PROCEEDINGS

OF THE

SCIENTIFIC MEETINGS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.

January 8th, 1861.

Dr. Gray, V.P., in the Chair.

The following papers were read :—

1. On Typical Selection, as a means of removing the difficulties attending the Doctrine of the Origin of Species by Natural Selection. By E. Vansittart Neale, F.Z.S.

The great interest excited in the scientific world by the theory of the origin of species proposed by Mr. Darwin, and the obscurity necessarily attached to many of the data employed in the arguments adduced either in support of or in opposition to it, must be my apology for bringing before this Society the following considerations, resting upon admitted facts, but which appear to me both to elucidate the difficulties of that theory, and to suggest the means of overcoming them.

The strong points of Mr. Darwin's theory I apprehend to be, (1) the satisfactory explanation afforded by it of the analogies and differences observed in the various forms of living beings which have been, or actually are, the tenants of our globe; (2) the fact, experimentally ascertainable, that the element of variation whence his explanations are derived exists in active operation at the present day. Mr. Darwin can say of the modifications of form manifested in living organisms,

as Sir I. Newton said of the attractive force of the earth, "*hypotheses non fingo*." I appeal to a power which can be shown to be at work in the present world; I ask only, is it capable of explaining the phænomena observable now, or ascertained by probable induction to have occurred formerly upon it?

These are great merits. But if these strong points of the theory are connected with the principle of diversity, whence the animal and vegetable creation derives the charm of its endless variety, it has, as I conceive, also its weak points connected with the opposite principle of *unity*: whence it attributes too large a share to death, and too small a share to life, in the formation of species.

In nature we find *two* powers at work, a principle of *change* producing varieties, and a principle of *permanence* producing species. Man is able, by making use of the principle of change, "adding up," as Mr. Darwin happily says, the successive minute differences of different generations in different directions, to bring about wonderful transformations in the original form whence he started,—from the Rock Pigeon, for example, educing Carriers, Tumblers, Runts, Fantails, &c., forms differing from each other more than do many undoubted natural species—more, for instance, than Fieldfares differ from Thrushes, or Wood Wrens from Willow Wrens. But, although man can do wonders through this principle of *change*, the principle of *permanence* slips through his fingers. He can preserve his varieties in their distinctness, only so long as he intervenes to prevent their interbreeding. Leave Carriers and Tumblers, Fantails and Runts together, without pairing them, and a race will soon arise neither Carrier, nor Tumbler, nor Fantail, nor Runt, but apparently in the process of reverting towards the Rock Pigeon. But Fieldfares and Thrushes, Wood Wrens and Willow Wrens live on for generation after generation, side by side, and remain Fieldfares and Thrushes, Wood Wrens and Willow Wrens still.

That this is the case, is unquestionable. It is equally clear why it is the case. Each distinct species in nature interbreeds by preference with those of its own kind; and if accidental unions do take place between nearly allied species, the offspring are either sterile or, at all events, much less fruitful than their parents. Here is the principle of *permanence* in nature, preventing the principle of *change* from producing *confusion*, as, again, the principle of *change* prevents the principle of *permanence* from producing *monotony*. Whence comes this principle of permanence? I look to Mr. Darwin for an answer, in vain. All that he says on this point amounts only to the position that the progeny of nearly allied species are not always sterile. That the preservatory tendency does not necessarily accompany a given amount of external difference is clear; for man can produce in living organisms external differences greater than those associated in nature with this principle of permanence, without calling that principle into action. To attribute it to the greater length of time occupied in the formation of natural species than in that of a variety, is to make an assumption wholly destitute of proof, and indeed inconsistent with a very beautiful and essential part of Mr. Darwin's hypothesis, namely, the doc-

trine that the living principle never loses its energy, and that the power of life now at work on our globe has been transmitted, unchanged in its essence, though infinitely richer in its manifestations, from the first inhabitants of the earth to the generations inhabiting it at the present day.

If then, Mr. Darwin may appeal to the principle of *change* disclosed in living organisms, as a "true cause," capable of accounting for the mutual affinities of species by the supposition of descent from a common origin, those who are opposed to his views are no less entitled to appeal to the principle of *permanence*, disclosed in these organisms, as a real force, not to be explained away, but requiring to be reconciled with the principle of change in any theory which shall satisfactorily account for the origin of species.

