingfleet, to which Mr. Garnett, of the British Museum, has kindly called my attention, "Did Sir Walter Raleigh believe that a male and female ounce (and if so why not two tigers and lions, &c.?) would have

produced in course of generations a cat, or a cat a lion? This is Darwinising with a vengeance."—See 'Athenæum,' March 27, 1875, p. 423.

[19]'Natural Theology,' ch. ix.

[20]"La vraie théorie n'est que l'enchaînement naturel des faits, qui dès qu'ils sont assez nombreux, se touchent, et se lient, les uns aux autres par leur seule vertu propre."—Flourens, 'Buffon, Hist. de ses Travaux.' Paris, 1844, p. 82.

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CHAPTER III.

IMPOTENCE OF PALEY'S CONCLUSION. THE TELEOLOGY OF THE EVOLUTIONIST.

Though the ideas of design, and of the foot, have come together in our minds with sufficient spontaneity, we yet feel that there is a difference—and a wide difference if we could only lay our hands upon it—between the design and manufacture of the ligament and tendons of the foot on the one hand, and on the other the design, manufacture, and combination of artificial strings, pieces of wood, and bandages, whereby a model of the foot might be constructed.

If we conceive of ourselves as looking simultaneously upon a real foot, and upon an admirably constructed artificial one, placed by the side of it, the idea of design, and design by an intelligent living being with a body and soul (without which, as has been already insisted on, the use of the word design is delusive), will present itself strongly to our minds in connection both with the true foot, and with the model; but we find another idea asserting itself with even greater strength, namely, that the design of the true foot is far more intricate, and yet is carried into execution in far more masterly manner than that of the model. We not only feel that there is a wider difference between the ability, time,[Pg 25] and care which have been lavished on the real foot and upon the model, than there is between the skill and the time taken to produce Westminster Abbey, and that bestowed upon a gingerbread cake stuck with sugar plums so as to represent it, but also that these two objects must have been manufactured on different principles. We do not for a moment doubt that the real foot was designed, but we are so astonished at the dexterity of the designer that we are at a loss for some time to think who could have designed it, where he can live, in what manner he studied, for how long, and by what processes he carried out his design, when matured, into actual practice. Until recently it was thought that there was no answer to many of these questions, more especially to those which bear upon the

mode of manufacture. For the last hundred years, however, the importance of a study has been recognized which does actually reveal to us in no small degree the processes by which the human foot is manufactured, so that in the endeavour to lay our hands upon the points of difference between the kind of design with which the foot itself is designed, and the design of the model, we turn naturally to the guidance of those who have made this study their specialty; and a very wide difference does this study, embryology, at once reveal to us.

Writing of the successive changes through which each embryo is forced to pass, the late Mr. G. H. Lewes says that "none of these phases have any adaptation to the future state of the animal, but are in positive contradiction to it or are simply purposeless; whereas[Pg 26] all show stamped on them the unmistakable characters of *ancestral* adaptation, and the progressions of organic evolution. What does the fact imply? There is not a single known example of a complex organism which is not developed out of simpler forms. Before it can attain the complex structure which distinguishes it, there must be an evolution of forms similar to those which distinguish the structure of organisms lower in the series. On the hypothesis of a plan which prearranged the organic world, nothing could be more unworthy of a supreme intelligence than this inability to construct an organism at once, without making several previous tentative efforts, undoing to-day what was so carefully done yesterday, and *repeating for centuries the same tentatives in the same succession*. Do not let us blink this consideration. There is a traditional phrase much in vogue among the anthropomorphists, which arose naturally enough from a tendency to take human methods as an explanation of the Divine—a phrase which becomes a sort of argument—'The Great Architect.' But if we are to admit the human point of view, a glance at the facts of embryology must produce very uncomfortable reflections. For what should we say to an architect who was unable, or being able was obstinately unwilling, to erect a palace except by first using his materials in the shape of a hut, then pulling them down and rebuilding them as a cottage, then adding story to story and room to room, *not* with any reference to the ultimate purposes of the palace, but wholly with reference to the way in which houses were constructed in ancient times? What should we say to the architect[Pg 27] who could not form a museum out of bricks and mortar, but was forced to begin as if going to construct a mansion, and after proceeding some way in this direction, altered his plan into a palace, and that again into a museum? Yet this is the sort of succession on which organisms are constructed. The fact has long been familiar; how has it been reconciled with infinite wisdom? Let the following passage answer for a thousand:—'The embryo is nothing like the miniature of the adult. For a long while the body in its entirety and in its details,

presents the strangest of spectacles. Day by day and hour by hour, the aspect of the scene changes, and this instability is exhibited by the most essential parts no less than by the accessory parts. One would say that nature feels her way, and only reaches the goal after many times missing the path' (on dirait que la nature tâtonne et ne conduit son œuvre à bon fin, qu'après s'être souvent trompée)."^[21]

The above passage does not, I think, affect the evidence for design which we adduced in the preceding chapter. However strange the process of manufacture may appear, when the work comes to be turned out the design is too manifest to be doubted.

If the reader were to come upon some lawyer's deed which dealt with matters of such unspeakable intricacy, that it baffled his imagination to conceive how it could ever have been drafted, and if in spite of this he were to find the intricacy of the provisions to be made, exceeded only by the ease and simplicity with which the[Pg 28] deed providing for them was found to work in practice; and after this, if he were to discover that the deed, by whomsoever drawn, had nevertheless been drafted upon principles which at first seemed very foreign to any according to which he was in the habit of drafting deeds himself, as for example, that the draftsman had begun to draft a will as a marriage settlement, and so forth—yet an observer would not, I take it, do either of two things. He would not in the face of the result deny the design, making himself judge rather of the method of procedure than of the achievement. Nor yet after insisting in the manner of Paley, on the wonderful proofs of intention and on the exquisite provisions which were to be found in every syllable—thus leading us up to the highest pitch of expectation—would he present us with such an impotent conclusion as that the designer, though a living person and a true designer, was yet immaterial and intangible, a something, in fact, which proves to be a nothing: an omniscient and omnipotent vacuum.

Our observer would feel he need not have been at such pains to establish his design if this was to be the upshot of his reasoning. He would therefore admit the design, and by consequence the designer, but would probably ask a little time for reflection before he ventured to say who, or what, or where the designer was. Then gaining some insight into the manner in which the deed had been drawn, he would conclude that the draftsman was a specialist who had had long practice in this particular kind of work, but who now worked almost as it might be said automatically and[Pg 29] without consciousness, and found it difficult to depart from a habitual method of procedure.

We turn, then, on Paley, and say to him: "We have admitted your design and your designer. Where is he? Show him to us. If you cannot show him to us as flesh and blood, show him as flesh and sap; show him as a living cell; show him as protoplasm.

Lower than this we should not fairly go; it is not in the bond or *nexus* of our ideas that something utterly inanimate and inorganic should scheme, design, contrive, and elaborate structures which can make mistakes: it may elaborate low unerring things, like crystals, but it cannot elaborate those which have the power to err. Nevertheless, we will commit such abuse with our understandings as to waive this point, and we will ask you to show him to us as air which, if it cannot be seen, yet can be felt, weighed, handled, transferred from place to place, be judged by its effects, and so forth; or if this may not be, give us half a grain of hydrogen, diffused through all space and invested with some of the minor attributes of matter; or if you cannot do this, give us an imponderable like electricity, or even the higher mathematics, but give us something or throw off the mask and tell us fairly out that it is your paid profession to hoodwink us on this matter if you can, and that you are but doing your best to earn an honest living."

We may fancy Paley as turning the tables upon us and as saying: "But you too have admitted a designer—you too then must mean a designer with a body and soul, who must be somewhere to be found in space, and[Pg 30] who must live in time. Where is this your designer? Can you show him more than I can? Can you lay your finger on him and demonstrate him so that a child shall see him and know him, and find what was heretofore an isolated idea concerning him, combine itself instantaneously with the idea of the designer, we will say, of the human foot, so that no power on earth shall henceforth tear those two ideas asunder? Surely if you cannot do this, you too are trifling with words, and abusing your own mind and that of your reader. Where, then, is your designer of man? Who made him? And where, again, is your designer of beasts and birds, of fishes, and of plants?"

Our answer is simple enough; it is that we can and do point to a living tangible person with flesh, blood, eyes, nose, ears, organs, senses, dimensions, who did of his own cunning after infinite proof of every kind of hazard and experiment scheme out, and fashion each organ of the human body. This is the person whom we claim as the designer and artificer of that body, and he is the one of all others the best fitted for the task by his antecedents, and his practical knowledge of the requirements of the case—for he is man himself.

Not man, the individual of any given generation, but man in the entirety of his existence from the dawn of life onwards to the present moment. In like manner we say that the designer of all organisms is so incorporate with the organisms themselves—so lives, moves, and has its being in those organisms, and is so one with them—they in it, and it in them—that it is more consistent with reason and the common use[Pg

31] of words to see the designer of each living form in the living form itself, than to look for its designer in some other place or person.

Thus we have a third alternative presented to us.

Mr. Charles Darwin and his followers deny design, as having any appreciable share in the formation of organism at all.

Paley and the theologians insist on design, but upon a designer outside the universe and the organism.

The third opinion is that suggested in the first instance, and carried out to a very high degree of development by Buffon. It was improved, and, indeed, made almost perfect by Dr. Erasmus Darwin, but too much neglected by him after he had put it forward. It was borrowed, as I think we may say with some confidence, from Dr. Darwin by Lamarck, and was followed up by him ardently thenceforth, during the remainder of his life, though somewhat less perfectly comprehended by him than it had been by Dr. Darwin. It is that the design which has designed organisms, has resided within, and been embodied in, the organisms themselves.

With but a very little change in the present signification of words, the question resolves itself into this.

Shall we see God henceforth as embodied in all living forms; as dwelling in them; as being that power in them whereby they have learnt to fashion themselves, each one according to its ideas of its own convenience, and to make itself not only a microcosm, or little world, but a little unwritten history of the universe from its own point of view into the bargain? From everlasting, in time past, only in so far as life has[Pg 32] lasted; invisible, only in so far as the ultimate connection between the will to do and the thing which does is invisible; imperishable, only in so far as life as a whole is imperishable; omniscient and omnipotent, within the limits only of a very long and large experience, but ignorant and impotent in respect of all else—limited in all the above respects, yet even so incalculably vaster than anything that we can conceive?

Or shall we see God as we were taught to say we saw him when we were children—as an artificial and violent attempt to combine ideas which fly asunder and asunder, no matter how often we try to force them into combination?

"The true mainspring of our existence," says Buffon, "lies not in those muscles, veins, arteries, and nerves, which have been described with so much minuteness, it is to be found in the more hidden forces which are not bounden by the gross mechanical laws

which we would fain set over them. Instead of trying to know these forces by their effects, we have endeavoured to uproot even their very idea, so as to banish them utterly from philosophy. But they return to us and with renewed vigour; they return to us in gravitation, in chemical affinity, in the phenomena of electricity, &c. Their existence rests upon the clearest evidence; the omnipresence of their action is indisputable, but that action is hidden away from our eyes, and is a matter of inference only; we cannot actually see them, therefore we find difficulty in admitting that they exist; we wish to judge of everything by its exterior; we imagine that the exterior is the whole, and deeming[Pg 33] that it is not permitted us to go beyond it, we neglect all that may enable us to do so."^[22]

Or may we not say that the unseen parts of God are those deep buried histories, the antiquity and the repeatedness of which go as far beyond that of any habit handed down to us from our earliest protoplasmic ancestor, as the distance of the remotest star in space transcends our distance from the sun?

By vivisection and painful introspection we can rediscover many a long buried history—rekindling that sense of novelty in respect of its action, whereby we can alone become aware of it. But there are other remoter histories, and more repeated thoughts and actions, before which we feel so powerless to reawaken fresh interest concerning them, that we give up the attempt in despair, and bow our heads, overpowered by the sense of their immensity. Thus our inability to comprehend God is coextensive with our difficulty in going back upon the past—and our sense of him is a dim perception of our own vast and now inconceivably remote history.

FOOTNOTES:

^[21]Quatrefages, 'Metamorphoses de l'Homme et des Animaux,' 1862, p. 42; G. H. Lewes, 'Physical Basis of Mind,' 1877, p. 83.

^[22]Tom. ii. p. 486, 1794.

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CHAPTER IV.

FAILURE OF THE FIRST EVOLUTIONISTS TO SEE THEIR POSITION AS TELEOLOGICAL.

It follows necessarily from the doctrine of Dr. Erasmus Darwin and Lamarck, if not from that of Buffon himself, that the greater number of organs are as purposive to the

evolutionist as to the theologian, and far more intelligibly so. Circumstances, however, prevented these writers from acknowledging this fact to the world, and perhaps even to themselves. Their *crux* was, as it still is to so many evolutionists, the presence of rudimentary organs, and the processes of embryological development. They would not admit that rudimentary and therefore useless organs were designed by a Creator to take their place once and for ever as part of a scheme whose main idea was, that every animal structure was to serve some useful end in connection with its possessor.

This was the doctrine of final causes as then commonly held; in the face of rudimentary organs it was absurd. Buffon was above all things else a plain matter of fact thinker, who refused to go far beyond the obvious. Like all other profound writers, he was, if I may say so, profoundly superficial. He felt that the aim of research does not consist in the knowing this or that, but in the easing of the desire to know or understand[Pg 35] more completely—in the peace of mind which passeth all understanding. His was the perfection of a healthy mental organism by which over effort is felt instinctively to be as vicious and contemptible as indolence. He knew this too well to know the grounds of his knowledge, but we smaller people who know it less completely, can see that such felicitous instinctive tempering together of the two great contradictory principles, love of effort and love of ease, has underlain every step of all healthy growth through all conceivable time. Nothing is worth looking at which is seen either too obviously or with too much difficulty. Nothing is worth doing or well done which is not done fairly easily, and some little deficiency of effort is more pardonable than any very perceptible excess; for virtue has ever erred rather on the side of self-indulgence than of asceticism, and well-being has ever advanced through the pleasures rather than through austerity.

According to Buffon, then—as also according to Dr. Darwin, who was just such another practical and genial thinker, and who was distinctly a pupil of Buffon, though a most intelligent and original one—if an organ after a reasonable amount of inspection appeared to be useless, it was to be called useless without more ado, and theories were to be ordered out of court if they were troublesome. In like manner, if animals bred freely *inter se* before our eyes, as for example the horse and ass, the fact was to be noted, but no animals were to be classed as capable of interbreeding until they had asserted their right to such classification by breeding with tolerable certainty. If,[Pg 36] again, an animal looked as if it felt, that is to say, if it moved about pretty quickly or made a noise, it must be held to feel; if it did neither of these things, it did not look as if it felt and therefore it must be said not to feel. *De non apparentibus et non existentibus eadem est lex* was one of the chief axioms of their philosophy; no

writers have had a greater horror of mystery or of ideas that have not become so mastered as to be, or to have been, superficial. Lamarck was one of those men of whom I believe it has been said that they have brain upon the brain. He had his theory that an animal could not feel unless it had a nervous system, and at least a spinal marrow—and that it could not think at all without a brain—all his facts, therefore, have to be made to square with this. With Buffon and Dr. Darwin we feel safe that however wrong they may sometimes be, their conclusions have always been arrived at on that fairly superficial view of things in which, as I have elsewhere said, our nature alone permits us to be comforted.

To these writers, then, the doctrine of final causes for rudimentary organs was a piece of mystification and an absurdity; no less fatal to any such doctrine were the processes of embryological development. It was plain that the commonly received teleology must be given up; but the idea of design or purpose was so associated in their minds with theological design that they avoided it altogether. They seem to have forgotten that an internal teleology is as much teleology as an external one; hence, unfortunately, though their whole theory of development is intensely purposive, it is the fact[Pg 37] rather than the name of teleology which has hitherto been insisted upon, even by the greatest writers on evolution—the name having been denied even by those who were most insisting on the thing itself.

It is easy to understand the difficulty felt by the fathers of evolution when we remember how much had to be seen before the facts could lie well before them. It was necessary to attain, firstly, to a perception of the unity of person between parents and offspring in successive generations; secondly, it must be seen that an organism's memory goes back for generations beyond its birth, to the first beginnings in fact, of which we know anything whatever; thirdly, the latency of that memory, as of memory generally till the associated ideas are reproduced, must be brought to bear upon the facts of heredity; and lastly, the unconsciousness with which habitual actions come to be performed, must be assigned as the explanation of the unconsciousness with which we grow and discharge most of our natural functions.

Buffon was too busy with the fact that animals descended with modification at all, to go beyond the development and illustration of this great truth. I doubt whether he ever saw more than the first, and that dimly, of the four considerations above stated.

Dr. Darwin was the first to point out the first two considerations with some clearness, but he can hardly be said to have understood their full importance: the two latter ideas do not appear to have occurred to him.

Lamarck had little if any perception of any one of the four. When, however, they are firmly seized and brought into their due bearings one upon another,[Pg 38] the facts of heredity become as simple as those of a man making a tobacco pipe, and rudimentary organs are seen to be essentially of the same character as the little rudimentary protuberance at the bottom of the pipe to which I referred in 'Erewhon.'^[23]

These organs are now no longer useful, but they once were so, and were therefore once purposive, though not so now. They are the expressions of a bygone usefulness; sayings, as it were, about which there was at one time infinite wrangling, as to what both the meaning and the expression should best be, so that they then had living significance in the mouths of those who used them, though they have become such mere shibboleths and cant formulæ to ourselves that we think no more of their meaning than we do of Julius Cæsar in the month of July. They continue to be reproduced through the force of habit, and through indisposition to get out of any familiar groove of action until it becomes too unpleasant for us to remain in it any longer. It has long been felt that embryology and rudimentary structures indicated community of descent. Dr. Darwin and Lamarck insisted on this, as have all subsequent writers on evolution; but the explanation of why and how the structures come to be repeated—namely, that they are simply examples of the force of habit—can only be perceived intelligently by those who admit so much unity between parents and offspring that the self-development of the latter can be properly called habitual (as being a repetition of an act by one and the same individual), and can only be fully sympathized[Pg 39] with by those who recognize that if habit be admitted as the key to the fact at all, the unconscious manner in which the habit comes to be repeated is only of a piece with all our other observations concerning habit. For the fuller development of the foregoing, I must refer the reader to my work 'Life and Habit.'

The purposiveness, which even Dr. Darwin, and Lamarck still less, seem never to have quite recognized in spite of their having insisted so much on what amounts to the same thing, now comes into full view. It is seen that the organs external to the body, and those internal to it are, the second as much as the first, things which we have made for our own convenience, and with a prevision that we shall have need of them; the main difference between the manufacture of these two classes of organs being, that we have made the one kind so often that we can no longer follow the processes whereby we make them, while the others are new things which we must make introspectively or not at all, and which are not yet so incorporate with our vitality as that we should think they grow instead of being manufactured. The manufacture of the tool, and the manufacture of the living organ prove therefore to be but two species of the same genus, which, though widely differentiated, have descended as it were

from one common filament of desire and inventive faculty. The greater or less complexity of the organs goes for very little. It is only a question of the amount of intelligence and voluntary self-adaptation which we must admit, and this must be settled rather by an appeal to what we find[Pg 40] in organism, and observe concerning it, than by what we may have imagined *à priori*.

Given a small speck of jelly with some kind of circumstance-suiting power, some power of slightly varying its actions in accordance with slightly varying circumstances and desires—given such a jelly-speck with a power of assimilating other matter, and thus, of reproducing itself, given also that it should be possessed of a memory, and we can show how the whole animal world can have descended it may be from an amœba without interference from without, and how every organ in every creature is designed at first roughly and tentatively but finally fashioned with the most consummate perfection, by the creature which has had need of that organ, which best knew what it wanted, and was never satisfied till it had got that which was the best suited to its varying circumstances in their entirety. We can even show how, if it becomes worth the Ethiopian's while to try and change his skin, or the leopard's to change his spots, they can assuredly change them within a not unreasonable time and adapt their covering to their own will and convenience, and to that of none other; thus what is commonly conceived of as direct creation by God is moved back to a time and space inconceivable in their remoteness, while the aim and design so obvious in nature are shown to be still at work around us, growing ever busier and busier, and advancing from day to day both in knowledge and power.

It was reserved for Mr. Darwin and for those who have too rashly followed him to deny purpose as having[Pg 41] had any share in the development of animal and vegetable organs; to see no evidence of design in those wonderful provisions which have been the marvel and delight of observers in all ages. The one who has drawn our attention more than perhaps any other living writer to those very marvels of coadaptation, is the foremost to maintain that they are the result not of desire and design, either within the creature or without it, but of blind chance, working no whither, and due but to the accumulation of innumerable lucky accidents.

"There are men," writes Professor Tyndall in the 'Nineteenth Century,' for last November, "and by no means the minority, who, however wealthy in regard to facts, can never rise into the region of principles; and they are sometimes intolerant of those that can. They are formed to plod meritoriously on in the lower levels of thought; unpossessed of the pinions necessary to reach the heights, they cannot realize the mental act—the act of inspiration it might well be called—by which a man of genius, after long pondering and proving, reaches a theoretic conception which unravels and

illuminates the tangle of centuries of observation and experiment. There are minds, it may be said in passing, who, at the present moment, stand in this relation to Mr. Darwin."

The more rhapsodical parts of the above must go for what they are worth, but I should be sorry to think that what remains conveyed a censure which might fall justly on myself. As I read the earlier part of the passage I confess that I imagined the conclusion was going to be very different from what it proved to be.[Pg 42] Fresh from the study of the older men and also of Mr. Darwin himself, I failed to see that Mr. Darwin had "unravell'd and illuminated" a tangled skein, but believed him, on the contrary, to have tangled and obscured what his predecessors had made in great part, if not wholly, plain. With the older writers, I had felt as though in the hands of men who wished to understand themselves and to make their reader understand them with the smallest possible exertion. The older men, if not in full daylight, at any rate saw in what quarter of the sky the dawn was breaking, and were looking steadily towards it. It is not they who have put their hands over their own eyes and ours, and who are crying out that there is no light, but chance and blindness everywhere.

FOOTNOTES:

[\[23\]](#)Page 210, first edition.

[Pg 43]

CHAPTER V.

THE TELEOLOGICAL EVOLUTION OF ORGANISM—THE PHILOSOPHY OF THE UNCONSCIOUS.

I have stated the foregoing in what I take to be an extreme logical development, in order that the reader may more easily perceive the consequences of those premises which I am endeavouring to re-establish. But it must not be supposed that an animal or plant has ever conceived the idea of some organ widely different from any it was yet possessed of, and has set itself to design it in detail and grow towards it.

The small jelly-speck, which we call the *amœba*, has no organs save what it can extemporize as occasion arises. If it wants to get at anything, it thrusts out part of its jelly, which thus serves it as an arm or hand: when the arm has served its purpose, it is absorbed into the rest of the jelly, and has now to do the duty of a stomach by helping to wrap up what it has just purveyed. The small round jelly-speck spreads itself out and envelops its food, so that the whole creature is now a stomach, and nothing but a

stomach. Having digested its food, it again becomes a jelly-speck, and is again ready to turn part of itself into hand or foot as its next convenience may dictate. It is not to be believed that such a creature as this, which is probably just sensitive to light and[Pg 44] nothing more, should be able to form a conception of an eye and set itself to work to grow one, any more than it is believable that he who first observed the magnifying power of a dew drop, or even he who first constructed a rude lens, should have had any idea in his mind of Lord Rosse's telescope with all its parts and appliances. Nothing could be well conceived more foreign to experience and common sense. Animals and plants have travelled to their present forms as man has travelled to any one of his own most complicated inventions. Slowly, step by step, through many blunders and mischances which have worked together for good to those that have persevered in elasticity. They have travelled as man has travelled, with but little perception of a want till there was also some perception of a power, and with but little perception of a power till there was a dim sense of want; want stimulating power, and power stimulating want; and both so based upon each other that no one can say which is the true foundation, but rather that they must be both baseless and, as it were, meteoric in mid air. They have seen very little ahead of a present power or need, and have been then most moral, when most inclined to pierce a little into futurity, but also when most obstinately declining to pierce too far, and busy mainly with the present. They have been so far blindfolded that they could see but for a few steps in front of them, yet so far free to see that those steps were taken with aim and definitely, and not in the dark.

"Plus il a su," says Buffon, speaking of man, "plus il a pu, mais aussi moins il a fait, moins il a su." This[Pg 45] holds good wherever life holds good. Wherever there is life there is a moral government of rewards and punishments understood by the amœba neither better nor worse than by man. The history of organic development is the history of a moral struggle.

We know nothing as yet about the origin of a creature able to feel want and power, nor yet what want and power spring from. It does not seem worth while to go into these questions until an understanding has been come to as to whether the interaction of want and power in some low form or forms of life which could assimilate matter, reproduce themselves, vary their actions, and be capable of remembering, will or will not suffice to explain the development of the varied organs and desires which we see in the higher vertebrates and man. When this question has been settled, then it will be time to push our inquiries farther back.

But given such a low form of life as here postulated, and there is no force in Paley's pretended objection to the Darwinism of his time.

"Give our philosopher," he says, "appetencies; give him a portion of living irritable matter (a nerve or the clipping of a nerve) to work upon; give also to his incipient or progressive forms the power of propagating their like in every stage of their alteration; and if he is to be believed, he could replenish the world with all the vegetable and animal productions which we now see in it."^[24]

After meeting this theory with answers which need not detain us, he continues:[Pg 46]—

"The senses of animals appear to me quite incapable of receiving the explanation of their origin which this theory affords. Including under the word 'sense' the organ and the perception, we have no account of either. How will our philosopher get at vision or make an eye? Or, suppose the eye formed, would the perception follow? The same of the other senses. And this objection holds its force, ascribe what you will to the hand of time, to the power of habit, to changes too slow to be observed by man, or brought within any comparison which he is able to make of past things with the present. Concede what you please to these arbitrary and unattested superstitions, how will they help you? Here is no inception. No laws, no course, no powers of nature which prevail at present, nor any analogous to these would give commencement to a new sense; and it is in vain to inquire how that might proceed which would never *begin*."

In answer to this, let us suppose that some inhabitants of another world were to see a modern philosopher so using a microscope that they should believe it to be a part of the philosopher's own person, which he could cut off from and join again to himself at pleasure, and suppose there were a controversy as to how this microscope had originated, and that one party maintained the man had made it little by little because he wanted it, while the other declared this to be absurd and impossible; I ask, would this latter party be justified in arguing that microscopes could never have been perfected by degrees through the preservation of and accumulation of small successive improvements, inasmuch[Pg 47] as men could not have begun to want to use microscopes until they had had a microscope which should show them that such an instrument would be useful to them, and that hence there is nothing to account for the *beginning* of microscopes, which might indeed make some progress when once originated, but which could never originate?

It might be pointed out to such a reasoner, firstly, that as regards any acquired power the various stages in the acquisition of which he might be supposed able to remember, he would find that, logic notwithstanding, the wish did originate the power, and yet was originated by it, both coming up gradually out of something which was not recognisable as either power or wish, and advancing through vain beating of the air, to

a vague effort, and from this to definite effort with failure, and from this to definite effort with success, and from this to success with little consciousness of effort, and from this to success with such complete absence of effort that he now acts unconsciously and without power of introspection, and that, do what he will, he can rarely or never draw a sharp dividing line whereat anything shall be said to begin, though none less certain that there has been a continuity in discontinuity, and a discontinuity in continuity between it and certain other past things; moreover, that his opponents postulated so much beginning of the microscope as that there should be a dew drop, even as our evolutionists start with a sense of touch, of which sense all the others are modifications, so that not one of them but is resolvable into touch by more or less easy stages; and secondly,[Pg 48] that the question is one of fact and of the more evident deductions therefrom, and should not be carried back to those remote beginnings where the nature of the facts is so purely a matter of conjecture and inference.

No plant or animal, then, according to our view, would be able to conceive more than a very slight improvement on its organization at a given time, so clearly as to make the efforts towards it that would result in growth of the required modification; nor would these efforts be made with any far-sighted perception of what next and next and after, but only of what next; while many of the happiest thoughts would come like all other happy thoughts—thoughtlessly; by a chain of reasoning too swift and subtle for conscious analysis by the individual, as will be more fully insisted on hereafter. Some of these modifications would be noticeable, but the majority would involve no more noticeable difference than can be detected between the length of the shortest day, and that of the shortest but one.

Thus a bird whose toes were not webbed, but who had under force of circumstances little by little in the course of many generations learned to swim, either from having lived near a lake, and having learnt the art owing to its fishing habits, or from wading about in shallow pools by the sea-side at low water, and finding itself sometimes a little out of its depth and just managing to scramble over the intermediate yard or so between it and safety—such a bird did not probably conceive the idea of swimming on the water and set itself to learn to do so, and then conceive the idea of webbed feet and set itself to get webbed feet. The[Pg 49] bird found itself in some small difficulty, out of which it either saw, or at any rate found that it could extricate itself by striking out vigorously with its feet and extending its toes as far as ever it could; it thus began to learn the art of swimming and conceived the idea of swimming synchronously, or nearly so; or perhaps wishing to get over a yard or two of deep water, and trying to do so without being at the trouble of rising to fly, it would splash and struggle its way over

the water, and thus practically swim, though without much perception of what it had been doing. Finding that no harm had come to it, the bird would do the same again, and again; it would thus presently lose fear, and would be able to act more calmly; then it would begin to find out that it could swim a little, and if its food lay much in the water so that it would be of great advantage to it to be able to alight and rest without being forced to return to land, it would begin to make a practice of swimming. It would now discover that it could swim the more easily according as its feet presented a more extended surface to the water; it would therefore keep its toes extended whenever it swam, and as far as in it lay, would make the most of whatever skin was already at the base of its toes. After very many generations it would become web-footed, if doing as above described should have been found continuously convenient, so that the bird should have continuously used the skin about its toes as much as possible in this direction.

For there is a margin in every organic structure (and perhaps more than we imagine in things inorganic[Pg 50] also), which will admit of references, as it were, side notes, and glosses upon the original text. It is on this margin that we may err or wander—the greatness of a mistake depending rather upon the extent of the departure from the original text, than on the direction that the departure takes. A little error on the bad side is more pardonable, and less likely to hurt the organism than a too great departure upon the right one. This is a fundamental proposition in any true system of ethics, the question what is too much or too sudden being decided by much the same higgling as settles the price of butter in a country market, and being as invisible as the link which connects the last moment of desire with the first of power and performance, and with the material result achieved.

It is on this margin that the fulcrum is to be found, whereby we obtain the little purchase over our structure, that enables us to achieve great results if we use it steadily, with judgment, and with neither too little effort nor too much. It is by employing this that those who have a fancy to move their ears or toes without moving other organs learn to do so. There is a man at the Agricultural Hall now playing the violin with his toes, and playing it, as I am told, sufficiently well. The eye of the sailor, the wrist of the conjuror, the toe of the professional medium, are all found capable of development to an astonishing degree, even in a single lifetime; but in every case success has been attained by the simple process of making the best of whatever power a man has had at any given time, and by being on the look out to take advantage of[Pg 51] accident, and even of misfortune. If a man would learn to paint, he must not theorize concerning art, nor think much what he would do beforehand, but he must do *something*—it does not matter what, except that it should be whatever at the

moment will come handiest and easiest to him; and he must do that something as well as he can. This will presently open the door for something else, and a way will show itself which no conceivable amount of searching would have discovered, but which yet could never have been discovered by sitting still and taking no pains at all. "Dans l'animal," says Buffon, "il y a moins de jugement que de sentiment."^[25]

It may appear as though this were blowing hot and cold with the same breath, inasmuch as I am insisting that important modifications of structure have been always purposive; and at the same time am denying that the creature modified has had any purpose in the greater part of all those actions which have at length modified both structure and instinct. Thus I say that a bird learns to swim without having any purpose of learning to swim before it set itself to make those movements which have resulted in its being able to do so. At the same time I maintain that it has only learned to swim by trying to swim, and this involves the very purpose which I have just denied. The reconciliation of these two apparently irreconcilable contentions must be found in the consideration that the bird was not the less trying to swim, merely because it did not know the name we have chosen to give to the art[Pg 52] which it was trying to master, nor yet how great were the resources of that art. A person, who knew all about swimming, if from some bank he could watch our supposed bird's first attempt to scramble over a short space of deep water, would at once declare that the bird was trying to swim—if not actually swimming. Provided then that there is a very little perception of, and prescience concerning, the means whereby the next desired end may be attained, it matters not how little in advance that end may be of present desires or faculties; it is still reached through purpose, and must be called purposive. Again, no matter how many of these small steps be taken, nor how absolute was the want of purpose or prescience concerning any but the one being actually taken at any given moment, this does not bar the result from having been arrived at through design and purpose. If each one of the small steps is purposive the result is purposive, though there was never purpose extended over more than one, two, or perhaps at most three, steps at a time.

Returning to the art of painting for an example, are we to say that the proficiency which such a student as was supposed above will certainly attain, is not due to design, merely because it was not until he had already become three parts excellent that he knew the full purport of all that he had been doing? When he began he had but vague notions of what he would do. He had a wish to learn to represent nature, but the line into which he has settled down has probably proved very different from that which he proposed to himself originally. Because he has taken advantage of his accidents, is it,[Pg 53] therefore, one whit the less true that his success is the result of his desires

and his design? The 'Times' pointed out not long ago that the theory which now associates meteors and comets in the most unmistakable manner, was suggested by one accident, and confirmed by another. But the writer added well that "such accidents happen only to the zealous student of nature's secrets." In the same way the bird that is taking to the habit of swimming, and of making the most of whatever skin it already has between its toes, will have doubtless to thank accidents for no small part of its progress; but they will be such accidents as could never have happened to, or been taken advantage of by any creature which was not zealously trying to make the most of itself—and between such accidents as this, and design, the line is hard to draw; for if we go deep enough we shall find that most of our design resolves itself into as it were a shaking of the bag to see what will come out that will suit our purpose, and yet at the same time that most of our shaking of the bag resolves itself into a design that the bag shall contain only such and such things, or thereabouts.

Again, the fact that animals are no longer conscious of design and purpose in much that they do, but act unreflectingly, and as we sometimes say concerning ourselves "automatically" or "mechanically"—that they have no idea whatever of the steps whereby they have travelled to their present state, and show no sign of doubt about what must have been at one time the subject of all manner of doubts, difficulties, and discussions—that whatever sign of reflection they now exhibit[Pg 54] is to be found only in case of some novel feature or difficulty presenting itself; these facts do not bar that the results achieved should be attributed to an inception in reason, design, and purpose, no matter how rapidly and as we call it instinctively, the creatures may now act.

For if we look closely at such an invention as the steam engine in its latest and most complicated developments, about which there can be no dispute but that they are achievements of reason, purpose, and design, we shall find them present us with examples of all those features the presence of which in the handiwork of animals is too often held to bar reason and purpose from having had any share therein.

Assuredly such men as the Marquis of Worcester and Captain Savery had very imperfect ideas as to the upshot of their own action. The simplest steam engine now in use in England is probably a marvel of ingenuity as compared with the highest development which appeared possible to these two great men, while our newest and most highly complicated engines would seem to them more like living beings than machines. Many, again, of the steps leading to the present development have been due to action which had but little heed of the steam engine, being the inventions of attendants whose desire was to save themselves the trouble of turning this or that

cock, and who were indifferent to any other end than their own immediate convenience. No step in fact along the whole route was ever taken with much perception of what would be the next step after the one being taken at any given moment.[Pg 55]

Nor do we find that an engine made after any old and well-known pattern is now made with much more consciousness of design than we can suppose a bird's nest to be built with. The greater number of the parts of any such engine, are made by the gross as it were like screws and nuts, which are turned out by machinery and in respect of which the labour of design is now no more felt than is the design of him who first invented the wheel. It is only when circumstances require any modification in the article to be manufactured that thought and design will come into play again; but I take it few will deny that if circumstances compel a bird either to give up a nest three-parts built altogether, or to make some trifling deviation from its ordinary practice, it will in nine cases out of ten make such deviation as shall show that it had thought the matter over, and had on the whole concluded to take such and such a course, that is to say, that it had reasoned and had acted with such purpose as its reason had dictated.

And I imagine that this is the utmost that anyone can claim even for man's own boasted powers. Set the man who has been accustomed to make engines of one type, to make engines of another type without any intermediate course of training or instruction, and he will make no better figure with his engines than a thrush would do if commanded by her mate to make a nest like a blackbird. It is vain then to contend that the ease and certainty with which an action is performed, even though it may have now become matter of such fixed habit that it cannot be suddenly and seriously modified without rendering the whole[Pg 56] performance abortive, is any argument against that action having been an achievement of design and reason in respect of each one of the steps that have led to it; and if in respect of each one of the steps then as regards the entire action; for we see our own most reasoned actions become no less easy, unerring, automatic, and unconscious, than the actions which we call instinctive when they have been repeated a sufficient number of times.

This has been often pointed out, but I insisted upon it and developed it in 'Life and Habit,' more I believe than has been done hitherto, at the same time making it the key to many phenomena of growth and heredity which without such key seem explained by words rather than by any corresponding peace of mind in our ideas concerning them. Seeing that I dwelt much on the importance of bearing in mind the vanishing tendency of consciousness, volition, and memory upon their becoming intense, a tendency which no one after five minutes' reflection will venture to deny, some

reviewers have imagined that I am advocating the same views as have been put forward by Von Hartmann under the title of 'the Philosophy of the Unconscious.' Unless, however, I am much mistaken, their opinion is without foundation. For so far as I can gather, Von Hartmann personifies the unconscious and makes it act and think—in fact deifies it—whereas I only infer a certain history for certain of our growths and actions in consequence of observing that often repeated actions come in time to be performed unconsciously. I cannot think I have done more than note a fact which all must acknowledge, and drawn from it an inference which may [Pg 57] or may not be true, but which is at any rate perfectly intelligible, whereas if Von Hartmann's meaning is anything like what Mr. Sully says it is, ^[26] I can only say that it has not been given to me to form any definite conception whatever as to what that meaning may be. I am encouraged moreover to hope that I am not in the same condemnation with Von Hartmann—if, indeed, Von Hartmann is to be condemned, about which I know nothing—by the following extract from a German Review of 'Life and Habit.'

"Der erste dieser beiden Erklärungsversuche, ist eine wahre 'Philosophie des Unbewussten' nicht des Hartmann'schen Unbewussten welches hellsehend und wunderthätig von aussen in die natürliche Entwicklung der Organismen eingreift, sondern eines Unbewussten welches wie der Verfasser zeigt, in allen organischen Wesen anzunehmen unsere eigene Erfahrung und die Stufenfolge der Organismen von den Moneren und Amöben bis zu den höchsten Pflanzen und Thieren und uns selbst aufwärts—uns gestattet, wenn nicht uns nöthigt. Der Gedankengang dieser neuen oder wenigstens in diesem Sinne wohl zum ersten Male consequent im Einzelnen durchgeführten Philosophie des Unbewussten ist, seinen Hauptzügen nach kurz angedeutet, folgender."^[27]

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Even here I am made to personify more than I like; I do not wish to say that the unconscious does this or that, but that when we have done this or that sufficiently often we do it unconsciously.

If the foregoing be granted, and it be admitted that the unconsciousness and seeming automatism with which any action may be performed is no bar to its having a foundation in memory, reason, and at one time consciously recognized effort—and this I believe to be the chief addition which I have ventured to make to the theory of Buffon and Dr. Erasmus Darwin—then the wideness of the difference between the Darwinism of eighty years ago and the Darwinism of to-day becomes immediately apparent, and it also becomes apparent, how important and interesting is the issue which is raised between them.

According to the older Darwinism the lungs are just as purposive as the corkscrew. They, no less than the corkscrew, are a piece of mechanism designed and gradually improved upon and perfected by an intelligent creature for the gratification of its own needs. True there are many important differences between mechanism which is part of the body, and mechanism which is no such part, but the differences are such as do not affect the fact that in each case the result, whether, for example, lungs or corkscrew, is due to desire, invention, and design.

And now I will ask one more question, which may seem, perhaps, to have but little importance, but which I find personally interesting. I have been told by a reviewer, of whom upon the whole I have little reason[Pg 59] to complain, that the theory I put forward in 'Life and Habit,' and which I am now again insisting on, is pessimism—pure and simple. I have a very vague idea what pessimism means, but I should be sorry to believe that I am a pessimist. Which, I would ask, is the pessimist? He who sees love of beauty, design, steadfastness of purpose, intelligence, courage, and every quality to which success has assigned the name of "worth," as having drawn the pattern of every leaf and organ now and in all past time, or he who sees nothing in the world of nature but a chapter of accidents and of forces interacting blindly?

FOOTNOTES:

[24]'Nat. Theol.,' ch. xxiii.

[25]'Oiseaux,' vol. i. p. 5.

[26]'Westminster Review,' vol. xlix. p. 124.

[27]Translation: "The first of these two attempts is a true 'philosophy of the unconscious,' not Hartmann's unconscious, which influences the natural evolution of organism from without as though by Providence and miracle, but of an unconscious, which, as the author shows, our own experience and the progressive succession of organisms from the monads and amœbæ up to the highest plants and animals, including ourselves, allows, if it does not compel us to assume [as obtaining] in all organic beings. This philosophy of the unconscious is new, or at any rate now for the first time carried out consequentially in detail; its main features, briefly stated are as follows."

[Pg 60]

CHAPTER VI.

SCHEME OF THE REMAINDER OF THE WORK. HISTORICAL SKETCH OF THE THEORY OF EVOLUTION.

I have long felt that evolution must stand or fall according as it is made to rest or not on principles which shall give a definite purpose and direction to the variations whose accumulation results in specific, and ultimately in generic differences. In other words, according as it is made to stand upon the ground first clearly marked out for it by Dr. Erasmus Darwin and afterwards adopted by Lamarck, or on that taken by Mr. Charles Darwin.