It appears to me that this reconciliation may be effected through the intervention of a conception proposed by one of whose labours and reputation we are justly proud, as an explanation of the "homologies" of structure, which he has profoundly illustrated. I mean the conception of the typical character pervading all organic life. But to make this apparent, I must premise some remarks on the characteristics of natural types. The types of nature must be carefully distinguished from the types of art. The types of art are forms realized in their perfection in some particular individual. A Phidias may prodnce a Jupiter, a Minerva, or a Venus, as the perfect outward embodiment of the ideal of Majesty, or Wisdom, or Grace. A Danecker may toil for years, in labour with his conception of the head of Christ. But in each case, the type, when realized, is a fixed, individualized object, expressing some one predominant characteristic, to which all others, though not necessarily lost, are subordinate. The types of nature are, as I conceive, ideals not of external form, but of internal relations, each realized in countless modifications of forms differing from one another in infinitely varied particulars, but balanced around central points common to them all. But the preservation of this balance depends upon the aptness of each variety of the type for interbreeding with all the rest, and thus perpetually recombining its own peculiarities with theirs. If any of the varieties by the action and reaction of which a type is preserved become locally distinct from the others, subtypes will arise; as we find to be the case in mankind. The original type becomes the centre of a circle including many lesser circles, where we find the same tendency repeated. Now this character of natural types offers a mode of passage from one type to another. Assume a subtypical variety to acquire a special aptness for interbreeding with itself, to the exclusion of other varieties, and it would become an independent type. But how is this special aptness to be acquired? That it does not accompany the formation of subtypes we see in numerous instances; and it would clearly be inconsistent with the idea of a natural type that it should do so, if, as has been suggested, it is the characteristic of such a type to preserve itself by the mutual actions of its varieties. That it should belong to some one variety and not to others, in virtue of the general principle of variation, is a supposition inconsistent with

itself: a general principle must apply to every individual case. There remains only the hypothesis of a special selection, by which particular varieties are internally modified, so as to acquire this special aptitude. Now such a special selection appears to me to involve the transition, which must take place at some point in all physical research, from conditioned, to self-conditioning power, from will working by upholding laws, to will working by constituting the laws to be upheld; in other words, we must resort to the hypothesis of an intelligent action as the only intelligible one. Accordingly it is to an intelligent choice, exercised upon the infinity of possible variations capable of arising in different organisms, through the laws belonging to their natures, that I would attribute the formation of species by what I venture to call Typical selection.

When that Power, of whose ordering will I conceive nature to be the expression, purposes to produce a new race, I suppose It to select from some existing race those individuals which show a disposition to vary in the desired direction, so modifying their constitutions as to render their unions with each other more prolific than their unions with other individuals differently formed, and if they are conscious agents, so modifying their instincts as to give them a preference for each other. How this internal modification is produced, I no more attempt to explain than Mr. Darwin attempts to explain how life was originally produced and is continued. The one act is not more difficult to conceive than the other. But there is no necessity for supposing the modification to be considerable in any one case. Divine providence need not be in a hurry. The amount of change at any step of the process of forming a new species, may be very small, and the completion of that process may require many generations.

The modification of the sexual instinct and fertility of sexual unions may be gradually introduced, and at first be scarcely perceptible. But if the alteration be brought about by an internal action tending always in the same direction, each generation will approximate more closely to the character of a new type; and by the time that the external change has become considerable, a corresponding amount of internal change will have been produced. A new phase of the principle of permanence will have taken its place in creation, amongst the many phases of the principle of change; the variety will be transformed into a species.