There is some reason to fear that in consequence of the disfavour into which modern Darwinism is seen to be falling by those who are more closely watching the course of opinion upon this subject, evolution itself may be for a time discredited as something inseparable from the theory that it has come about mainly through "the means" of natural selection. If people are shown that the arguments by which a somewhat startling conclusion has been reached will not legitimately lead to that conclusion, they are very ready to assume that the conclusion must be altogether unfounded, especially when, as in the present case, there is a vast mass of vested interests opposed to the conclusion. Few know that there[Pg 61] are other great works upon descent with modification besides Mr. Darwin's. Not one person in ten thousand has any distinct idea of what Buffon, Dr. Darwin, and Lamarck propounded. Their names have been discredited by the very authors who have been most indebted to them; there is hardly a writer on evolution who does not think it incumbent upon him to warn Lamarck off the ground which he at any rate made his own, and to cast a stone at what he will call the "shallow speculations" or "crude theories" or the "well-known doctrine" of the foremost exponent of Buffon and Dr. Darwin. Buffon is a great name, Dr. Darwin is no longer even this, and Lamarck has been so systematically laughed at that it amounts to little less than philosophical suicide for anyone to stand up in his behalf. Not one of our scientific elders or chief priests but would caution a student rather to avoid the three great men whom I have named than to consult them. It is a perilous task therefore to try and take evolution from the pedestal on which it now appears to stand so securely, and to put it back upon the one raised for it by its propounders; yet this is what I believe will have to be done sooner or later unless the now general acceptance of evolution is to be shaken more rudely than some of its upholders may anticipate. I propose therefore to give a short biographical sketch of the three writers whose works form new departures in the history of evolution, with a somewhat full *résumé* of the positions they took in regard to it. I will also touch briefly upon some other writers who have handled the same subject. The reader will thus be enabled to[Pg 62] follow the development of a great conception as it has grown up in

the minds of successive men of genius, and by thus growing with it, as it were, through its embryonic stages, he will make himself more thoroughly master of it in all its bearings.

I will then contrast the older with the newer Darwinism, and will show why the 'Origin of Species,' though an episode of incalculable value, cannot, any more than the 'Vestiges of Creation,' take permanent rank in the literature of evolution.

It will appear that the evolution of evolution has gone through the following principal stages:—

I. A general conception of the fact that specific types were not always immutable.

This was common to many writers, both ancient and modern; it has been occasionally asserted from the times of Anaximander and Lucretius to those of Bacon and Sir Walter Raleigh.

II. A definite conception that animal and vegetable forms were so extensively mutable that few (and, if so, perhaps but one) could claim to be of an original stock; the direct effect of changed conditions being assigned as the cause of modification, and the important consequences of the struggle for existence being in many respects fully recognized. The fact of design or purpose in connection with organism, as causing habits and thus as underlying all variation, was also indicated with some clearness, but was not thoroughly understood.

This phase must be identified with the name of Buffon, who, as I will show reason for believing, would have carried his theory much further if he had not [Pg 63] felt that he had gone as far in the right direction as was then desirable. Buffon put forward his opinions, with great reserve and yet with hardly less frankness, in volume after volume from 1749 to 1788, the year of his death, but they do not appear to have taken root at once in France. They took root in England, and were thence transplanted back to France.

III. A development in England of the Buffonian system, marked by glimpses of the unity between offspring and parents, and broad suggestions to the effect that the former must be considered as capable of remembering, under certain circumstances, what had happened to it, and what it did, when it was part of the personality of those from whom it had descended.

A definite belief, openly expressed, that not only are many species mutable, but that all living forms, whether animal or vegetable, are descended from a single, or at any rate from not many, original low forms of life, and this as the direct consequence of

the actions and requirements of the living forms themselves, and as the indirect consequence of changed conditions. A definite cause is thus supposed to underlie variations, and the resulting adaptations become purposive; but this was not said, nor, I am afraid, seen.

This is the original Darwinism of Dr. Erasmus Darwin. It was put forward in his 'Zoonomia,' in 1794, and was adopted almost in its entirety by Lamarck, who, when he had caught the leading idea (probably through a French translation of the 'Loves of the Plants,' which appeared in 1800), began to expound it in 1801; in 1802, 1803, 1806, and 1809,[Pg 64] he developed it with greater fulness of detail than Dr. Darwin had done, but perhaps with a somewhat less nice sense of some important points. Till his death, in 1831, Lamarck, as far as age and blindness would permit, continued to devote himself to the exposition of the theory of descent with modification.

IV. A more distinct perception of the unity of parents and offspring, with a bolder reference of the facts of heredity (whether of structure or instinct), to memory pure and simple; a clearer perception of the consequences that follow from the survival of the fittest, and a just view of the relation in which those consequences stand to "the circumstance-suited" power of animals and plants; a reference of the variations whose accumulation results in species, to the volition of the animal or plant which varies, and perhaps a dawning perception that all adaptations of structure to need must therefore be considered as "purposive."

This must be connected with Mr. Matthew's work on 'Naval Timber and Arboriculture,' which appeared in 1831. The remarks which it contains in reference to evolution are confined to an appendix, but when brought together, as by Mr. Matthew himself, in the 'Gardeners' Chronicle' for April 7, 1860, they form one of the most perfect yet succinct expositions of the theory of evolution that I have ever seen. I shall therefore give them in full.^[28] This book was well received, and was reviewed in the 'Quarterly Review,'^[29] but seems to have been valued rather for its views on naval timber than on evolution. Mr. Matthew's merit[Pg 65] lies in a just appreciation of the importance of each one of the principal ideas which must be present in combination before we can have a correct conception of evolution, and of their bearings upon one another. In his scheme of evolution I find each part kept in due subordination to the others, so that the whole theory becomes more coherent and better articulated than I have elsewhere found it; but I do not detect any important addition to the ideas which Dr. Darwin and Lamarck had insisted upon.

I pass over the 'Vestiges of Creation,' which should be mentioned only as having, as Mr. Charles Darwin truly says, "done excellent service in this country, in calling

attention to this subject, in removing prejudice, and in thus preparing the ground for the reception of analogous views."^[30] The work neither made any addition to ideas which had been long familiar, nor arranged old ones in a satisfactory manner. Such as it is, it is Dr. Darwin and Lamarck, but Dr. Darwin and Lamarck spoiled. The first edition appeared in 1844.

I also pass over Isidore Geoffroy St. Hilaire's 'Natural History,' which appeared 1854-62, and the position of which is best described by calling it intermediate between the one which Buffon thought fit to pretend to take, and that actually taken by Lamarck. The same may be said also of Étienne Geoffroy. I will, however, just touch upon these writers later on.

A short notice, again, will suffice for the opinions of Goethe, Treviranus, and Oken, none of whom can I discover as having originated any important new idea;[Pg 66] but knowing no German, I have taken this opinion from the résumé of each of these writers, given by Professor Haeckel in his 'History of Creation.'

V. A time of retrogression, during which we find but little apparent appreciation of the unity between parents and offspring; no reference to memory in connection with heredity, whether of instinct or structure; an exaggerated view of the consequences which may be deduced from the fact that the fittest commonly survive in the struggle for existence; the denial of any known principle as underlying variations; comparatively little appreciation of the circumstance-suited power of plants and animals, and a rejection of purposiveness. By far the most important exponent of this phase of opinion concerning evolution is Mr. Charles Darwin, to whom, however, we are more deeply indebted than to any other living writer for the general acceptance of evolution in one shape or another. The 'Origin of Species' appeared in 1859, the same year, that is to say, as the second volume of Isidore Geoffroy's 'Histoire Naturelle Générale.'

VI. A reaction against modern Darwinism, with a demand for definite purpose and design as underlying variations. The best known writers who have taken this line are the Rev. J. J. Murphy and Professor Mivart, whose 'Habit and intelligence' and 'Genesis of Species' appeared in 1869 and 1871 respectively. In Germany Professor Hering has revived the idea of memory as explaining the phenomena of heredity satisfactorily, without probably having been more aware that it had been advanced already than[Pg 67] I was myself when I put it forward recently in 'Life and Habit.' I have never seen the lecture in which Professor Hering has referred the phenomena of heredity to memory, but will give an extract from it which appeared in the 'Athenæum,' as translated by Professor Ray Lankester.^[31] The only new feature which I believe I may claim to have

added to received ideas concerning evolution, is a perception of the fact that the unconsciousness with which we go through our embryonic and infantile stages, and with which we discharge the greater number and more important of our natural functions, is of a piece with what we observe concerning all habitual actions, as well as concerning memory; an explanation of the phenomena of old age; and of the main principle which underlies longevity. I may, perhaps, claim also to have more fully explained the passage of reason into instinct than I yet know of its having been explained elsewhere. ^[32]

FOOTNOTES:

[28] See ch. [xviii](#). of this volume.

[29] Vol. xlix. p. 125.

[30] 'Origin of Species,' Hist. Sketch, xvii.

[31] See page [199](#) of this volume.

[32] Apropos of this, a friend has kindly sent me the following extract from Balzac: — "Historiquement, les paysans sont encore au lendemain de la Jacquerie, leur défaite est restée inscrite dans leur cervelle. *Ils ne se souviennent plus du fait, il est passé à l'état d'idée instinctive.*" — Balzac, 'Les Paysans,' v.

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CHAPTER VII.

PRE-BUFFONIAN EVOLUTION, AND SOME GERMAN WRITERS.

Let us now proceed to the fuller development of the foregoing sketch.

"Undoubtedly," says Isidore Geoffroy, "from the most ancient times many philosophers have imagined vaguely that one species can be transformed into another. This doctrine seems to have been adopted by the Ionian school from the sixth century before our era.... Undoubtedly also the same opinion reappeared on several occasions in the middle ages, and in modern times; it is to be found in some of the hermetic books, where the transmutation of animal and vegetable species, and that of metals, are treated as complementary to one another. In modern times we again find it alluded to by some philosophers, and especially by Bacon, whose boldness is on this point extreme. Admitting it as 'incontestable that plants sometimes degenerate so far as to become plants of another species,' Bacon did not

hesitate to try and put his theory into practice. He tried, in 1635, to give 'the rules' for the art of changing 'plants of one species into those of another.'

This must be an error. Bacon died in 1626. The passage of Bacon referred to is in 'Nat. Hist.,' Cent. vi.[Pg 69] ("Experiments in consort touching the degenerating of plants, and the transmutation of them one into another"), and is as follows:—

"518. This rule is certain, that plants for want of culture degenerate to be baser in the same kind; and sometimes so far as to change into another kind. 1. The standing long and not being removed maketh them degenerate. 2. Drought unless the earth, of itself, be moist doth the like. 3. So doth removing into worse earth, or forbearing to compost the earth; as we see that water mint turneth into field mint, and the colewort into rape by neglect, &c."

"525. It is certain that in very steril years corn sown will grow to another kind:—

'Grandia sæpe quibus mandavimus hordea sulcis, Infelix lolium, et steriles dominantur avenæ.'

And generally it is a rule that plants that are brought forth for culture, as corn, will sooner change into other species, than those that come of themselves; for that culture giveth but an adventitious nature, which is more easily put off."

Changed conditions, according to Bacon (though he does not use these words), appear to be "the first rule for the transmutation of plants."

"But how much value," continues M. Geoffroy, "ought to be attached to such prophetic glimpses, when they were neither led up to, nor justified by any serious study? They are conjectures only, which, while bearing evidence to the boldness or rashness of those who hazarded them, remain almost without effect upon the advance of science. Bacon excepted, they hardly deserve[Pg 70] to be remembered. As for De Maillet, who makes birds spring from flying fishes, reptiles from creeping fishes, and men from tritons, his dreams, taken in part from Anaximander, should have their place not in the history of science, but in that of the aberrations of the human mind."^[33]

A far more forcible and pregnant passage, however, is the following, from Sir Walter Raleigh's 'History of the World,' which Mr. Garnett has been good enough to point out to me:—

"For mine owne opinion I find no difference but only in magnitude between the Cat of Europe, and the Ounce of India; and even those dogges which are become wild in Hispagniola, with which the Spaniards used to devour the naked Indians, are now changed to Wolves, and begin to destroy the breed of their Cattell, and doe often

times teare asunder their owne children. The common crow and rooke of India is full of red feathers in the droun'd and low islands of Caribana, and the blackbird and thrush hath his feathers mixt with black and carnation in the north parts of Virginia. The Dog-fish of England is the Sharke of the South Ocean. For if colour or magnitude made a difference of Species, then were the Negroes, which wee call the Blacke-Mores, *non animalia rationalia*, not Men but some kind of strange Beasts, and so the giants of the South America should be of another kind than the people of this part of the World. We also see it dayly that the nature of fruits are changed by transplantation."^[34]

[Pg 71]For information concerning the earliest German writers on evolution, I turn to Professor Haeckel's 'History of Creation,' and find Goethe's name to head the list. I do not gather, however, that Goethe added much to the ideas which Buffon had already made sufficiently familiar. Professor Haeckel does not seem to be aware of Buffon's work, and quotes Goethe as making an original discovery when he writes, in the year 1796:—"Thus much then we have gained, that we may assert without hesitation that all the more perfect organic natures, such as fishes, amphibious animals, birds, mammals, and man at the head of the last, were all formed upon one original type, which only varies more or less in parts which were none the less permanent, and still daily changes and modifies its form by propagation."^[35] But these, as we shall see, are almost Buffon's own words—words too that Buffon insisted on for many years. Again Professor Haeckel quotes Goethe as writing in the year 1807:—

"If we consider plants and animals in their most imperfect condition, they can hardly be distinguished." This, however, had long been insisted upon by Bonnet and Dr. Erasmus Darwin, the first of whom was a naturalist of world-wide fame, while the 'Zoonomia' of Dr. Darwin had been translated into German between the years 1795 and 1797, and could hardly have been unknown to Goethe in 1807, who continues: "But this much we may say, that the creatures which by degrees emerge as plants and animals out of a common phase where they are barely distinguishable, arrive at perfection in two opposite directions, so that the plant in the[Pg 72] end reaches its highest glory in the tree, which is immovable and stiff, the animal in man who possesses the greatest elasticity and freedom." Professor Haeckel considers this to be a remarkable passage, but I do not think it should cause its author to rank among the founders of the evolution theory, though he may justly claim to have been one of the first to adopt it. Goethe's anatomical researches appear to have been more important, but I cannot find that he insisted on any new principle, or grasped any unfamiliar conception, which had not been long since grasped and widely promulgated by Buffon and by Dr. Erasmus Darwin.

Treviranus (1776-1837), whom Professor Haeckel places second to Goethe, is clearly a disciple of Buffon, and uses the word "degeneration" in the same sense as Buffon used it many years earlier, that is to say, as "descent with modification," without any reference to whether the offspring was, as Buffon says, "perfectionné ou dégradé." He cannot claim, any more than Goethe, to rank as a principal figure in the history of evolution.

Of Oken, Professor Haeckel says that his 'Naturphilosophie,' which appeared in 1809—in the same year, that is to say, as the 'Philosophie Zoologique' of Lamarck—was "the nearest approach to the natural theory of descent, newly established by Mr. Charles Darwin," of any work that appeared in the first decade of our century. But I do not detect any important difference of principle between his system and that of Dr. Erasmus Darwin, among whose disciples he should be reckoned.

"We now turn," says Professor Haeckel after referring to a few more German writers who adopted a belief in[Pg 73] evolution, "from the German to the French nature-philosophers who have likewise held the theory of descent, since the beginning of this century. At their head stands Jean Lamarck, who occupies the first place next to Darwin and Goethe in the history of the doctrine of Filiation."^[36] This is rather a surprising assertion, but I will leave the reader of the present volume to assign the value which should be attached to it.

Professor Haeckel devotes ten lines to Dr. Erasmus Darwin, who he declares "expresses views very similar to those of Goethe and Lamarck, without, however, *then* knowing anything about these two men;" which is all the more strange inasmuch as Dr. Darwin preceded them, and was a good deal better known to them, probably, than they to him; but it is plain Professor Haeckel has no acquaintance with the 'Zoonomia' of Dr. Erasmus Darwin. From all, then, that I am able to collect, I conclude that I shall best convey to the reader an idea of the different phases which the theory of descent with modification has gone through, by confining his attention almost entirely to Buffon, Dr. Erasmus Darwin, Lamarck, and Mr. Charles Darwin.

FOOTNOTES:

^[33]'Hist. Nat. Gen.,' vol. ii. p. 385, 1859.

^[34]'History of the World,' bk. i. ch. vii. § 9 ('Athenæum,' March 27, 1875).

^[35]'History of Creation,' vol. i. p. 91.

^[36]'History of Creation,' bk. i. ch. iii. (H. S. King, 1876).

CHAPTER VIII.

BUFFON—MEMOIR.

Buffon, says M. Flourens, was born at Montbar, on the 7th of September, 1707; he died in Paris, at the Jardin du Roi, on the 16th of April, 1788, aged 81 years. More than fifty of these years, as he used himself to say, he had passed at his writing-desk. His father was a councillor of the parliament of Burgundy. His mother was celebrated for her wit, and Buffon cherished her memory.

He studied at Dijon with much *éclat*, and shortly after leaving became accidentally acquainted with the Duke of Kingston, a young Englishman of his own age, who was travelling abroad with a tutor. The three travelled together in France and Italy, and Buffon then passed some months in England.

Returning to France, he translated Hales's 'Vegetable Statics' and Newton's 'Treatise on Fluxions.' He refers to several English writers on natural history in the course of his work, but I see he repeatedly spells the English name Willoughby, "Willulghby." He was appointed superintendent of the Jardin du Roi in 1739, and from thenceforth devoted himself to science.

In 1752 Buffon married Mdlle. de Saint Bélin, whose beauty and charm of manner were extolled by all her[Pg 75] contemporaries. One son was born to him, who entered the army, became a colonel, and I grieve to say, was guillotined at the age of twenty-nine, a few days only before the extinction of the Reign of Terror.

Of this youth, who inherited the personal comeliness and ability of his father, little is recorded except the following story. Having fallen into the water and been nearly drowned when he was about twelve years old, he was afterwards accused of having been afraid: "I was so little afraid," he answered, "that though I had been offered the hundred years which my grandfather lived, I would have died then and there, if I could have added one year to the life of my father;" then thinking for a minute, a flush suffused his face, and he added, "but I should petition for one quarter of an hour in which to exult over the thought of what I was about to do."

On the scaffold he showed much composure, smiling half proudly, half reproachfully, yet wholly kindly upon the crowd in front of him. "Citoyens," he said, "Je me nomme Buffon," and laid his head upon the block.

The noblest outcome of the old and decaying order, overwhelmed in the most hateful birth frenzy of the new. So in those cataclysms and revolutions which take place in our

own bodies during their development, when we seem studying in order to become fishes and suddenly make, as it were, different arrangements and resolve on becoming men—so, doubtless, many good cells must go, and their united death cry comes up, it may be, in the pain which an infant feels on teething.

But to return. The man who could be father of [Pg 76] such a son, and who could retain that son's affection, as it is well known that Buffon retained it, may not perhaps always be strictly accurate, but it will be as well to pay attention to whatever he may think fit to tell us. These are the only people whom it is worth while to look to and study from.

"Glory," said Buffon, after speaking of the hours during which he had laboured, "glory comes always after labour if she can—and *she generally can*." But in his case she could not well help herself. "He was conspicuous," says M. Flourens, "for elevation and force of character, for a love of greatness and true magnificence in all he did. His great wealth, his handsome person, and graceful manners seemed in correspondence with the splendour of his genius, so that of all the gifts which Fortune has it in her power to bestow she had denied him nothing."

Many of his epigrammatic sayings have passed into proverbs: for example, that "genius is but a supreme capacity for taking pains." Another and still more celebrated passage shall be given in its entirety and with its original setting.

"Style," says Buffon, "is the only passport to posterity. It is not range of information, nor mastery of some little known branch of science, nor yet novelty of matter that will ensure immortality. Works that can claim all this will yet die if they are conversant about trivial objects only, or written without taste, genius and true nobility of mind; for range of information, knowledge of details, novelty of discovery are of a volatile essence and fly off readily into other hands [Pg 77] that know better how to treat them. The matter is foreign to the man, and is not of him; the manner is the man himself."^[37]

"Le style, c'est l'homme même." Elsewhere he tells us what true style is, but I quote from memory and cannot be sure of the passage. "Le style," he says, "est comme le bonheur; il vient de la douceur de l'âme."

Is it possible not to think of the following?—

"But whether there be prophecies they shall fail; whether there be tongues they shall cease; whether there be knowledge it shall vanish away ... and now abideth faith, hope and charity, these three; but the greatest of these is charity."^[38]

FOOTNOTES:

[37]'Discours de Réception à l'Académie Française.'

[38]1 Cor. xiii. 8, 13.

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CHAPTER IX.

BUFFON'S METHOD—THE IRONICAL CHARACTER OF HIS WORK.

Buffon's idea of a method amounts almost to the denial of the possibility of method at all. "The true method," he writes, "is the complete description and exact history of each particular object,"^[39] and later on he asks, "is it not more simple, more natural and more true to call an ass an ass, and a cat a cat, than to say, without knowing why, that an ass is a horse, and a cat a lynx."^[40]

He admits such divisions as between animals and vegetables, or between vegetables and minerals, but that done, he rejects all others that can be founded on the nature of things themselves. He concludes that one who could see things in their entirety and without preconceived opinions, would classify animals according to the relations in which he found himself standing towards them:—

"Those which he finds most necessary and useful to him will occupy the first rank; thus he will give the precedence among the lower animals to the dog and the horse; he will next concern himself with those which without being domesticated, nevertheless occupy the[Pg 79] same country and climate as himself, as for example stags, hares, and all wild animals; nor will it be till after he has familiarized himself with all these that curiosity will lead him to inquire what inhabitants there may be in foreign climates, such as elephants, dromedaries, &c. The same will hold good for fishes, birds, insects, shells, and for all nature's other productions; he will study them in proportion to the profit which he can draw from them; he will consider them in that order in which they enter into his daily life; he will arrange them in his head according to this order, which is in fact that in which he has become acquainted with them, and in which it concerns him to think about them. This order—the most natural of all—is the one which I have thought it well to follow in this volume. My classification has no more mystery in it than the reader has just seen ... it is preferable to the most profound and ingenious that can be conceived, for there is none of all the classifications which ever have been made or ever can be, which has not more of an arbitrary character than this has. Take it for all in all," he concludes, "it is more easy,

more agreeable, and more useful, to consider things in their relation to ourselves than from any other standpoint."^[41]

"Has it not a better effect not only in a treatise on natural history, but in a picture or any work of art to arrange objects in the order and place in which they are commonly found, than to force them into association in virtue of some theory of our own? Is it not better to let the dog which has toes, come after the horse which [Pg 80] has a single hoof, in the same way as we see him follow the horse in daily life, than to follow up the horse by the zebra, an animal which is little known to us, and which has no other connection with the horse than the fact that it has a single hoof?"^[42]

Can we suppose that Buffon really saw no more connection than this? The writer whom we shall presently find^[43] declining to admit any essential difference between the skeletons of man and of the horse, can here see no resemblance between the zebra and the horse, except that they each have a single hoof. Is he to be taken at his word?