By this conception of the origin of species, we escape from another serious difficulty, which appears to me to lie in the way of the conception of their formation by such a process of external selection as Mr. Darwin assumes. When we are asked to suppose that differences so considerable as we observe between different organisms, past or present, have been brought about by a process precisely analogous to that by which man can change the shape of a sheep or a pigeon, we naturally ask whether there are no limits to the amount of change producible by man? Could he, by any degree of watchfulness however long continued, expand a race of sparrows to the size of condors, or condense a race of turkeys to the size of humming-birds, or

lengthen out a pig's snout, and thicken his legs and body into a trunk and frame similar in size to the elephant? Mr. Darwin must contend that this would be possible, if man continued to act uninterruptedly, for a sufficient length of time in the same direction. Perhaps future experiments may enable us to speak with certainty upon this point. At present I conceive the general feeling of the most experienced breeders would be against him. It may be true that they "habitually speak of an animal's organization as something quite plastic, which they can mould almost as they please" by the principle of selection (Darwin, p. 31). Yet Mr. Darwin also tells us that "all the breeders of the various domestic animals, and cultivators of plants, with whom he has ever conversed, or whose treatises he has read, are firmly convinced that the several breeds to which they have attended are descended from so many aboriginally distinct species" (*id.* p. 28). Now they are no doubt mistaken in this notion; and it is easy to see whence the mistake has arisen,—namely, from each one having attended only to one out of many possible kinds of variation, producible in the particular animal or plant forming the object of his care. But it is difficult to conceive whence the general notion could be derived, if each breeder found no limit, no stop, to the amount of variation which he can produce in the particular direction selected by him for experiment.

But this difficulty disappears, like that first stated, if the process of selection be transferred from the external action of circumstance, to the internal action of the living Power gradually modifying the constitution of the individual. It is a supposition agreeable to common experience, that to each particular constitution, certain limits of change are assigned, within which the possible varieties of the creature possessing it fluctuate. But if the constitution changes, these limits must be presumed to change also. Each fresh species, then, may be regarded as a resting-place in the advance of life,—the development of the possible varieties inherent in it being left to the external action of circumstances; while among these the Power manifested in life selects the forms most suitable to be converted into other species, and thus carries on the differentiation of living beings a step further in its proposed course.

Other grave difficulties disappear if we accept the idea of "typical," in place of "natural" selection. One very serious one, in my judgment, is the difficulty of seeing how natural varieties could perpetuate themselves at all, if they retained that mutual prolificness characteristic of all the varieties upon which we can experimentalize.

Able and ingenious as is Mr. Darwin's argument to show that selection, by the "struggle for existence" is possible, he seems to me, throughout the whole of it, to confuse two distinct conceptions, namely, the *effect* of peculiarities of structure in giving one plant or animal an advantage over another, and the *preservation* of those peculiarities. His reasoning would be conclusive if applied to a state of things where each different variety was distinguished by an exclusive disposition to produce its own kind, as we actually find to be the case with species; but he applies it to a state of things

where, by his own hypothesis, he has swept away the ground of his argument. If one variety of wading birds possessed longer bills than another, this "advantage" might lead to the ultimate annihilation of the short-bills, through the more rapid multiplication of the long, if a long-billed parent always produced a long-billed offspring. But if the long-bills and the short live side by side, as they must do if they are to struggle for existence, and possess that aptness and disposition for interbreeding which all known varieties are experimentally found to possess, and the laws of interbreeding be supposed to be what they now are, long-bills and short would soon merge into one race of medium-billed birds, between whom the struggle for existence would be reduced to one of individual strength. In connexion with this topic, the fact insisted upon by Mr. Darwin must be borne in mind, that intercrossing between varieties is conducive to fertility, as on the other hand breeding in and in is well known to cause unhealthiness, if not sterility. On the whole, then, I conclude that the permanent distinction of type which Mr. Darwin assumes to result as a *consequence* from the struggle for existence, is really a necessary *condition*, in order that this struggle may assume the form of a contest of races.

Illustrations of this position might be endlessly multiplied. I will adduce one only, drawn from the instance of the humble bee and the honey bee, the origin of whose architectural powers is the subject of a most interesting and ingenious discussion in Mr. Darwin's work. He adduces, as the "advantage" of the honey bee, and therefore the constitutive principle of its peculiarities, the economy of wax in the construction of its cells when compared with the round imperfectly connected cells of the humble bee; for thus, in seasons when honey was scarce a saving in food might result. But the humble bee still raises her lowly dwellings along side of the palatial storehouses of her insect neighbour. Whatever the vicissitudes of the seasons may have been, since she first appeared on the earth, Death has not swept her away; she survives now. What probable ground, then, is there for assuming that she was not present when Mr. Darwin's incipient honey bee began its work, to destroy by intercrosses the peculiarities of her rival, and bring down its "advantages" to the common level?

It is unnecessary to dwell upon the complete removal of this difficulty, by the supposition of "typical selection." But more notice is requisite of the bearing of this supposition upon another subject, whereon Mr. Darwin's hypothesis of selection by means of the struggle for existence has produced much controversy, namely, the evidence of the "stone-book." That, if a new species can be formed at all by "natural selection," it can be only as the ultimate result of a long balancing of rival tendencies, ending in the preponderance of one side, Mr. Darwin admits. It follows, as he also admits, that each new species, if thus formed, must have left behind it a long trail of intermediate forms between itself and the species whence it arises. Now, we do not find this "trail;" the links are wanting in many cases; and Mr. Darwin's explanation of their failure is, that they once

existed, but that the evidence of their existence has either not yet turned up, or has been altogether swept away.

Other eminent geologists have questioned the probability, if not the possibility of this total sweeping away of the links wanted to bind together, upon Mr. Darwin's supposition, the forms known to have existed. I do not propose to enter into this controversy, but only to remark that, whatever difficulty may arise from the absence of intermediate forms in tracing connected lines of descent of the different forms whose existence has been ascertained, it is most materially diminished on the hypothesis of typical selection,—(1) because the advance in each case will be always in the same direction, and therefore the interval between one marked form and another will be indicated by much fewer steps than are required on Mr. Darwin's supposition, even if each step be very gradual; (2) because it is consistent with our present experience, that a very considerable amount of change may take place in animal or vegetable organisms at once. I will refer only to General Tom Thumb, and the Giant whose skeleton is preserved in the College of Surgeons, in proof of the important departures from the ordinary human scale of proportion which may be produced at one birth, under the ascertained laws of life. Now, suppose individuals, male and female, characterized by the possession of forms thus departing from the general human standard, to be selected to constitute a new human species, forming the centre of variations extending on all sides of the type thus manifested, and the process to be repeated three or four times, by transitions of equal magnitude on each occasion, in both directions; we should arrive at forms almost as distinct from each other as Swift's men of Lilliput and Brobdingnag. And yet the intermediate variations might succeed each other at short intervals, and leave but scanty traces of their existence in any geological record. The Lilliputian and Brobdingnagian students of geology might thus find it as difficult to connect their own history with that of the present race of mankind, by geological evidence, as we find it to trace the descent of Teleostean fishes, or Saurian amphibians, by the same records.

The conception of "typical selection" seems also to elucidate another subject, not altogether unencumbered with difficulty on Mr. Darwin's hypothesis, namely, the disappearance of types. If one species is educed out of another by a modification of the sexual character of some particular variety of the first, whence it acquires a peculiar aptness and disposition for interbreeding, this variety would be withdrawn from the circle of varieties by whose mutual action the original type was preserved. Consequently the type would itself have a tendency to alter; and if several varieties were thus withdrawn from any type, it would seem that this type must change into some modification of itself, and take its place amid the circle of variously related types evolved out of its original unity. The process would be analogous to what appears to have happened in some cases, where, through local circumstances or human interference, many distinct varieties of the same plant or animal have been formed, as in the case of wheat, of horses, of dogs, and of man himself; and the result

seems to accord with many ascertained facts in the relations of plants and animals, living and extinct.

If in the course of these observations I have been occupied in criticising rather than in defending Mr. Darwin's views, the object of this criticism has been to separate what I regard as a most valuable scientific conception, from association with a theory which, though highly ingenious, is entirely hypothetical, and, in my judgment untenable.

That there is a principle of variation at work around us in the living world, animal and vegetable, is certain. That by adding up successive changes effected by this principle, we can bring about a large sum of total change, is ascertained. The idea that the variety of living beings to be observed on the earth has arisen from the long-continued operation of this ascertained principle of variation during the countless ages when, as we learn from geology, a vast succession of creatures gradually tending to similarity with those existing now, have followed each other as its occupants—creation, to use the forcible language of Professor Owen, ever compensating for extinction—is an idea full of the promise of scientific results, because it seeks to explain the unknown by the known or knowable, and to substitute thought interpreting experiment, in place of thought dealing only with itself. This true scientific character forms the distinction between Mr. Darwin's fundamental hypothesis and the theories of those who like Lamarck, or the author of the 'Vestiges of Creation,' have previously attempted to embrace under one comprehensive thought the riches of the organic world. They presented only conjectures incapable of being tested; he has offered a conception respecting the past, which may be tested by the study of the present.