It is perhaps necessary to tell the reader that Buffon carried the foregoing scheme into practice as nearly as he could in the first fifteen volumes of his 'Natural History.' He begins with man—and then goes on to the horse, the ass, the cow, sheep, goat, pig, dog, &c. One would be glad to know whether he found it always more easy to decide in what order of familiarity this or that animal would stand to the majority of his readers than other classifiers have found it to know whether an individual more resembles one species or another; probably he never gave the matter a thought after he had gone through the first dozen most familiar animals, but settled generally down into a classification which becomes more and more specific—as when he treats of the apes and monkeys—till he reaches the birds, when he openly abandons his original idea, in deference, as he says, to the opinion of "le peuple des naturalistes."

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Perhaps the key to this piece of apparent extravagance is to be found in the word "mystérieuse."^[44] Buffon wished to raise a standing protest against mystery mongering. Or perhaps more probably, he wished at once "to turn to animals and plants under domestication," so as to insist early on the main object of his work—the plasticity of animal forms.

I am inclined to think that a vein of irony pervades the whole, or much the greater part of Buffon's work, and that he intended to convey, one meaning to one set of readers, and another to another; indeed, it is often impossible to believe that he is not writing between his lines for the discerning, what the undiscerning were not intended to see.

It must be remembered that his 'Natural History' has two sides,—a scientific and a popular one. May we not imagine that Buffon would be unwilling to debar himself from speaking to those who could understand him, and yet would wish like Handel and Shakespeare to address the many, as well as the few? But the only manner in which these seemingly irreconcilable ends could be attained, would be by the use of language which should be self-adjusting to the capacity of the reader. So keen an observer can hardly have been blind to the signs of the times which were already close at hand. Free-thinker though he was, he was also a powerful member of the aristocracy, and little likely to demean himself—for so he would doubtless hold it—by playing the part of Voltaire or Rousseau. He would help those who could see to see still further, but he would not dazzle eyes that were yet[Pg 82] imperfect with a light brighter than they could stand. He would therefore impose upon people, as much as he thought was for their good; but, on the other hand, he would not allow inferior men to mystify them.

"In the private character of Buffon," says Sir William Jardine in a characteristic passage, "we regret there is not much to praise; his disposition was kind and benevolent, and he was generally beloved by his inferiors, followers, and dependents, which were numerous over his extensive property; he was strictly honourable, and was an affectionate parent. In early youth he had entered into the pleasures and dissipations of life, and licentious habits seem to have been retained to the end. But the great blemish in such a mind was his declared infidelity; it presents one of those exceptions among the persons who have been devoted to the study of nature; and it is not easy to imagine a mind apparently with such powers, scarcely acknowledging a Creator, and when noticed, only by an arraignment for what appeared wanting or defective in his great works. So openly, indeed, was the freedom of his religious opinions expressed, that the indignation of the Sorbonne was provoked. He had to enter into an explanation which he in some way rendered satisfactory; and while he afterwards attended to the outward ordinances of religion, he considered them as a system of faith for the multitude, and regarded those most impolitic who most opposed them."^[45]

This is partly correct and partly not. Buffon was a free-thinker, and as I have sufficiently explained, a[Pg 83] decided opponent of the doctrine that rudimentary and therefore useless organs were designed by a Creator in order to serve some useful end throughout all time to the creature in which they are found.

He was not, surely, to hide the magnificent conceptions which he had been the first to grasp, from those who were worthy to receive them; on the other hand he would not tell the uninstructed what they would interpret as a license to do whatever they

pleased, inasmuch as there was no God. What he did was to point so irresistibly in the right direction, that a reader of any intelligence should be in no doubt as to the road he ought to take, and then to contradict himself so flatly as to reassure those who would be shocked by a truth for which they were not yet ready. If I am right in the view which I have taken of Buffon's work, it is not easy to see how he could have formed a finer scheme, nor have carried it out more finely.

I should, however, warn the reader to be on his guard against accepting my view too hastily. So far as I know I stand alone in taking it. Neither Dr. Darwin nor Flourens, nor Isidore Geoffroy, nor Mr. Charles Darwin see any subversive humour in Buffon's pages; but it must be remembered that Flourens was a strong opponent of mutability, and probably paid but little heed to what Buffon said on this question; Isidore Geoffroy is not a safe guide, as will appear presently; Mr. Charles Darwin seems to have adopted the one half of Isidore Geoffroy's conclusions without verifying either; and Dr. Erasmus Darwin, who has no small share of a very pleasant conscious humour, yet sometimes[Pg 84] rises to such heights of unconscious humour, that Buffon's puny labour may well have been invisible to him. Dr. Darwin wrote a great deal of poetry, some of which was about the common pump. Miss Seward tells us, as we shall see later on, that he "illustrated this familiar object with a picture of Maternal Beauty administering sustenance to her infant." Buffon could not have done anything like this.

Buffon never, then, "arraigned the Creator for what was wanting or defective in His works;" on the contrary, whenever he has led up by an irresistible chain of reasoning to conclusions which should make men recast their ideas concerning the Deity, he invariably retreats under cover of an appeal to revelation. Naturally enough, the Sorbonne objected to an artifice which even Buffon could not conceal completely. They did not like being undermined; like Buffon himself, they preferred imposing upon the people, to seeing others do so. Buffon made his peace with the Sorbonne immediately, and, perhaps, from that time forward, contradicted himself a little more impudently than heretofore.

It is probably for the reasons above suggested that Buffon did not propound a connected scheme of evolution or descent with modification, but scattered his theory in fragments up and down his work in the prefatory remarks with which he introduces the more striking animals or classes of animals. He never wastes evolutionary matter in the preface to an uninteresting animal; and the more interesting the animal, the more evolution will there be commonly found. When he comes to describe the animal more familiarly—and he generally[Pg 85] begins a fresh chapter or half chapter when he does so—he writes no more about evolution, but gives an admirable description, which no one can fail to enjoy, and which I cannot think is nearly so inaccurate as is

commonly supposed. These descriptions are the parts which Buffon intended for the general reader, expecting, doubtless, and desiring that such a reader should skip the dry parts he had been addressing to the more studious. It is true the descriptions are written *ad captandum*, as are all great works, but they succeed in captivating, having been composed with all the pains a man of genius and of great perseverance could bestow upon them. If I am not mistaken, he looked to these parts of his work to keep the whole alive till the time should come when the philosophical side of his writings should be understood and appreciated.

Thus the goat breeds with the sheep, and may therefore serve as the text for a dissertation on hybridism, which is accordingly given in the preface to this animal. The presence of rudimentary organs under a pig's hoof suggests an attack upon the doctrine of final causes in so far as it is pretended that every part of every animal or plant was specially designed with a view to the wants of the animal or plant itself once and for ever throughout all time. The dog with his great variety of breeds gives an opportunity for an article on the formation of breeds and sub-breeds by man's artificial selection. The cat is not honoured with any philosophical reflections, and comes in for nothing but abuse. The hare suggests the rabbit, and the rabbit is a rapid breeder, although the hare is an unusually slow one; but this is near[Pg 86] enough, so the hare shall serve us for the theme of a discourse on the geometrical ratio of increase and the balance of power which may be observed in nature. When we come to the carnivora, additional reflections follow upon the necessity for death, and even for violent death; this leads to the question whether the creatures that are killed suffer pain; here, then, will be the proper place for considering the sensations of animals generally.

Perhaps the most pregnant passage concerning evolution is to be found in the preface to the ass, which is so near the beginning of the work as to be only the second animal of which Buffon treats after having described man himself. It points strongly in the direction of his having believed all animal forms to have been descended from one single common ancestral type. Buffon did not probably choose to take his very first opportunity in order to insist upon matter that should point in this direction; but the considerations were too important to be deferred long, and are accordingly put forward under cover of the ass, his second animal.

When we consider the force with which Buffon's conclusion is led up to; the obviousness of the conclusion itself when the premises are once admitted; the impossibility that such a conclusion should be again lost sight of if the reasonableness of its being drawn had been once admitted; the position in his scheme which is assigned to it by its propounder; the persistency with which he

demonstrates during forty years thereafter that the premises, which he has declared should establish the conclusion in question, are indisputable;—when we consider, too, that we are dealing with a[Pg 87] man of unquestionable genius, and that the times and circumstances of his life were such as would go far to explain reserve and irony—is it, I would ask, reasonable to suppose that Buffon did not, in his own mind, and from the first, draw the inference to which he leads his reader, merely because from time to time he tells the reader, with a shrug of the shoulders, that *he* draws no inferences opposed to the Book of Genesis? Is it not more likely that Buffon intended his reader to draw his inferences for himself, and perhaps to value them all the more highly on that account?

The passage to which I am alluding is as follows:—

"If from the boundless variety which animated nature presents to us, we choose the body of some animal or even that of man himself to serve as a model with which to compare the bodies of other organized beings, we shall find that though all these beings have an individuality of their own, and are distinguished from one another by differences of which the gradations are infinitely subtle, there exists at the same time a primitive and general design which we can follow for a long way, and the departures from which (*dégénérations*) are far more gentle than those from mere outward resemblance. For not to mention organs of digestion, circulation, and generation, which are common to all animals, and without which the animal would cease to be an animal, and could neither continue to exist nor reproduce itself—there is none the less even in those very parts which constitute the main difference in outward appearance, a striking resemblance which carries with it irresistibly the idea of a single pattern[Pg 88] after which all would appear to have been conceived. The horse, for example—what can at first sight seem more unlike mankind? Yet when we compare man and horse point by point and detail by detail, is not our wonder excited rather by the points of resemblance than of difference that are to be found between them? Take the skeleton of a man; bend forward the bones in the region of the pelvis, shorten the thigh bones, and those of the leg and arm, lengthen those of the feet and hands, run the joints together, lengthen the jaws, and shorten the frontal bone, finally, lengthen the spine, and the skeleton will now be that of a man no longer, but will have become that of a horse—for it is easy to imagine that in lengthening the spine and the jaws we shall at the same time have increased the number of the vertebræ, ribs, and teeth. It is but in the number of these bones, which may be considered accessory, and by the lengthening, shortening, or mode of attachment of others, that the skeleton of the horse differs from that of the human body.... We find ribs in man, in all the quadrupeds, in birds, in fishes, and we may find traces of them as far down as the

turtle, in which they seem still to be sketched out by means of furrows that are to be found beneath the shell. Let it be remembered that the foot of the horse, which seems so different from a man's hand, is, nevertheless, as M. Daubenton has pointed out, composed of the same bones, and that we have at the end of each of our fingers a nail corresponding to the hoof of a horse's foot. Judge, then, whether this hidden resemblance is not more marvellous than any outward differences[Pg 89]—whether this constancy to a single plan of structure which we may follow from man to the quadrupeds, from the quadrupeds to the cetacea, from the cetacea to birds, from birds to reptiles, from reptiles to fishes—in which all such essential parts as heart, intestines, spine, are invariably found—whether, I say, this does not seem to indicate that the Creator when He made them would use but a single main idea, though at the same time varying it in every conceivable way, so that man might admire equally the magnificence of the execution and the simplicity of the design. ^[46]

"If we regard the matter thus, not only the ass and the horse, *but even man himself, the apes, the quadrupeds, and all animals might be regarded but as forming members of one and the same family*. But are we to conclude that within this vast family which the Creator has called into existence out of nothing, there are other and smaller families, projected as it were by Nature, and brought forth by her in the natural course of events and after a long time, of which some contain but two members, as the ass and the horse, others many members, as the weasel, martin, stoat, ferret, &c., and that on the same principle there are families of vegetables, containing ten, twenty, or thirty plants, as the case may be? If such families had any real existence they could have been formed only by crossing, by the accumulation of successive variations (*variation successive*), and by degeneration from an original type; but if we once admit that there are families of plants and animals, so that the ass may be of the family of the[Pg 90] horse, and that the one may only differ from the other through degeneration from a common ancestor, we might be driven to admit that the ape is of the family of man, that he is but a degenerate man, and that he and man have had a common ancestor, even as the ass and horse have had. It would follow then that every family, whether animal or vegetable, had sprung from a single stock, which after a succession of generations, had become higher in the case of some of its descendants and lower in that of others."

What inference could be more aptly drawn? But it was not one which Buffon was going to put before the general public. He had said enough for the discerning, and continues with what is intended to make the conclusions they should draw even plainer to them, while it conceals them still more carefully from the general reader.

"The naturalists who are so ready to establish families among animals and vegetables, do not seem to have sufficiently considered the consequences which should follow from their premises, for these would limit direct creation to as small a number of forms as anyone might think fit (*reduisoient le produit immédiat de la création, à un nombre d'individus aussi petit que l'on voudroit*). *For if it were once shown that we had right grounds for establishing these families; if the point were once gained that among animals and vegetables there had been, I do not say several species, but even a single one, which had been produced in the course of direct descent from another species; if for example it could be once shown that the ass was but a degeneration from the horse—then*[Pg 91] *there is no further limit to be set to the power of nature, and we should not be wrong in supposing that with sufficient time she could have evolved all other organized forms from one primordial type (et l'on n'aurait pas tort de supposer, que d'un seul être elle a su tirer avec le temps tous les autres êtres organisés).*"

Buffon now felt that he had sailed as near the wind as was desirable. His next sentence is as follows:—

"But no! It is certain *from revelation* that all animals have alike been favoured with the grace of an act of direct creation, and that the first pair of every species issued full formed from the hands of the Creator."^[47]

This might be taken as *bonâ fide*, if it had been written by Bonnet, but it is impossible to accept it from Buffon. It is only those who judge him at second hand, or by isolated passages, who can hold that he failed to see the consequences of his own premises. No one could have seen more clearly, nor have said more lucidly, what should suffice to show a sympathetic reader the conclusion he ought to come to. Even when ironical, his irony is not the ill-natured irony of one who is merely amusing himself at other people's expense, but the serious and legitimate irony of one who must either limit the circle of those to whom he appeals, or must know how to make the same language appeal differently to the different capacities of his readers, and who trusts to the good sense of the discerning to understand the difficulty of his position, and make due allowance for it.[Pg 92]

The compromise which he thought fit to put before the public was that "Each species has a type of which the principal features are engraved in indelible and eternally permanent characters, while all accessory touches vary."^[48] It would be satisfactory to know where an accessory touch is supposed to begin and end.

And again:—

"The essential characteristics of every animal have been conserved without alteration in their most important parts.... The individuals of each genus still represent the same forms as they did in the earliest ages, especially in the case of the larger animals" (so that the generic forms even of the larger animals prove not to be the same, but only 'especially' the same as in the earliest ages). ^[49]

This transparently illogical position is maintained ostensibly from first to last, much in the same spirit as in the two foregoing passages, written at intervals of thirteen years. But they are to be read by the light of the earlier one—placed as a lantern to the wary upon the threshold of his work in 1753—to the effect that a single, well substantiated case of degeneration would make it conceivable that all living beings were descended from a single common ancestor. If after having led up to this by a remorseless logic, a man is found five-and-twenty years later still substantiating cases of degeneration, as he has been substantiating them unceasingly in thirty quartos during the whole interval, there should be little[Pg 93] question how seriously we are to take him when he wishes us to stop short of the conclusions he has told us we ought to draw from the premises that he has made it the business of his life to establish—especially when we know that he has a Sorbonne to keep a sharp eye upon him.

I believe that if the reader will bear in mind the twofold, serious and ironical, character of Buffon's work he will understand it, and feel an admiration for it which will grow continually greater and greater the more he studies it, otherwise he will miss the whole point.

Buffon on one of the early pages of his first volume protested against the introduction of either "*plaisanterie*" or "*équivoque*" (p. 25) into a serious work. But I have observed that there is an unconscious irony in most disclaimers of this nature. When a writer begins by saying that he has "an ineradicable tendency to make things clear," we may infer that we are going to be puzzled; so when he shows that he is haunted by a sense of the impropriety of allowing humour to intrude into his work, we may hope to be amused as well as interested. As showing how far the objection to humour which he expressed upon his twenty-fifth page succeeded in carrying him safely over his twenty-sixth and twenty-seventh, I will quote the following, which begins on page twenty-six:—

"Aldrovandus is the most learned and laborious of all naturalists; after sixty years of work he has left an immense number of volumes behind him, which have been printed at various times, the greater number of[Pg 94] them after his death. It would be possible to reduce them to a tenth part if we could rid them of all useless and foreign matter, and of a prolixity which I find almost overwhelming; were this only done, his

books should be regarded as among the best we have on the subject of natural history in its entirety. The plan of his work is good, his classification distinguished for its good sense, his dividing lines well marked, his descriptions sufficiently accurate—monotonous it is true, but painstaking; the historical part of his work is less good; it is often confused and fabulous, and the author shows too manifestly the credulous tendencies of his mind.

"While going over his work, I have been struck with that defect, or rather excess, which we find in almost all the books of a hundred or a couple of hundred years ago, and which prevails still among the Germans—I mean with that quantity of useless erudition with which they intentionally swell out their works, and the result of which is that their subject is overlaid with a mass of extraneous matter on which they enlarge with great complacency, but with no consideration whatever for their readers. They seem, in fact, to have forgotten what they have to say in their endeavour to tell us what has been said by other people.

"I picture to myself a man like Aldrovandus, after he has once conceived the design of writing a complete natural history. I see him in his library reading, one after the other, ancients, moderns, philosophers, theologians, jurisconsults, historians, travellers, poets, and[Pg 95] reading with no other end than with that of catching at all words and phrases which can be forced from far or near into some kind of relation with his subject. I see him copying all these passages, or getting them copied for him, and arranging them in alphabetical order. He fills many portfolios with all manner of notes, often taken without either discrimination or research, and at last sets himself to write with a resolve that not one of all these notes shall remain unused. The result is that when he comes to his account of the cow or of the hen, he will tell us all that has ever yet been said about cows or hens; all that the ancients ever thought about them; all that has ever been imagined concerning their virtues, characters, and courage; every purpose to which they have ever yet been put; every story of every old woman that he can lay hold of; all the miracles which certain religions have ascribed to them; all the superstitions they have given rise to; all the metaphors and allegories which poets have drawn from them; the attributes that have been assigned to them; the representations that have been made of them in hieroglyphics and armorial bearings, in a word all the histories and all fables in which there was ever yet any mention either of a cow or hen. How much natural history is likely to be found in such a lumber room? and how is one to lay one's hand upon the little that there may actually be?" [\[50\]](#)

It is hoped that the reader will see Buffon, much as Buffon saw the learned Aldrovandus. He should see[Pg 96] him going into his library, &c., and quietly chuckling to himself as he wrote such a passage as the one in which we lately found

him saying that the larger animals had "especially" the same generic forms as they had always had. And the reader should probably see Daubenton chuckling also.

FOOTNOTES:

[39]Tom. i. p. 24, 1749.

[40]Tom. i. p. 40, 1749.

[41]Vol. i. p. 34, 1749.

[42]Tom. i. p. 36.

[43]See p. [88](#) of this volume; see also p. [155](#), and [164](#).

[44]Tom. i. p. 33.

[45]'The Naturalist's Library,' vol. ii. p. 23, Edinburgh, 1843.

[46]Tom. iv. p. 381, 1753.

[47]Tom. iv. p. 383, 1753 (this was the first volume on the lower animals).

[48]Tom. xiii. p. ix. 1765.

[49]Sup. tom. v. p. 27, 1778.

[50]Tom. i. p. 28, 1749.

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CHAPTER X.

SUPPOSED FLUCTUATIONS OF OPINION—CAUSES OR MEANS OF THE TRANSFORMATION OF SPECIES.

Enough, perhaps, has been already said to disabuse the reader's mind of the common misconception of Buffon, namely, that he was more or less of an elegant trifler with science, who cared rather about the language in which his ideas were clothed than about the ideas themselves, and that he did not hold the same opinions for long together; but the accusation of instability has been made in such high quarters that it is necessary to refute it still more completely.

Mr. Darwin, for example, in his "Historical Sketch of the Recent Progress of Opinion on the Origin of Species" prefixed to all the later editions of his own 'Origin of Species,' says of Buffon that he "was the first author who, in modern times, has treated" the

origin of species "in a scientific spirit. But," he continues, "as his opinions fluctuated greatly at different periods, and as he does not enter on the causes or means of the transformation of species, I need not here enter on details."^[51]

Mr. Darwin seems to have followed the one half of Isidore Geoffroy St. Hilaire's "full account of Buffon's[Pg 98] conclusions" upon the subject of descent with modification,^[52] to which he refers with approval on the second page of his historical sketch.^[53]

Turning, then, to Isidore Geoffroy's work, I find that in like manner he too has been following the one half of what Buffon actually said. But even so, he awards Buffon very high praise.