But this observation applies only to the conception that specific differences arise from selection. In referring the method of selection to the "struggle for existence," Mr. Darwin leaves the solid ground of experiment for the airy regions of ingenious hypothesis. The "struggle for existence" is perpetually going on around us; yet Mr. Darwin has not adduced a single case of even an approach to the formation of a new species as its ascertained result. All his instances of the effects produced by the addition of minute changes, in animal or vegetable organisms, are instances where the principle of variety is modified in its operation by the principle of intelligent choice. That the last principle has been concerned in producing the changes observed in nature, we cannot, indeed, show directly; but when we learn experimentally that, by this means, something very like natural species can be produced, surely it is more accordant with the sobriety of science to assume that by this means also natural species have been produced, than to refer their production to another principle, which cannot be shown to be in operation at all, and of which, if it is in operation, we cannot show how it could bring about the effects attributed to it.

I have said "something very like natural species;" for, as has been observed above, man cannot confer upon his varieties the self-preserving power characteristic of true species. But this is only accordant

with the universal analogy of the distinction between man's work and the works of what we call Nature. Man always works from without, Nature from within. But otherwise their works are subject to similar conditions. The crystalline lens of the eye is formed of elementary particles, held together by molecular or chemical attraction, as is the lens of the eyeglass. The formation of the optical image, the prevention of diffraction, is brought about in each case by an observance of the same principles of construction. But the eyeglass is shaped and put together by a power operating from without, upon masses of elementary particles, already drawn to each other by their natural attractions. The lens of the eye is formed by a power working from within, which draws these elementary particles together, by secret processes, into positions where their natural attractions keep them in the required arrangement.

So is it, as I conceive, in the formation of species. Man and Nature both bring about changes of form in organized beings, by the same process, namely, by directing into particular channels the tendency to vary inherent in all organisms, "adding up" in different directions the sum total of many changes, tending the same way. Both effect this addition by the same instrumentality, namely, by favouring sexual intercourse in the organisms which show a tendency to vary in the required direction, and impeding it in those which do not. But man, working in this case as in every other from *without*, can effect his "additions" only by bringing the suitable organisms together for the purpose of that intercourse, and keeping the unsuitable apart. Nature, working, in this case as in every other, from within, effects her additions by so modifying the wish for this intercourse, that the animals whom she desires to bring together shall prefer each other's society, and so modifying its consequences, that accidental unions of organisms, whether animal or vegetable, with other than the organisms suitable for her purposes, shall be incapable of seriously disturbing them. To seek an explanation of the natural process in an external action, seems me as contrary to the whole analogy of our knowledge, as it would be to seek an explanation of the human process in an internal action.

And yet there is an external action in nature, bearing upon the constitution of species—an action admirably described by Mr. Darwin under the name of the struggle for existence, and having, as I apprehend, an effect analogous to that of external action on living organisms considered individually. The struggle with circumstances destroys the dead, but it developes and exercises the living individual; and so the struggle for existence developes the capacities of variation of each typical form, while it prevents those variations from injuring the type. For the order of the living creation depends upon the more or less perfect transmission of the distinctive peculiarities of each living being to its descendants; and since these peculiarities are subject to constant variation, there would be a tendency to a perpetual degradation of each natural type, but for some counteracting influence. For the characters of a living being cannot be balanced like

ciphers in arithmetic—so many good on the *plus* side, so many bad on the *minus*: they involve a mutual harmony, which cannot be departed from far in any direction, without fatal injury to the whole: one vice spoils many virtues; and the union of great perfections with great defects can, at the best, be only grotesque.

Now the risk of degradation consequent on these circumstances appears to be prevented principally by two causes: first, that, in the general course of nature, more than one individual must concur in every act of generation; for since these individuals commonly differ in their accidental peculiarities, these peculiarities tend to efface each other, and thus to preserve in their offspring the typical character: secondly, that Death is, so to speak, ever on the watch to keep the individual up to the mark, sternly sweeping away the varieties afflicted with any serious imperfection, while he leaves the more perfect specimens to transmit their endowments to their posterity,—an operation probably aided by what Mr. Darwin has called "sexual selection."