"Buffon," he writes, "is to the doctrine of the mutability of species what Linnæus is to that of its fixity. It is only since the appearance of Buffon's 'Natural History,' and in consequence thereof, that the mutability of species has taken rank among scientific questions."^[54]

.....

"Buffon, who comes next in chronological order after Bacon, follows him in no other respect than that of time. He is entirely original in arriving at the doctrine of the variability of organic types, and in enouncing it after long hesitation, during which one can watch the labour of a great intelligence freeing itself little by little from the yoke of orthodoxy.

"But from this source come difficulties in the interpretation of Buffon's work which have misled many writers. Buffon expresses absolutely different opinions in different parts of his natural history—so much so that partisans and opponents of the doctrine of the fixity of species have alike believed and still believe themselves at liberty to claim Buffon as one of the great authorities upon their side."[Pg 99]

Then follow the quotations upon which M. Geoffroy relies—to which I will return presently—after which the conclusion runs thus:—

"The dates, however, of the several passages in question are sufficient to explain the differences in their tenor, in a manner worthy of Buffon. Where are the passages in which Buffon affirms the immutability of species? At the beginning of his work. His first volume on animals^[55] is dated 1753. The two following are those in which Buffon still shares the views of Linnæus; they are dated 1755 and 1756. Of what date are those in which Buffon declares for variability? From 1761 to 1766. And those in which,

after having admitted variability and declared in favour of it, he proceeds to limit it?
From 1765 to 1778.

"The inference is sufficiently simple. Buffon does but correct himself. He does not fluctuate. He goes once for all from one opinion to the other, from what he accepted at starting on the authority of another to what he recognized as true after twenty years of research. If while trying to set himself free from the prevailing notions, he in the first instance went, like all other innovators, somewhat to the opposite extreme, he essays as soon as may be to retrace his steps in some measure, and thenceforward to remain unchanged.

"Let the reader cast his eye over the general table of contents wherein Buffon, at the end of his 'Natural History,' gives a *résumé* of all of it that he is anxious to preserve. He passes over alike the passages in which he affirms and those in which he unreservedly denies[Pg 100] the immutability of species, and indicates only the doctrine of the permanence of essential features and the variability of details (*toutes les touches accessoires*); he repeats this eleven years later in his 'Époques de la Nature'" (published 1778).^[56]

But I think I can show that the passages which M. Geoffroy brings forward, to prove that Buffon was in the first instance a supporter of invariability, do not bear him out in the deduction he has endeavoured to draw from them.

"What author," he asks, "has ever pronounced more decidedly than Buffon in favour of the invariability of species? Where can we find a more decided expression of opinion than the following?

"The different species of animals are separated from one another by a space which Nature cannot overstep."

On turning, however, to Buffon himself, I find the passage to stand as follows:—

"*Although the different species of animals are separated from one another by a space which Nature cannot overstep—yet some of them approach so nearly to one another in so many respects that there is only room enough left for the getting in of a line of separation between them*,"^[57] and on the following page he distinctly encourages the idea of the mutability of species in the following passage:—

"In place of regarding the ass as a degenerate horse, there would be more reason in calling the horse a more perfect kind of ass (*un âne perfectionné*), and the[Pg 101] sheep a more delicate kind of goat, that we have tended, perfected, and propagated for our use, and that the more perfect animals in general—especially the

domestic animals—*draw their origin from some less perfect species of that kind of wild animal which they most resemble. Nature alone not being able to do as much as Nature and man can do in concert with one another.*"^[58]

But Buffon had long ago declared that if the horse and the ass could be considered as being blood relations there was no stopping short of the admission that all animals might also be blood relations—that is to say, descended from common ancestors—and now he tells us that the ass and horse *are* in all probability descended from common ancestors. Will a reader of any literary experience hold that so laborious, and yet so witty a writer, and one so studious of artistic effect, could ignore the broad lines he had laid down for himself, or forget how what he had said would bear on subsequent passages, and subsequent passages on it? A less painstaking author than Buffon may yet be trusted to remember his own work well enough to avoid such literary bad workmanship as this. If Buffon had seen reason to change his mind he would have said so, and would have contradicted the inference he had originally pronounced to be deducible from an admission of kinship between the ass and the horse. This, it is hardly necessary to say, he never does, though he frequently thinks it well to remind his reader of the fact that the ass and the horse are in all probability [Pg 102] closely related. This is bringing two and two together with sufficient closeness for all practical purposes.

Should not M. Geoffroy's question, then, have rather been "Who has ever pronounced more grudgingly, even in an early volume, &c., &c., and who has more completely neutralized whatever concession he might appear to have been making?"

Nor does the only other passage which M. Geoffroy brings forward to prove that Buffon was originally a believer in the fixity of species bear him out much better. It is to be found on the opening page of a brief introduction to the wild animals. M. Geoffroy quotes it thus: "We shall see Nature dictating her laws, so simple yet so unchangeable, and imprinting her own immutable characters upon every species." But M. Geoffroy does not give the passage which, on the same page, admits mutability among domesticated animals, in the case of which he declares we find Nature "rarement perfectionnée, souvent altérée, défigurée;" nor yet does he deem it necessary to show that the context proves that this unchangeableness of wild animals is only relative; and this he should certainly have done, for two pages later on Buffon speaks of the American tigers, lions, and panthers as being "degenerated, if their original nature was cruel and ferocious; or, rather, they have experienced the effect of climate, and under a milder sky have assumed a milder nature, their excesses have become moderated, and by the changes which they have undergone they have become more in conformity with the country they inhabit."^[59]

[Pg 103]And again:—

"If we consider each species in the different climates which it inhabits, we shall find perceptible varieties as regards size and form: they all derive an impress to a greater or less extent from the climate in which they live. *These changes are only made slowly and imperceptibly.* Nature's great workman is Time. He marches ever with an even pace, and does nothing by leaps and bounds, but by degrees, gradations, and succession he does all things; and the changes which he works—at first imperceptible—become little by little perceptible, and show themselves eventually in results about which there can be no mistake.

"Nevertheless animals in a free, wild state are perhaps less subject than any other living beings, man not excepted, to alterations, changes, and variations of all kinds. Being free to choose their own food and climate, they vary less than domestic animals vary."^[60] The conditions of their existence, in fact, remaining practically constant, the animals are no less constant themselves.

The writer of the above could hardly be claimed as a very thick and thin partisan of immutability, even though he had not shown from the first how clearly he saw that there was no middle position between the denial of all mutability, and the admission that in the course of sufficient time any conceivable amount of mutability is possible. I will give a considerable part of what I have found in the first six volumes of Buffon to bear one way or the other on his views concerning the mutability of species; and I think the reader, so far from agreeing with M. Isidore Geoffroy that Buffon [Pg 104] began his work with a belief in the fixity of species, will find, that from the very first chapter onward, he leant strongly to mutability, even if he did not openly avow his belief in it.

In support of this assertion, one quotation must suffice:—

"Nature advances by gradations which pass unnoticed. She passes from one species, and often from one genus to another by imperceptible degrees, so that we meet with a great number of mean species and objects of such doubtful characters that we know not where to place them."^[61]

The reader who turns to Buffon himself will find the idea that Buffon took a less advanced position in his old age than he had taken in middle life is also without foundation.

Mr. Darwin has said that Buffon "does not enter into the causes or means of the transformation of species." It is not easy to admit the justice of this. Independently of his frequently insisting on the effect of all kinds of changed surroundings, he has

devoted a long chapter of over sixty quarto pages to this very subject; it is to be found in his fourteenth volume, and is headed "De la Dégénération des Animaux," of which words "On descent with modification" will be hardly more than a literal translation. I shall give a fuller but still too brief outline of the chapter later on, and will confine myself here to saying that the three principal causes of modification which Buffon brings forward are changes of climate, of food, and the effects of domestication. [Pg 105] He may be said to have attributed variation to the direct and specific action of changed conditions of life, and to have had but little conception of the view which he was himself to suggest to Dr. Erasmus Darwin, and through him to Lamarck.

Isidore Geoffroy, writing of Lamarck, and comparing his position with that taken by Buffon, says, on the whole truly, that "what Buffon ascribes to the general effects of climate, Lamarck maintains to be caused, especially in the case of animals, by the force of habits; *so that, according to him, they are not, properly speaking, modified by the conditions of their existence, but are only induced by these conditions to set about modifying themselves.*"^[62] But it is very hard to say how much Buffon saw and how much he did not see. He may be trusted to have seen that if he once allowed the thin end of this wedge into his system, he could no more assign limits to the effect which living forms might produce upon their own organisms by effort and ingenuity in the course of long time, than he could set limits to what he had called the power of Nature if he was once to admit that an ass and a horse might, through that power, have been descended from a common ancestor. Nevertheless, he shows no unwillingness or recalcitrancy about letting the wedge enter, for he speaks of domestication as inducing modifications "sufficiently profound to become constant and hereditary in successive generations ... *by its action on bodily habits it influences also their natures, instincts, and most inward qualities.*"^[63]

[Pg 106] This is a very thick thin end to have been allowed to slip in unawares; but it is astonishing how little Buffon can see when he likes. I hardly doubt but he would have been well enough pleased to have let the wedge enter still farther, but this fluctuating writer had assigned himself his limits some years before, and meant adhering to them. Again, in this very chapter on Degeneration, to which M. Geoffroy has referred, there are passages on the callosities on a camel's knees, on the llama, and on the haunches of pouched monkeys which might have been written by Dr. Darwin himself.^[64] They will appear more fully presently. Buffon now probably felt that he had said enough, and that others might be trusted to carry the principle farther when the time was riper for its enforcement.

FOOTNOTES:

- [51]'Origin of Species,' p. xiii. ed. 1876.
- [52]'Hist. Nat. Gén.,' tom. ii. p. 405, 1859.
- [53]'Origin of Species,' p. xiv. 1876.
- [54]'Hist. Nat. Gén.,' tom. ii. p. 383.
- [55]Tom. iv.
- [56]'Hist. Nat. Gén.,' tom. ii. p. 391, 1859.
- [57]Tom. v. p. 59, 1755.
- [58]Tom. v. p. 60.
- [59]Tom. vi. p. 58, 1756.
- [60]Tom. vi. pp. 59-60, 1756.
- [61]Tom. i. p. 13, 1749.
- [62]'Hist. Nat. Gén.,' tom. ii. p. 411, 1859.
- [63]Tom. xi. p. 290, 1764 (misprinted on title-page 1754).
- [64]See tom. xiv. p. 326, 1766; and p. [162](#) of this volume.
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CHAPTER XI.

BUFFON—FULLER QUOTATIONS.

Let us now proceed to those fuller quotations which may answer the double purpose of bearing me out in the view of Buffon's work which I have taken in the foregoing pages, and of inducing the reader to turn to Buffon himself.

I have already said that from the very commencement of his work Buffon showed a proclivity towards considerations which were certain to lead him to a theory of evolution, even though he had not, as I believe he had, already taken a more comprehensive view of the subject than he thought fit to proclaim unreservedly.

In 1749, at the beginning of his first volume he writes:—

"The first truth that makes itself apparent on serious study of Nature, is one that man may perhaps find humiliating; it is this—that he, too, must take his place in the ranks

of animals, being, as he is, an animal in every material point. It is possible also that the instinct of the lower animals will strike him as more unerring, and their industry more marvellous than his own. Then, running his eye over the different objects of which the universe is composed, he will observe with astonishment[Pg 108] that we can descend by almost imperceptible degrees from the most perfect creature to the most formless matter—from the most highly organized animal to the most entirely inorganic substance. He will recognize this gradation as the great work of Nature; and he will observe it not only as regards size and form, but also in respect of movements, and in the successive generations of every species.^[65]

"Hence," he continues, "arises the difficulty of arriving at any perfect system or method in dealing either with Nature as a whole or even with any single one of her subdivisions. The gradations are so subtle that we are often obliged to make arbitrary divisions. Nature knows nothing about our classifications, and does not choose to lend herself to them without reserve. We therefore see a number of intermediate species and objects which it is very hard to classify, and which of necessity derange our system whatever it may be."^[66]

"The attempt to form perfect systems has led to such disastrous results that it is now more easy to learn botany than the terminology which has been adopted as its language."^[67]

After saying that "*la marche de la Nature*" has been misunderstood, and that her progress has ever been by a succession of slow steps, he maintains that the only proper course is to class together whatever objects resemble one another, and to separate those which are unlike. If individual specimens are absolutely alike, or differ so little that the differences can hardly be perceived, they must be classed as of the same species;[Pg 109] if the differences begin to be perceptible, but if at the same time there is more resemblance than difference, the individuals presenting these features should be classed as of a different species, but as of the same genus; if the differences are still more marked, but nevertheless do not exceed the resemblances, then they must be taken as not only specific but generic, though as not sufficient to warrant the individuals in which they appear, being placed in different classes. If they are still greater, then the individuals are not even of the same class; but it should be always understood that the resemblances and differences are to be considered in reference to the entirety of the plant or animal, and not in reference to any particular part only.^[68] The two rocks which are equally to be avoided are, on the one hand, absence of method, and, on the other, a tendency to over-systematize.^[69]

Like Dr. Erasmus Darwin, and more recently Mr. Francis Darwin, Buffon is more struck with the resemblances than with the differences between animals and plants, but he supposes the vegetable kingdom to be a continuation of the animal, extending lower down the scale, instead of holding as Dr. Darwin did, that animals and vegetables have been contemporaneous in their degeneration from a common stock.

"We see," he writes, "that there is no absolute and essential difference between animals and vegetables, but that Nature descends by subtle gradations from what we deem the most perfect animal to one which is less so, and again from this to the vegetable. The [Pg 110] fresh-water polypus may perhaps be considered as the lowest animal, and as at the same time the highest plant."^[70]

Looking to the resemblances between animals and plants, he declares that their modes of reproduction and growth involve such close analogy that no difference of an essential nature can be admitted between them.^[71]

On the other hand, Buffon appears, at first sight, to be more struck with the points of difference between the mental powers of the lower animals and man than with those which they present in common. It is impossible, however, to accept this as Buffon's real opinion, on the strength of isolated passages, and in face of a large number of others which point stealthily but irresistibly to an exactly opposite conclusion. We find passages which show a clear apprehension of facts that the world is only now beginning to consider established, followed by others which no man who has kept a dog or cat will be inclined to agree with. I think I have already explained this sufficiently by referring it to the impossibility of his taking any other course under the circumstances of his own position and the times in which he lived. Buffon does not deal with such pregnant facts, as, for example, the geometrical ratio of increase, in such manner as to suggest that he was only half aware of their importance and bearing. On the contrary, in the very middle of those passages which, if taken literally, should most shake confidence in his judgment, there comes a sustaining sentence, so quiet that it shall pass unnoticed by all who are not attentive [Pg 111] listeners, yet so encouraging to those who are taking pains to understand their author that their interest is revived at once.

Thus, he has insisted, and means insisting much further, on the many points of resemblance between man and the lower animals, and it has now become necessary to neutralize the effect of what he has written upon the minds of those who are not yet fitted to see instinct and reason as differentiations of a single faculty. He accordingly does this, and, as is his wont, he does it handsomely; so handsomely that even his most admiring followers begin to be uncomfortable. Whereon he begins his next

paragraph with "Animals have excellent senses, but not *generally, all of them*, as good as man's."^[72] We have heard of damning with faint praise. Is not this to praise with faint damnation? Yet we can lay hold of nothing. It was not Buffon's intention that we should. An ironical writer, concerning whom we cannot at once say whether he is in earnest or not, is an actor who is continually interrupting his performance in order to remind the spectator that he is acting. Complaint, then, against an ironical writer on the score that he puzzles us, is a complaint against irony itself; for a writer is not ironical unless he puzzles. He should not puzzle unless he believes that this is the best manner of making his reader understand him in the end, or without having a *bonne bouche* for those who will be at the pains to puzzle over him; and he should make it plain that for long parts of his work together he is to be taken according to the literal interpretation [Pg 112] of his words; but if he has observed the above duly, he is a successful or unsuccessful writer according as he puzzles or fails to do so, and should be praised or blamed accordingly. To condemn irony entirely, is to say that there should be no people allowed to go about the world but those to whom irony would be an impertinence.

Having already in some measure reassured us by the faintness with which he disparages the senses of the lower animals, Buffon continues, that these senses, whether in man or in animals, may be greatly developed by exercise: which we may suppose that a man of even less humour than Buffon must know to be great nonsense, unless it be taken to involve that animals as well as man can reflect and remember; it now, therefore, becomes necessary to reassure the other side, and to maintain that animals cannot reflect, and have no memory. "*Je crois*," he writes, "*qu'on peut démontrer que les animaux n'ont aucune connaissance du passé, aucune idée du temps, et que par conséquent ils n'ont pas la mémoire*."^[73]

I am ashamed of even arguing seriously against the supposition that this was Buffon's real opinion. The very sweepingness of the assertion, the baldness, and I might say brutality with which it is made, are convincing in their suggestiveness of one who is laughing very quietly in his sleeve.

"Society," he continues, later on, "considered even in the case of a single human family, involves the power of reason; it involves feeling in such of the lower [Pg 113] animals as form themselves into societies freely and of their own accord, but it involves nothing whatever in the case of bees, who have found themselves thrown together through no effort of their own. Such societies can only be, and it is plain have only been, the results—neither foreseen, nor ordained, nor conceived by those who achieve them—of the universal mechanism and of the laws of movement established by the Creator."^[74] A hive of bees, in fact, is to be considered as composed of "ten

thousand animated automata."^[75] Years later he repeats these views with little if any modification.^[76] A still more remarkable passage is to be found a little farther on. "If," he asks, "animals have neither understanding, mind, nor memory, if they are wholly without intelligence, and if they are limited to the exercise and experience of feeling only," and it must be remembered that Buffon has denied all these powers to the inferior animals, "whence comes that remarkable prescient instinct which so many of them exhibit? Is the mere power of feeling sensations sufficient to make them garner up food during the summer, on which food they may subsist in winter? Does not this involve the power of comparing dates, and the idea of a coming future, an '*inquiétude raisonnée*'? Why do we find in the hole of the field-mouse enough acorns to keep him until the following summer? Why do we find such an abundant store of honey and wax within the bee-hive? Why do ants store food? Why should birds make nests if they do not know that they will have[Pg 114] need of them? Whence arise the stories that we hear of the wisdom of foxes, which hide their prey in different spots, that they may find it at their need and live upon it for days together? Or of the subtilty of owls, which husband their store of mice by biting off their feet, so that they cannot run away? Or of the marvellous penetration of bees, which know beforehand that their queen should lay so many eggs in such and such a time, and that so many of these eggs should be of a kind which will develop into drones, and so many more of such another kind as should become neuters; and who in consequence of this their foreknowledge build so many larger cells for the first, and so many smaller for the second?"^[77]

Buffon answers these questions thus:—

"Before replying to them," he says, "we should make sure of the facts themselves;—are they to be depended upon? Have they been narrated by men of intelligence and philosophers, or are they popular fables only?" (How many delightful stories of the same character does he not soon proceed to tell us himself). "I am persuaded that all these pretended wonders will disappear, and the cause of each one of them be found upon due examination. But admitting their truth for a moment, and granting to the narrators of them that animals have a presentiment, a forethought, and even a certainty concerning coming events, does it therefore follow that this should spring from intelligence? If so, theirs is assuredly much greater than our own. For our foreknowledge amounts to conjecture only; the vaunted[Pg 115] light of our reason doth but suffice to show us a little probability; whereas the forethought of animals is unerring, and must spring from some principle far higher than any we know of through our own experience. Does not such a consequence, I ask, *prove repugnant alike to religion and common sense*?"^[78]

This is Buffon's way. Whenever he has shown us clearly what we ought to think, he stops short suddenly on religious grounds. It is incredible that the writer who at the very commencement of his work makes man take his place among the animals, and who sees a subtle gradation extending over all living beings "from the most perfect creature"—who must be man—"to the most entirely inorganic substance"—I say it is incredible that such a writer should not see that he had made out a stronger case in favour of the reason of animals than against it.

According to him, the test whether a thing is to have such and such a name is whether it looks fairly like other things to which the same name is given; if it does, it is to have the name; if it does not, it is not. No one accepted this lesson more heartily than Dr. Darwin, whose shrewd and homely mind, if not so great as Buffon's, was still one of no common order. Let us see the view he took of this matter. He writes:—

"If we were better acquainted with the histories of those insects which are formed into societies, as the bees, wasps, and ants, I make no doubt but we should find that their arts and improvements are not so similar[Pg 116] and uniform as they now appear to us, but that they arose in the same manner from experience and tradition, as the arts of our own species; though their reasoning is from fewer ideas, is busied about fewer objects, and is executed with less energy."^[79]

And again, a little later:—

"According to the late observations of Mr. Hunter, it appears that beeswax is not made from the dust of the anthers of flowers, which they bring home on their thighs, but that this makes what is termed bee-bread, and is used for the purpose of feeding the bee-maggots; in the same way butterflies live on honey, but the previous caterpillar lives on vegetable leaves, while the maggots of large flies require flesh for their food. What induces the bee, who lives on honey, to lay up vegetable powder for its young? What induces the butterfly to lay its eggs on leaves when itself feeds on honey?... If these are not deductions from their own previous experience or observation, all the actions of mankind must be resolved into instincts."^[80]

Or again:—

"Common worms stop up their holes with leaves or straws to prevent the frost from injuring them, or the centipes from devouring them. The habits of peace or the stratagems of war of these subterranean nations are covered from our view; but a friend of mine prevailed on a distressed worm to enter the hole of another worm on a bowling green, and he presently returned much wounded about the head, ... which evinces[Pg 117] they have design in stopping the mouths of their habitations."^[81]

Does it not look as if Dr. Darwin had in his mind the very passage of Buffon which I have been last quoting? and is it likely that the facts which were accepted by Dr. Darwin without question, or the conclusions which were obvious to him, were any less accepted by or obvious to Buffon?