In this conservative action, not in the creative operations ascribed to Death by Mr. Darwin, his true function appears to me to consist. Death throws away the worst of each *kind* to preserve the best; but he must have the *kind* given him to operate upon. So he sweeps away those types which change of circumstances have made unsuitable to the surrounding creation, to make room for others; but these are educed from the former, not by the unconscious action of death, but through an "ordained becoming," realized by the wise foresight of the ever-acting Power whose works we generalize into Nature.

Our greatest living poet has poured forth the dirge of existence:—

> "Are God and Nature, then, at strife,
> That Nature lends such fearful dreams?
> So careful of the type she seems,"
> So careless of the single life.
>
> So careful of the type! but no,
> From scarped cliff, and quarried stone,
> She cries, "A thousand types are gone,
> I care for nothing—all shall go."

But the history of organized being, considered as a succession of typical forms, assumes a more cheerful character; life appears everywhere triumphant over death. As, in the order of nature the individual transmits to its successors its own peculiarities, modified, indeed, but not lost in the great stream of being, so each type, if it passes away when it has done its work, is yet not lost, but transmits to succeeding types the undying fire, tinted with its own characteristic hue. And this succession of typical forms, like the perpetuation of each particular type, is brought about by the action of the individual, following the laws and impulses of its own nature, and unwittingly contributing, by the performance of its own little part, to the gradual unfolding of the majestic drama of creation. But the arrangement of the scenes is due to foresight, not to chance, to the constructive power of thought adapting organization to circumstance, not to any

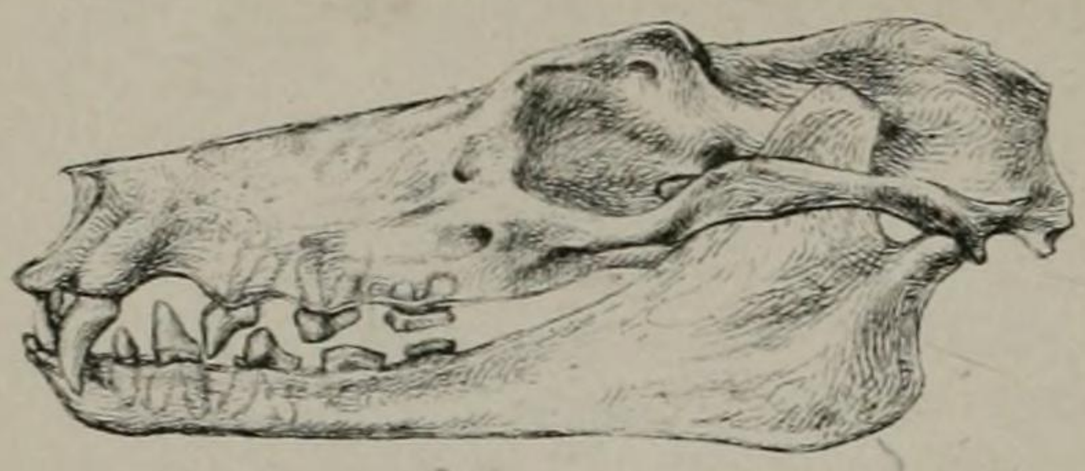

Fig.1.

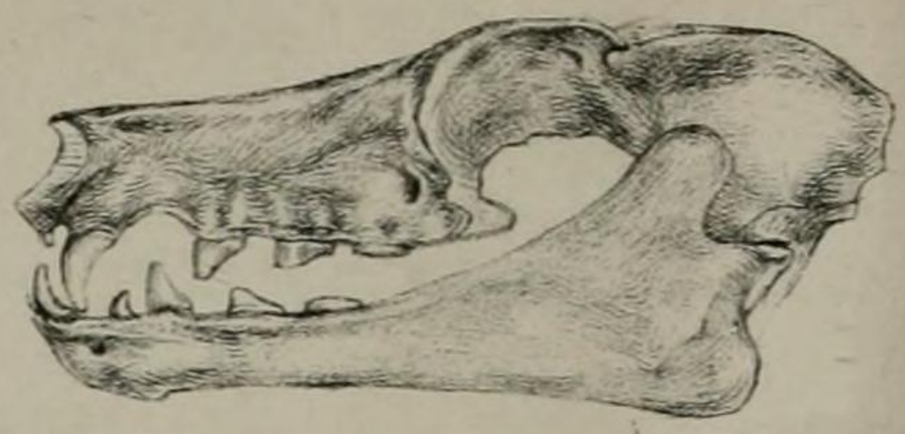

Fig.2.

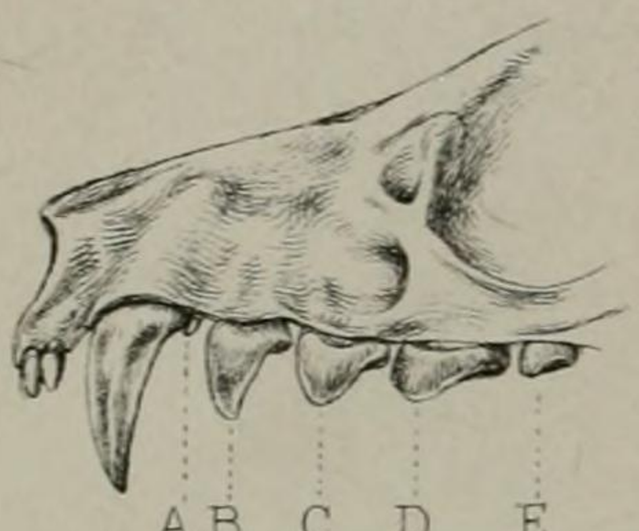

Fig.5.

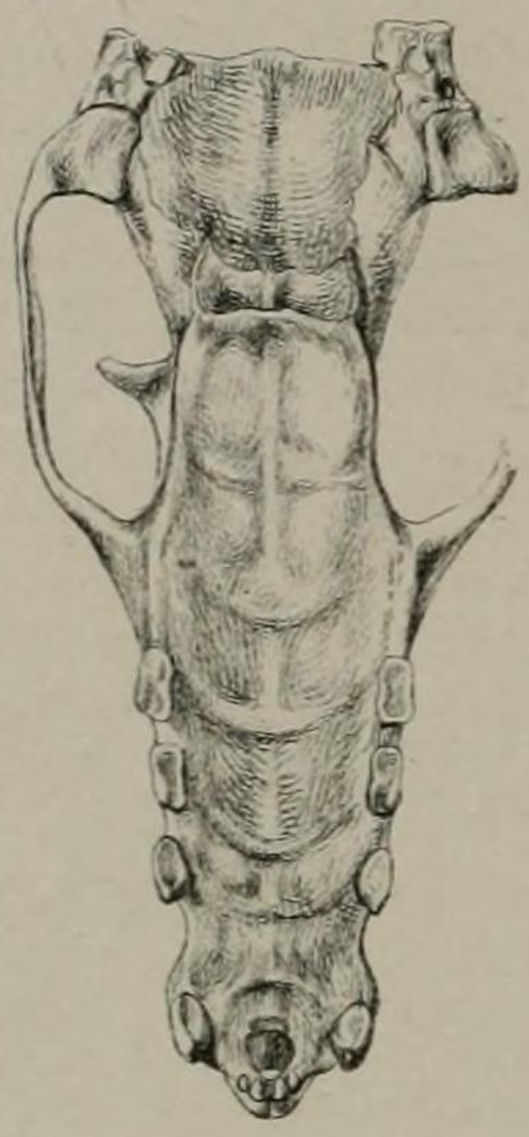

Fig.1a.

Fig.2b.

Fig.2a.