The Goat—Hybridism.

In his prefatory remarks upon the goat, Buffon complains of the want of systematic and certified experiment as to what breeds and species will be fertile *inter se*, and with what results. The passage is too long to quote, but is exceedingly good, and throughout involves belief in a very considerable amount of modification in the course of successive generations. I may give the following as an example:—

"We do not know whether or no the zebra would breed with the horse or ass—whether the large-tailed Barbary sheep would be fertile if crossed with our own—whether the chamois is not a wild goat; and whether it would not form an intermediate breed if crossed with our domesticated goats; we do not know whether the differences between apes are really specific, or whether apes are not like dogs, one single species, of which there are many different breeds.... Our ignorance concerning all these facts is almost inevitable, as the experiments which would decide them require more time, pains, and money than can be spared from, the life and [Pg 118] fortune of an ordinary man. I have spent many years in experiments of this kind, and will give my results when I come to my chapter on mules; but I may as well say at once that they have thrown but little light upon the subject, and have been for the most part unsuccessful."^[82]

"But these," he continues, "are the very points which must determine our whole knowledge concerning animals, their right division into species, and the true understanding of their history." He proposes therefore, in the present lack of knowledge, "to regard all animals as different species which do not breed together under our eyes," and to leave time and experiment to correct mistakes.^[83]

The Pig—Doctrine of Final Causes.

We have seen that the doctrine of the mutability of species has been unfortunately entangled with that of final causes, or the belief that every organ and every part of each animal or plant has been designed to serve some purpose useful to the animal, and this not only useful at some past time, but useful now, and for all time to come. He who believes species to be mutable will see in many organs signs of the history of the individual, but nothing more. Buffon, as I have said, is explicit in his denial of final

causes in the sense expressed above. After pointing out that the pig is an animal whose relation to other animals it is difficult to define, he says:—

"In a word, it is of a nature altogether equivocal[Pg 119] and ambiguous, or, rather, it must appear so to those who believe the hypothetical order of their own ideas to be the real order of things, and who see nothing in the infinite chain of existences but a few apparent points to which they will refer everything.

"But we cannot know Nature by inclosing her action within the narrow circle of our own thoughts.... Instead of limiting her action, we should extend it through immensity itself; we should regard nothing as impossible, but should expect to find all things—supposing that all things are possible—nay, *are*. Doubtful species, then, irregular productions, anomalous existences will henceforth no longer surprise us, and will find their place in the infinite order of things as duly as any others. They fill up the links of the chain; they form knots and intermediate points, and also they mark its extremities: they are of especial value to human intelligence, as providing it with cases in which Nature, being less in conformity with herself, is taken more unawares, so that we can recognize singular characters and fleeting traits which show us that her ends are much more general than are our own views of those ends, and that, though she does nothing in vain, yet she does but little with the designs which we ascribe to her."^[84]

"The pig," he continues, "is not formed on an original, special, and perfect type; its type is compounded of that of many other animals. It has parts which are evidently useless, or which at any rate it cannot use—such as toes, all the bones of which are[Pg 120] perfectly formed but which are yet of no service to it. Nature then is far from subjecting herself to final causes in the composition of her creatures. Why should she not sometimes add superabundant parts, seeing she so often omits essential ones?" "How many animals are there not which lack sense and limbs? Why is it considered so necessary that every part in an individual should be useful to the other parts and to the whole animal? Should it not be enough that they do not injure each other nor stand in the way of each other's fair development? All parts coexist which do not injure each other enough to destroy each other, and perhaps in the greater number of living beings the parts which must be considered as relative, useful, or necessary, are fewer than those which are indifferent, useless, and superabundant. But we—ever on the look out to refer all parts to a certain end—when we can see no apparent use for them suppose them to have hidden uses, and imagine connections which are without foundation, and serve only to obscure our perception of Nature as she really is: we fail to see that we thus rob philosophy of her true character, which is to inquire into the 'how' of things—into the manner in which Nature acts—and that we

substitute for this true object a vain idea, seeking to divine the 'why'—the ends which she has proposed in acting."^[85]

The Dog—Varieties in consequence of Man's Selection.

"Of all animals the dog is most susceptible of impressions, and becomes most easily modified by moral[Pg 121] causes. He is also the one whose nature is most subject to the variations and alterations caused by physical influences: he varies to a prodigious extent, in temperament, mental powers, and in habits: his very form is not constant;" ... but presents so many differences that "dogs have nothing in common but conformity of interior organization, and the power of interbreeding freely."...

... "How then can we detect the characters of the original race? How recognize the effects produced by climate, food, &c.? How, again, distinguish these from those other effects which come from the intermixture of races, either when wild or in a state of domestication? All these causes, in the course of time, alter even the most constant forms, so that the imprint of Nature does not preserve its sharpness in races which man has dealt with largely. Those animals which are free to choose climate and food for themselves can best conserve their original character, ... but those which man has subjected to his own influence—which he has taken with him from clime to clime, whose food, habits, and manner of life he has altered—must also have changed their form far more than others; and as a matter of fact we find much greater variety in the species of domesticated animals than in those of wild ones. Of all these, however, the dog is the one most closely attached to man, living like man the least regular manner of life; he is also the one whose feelings so master him as to make him docile, obedient, susceptible of every kind of impression, and even of every kind of constraint; it is not surprising, then, that[Pg 122] he should of all animals present us with the greatest variety in shape, stature, colour, and all physical and mental qualities."

Here again the direct cause of modification is given as being the inner feelings of the animal modified, change of conditions being the indirect cause as with Dr. Erasmus Darwin and Lamarck.

"Other circumstances, however, concur to produce these results. The dog is short-lived: he breeds often and freely: he is perpetually under the eye of man; hence when—by some chance common enough with Nature—a variation or special feature has made its appearance, man has tried to perpetuate it by uniting together the individuals in which it has appeared, as people do now who wish to form new breeds of dogs and other animals. Moreover, though species were all formed at the same time, yet the number of generations since the creation has been much greater in the

short-lived than in the long-lived species: hence variations, alterations, and departure from the original type, may be expected to have become more perceptible in the case of animals which are so much farther removed from their original stock.

"Man is now eight times nearer Adam than the dog is to the first dog—for man lives eighty years, while the dog lives but ten. If, then, these species have an equal tendency to depart from their original type, the departure should be eight times more apparent with the dog than with man."^[86]

Here follow remarks upon the great variability of ephemeral insects and of animal plants, on the impossibility[Pg 123] of discovering the parent-stock of our wheat and of others of our domesticated plants,^[87] and on the tendency of both plants and animals to resume feral characteristics on becoming wild again after domestication.^[88]

The Hare—Geometrical Ratio of Increase.

We have already seen that it was Buffon's pleasure to consider the hare a rabbit for the time being, and to make it the text for a discourse upon fecundity. I have no doubt he enjoyed doing this, and would have found comparatively little pleasure in preaching the same discourse upon the rabbit. Speaking of the way in which even the races of mankind have struggled and crowded each other out, Buffon says:—

"These great events—these well-marked epochs in the history of the human race—are yet but ripples, as it were, on the current of life; which, as a general rule, flows onward evenly and in equal volume.

"It may be said that the movement of Nature turns upon two immovable pivots—one, the illimitable fecundity which she has given to all species; the other, the innumerable difficulties which reduce the results of that fecundity, and leave throughout time nearly the same quantity of individuals in every species.^[89]...[Pg 124] Taking the earth as a whole, and the human race in its entirety, the numbers of mankind, like those of animals, should remain nearly constant throughout time; for they depend upon an equilibrium of physical causes which has long since been reached, and which neither man's moral nor his physical efforts can disturb, inasmuch as these moral efforts do but spring from physical causes, of which they are the special effects. No matter what care man may take of his own species, he can only make it more abundant in one place by destroying it or diminishing its numbers in another. When one part of the globe is overpeopled, men emigrate, spread themselves over other countries, destroy one another, and establish laws and customs which sometimes only too surely prevent excess of population. In those climates where fecundity is greatest, as in

China, Egypt, and Guinea, they banish, mutilate, sell, or drown infants. Here, we condemn them to a perpetual celibacy. Those who are in being find it easy to assert rights over the unborn. Regarding themselves as the necessary, they annihilate the contingent, and suppress future generations for their own pleasure and advantage. Man does for his own race, without perceiving it, what he does also for the inferior animals: that is to say, he protects it and encourages it to increase, or neglects it according to his sense of need—according as advantage or inconvenience is expected as the consequence of either course. And since all these moral effects themselves depend upon physical causes, which have been in permanent equilibrium ever since the world was formed, it follows that the numbers of [Pg 125] mankind, like those of animals, should remain constant.

"Nevertheless, this fixed state, this constant number, is not absolute, all physical and moral causes, and all the results which spring from them, balance themselves, as though, upon a see-saw, which has a certain play, but never so much as that equilibrium should be altogether lost. As everything in the universe is in movement, and as all the forces which are contained in matter act one against the other and counterbalance one another, all is done by a kind of oscillation; of which the mean points are those to which we refer as being the ordinary course of nature, while the extremes are the periods which deviate from that course most widely. And, as a matter of fact, with animals as much as with plants, a time of unusual fecundity is commonly followed by one of sterility; abundance and dearth come alternately, and often at such short intervals that we may foretell the production of a coming year by our knowledge of the past one. Our apples, pears, oaks, beeches, and the greater number of our fruit and forest trees, bear freely but about one year in two. Caterpillars, cockchafers, woodlice, which in one year may multiply with great abundance, will appear but sparsely in the next. What indeed would become of all the good things of the earth, what would become of the useful animals, and indeed of man himself, if each individual in these years of excess was to leave its quatum of offspring? This, however, does not happen, for destruction and sterility follow closely upon excessive fecundity, and, independently of the contagion which follows inevitably upon [Pg 126] overcrowding, each species has its own special sources of death and destruction, which are of themselves sufficient to compensate for excess in any past generation.

"Nevertheless the foregoing should not be taken in an absolute sense, nor yet too strictly,—especially in the case of those races which are not left entirely to the care of Nature. Those which man takes care of—commencing with his own—are more abundant than they would be without his care, yet, as his power of taking this care is

limited, the increase which has taken place is also fixed, and has long been restrained within impassable boundaries. Again, though in civilized countries man, and all the animals useful to him, are more numerous than in other places, yet their numbers never become excessive, for the same power which brings them into being destroys them as soon as they are found inconvenient."^[90]

The Carnivora—Sensation.

Buffon begins his seventh volume with some remarks on the *carnivora* in general, which I would gladly quote at fuller length than my space will allow. He dwells on the fact that the number, as well as the fecundity of the insect races is greater than that of the mammalia, and even than of plants; and he points out that "violent death is almost as necessary an usage as is the law that we must all, in one way or another, die." This leads him to the question whether animals can feel. "To speak seriously," (au réel) he says (and why this, if he had[Pg 127] always spoken seriously?^[91]), "can we doubt that those animals whose organization resembles our own, feel the same sensations as we do? They must feel, for they have senses, and they must feel more and more in proportion as their senses are more active and more perfect." Those whose organ of any sense is imperfect, have but imperfect perception in respect of that sense; and those that are entirely without the organ want also all corresponding sensation. "Movement is the necessary consequence of acts of perception. I have already shown that in whatever manner a living being is organized, if it has perceptions at all, it cannot fail to show that it has them by some kind of movement of its body. Hence plants, though highly organized, have no feeling, any more than have those animals which, like plants, manifest no power of motion. Among animals there are those which, like the sensitive plant, have but a certain power of movement about their own parts, and which have no power of locomotion; such animals have as yet but little perception. Those, again, which have power of locomotion, but which, like automata, do but a small number of things, and always after the same fashion, can have only small powers of perception, and these limited to a small number of objects. But in the case of man, what automata, indeed, have we not here! How much do not education and the intercommunication of ideas increase our powers and vivacity of perception. What difference can we not see in this respect between civilized and uncivilized races, between the peasant girl, and the woman of the world? And in like manner among[Pg 128] animals, those which live with us have their perceptions increased in range, while those that are wild have but their natural instinct, which is often more certain but always more limited in range than is the intelligence of domesticated animals."^[92]

.....

"For perception to exist in its fullest development in any animal body, that body must form a whole—an *ensemble*, which shall not only be capable of feeling in all its parts, but shall be so arranged that all these feeling parts shall have a close correspondence with one another, and that no one of them can be disturbed without communicating a portion of that disturbance to every other part. There must also be a single chief centre, with which all these different disturbances may be connected, and from which, as from a common *point d'appui*, the reactions against them may take their rise. Hence man, and those animals whose organization most resembles man's, will be the most capable of perceptions, while those whose unity is less complete, whose parts have a less close correspondence with each other—which have several centres of sensation, and which seem, in consequence, less to envelope a single existence in a single body than to contain many centres of existence separated and different from one another—these will have fewer and duller perceptions. The polypus, which can be reproduced by fission; the wasp, whose head even after separation from the body still moves, lives, acts, and even eats as heretofore; the lizard which we deprive neither of sensation nor movement by cutting[Pg 129] off part of its body; the lobster which can restore its amputated limbs; the turtle whose heart beats long after it has been plucked out, in a word all the animals whose organization differs from our own, have but small powers of perception, and the smaller the more they differ from us."^[93]

This is Buffon's way of satirizing our inability to bear in mind that we are compelled to judge all things by our own standards. He also wishes to reassure those who might be alarmed at the tendency of some of his foregoing remarks, and who he knew would find comfort in being told that a thing which does not express itself as they do does not feel at all.

The diaphragm according to Buffon appears to be the centre of the powers of sensation; the slightest injury "even to the attachments of the diaphragm is followed by strong convulsions, and even by death. The brain which has been called the seat of 'sensations' is yet not the centre of 'perception,' since we can wound it, and even take considerable parts of it away, without death's ensuing, and without preventing an animal from living, moving and feeling in all its parts."

Buffon thus distinguishes between "sensation" and "perception." "Sensation," he says, "is simply the activity of a sense, but perception is the pleasantness or unpleasantness of this sensation," "perceived by its being propagated and becoming active throughout the entire system." I have therefore several times, when translating from Buffon, rendered the word "*sentiment*" by "perception," and shall continue to do so. "I say,"[Pg 130] writes Buffon, "the pleasantness or unpleasantness, because this is the very essence of perception; the one feature of perception consists in perceiving

either pain or pleasure; and though movements which do not affect us in either one or the other of these two ways may indeed take place within us, yet we are indifferent to them, and do not perceive that we are affected by them. All external movement, and all exercise of the animal powers, spring from perception; its action is proportionate to the extent of its excitation, to the extent of the feeling which is being felt. ^[94] And this same part, which we regard as the centre of sensation, will also be that of all the animal powers; or, if it is preferred to call it so, it will be the common *point d'appui* from which they all take rise. The diaphragm is to the animal what the 'stock' is to the plant; both divide an organism transversely, both serve as the *point d'appui* of opposing forces; for the forces which push upward those parts of a tree which should form its trunk and branches, bear upon and are supported by the 'stock,' as do those opposing forces, which drive the roots downwards.

.....

"Even on a cursory examination we can see that all our innermost affections, our most lively emotions, our most expansive moments of delight, and, on the other hand, our sudden starts, pains, sicknesses, and swoons—in fact, all our strong impressions concerning the pleasure or pain of any sensation—make themselves felt within the body, and about the region of the diaphragm. The brain, on the contrary, shows no sign of being a seat [Pg 131] of perception. In the head there are pure sensations and nothing else, or rather, there are but the representations of sensations stripped of the character of perception; that is to say, we can remember and call to mind whether such and such a sensation was pleasant to us or otherwise, and if this operation, which goes on in the head, is followed by a vivid perception, then the impression made is perceived in the interior of the body, and always in the region of the diaphragm. Hence, in the fœtus where this membrane is without use, there is no perception, or so little that nothing comes of it, the movements of the fœtus, such as they are, being rather mechanical than dependent on sensation and will.

"Whatever the matter may be which serves as the vehicle of perception, and produces muscular movement, it is certain that it is propagated through the nerves, and that it communicates itself instantaneously from one extremity of the system to the other. In whatever manner this operation is conducted, whether by the vibrations, as it were, of elastic cords or by a subtle fire, or by a matter resembling electricity, which not only resides in animal as in all other bodies, but is being continually renewed in them by the movements of the heart and lungs, by the friction of the blood within the arteries, and also by the action of exterior causes upon our organs of sense—in whatever manner, I say, the operation is conducted, it is nevertheless certain that the nerves and membranes are the only parts in an animal body that can feel. The blood, lymphs,

and all other fluids, the fats, bone, flesh, and all other solids, are of themselves void of sensation. And[Pg 132] so also is the brain; it is a soft and inelastic substance, incapable therefore of producing or of propagating the movement, vibrations, or concussions which, result in perception. The meninges, on the other hand, are exceedingly sensitive, and are the envelopes of all the nerves; like the nerves, they take rise in the head; and, dividing themselves like the branches of the nerves, they extend even to their smallest ramifications: they are, so to speak, flattened nerves; they are of the same substance as the nerves, are nearly of the same degree of elasticity, and form a necessary part of the system of sensation. If, then, the seat of the sensations must be placed in the head, let it be placed in the meninges, and not in the medullary part of the brain, which is of an entirely different substance."^[95]

If this is so, it appears from what will follow as though the meninges must be the "stock" rather than the diaphragm.

"What perhaps has given rise to the opinion that the seat of all sensations and the centre of all sensibility is in the brain, is the fact that the nerves, which are the organs of perception, all attach themselves to the brain, which has hence come to be regarded as the one common centre which can receive all their vibrations and impressions. This fact alone has sufficed to indicate the brain as the origin of perceptions—as the essential organ of sensations; in a word, as the common sensorium. This supposition has appeared so simple and natural that its physical impossibility has been overlooked, an impossibility, however, which should be[Pg 133] sufficiently apparent. For how can a part which cannot feel—a soft inactive substance like the brain—be the very organ of perception and movement? How can this soft and perceptionless part not only receive impressions, but preserve them for a length of time, and transmit their undulatory movements (*en propage les ébranlements*) throughout all the solid and feeling parts of the body? It may perhaps be maintained with Descartes and M. de Peyronie that the principle of sensation does not reside in the brain, but in the pineal gland or in the *corpus callosum*; but a glance at the conformation of the brain itself will suffice to show that these parts do not join on to the nerves, but that they are entirely surrounded by those parts of the brain which do not feel, and are so separated from the nerves that they cannot receive any movement from them; whence it follows that this second supposition is as groundless as the first."^[96]

What, then, asks Buffon, is the use of the brain? Man, the quadrupeds, and birds all have larger brains, and at the same time more extended perceptions, than fishes, insects, and those other living beings whose brains are smaller in proportion. "When the brain is compressed, there is suspension of all power of movement. If this part is

not the source of our powers of motion, why is it so necessary and so essential? Why, again, does it seem so proportionate in each animal to the amount of perceiving power which that animal possesses?

"I think I can answer this question in a satisfactory[Pg 134] manner, difficult though it seems; but in order that I may do so, I would ask the reader to lend me his attention for a few moments while we regard the brain simply *as brain*, and have no other idea concerning it than we can derive from inspection and reflection. The brain, as well as the *medulla oblongata* and the spinal marrow, which are but prolongations of the brain itself, is only a kind of hardly organized mucilage; we find in it nothing but the extremities of small arteries, which run into it in very great numbers, but which convey a white and nourishing lymph instead of blood. When the parts of the brain are disunited by maceration, these same small arteries, or lymphatic vessels, appear as very delicate threads throughout their whole length. The nerves, on the contrary, do not penetrate the substance of the brain; they abut upon its surface only; before reaching it they lose their elasticity and solidity, and the extremities of the nerves which are nearest to the brain are soft, and nearly mucilaginous. From this exposition, in which there is nothing hypothetical, it appears that the brain, which is nourished by the lymphatic arteries, does in its turn provide nourishment for the nerves, and that we must regard these as a kind of vegetation which rises as trunks and branches from the brain, and become subsequently subdivided into an infinite number, as it were, of twigs. The brain is to the nerves what the earth is to plants: the last extremities of the nerves are the roots, which with every vegetable are more soft and tender than the trunk or branches; they contain a ductile matter fit for the growth and nourishment of the nervous tree or fibre;[Pg 135] they draw the ductile matter from the substance of the brain itself, to which the arteries are continually bringing the lymph that is necessary to supply it. The brain, then, instead of being the seat of the sensations, and the originator of perception, is an organ of secretion and nutrition only, though a very essential organ, without which the nerves could neither grow nor be maintained.

"This organ is greater in man, in quadrupeds, and in birds, because the number or bulk of the nerves is greater in these animals than in fishes or insects, whose power of perception is more feeble, for this very reason, that they have but a small brain; one, in fact, that is proportioned to the small quantity of nerves which that brain must support. Nor can I omit to state here that man has not, as has been pretended by some, a larger brain than has any other animal; for there are apes and cetacea which have more brain than man in proportion to the volume of their bodies—another fact which proves that the brain is neither the seat of sensations nor the originator of

perception, since in that case these animals would have more sensations and perception than man.

"If we consider the manner in which plants derive their nourishment, we shall find that they do not draw up the grosser parts either of earth or water; these parts must be reduced by warmth into subtle vapours before the roots can suck them up into the plant. In like manner the nutrition of the nerves is only effected by means of the more subtle parts of the humidity of the brain, which are sucked up by the roots or extremities[Pg 136] of the nerves, and are carried thence through all the branches of the sensory system. This system forms, as we have said, a whole, all whose parts are interconnected by so close a union that we cannot wound one without communicating a violent shock to all the others; the wounding or simply pulling of the smallest nerve is sufficient to cause lively irritation to all the others, and to put the body in convulsion; nor can we ease this pain and convulsion except by cutting the nerve higher up than the injured part; but on this all the parts abutting on this nerve become thenceforward senseless and immovable for ever. The brain should not be considered as of the same character, nor as an organic portion of the nervous system, for it has not the same properties nor the same substance, being neither solid nor elastic, nor yet capable of feeling. I admit that on its compression perception ceases, but this very fact shows it to be a body foreign to the nervous system itself, which, acting by its weight, or pressure, against the extremities of the nerves, oppresses them and stupefies them in the same way as a weight placed upon the arm, leg, or any other part of the body, stupefies the nerves and deadens the perceptions of that part. And it is evident that this cessation of sensation on compression is but a suspension and temporary stupefaction, for the moment the compression of the brain ceases, perception and the power of movement returns. Again, I admit that on tearing the medullary substance, and on wounding the brain till the *corpus callosum* is reached, convulsion, loss of sensation, and death ensue; but this is because the nerves are so entirely deranged that they[Pg 137] are, so to speak, torn up by the roots and wounded all together, and at their source.

"In further proof that the brain is neither the centre of perception nor the seat of the sensations, I may remind the reader that animals and even children have been born without heads and brains, and have yet had feeling, movement, and life. There are also whole classes of animals, like insects and worms, with a brain that is by no means a distinct mass nor of sensible volume, but with only something which corresponds with the *medulla oblongata* and the spinal marrow. There would be more reason, then, in placing the seat of the feelings and perceptions in the spinal marrow,

which no animal is without, than in the brain which is not an organ common to all creatures that can feel."

If Buffon's ideas concerning the brain are as just as they appear to be, the resemblance between plants and animals is more close than is apparent, even to a superficial observer, on a first inspection of the phenomena. Such an observer, however, on looking but a little more intently, will see the higher *vertebrata* as perambulating vegetables planted upside down. So the man who had been born blind, on being made to see, and on looking at the objects before him with unsophisticated eyes, said without hesitation that he saw "men as trees walking," thus seeing with more prophetic insight than either he or the bystanders could interpret. For our skull is as a kind of flower-pot, and holds the soil from which we spring, that is to say the brain; our mouth and stomach are roots, in two stories or stages; our bones are the trellis-work to which we cling while going about in[Pg 138] search of sustenance for our roots; or they are as the woody trunk of a tree; we are the nerves which are rooted in the brain, and which draw thence the sustenance which is supplied it by the stomach; our lungs are leaves which are folded up within us, as the blossom of a fig is hidden within the fruit itself.

This is what should follow if Buffon's theory of the brain is allowed to stand, which I hope will prove to be the case, for it is the only comfortable thought concerning the brain that I have met with in any writer. I have given it here at some length on a account of its importance, and for the illustration it affords of Buffon's hatred of mystery, rather than for its bearing upon evolution. The fact that our leading men of science have adopted other theories will weigh little with those who have watched scientific orthodoxy with any closeness. What Buffon thought of that orthodoxy may be gathered from the following:—

"The greatest obstacles to the advancement of human knowledge lie less in things themselves than in man's manner of considering them. However complicated a machine the human body may be, it is still less complicated than are our own ideas concerning it. It is less difficult to see Nature as she is, than as she is presented to us. She carries a veil only, while we would put a mask over her face; we load her with our own prejudices, and suppose her to act and to conduct her operations even after the same fashion as ourselves."^[97]

.....

"I am by no means speaking of those purely arbitrary[Pg 139] systems which we are able at a glance to detect as chimeras that are being pretended to us as realities, but I refer to the methods whereby people have set themselves seriously to study nature.

Even the experimental method itself has been more fertile of error than of truth, for though it is indeed the surest, yet is it no surer than the hand of him who uses it. No matter how little we incline out of the straight path, we soon find ourselves wandering in a sterile wilderness, where we can see but a few obscure objects scattered sparsely; nevertheless we do violence to these facts and to ourselves, and resemble them together on a conceit of analogies and common properties amongst them. Then, passing and repassing complaisantly over the tortuous path which we have ourselves beaten, we deem the road a worn one, and though it leads no whither, the world follows it, adopts it, and accepts its supposed consequences as first principles. I could show this by laying bare the origin of that which goes by the name of 'principle' in all the sciences, whether abstract or natural. In the case of the former, the basis of principle is abstraction—that is to say, one or more suppositions: in that of the second, principles are but the consequences, better or worse, of the methods which may have been followed. And to speak here of anatomy only, did not he who first surmounted his natural repugnance and set himself to work to open a human body—did he not believe that through going all over it, dissecting it, dividing it into all its parts, he would soon learn its structure, mechanism, and functions? But he found the task greater than he had expected, and[Pg 140] renouncing such pretensions, was fain to content himself with a method—not for seeing and judging, but for seeing after an orderly fashion. This method ... is still the sole business of our ablest anatomists, but it is not science. It is the road which should lead scienceward, and might perhaps have reached science itself, if instead of walking ever on a single narrow path men had set the anatomy of man and that of animals face to face with one another. For, what real knowledge can be drawn from an isolated pursuit? Is not the foundation of all science seen to consist in the comparison which the human mind can draw between different objects in the matter of their resemblances and differences—of their analogous or conflicting properties, and of all the relations in which they stand to one another? The absolute, if it exist at all, is but of the concurrence of man's own knowledge; we judge and can judge of things only by their bearings one upon another; hence whenever a method limits us to only a single subject, whenever we consider it in its solitude and without regard to its resemblances or to its differences from other objects, we can attain to no real knowledge, nor yet, much less, reach any general principle. We do but give names, and make descriptions of a thing, and of all its parts. Hence comes it that, after three thousand years of dissection, anatomy is still but a nomenclature, and has hardly advanced a step towards its true object, which is the science of animal economy. Furthermore, what defects are there not in the method itself, which should above all things else be simple and easy to be understood, depending as it does upon inspection and[Pg 141] having denominations only for its

end! For seeing that nomenclature has been mistaken for knowledge, men have made it their chief business to multiply names, instead of limiting things; they have crushed themselves under the burden of details, and been on the look out for differences where there was no distinction. When they had given a new name they conceived of it as a new thing, and described the smallest parts with the most minutious exactness, while the description of some still smaller part, forgotten or neglected by previous anatomists, has been straightway hailed as a discovery. The denominations themselves being often taken from things which had no relation to the object that it was desired to denominate, have served but to confound confusion. The part of the brain, for example, which is called testes and nates, wherein does it so differ from the rest of the brain that it should deserve a name? These names, taken at haphazard or springing from some preconceived opinion, have themselves become the parents of new prejudices and speculations; other names given to parts which have been ill observed, or which are even non-existent, have been sources of new errors. What functions and uses has it not been attempted to foist upon the pineal gland, and on the alleged empty space in the brain which is called the arch, the first of which is but a gland, while the very existence of the other is doubtful,—the empty space being perhaps produced by the hand of the anatomist and the method of dissection."^[98]

[Pg 142]

The Genus felis.

In his preliminary remarks upon the lion, Buffon while still professing to believe in some considerable mutability of species, seems very far from admitting that all living forms are capable of modification. But he has shown us long since how clearly he saw the impossibility of limiting mutability, if he once admitted so much of the thin end of the wedge as that a horse and an ass might be related. It is plain, therefore, that he is not speaking "*au réel*" here, and we accordingly find him talking clap-trap about the nobleness of the lion in having no species immediately allied to it. A few lines lower on he reminds us in a casual way that the ass and horse are related.

He writes:—

"Added to all these noble individual features the lion has also what may be called a *specific* nobility. For I call those species noble which are constant, invariable, and which are above suspicion of having degenerated. These species are commonly isolated, and the only ones of their genus. They are distinguished by such well-marked features that they cannot be mistaken, nor confounded with any other species. To begin for example with man, the noblest of created beings; he is but of a single species, inasmuch as men and women will breed freely *inter se* in spite of all existing

differences of race, climate and colour; and also inasmuch as there is no other animal which can claim either a distant or near relationship with him. The horse, on the other hand, is more noble as an individual than as a species,[Pg 143] for he has the ass as his near neighbour, *and seems himself to be nearly enough related to it*; ... the dog is perhaps of even less noble species, approaching as he does to the wolf, fox, and jackal, *which we can only consider to be the degenerated species of a single family*"^[99]—all which may seem very natural opinions for a French aristocrat in the days before the Revolution, but which cannot for a moment be believed to have been Buffon's own. I have not ascertained the date of Buffon's little quarrel with the Sorbonne, but I cannot doubt that if we knew the inner history of the work we are considering, we should find this passage and others like it explained by the necessity of quieting orthodox adversaries. He concludes the paragraph from which I have just been quoting by saying, "To class man and the ape together, or the lion with the cat, and to say that the lion is a *cat with a mane and a long tail*—this were to degrade and disfigure nature instead of describing her and denominating her species." Buffon very rarely uses italics, but those last given are his, not mine; could words be better chosen to make us see the lion and the cat as members of the same genus? No wonder the Sorbonne considered him an infelicitous writer; why could he not have said "cat," and have done with it, instead of giving a couple of sly but telling touches, which make the cat as like a lion as possible, and then telling us that we must not call her one? Sorbonnes never do like people who write in this way.

"The lion, then, belongs to a most noble species, standing as he does alone, and incapable of being confounded[Pg 144] with the tiger, leopard, ounce, &c., while, on the contrary, those species, which appear to be least distant from the lion, are very sufficiently indistinguishable, so that travellers and nomenclators are continually confounding them."^[100]

If this is not pure malice, never was a writer more persistently unfortunate in little ways. Why remind us here that the species which come nearest to the lion are so hard to distinguish? Why not have said nothing about it? As it is, the case stands thus: we are required to admit close resemblance between the leopard and the tiger, while we are to deny it between the tiger and the lion, in spite of there being no greater outward difference between the first than between the second pair, and in spite of the hurried whisper "*cat with a mane and a long tail*" still haunting our ears. Isidore Geoffroy and his followers may consent to this arrangement, but I hope the majority of my readers will not do so.

I went on to the account of the tiger with some interest to see the line which Buffon would take concerning it. I anticipated that we should find cats, pumas, lynxes, &c., to

be really very like tigers, and was surprised to learn that the "true" tiger, though certainly not unlike these animals, was still to be distinguished from "many others which had since been called tigers." He is on no account to be confounded with these, in spite of the obvious temptation to confound him. He is "a rare animal, little known to the ancients, and badly described by the moderns." He is [Pg 145] a beast "of great ferocity, of terrible swiftness, and surpassing even the proportions of the lion." The effect of the description is that we no longer find the lion standing alone, but with the tiger on a par with him if not above him; but at the same time we fall easy victims to the temptation to confound the tiger with "the many other animals which are also called tigers." A surface stream has swept the members of the cat family in different directions, but a stealthy undercurrent has seized them from beneath, and they are now happily reunited.

Animals of the Old and New World—Changed Geographical Distribution.

Writing upon the animals of the old world, ^[101] and referring to the humps of the camel and the bison, Buffon shows that very considerable modification may be effected in some animals within even a few generations, but he attributes the effect produced to the direct influence of climate. Buffon concludes his sketch of the animals of the new world by pointing out that the larger animals of the African torrid zone have been hindered by sea and desert from finding their way to America, and by claiming to be the first "even to have suspected" that there was not a single denizen of the torrid zone of one continent which was common also to the other. ^[102]

The animals common to both continents are those which can stand the cold and which are generally suited for a temperate climate. These, Buffon believes, to [Pg 146] have travelled either over some land still unknown, or "more probably," over territory which has long since been submerged. The species of the old and new world are never without some well-marked difference, which however should not be held sufficient for us to refuse to admit their practical identity. But he maintains, I imagine wilfully, that there is a tendency in all the mammalia to become smaller on being transported to the new world, and refers the fact to the quality of the earth, the condition of the climate, the degrees of heat and humidity, to the height of mountains, amounts of running or stagnant waters, extent of forest, and above all to the brutal condition of nature in a new country, which he evidently regards with true aristocratic abhorrence. ^[103]

Then follows a passage which I had better perhaps give in full:—

The mammoth "was certainly the greatest and strongest of all quadrupeds; but it has disappeared; and if so, how many smaller, feebler, and less remarkable species must

have also perished without leaving us any traces or even hints of their having existed? How many other species have changed their nature, that is to say, become perfected or degraded, through great changes in the distribution of land and ocean, through the cultivation or neglect of the country which they inhabit, through the long-continued effects of climatic changes, so that they are no longer the same animals that they once were? Yet of all living beings after[Pg 147] man, the quadrupeds are the ones whose nature is most fixed and form most constant: birds and fishes vary much more easily; insects still more again than these, and if we descend to plants, which certainly cannot be excluded from animated nature, we shall be surprised at the readiness with which species are seen to vary, and at the ease with which they change their forms and adopt new natures.

"It is probable then that all the animals of the new world are derived from congeners in the old, without any deviation from the ordinary course of nature. We may believe that having become separated in the lapse of ages, by vast oceans and countries which they could not traverse, they have gradually been affected by, and derived impressions from, a climate which has itself been modified so as to become a new one through the operation of those same causes which dissociated the individuals of the old and new world from one another; thus in the course of time they have grown smaller and changed their characters. This, however, should not prevent our classifying them as different species now, for the difference is no less real whether it is caused by time, climate and soil, or whether it dates from the creation. *Nature I maintain is in a state of continual flux and movement. It is enough for man if he can grasp her as she is in his own time, and throw but a glance or two upon the past and future, so as to try and perceive what she may have been in former times and what one day she may attain to.*"^[104]

[Pg 148]

The Buffalo—Animals under Domestication.

"The bison and the aurochs," says Buffon, "differ only in unessential characteristics, and are, by consequence, of the same species as our domestic cattle, so that I believe all the pretended species of the ox, whether ancient or modern, may be reduced to three—the bull, the buffalo, and the bubalus.

"The case of animals under domestication is in many respects different from that of wild ones; they vary much more in disposition, size and shape, especially as regards the exterior parts of their bodies: the effects of climate, so powerful throughout nature, act with far greater effect upon captive animals than upon wild ones. Food prepared by man, and often ill chosen, combined with the inclemency of an

uncongenial climate—these eventuate in modifications sufficiently profound to become constant and hereditary in successive generations. I do not pretend to say that this general cause of modification is so powerful as to change radically the nature of beings which have had their impress stamped upon them in that surest of moulds—heredity; but it nevertheless changes them in not a few respects; it masks and transforms their outward appearance; it suppresses some of their parts, and gives them new ones; it paints them with various colours, and *by its action on bodily habits influences also their natures, instincts, and most inward qualities*" (and what is this but "radically changing their nature"?). "The modification of but a single part, moreover, in a whole as perfect as an animal body, will necessitate a correlative[Pg 149] modification in every other part, and it is from this cause that our domestic animals differ almost as much in nature and instinct, as in form, from those from which they originally sprung."^[105]

Buffon confirms this last assertion by quoting the sheep as an example—an animal which can now no longer exist in a wild state. Then returning to cattle, he repeats that many varieties have been formed by the effects—"diverse in themselves, and diverse in their combinations—of climate, food, and treatment, whether under domestication or in their wild state." These are the main causes of variation ("causes générales de variété"),^[106] among our domesticated animals, but by far the greatest is changed climate in consequence of their accompanying man in his migrations. The effects of the foregoing causes of modification, especially the last of them, are repeatedly insisted on in the course of the forty pages which complete the preliminary account of the buffalo.

What holds good for the buffalo does so also for the mouflon or wild sheep. This, Buffon declares to be the source of all our domesticated breeds: of these there are in all some four or five, "all of them being but degenerations from a single stock, produced by man's agency, and propagated for his convenience."^[107] At the same time that man has protected them he has hunted out the original race which was "less useful to him,"^[108] so that it is now to be found only in a few secluded spots, such as the mountains of Greece, Cyprus, and Sardinia.[Pg 150] Buffon does not consider even the differences between sheep and goats to be sufficiently characteristic to warrant their being classed as different species.

"I shall never tire," he continues, "of repeating—seeing how important the matter is—that we must not form our opinions concerning nature, nor differentiate (*différencier*) her species, by a reference to minor special characteristics. And, again, that systems, far from having illustrated the history of animals, have, on the contrary, served rather to obscure it ... leading, as they do, to the creation of arbitrary species which nature

knows nothing about; perpetually confounding real and hypothetical existences; giving us false ideas as to the very essence of species; uniting them and separating them without foundation or knowledge, and often without our having seen the animal with which we are dealing."^[109]

First and Second Views of Nature.

The twelfth volume begins with a preface, entitled "A First View of Nature," from which I take the following:—

"What cannot Nature effect with such means at her disposal? She can do all except either create matter or destroy it. These two extremes of power the deity has reserved for himself only; creation and destruction are the attributes of his omnipotence. To alter and undo, to develop and to renew—these are powers which he has handed over to the charge of Nature."^[110]

The thirteenth volume opens with a second view of nature. After describing what a man would have observed[Pg 151] if he could have lived during many continuous ages, Buffon goes on to say:—

"And as the number, sustenance, and balance of power among species is constant, Nature would present ever the same appearance, and would be in all times and under all climates absolutely and relatively the same, if it were not her fashion to vary her individual forms as much as possible. The type of each species is founded in a mould of which the principal features have been cut in characters that are ineffaceable and eternally permanent, but all the accessory touches vary; no one individual is the exact facsimile of any other, and no species exists without a large number of varieties. In the human race on which the divine seal has been set most firmly, there are yet varieties of black and white, large and small races, the Patagonian, Hottentot, European, American, Negro, which, though all descended from a common father, nevertheless exhibit no very brotherly resemblance to one another."^[111]

On an earlier page there is a passage which I may quote as showing Buffon to have not been without some—though very imperfect—perception of the fact which evidently made so deep an impression upon his successor, Dr. Erasmus Darwin. I refer to that continuity of life in successive generations, and that oneness of personality between parents and offspring, which is the only key that will make the phenomena of heredity intelligible.

"Man," he says, "and especially educated man, is no longer a single individual, but represents no small[Pg 152] part of the human race in its entirety. He was the first to receive from his fathers the knowledge which their own ancestors had handed down

to them. These, having discovered the divine art of fixing their thoughts so that they can transmit them to their posterity, become, as it were, one and the same people with their descendants (*se sont, pour ainsi dire, identifiés avec leur neveux*); while our descendants will in their turn be one and the same people with ourselves (*s'identifieront avec nous*). This reunion in a single person of the experience of many ages, throws back the boundaries of man's existence to the utmost limits of the past; he is no longer a single individual, limited as other beings are to the sensations and experiences of to-day. In place of the individual we have to deal, as it were, with the whole species."^[112]

"Differences in exterior are nothing in comparison with those in interior parts. These last must be regarded as the causes, while the others are but the effects. The interior parts of living beings are the foundation of the plan of their design; this is their essential form, their real shape, their exterior is only the surface, or rather the drapery in which their true figure is enveloped. How often does not the study of comparative anatomy show us that two exteriors which differ widely conceal interiors absolutely like each other, and, on the contrary, that the smallest internal difference is accompanied by the most marked differences of outward appearance, changing as it does even the natural habits, faculties and attributes of the animal?"^[113]

[Pg 153]

Apes and Monkeys.

The fourteenth volume is devoted to apes and monkeys, and to the chapter with which the volumes on quadrupeds are brought to a conclusion—a chapter for which perhaps the most important position in the whole work is thus assigned. It is very long, and is headed "On Descent with Modification" ("De la Dégénération des Animaux"). This is the chapter in which Buffon enters more fully into the "causes or means" of the transformation of species.

At the opening of the chapter on the nomenclature of monkeys, the theory is broached that there is a certain fixed amount of life-substance as of matter in nature; and that neither can be either augmented or diminished. Buffon maintains this organic and living substance to be as real and durable as inanimate matter; as permanent in its state of life as the other in that of death; it is spread over the whole of nature, and passes from vegetables to animals by way of nutrition, and from animals back to vegetables through putrefaction, thus circulating incessantly to the animation of all that lives.

As might be expected, Buffon is loud in his protest against any real similarity between man and the apes—man has had the spirit of the Deity breathed into his nostrils, and the lowest creature with this is higher than the highest without it. Having settled this point, he makes it his business to show how little difference in other respects there is between the apes and man.

"One who could view," he writes, "Nature in her[Pg 154] entirety, from first to last, and then reflect upon the manner in which these two substances—the living and the inanimate—act and react upon one another, would see that every living being is a mould which casts into its own shape those substances upon which it feeds; that it is this assimilation which constitutes the growth of the body, whose development is not simply an augmentation of volume, but an extension in all its dimensions, a penetration of new matter into all parts of its mass: he would see that these parts augment proportionately with the whole, and the whole proportionately with these parts, while general configuration remains the same until the full development is accomplished.... He would see that man, the quadruped, the cetacean, the bird, reptile, insect, tree, plant, herb, all are nourished, grow, and reproduce themselves on this same system, and that though their manner of feeding and of reproducing themselves may appear so different, this is only because the general and common cause upon which these operations depend can only operate in the individual agreeably with the form of each species. Travelling onward (for it has taken the human mind ages to arrive at these great truths, from which all others are derived), he would compare living forms, give them names to distinguish them, and other names to connect them with each other. Taking his own body as the model with which all living forms should be compared, and having measured them, explained them thoroughly, and compared them in all their parts, he would see that there is but small difference between the forms of living beings; that by dissecting the ape he could arrive at[Pg 155] the anatomy of man, and that taking some other animal we find always the same ultimate plan of organization, the same senses, the same viscera, the same bones, the same flesh, the same movements of the fluids, the same play and action of the solids; he would find all of them with a heart, veins, arteries, in all the same organs of circulation, respiration, digestion, nutrition, secretion; in all of them a solid frame, composed of pieces put together in nearly the same manner; and he would find this system always the same, from man to the ape, from the ape to the quadrupeds, from the quadrupeds to the cetacea, birds, fishes, reptiles; this system or plan then, I say, if firmly laid hold of and comprehended by the human mind, is a true copy of nature; it is the simplest and most general point of view from which we can consider her, and if we extend our view, and go on from what lives to what vegetates, we may see this plan—

which originally did but vary almost imperceptibly—change its scope and descend gradually from reptiles to insects, from insects to worms, from worms to zoophytes, from zoophytes to plants, and yet keeping ever the same fundamental unity in spite of differences of detail, insomuch that nutrition, development, and reproduction remain the common traits of all organic bodies; traits eternally essential and divinely implanted; which time, far from effacing or destroying, does but make plainer and plainer continually."

This is the writer who can see nothing in common between the horse and the zebra except that each has a solid hoof. ^[114] He continues:—

"If from this grand tableau of resemblances, in [Pg 156] which the living universe presents itself to our eyes as though it were a single family, we pass to a tableau rather of the differences between living forms, we shall see that, with the exception of some of the greater species, such as the elephant, rhinoceros, hippopotamus, tiger, lion, which must each have their separate place, the other races seem all to blend with neighbouring forms, and to fall into groups of likenesses, greater or lesser, and of genera which our nomenclators represent to us by a network of shapes, of which some are held together by the feet, others by the teeth, horns, and skin, and others by points of still minor importance. And even those whose form strikes us as most perfect, as approaching most nearly to our own—even the apes—require some attention before they can be distinguished from one another, for the privilege of being an isolated species has been assigned less to form than to size; and man himself, though of a separate species and differing infinitely from all or any others, has but a medium size, and is less isolated and has nearer neighbours than have the greater animals. If we study the Orang-outang with regard only to his configuration, we might regard him, with equal justice, as either the highest of the apes or as the lowest of mankind, because, with the exception of the soul, he wants nothing of what we have ourselves, and because, as regards his body, he differs less from man than he does from other animals which are still called apes." ^[115]

The want of a soul Buffon maintains to be the only essential difference between the Orang-outang and [Pg 157] man—"his body, limbs, senses, brain and tongue are the same as ours. He can execute whatever movements man can execute; yet he can neither think nor speak, nor do any action of a distinctly human character. Is this merely through want of training? or may it not be through wrong comparison on our own parts? We compare the wild ape in the woods to the civilized citizen of our great towns. No wonder the ape shows to disadvantage. He should be compared with the hideous Hottentot rather, who is himself almost as much above the lowest man, as the lowest man is above the Orang-outang." ^[116]

The passage is a much stronger one than I have thought it fit to quote. The reader can refer to it for himself. After reading it I entertain no further doubt that Buffon intended to convey the impression that men and apes are descended from common ancestors. He was not, however, going to avow this conclusion openly.

"I admit," he continues, "that if we go by mere structure the ape might be taken for a variety of the human race; the Creator did not choose to model mankind upon an entirely distinct system from the other animals: He comprised their form and man's under a plan which is in the main uniform."^[117] Buffon then dwells upon the possession of a soul by man; "even the lowest creature," he avers, "which had this, would have become man's rival."

"The ape then is purely an animal, far from being a variety of our own species, he does not even come first in[Pg 158] the order of animals, since he is not the most intelligent: the high opinion which men have of the intelligence of apes is a prejudice based only upon the resemblance between their outward appearance and our own."^[118] But the undiscerning were not only to be kept quiet, they were to be made happy. With this end, if I am not much mistaken, Buffon brings his chapter on the nomenclature of apes to the following conclusion:—

"The ape, which the philosopher and the uneducated have alike regarded as difficult to define, and as being at best equivocal, and midway between man and the lower animals, proves in fact to be an animal and nothing more; he is masked externally in the shape of man, but internally he is found incapable of thought, and of all that constitutes man; apes are below several of the other animals in respect of qualities corresponding to their own, and differ essentially from man, in nature, temperament, the time which must be spent upon their gestation and education, in their period of growth, duration of life, and in fact in all those profounder habits which constitute what is called the 'nature' of any individual existence."^[119] This is handsome, and leaves the more timorous reader in full possession of the field.

Buffon is accordingly at liberty in the following chapter to bring together every fact he can lay his hands on which may point the resemblance between man and the Orang-outang most strongly; but he is careful to use inverted commas here much more freely than is his wont. Having thus made out a strong case for the near affinity between man and the Orang-outang,[Pg 159] and having thrown the responsibility on the original authors of the passages he quotes, he excuses himself for having quoted them on the ground that "everything may seem important in the history of a brute which resembles man so nearly," and then insists upon the points of difference between the Orang-outang and ourselves. They do not, however, in Buffon's hands

come to much, until the end of the chapter, when, after a *résumé* dwelling on the points of resemblance, the differences are again emphatically declared to have the best of it.

I need not follow Buffon through his description of the remaining monkeys. It comprises 250 pp., and is confined to details with which we have no concern; but the last chapter—"De la Dégénération des Animaux"—deserves much fuller quotation than my space will allow me to make from it. The chapter is very long, comprising, as I have said, over sixty quarto pages. It is impossible, therefore, for me to give more than an outline of its contents.

Causes or Means of the Transformation of Species.

The human race is declared to be the one most capable of modification, all its different varieties being descended from a common stock, and owing their more superficial differences to changes of climate, while their profounder ones, such as woolly hair, flat noses, and thick lips, are due to differences of diet, which again will vary with the nature of the country inhabited by any race. Changes will be exceedingly gradual; it will take centuries of unbroken habit to bring about modifications which can[Pg 160] be transmitted with certainty so as to eventuate in national characteristics.^[120] It is a pleasure to find that here, too, habit is assigned as the main cause which underlies heredity.

Modification will be much prompter with animals. When compelled to abandon their native land, they undergo such rapid and profound modification, that at first sight they can hardly be recognized as the same race, and cannot be detected in their disguise till after the most careful inspection, and on grounds of analogy only. Domestication will produce still more surprising results; the stigmata of their captivity, the marks of their chains, can be seen upon all those animals which man has enslaved; the older and more confirmed the servitude, the deeper will be its scars, until at length it will be found impossible to rehabilitate the creature and restore to it its lost attributes.

"Temperature of climate, quality of food, and the ills of slavery—here are the three main causes of the alteration and degeneration of animals. The consequences of each of these should be particularly considered, so that by examining Nature as she is to-day we may thus perceive what she was in her original condition."^[121]

I have more than once admitted that there is a wide difference between this opinion, which assigns modification to the direct influence of climate, food, and other changed conditions of life, and that of Dr. Erasmus Darwin, which assigns only an indirect effect to these, while the direct effect is given to changed actions in[Pg

161] consequence of changed desires; but it is surprising how nearly Buffon has approached the later and truer theory, which may perhaps have been suggested to Dr. Darwin by the following pregnant passage—as pregnant, probably, to Buffon himself as to another:—

"The camel is the animal which seems to me to have felt the weight of slavery most profoundly. He is born with wens upon his back and callosities upon his knees and chest; these callosities are the unmistakable results of rubbing, for they are full of pus and of corrupted blood. The camel never walks without carrying a heavy burden, and the pressure of this has hindered, for generations, the free extension and uniform growth of the muscular parts of the back; whenever he reposes or sleeps his driver compels him to do so upon his folded legs, so that little by little this position becomes habitual with him. All the weight of his body bears, during several hours of the day continuously, upon his chest and knees, so that the skin of these parts, pressed and rubbed against the earth, loses its hair, becomes bruised, hardened, and disorganized.

"The llama, which like the camel passes its life beneath burdens, and also reposes only by resting its weight upon its chest, has similar callosities, which again are perpetuated in successive generations. Baboons, and pouched monkeys, whose ordinary position is a sitting one, whether waking or sleeping, have callosities under the region of the haunches, and this hard skin has even become inseparable from the bone against which it is being continually pressed by the weight of the body; in the case, however, of these animals the[Pg 162] callosities are dry and healthy, for they do not come from the constraint of trammels, nor from the burden of a foreign weight, but are the effects only of the natural habits of the animal, which cause it to continue longer seated than in any other position. There are callosities of these pouched monkeys which resemble the double sole of skin which we have ourselves under our feet; this sole is a natural hardness which our continued habit of walking or standing upright will make thicker or thinner according to the greater or less degree of friction to which we subject our feet."^[122]

This involves the whole theory of Dr. Darwin.

Wild animals would not change either their food or climate if left to themselves, and in this case they would not vary, but either man or some other enemies have harassed most of them into migrations; "those whose nature was sufficiently flexible to lend itself to the new situation spread far and wide, while others have had no resource but the deserts in the neighbourhood of their own countries."^[123]

Since food and climate, and still less man's empire over them, can have but little effect upon wild animals, Buffon refers their principal varieties in great measure to their sexual habits, variations being much less frequent among animals that pair and breed slowly, than among those which do not mate and breed more freely. After running rapidly over several animals, and discussing the flexibility or inflexibility of their organizations, he declares the elephant to be the only one on which a state of domestication has produced[Pg 163] no effect, inasmuch as "it refuses to breed under confinement, and cannot therefore transmit the badges of its servitude to its descendants."^[124]

Here is an example of Buffon's covert manner, in the way he maintains that descent with modification may account not only for specific but for generic differences.

"But after having taken a rapid survey of the varieties which indicate to us the alterations that each species has undergone, there arises a broader and more important question, how far, namely, species themselves can change—how far there has been an older degeneration, immemorial from all antiquity, which has taken place in every family, or, if the term is preferred, *in all the genera* under which those species are comprehended which neighbour one another without presenting points of any very profound dissimilarity? We have only a few isolated species, such as man, which form at once the species and the whole genus; the elephant, the rhinoceros, the hippopotamus, and the giraffe form genera, or simple species, which go down in a single line, with no collateral branches. All other races appear to form families, in which we may perceive a common source or stock from which the different branches seem to have sprung in greater or less numbers according as the individuals of each species are smaller and more fecund."^[125]

I can see no explanation of the introduction of this passage unless that it is intended to raise the question whether modification may be not only specific but generic, the point of the paragraph lying in the words[Pg 164] "*dans chaque famille, ou si l'on veut, dans chacun des genres.*" We are told in the next paragraph, that if we choose to look at the matter in this light, well—in that case—we ought to see not only the ass and the horse, but *the zebra too*, as members of the same family; "the number of their points of resemblance being infinitely greater than those in respect of which they differ."^[126] Thus, at the close of his work on the quadrupeds, he thinks it well, as at the commencement seventeen years earlier, to emphasize—in his own quiet way—his perception that the principles on which he has been insisting should be carried much farther than he has chosen to carry them.

His conclusion is, that "after comparing all the animals and bringing them each under their proper genus, we shall find the two hundred species we have already described to be reducible into a sufficiently small number of families or main stocks from which it is not impossible that all the others may be derived."^[127]

The chapter closes thus:—

"To account for the origin of these animals" (certain of those peculiar to America), "we must go back to the time when the two continents were not yet separated, and call to mind the earliest geological changes. At the same time, we must consider the two hundred existing species of quadrupeds as reduced to thirty-eight families. And though this is not at all the state of Nature as she is in our time, and as she has been represented in this volume, and though, in fact, it is a condition which we can only arrive at by induction,[Pg 165] and by analogies almost as difficult to lay hold of as is the time which has effaced the greater number of their traces, I shall, nevertheless, endeavour to ascend to these first ages of Nature by the aid of facts and monuments which yet remain to us, and to represent the epochs which these facts seem to indicate."^[128]

The fifteenth volume contains a description of a few more monkeys, as also of some animals which Buffon had never actually seen, a great part being devoted to indices.

Supplement.

The first four volumes of the Supplement to Buffon's 'Natural History,' 1774-1789, contain little which throws additional light upon his opinions concerning the mutability of species. At the beginning, however, of the fifth volume I find the following:—

"On comparing these ancient records of the first ages of life [fossils] with the productions of to-day, we see with sufficient clearness that the essential form has been preserved without alteration in its principal parts: there has been no change whatever in the general type of each species; the plan of the inner parts has been preserved without variation. However long a time we may imagine for the succession of ages, whatever number of generations we may suppose, the individuals of to-day present to us in each genus the same forms as they did in the earliest ages; and this is more especially true of the greater species, whose characters are more invariable and nature more fixed; for the inferior species[Pg 166] have, as we have said, experienced in a perceptible manner all the effects of different causes of degeneration. Only it should be remarked in regard to these greater species, such as the elephant and hippopotamus, that in comparing their fossil remains with the existing forms we find

the earlier ones to have been larger. Nature was then in the full vigour of her youth, and the interior heat of the earth gave to her productions all the force and all the extent of which they were capable ... if there have been lost species, that is to say animals which existed once, but no longer do so, these can only have been animals which required a heat greater than that of our present torrid zone."^[129]

The context proves Buffon to have been thinking of such huge creatures as the megatherium and mastodon, but his words seem to limit the extinction of species to the denizens of a hot climate which had turned colder. It is not at all likely that Buffon meant this, as the passage quoted at p. [146](#) of this work will suffice to show. The whole paragraph is ironical.

I can see nothing to justify the conclusion drawn from this passage by Isidore Geoffroy, that Buffon had modified his opinions, and was inclined to believe in a more limited mutability than he had done a few years earlier. His exoteric position is still identical with what it was in the outset, and his esoteric may be seen from the spirit which is hardly concealed under the following:—

"I shall be told that analogy points towards the belief that our own race has followed the same path,[Pg 167] and dates from the same period as other species; that it has spread itself even more widely than they; and that if man's creation has a later date than that of the other animals, nothing shows that he has not been subjected to the same laws of nature, the same alterations, and the same changes as they. We will grant that the human species does not differ essentially from others in the matter of bodily organs, and that, in respect of these, our lot has been much the same as that of other animals."^[130]

Plants under Domestication.

"If more modern and even recent examples are required in order to prove man's power over the vegetable kingdom, it is only necessary to compare our vegetables, flowers, and fruits with the same species such as they were a hundred and fifty years ago; this can be done with much ease and certainty by running the eye over the great collection of coloured drawings begun in the time of Gaston of Orleans, and continued to the present day at the Jardin du Roi. We find with surprise that the finest flowers of that date, as the ranunculuses, pinks, tulips, bear's ears, &c., would be rejected now, I do not say by our florists, but by our village gardeners. These flowers, though then already cultivated, were still not far above their wild condition. They had a single row of petals only, long pistils, colours hard and false; they had little velvety texture, variety, or gradation of tints, and, in fact, presented all the characteristics of untamed nature. Of herbs there[Pg 168] was a single kind of endive, and two of lettuce—both bad—while

we can now reckon more than fifty lettuces and endives, all excellent. We can even name the very recent dates of our best pippins and kernel fruits—all of them differing from those of our forefathers, which they resemble in name only. In most cases things remain while names change; here, on the contrary, it is the names that have been constant while the things have varied.^[131]

.....

"It is not that every one of these good varieties did not arise from the same wild stock; but how many attempts has not man made on Nature before he succeeded in getting them. How many millions of germs has he not committed to the earth, before she has rewarded him by producing them? It was only by sowing, tending, and bringing to maturity an almost infinite number of plants of the same kind that he was able to recognize some individuals with fruits sweeter and better than others; and this first discovery, which itself involves so much care, would have remained for ever fruitless if he had not made a second, which required as much genius as the first required patience—I mean the art of grafting those precious individuals, which, unfortunately, cannot continue a line as noble as their own, nor themselves propagate their rare and admirable qualities? And this alone proves that these qualities are purely individual, and not specific, for the pips or stones of these excellent fruits bring forth the original wild stock, so that they do not form species[Pg 169] essentially different from this. Man, however, by means of grafting, produces what may be called secondary species, which he can propagate at will; for the bud or small branch which he engrafts upon the stock contains within itself the individual quality which cannot be transmitted by seed, but which needs only to be developed in order to bring forth the same fruits as the individual from which it was taken in order to be grafted on to the wild stock. The wild stock imparts none of its bad qualities to the bud, for it did not contribute to the forming thereof, being, as it were, a wet nurse, and no true mother.

"In the case of animals, the greater number of those features which appear individual, do not fail to be transmitted to offspring, in the same way as specific characters. It was easier then for man to produce an effect upon the natures of animals than of plants. The different breeds in each animal species are variations that have become constant and hereditary, while vegetable species on the other hand present no variations that can be depended on to be transmitted with certainty.

"In the species of the fowl and the pigeon alone, a large number of breeds have been formed quite recently, which are all constant, and in other species we daily improve breeds by crossing them. From time to time we acclimatize and domesticate some foreign and wild species. All these examples of modern times prove that man has but

tardily discovered the extent of his own power, and that he is not even yet sufficiently aware of it. It depends entirely upon the exercise of his intelligence;[Pg 170] the more, therefore, he observes and cultivates nature the more means he will find of making her subservient to him, and of drawing new riches from her bosom without diminishing the treasures of her inexhaustible fecundity."[\[132\]](#)

Birds.

In the preface to his volumes upon birds, Buffon says that these are not only much more numerous than quadrupeds, but that they also exhibit a far larger number of varieties, and individual variations.

"The diversities," he declares, "which arise from the effects of climate and food, of domestication, captivity, transportation, voluntary and compulsory migration—all the causes in fact of alteration and degeneration—unite to throw difficulties in the way of the ornithologist."[\[133\]](#)

He points out the infinitely keener vision of birds than that of man and quadrupeds, and connects it with their habits and requirements.[\[134\]](#) He does not appear to consider it as caused by those requirements, though it is quite conceivable that he saw this, but thought he had already said enough. He repeatedly refers to the effects of changed climate and of domestication, but I find nothing in the first volume which modifies the position already taken by him in regard to descent with modification: it is needless, therefore, to repeat the few passages which are to be found bearing at all upon the subject. The chapter on the birds that cannot fly,[Pg 171] contains a sentence which seems to be the germ that has been developed, in the hands of Lamarck, into the comparison between nature and a tree. Buffon says that the chain of nature is not a single long chain, but is comparable rather to something woven, "which at certain intervals throws out a branch sideways that unites it with the strands of some other web."[\[135\]](#) On the following page there is a passage which has been quoted as an example of Buffon's contempt for the men of science of his time. The writer maintains that the most lucid arrangement of birds, would have been to begin with those which most resembled quadrupeds. "The ostrich, which approaches the camel in the shape of its legs, and the porcupine in the quills with which its wings are armed, should have immediately followed the quadrupeds, but philosophy is often obliged to make a show of yielding to popular opinions, and *the tribe of naturalists* is both numerous and impatient of any disturbance of its methods. It would only, then, have regarded this arrangement as an unreasonable innovation caused by a desire to contradict and to be singular."[\[136\]](#)

It is, I believe, held not only by "*le peuple des naturalistes*," but by most sensible persons, that the proposed arrangement would not have been an improvement. I find, however, in the preface to the third volume on birds that M. Gueneau de Montbeillard described all the birds from the ostrich to the quail, so the foregoing passage is perhaps his and not Buffon's. If so, the imitation is fair, but when we reflect upon it[Pg 172] we feel uncertain whether it is or is not beneath Buffon's dignity.

Here, as often with pictures and music, we cannot criticise justly without taking more into consideration than is actually before us. We feel almost inclined to say that if the passage is by Buffon it is probably right, and if by M. Gueneau de Montbeillard, probably wrong. It must also be remembered that, as we learn from the preface already referred to, Buffon was seized at this point in his work with a long and painful illness, which continued for two years; a single hasty passage in so great a writer may well be pardoned under such circumstances.

Looking through the third and remaining volumes on birds, the greater part of which was by Gueneau de Montbeillard, and bearing in mind that in point of date they are synchronous with some of those upon quadrupeds from which I have already extracted as much as my space will allow, and not seeing anything on a rapid survey which promises to throw new light upon the author's opinions, I forbear to quote further. I therefore leave Buffon with the hope that I have seen him more justly than some others have done, but with the certainty that the points I have caught and understood are few in comparison with those that I have missed.