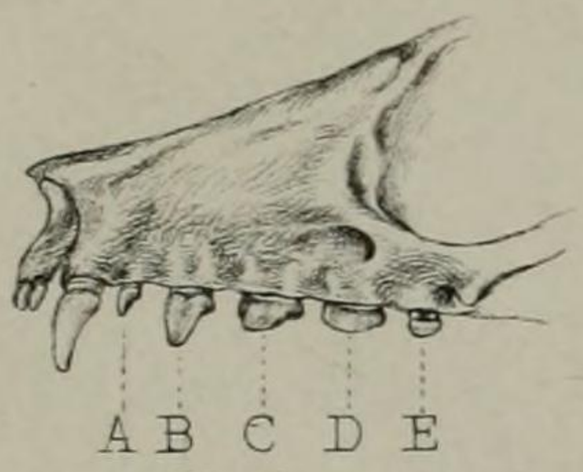

Fig.6.

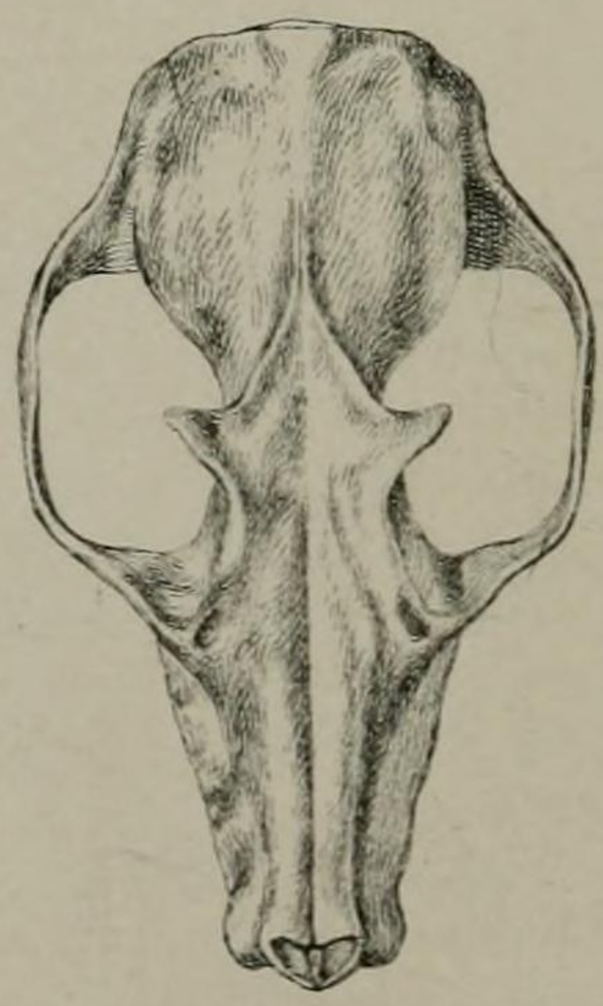

Fig.3a.

Fig.3b.

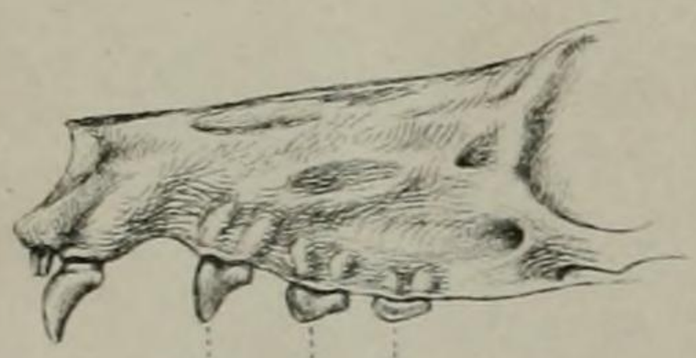

Fig.7.

Fig.4a.

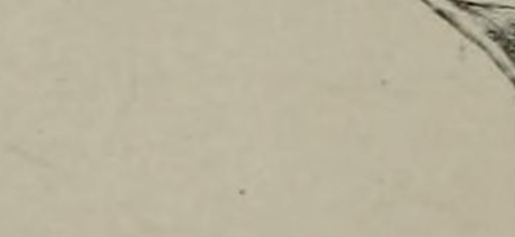

Fig.4.

Fig.3.

power in circumstance to create by destroying. In the words of the same great master whose language I have already quoted—

> Nature also, cold and warm,
> And moist and dry, *devising* long,
> Through many agents, making strong,
> Matures the individual form.

2. Additions to the Monograph of the Genus Epomophorus. By Robert F. Tomes, Corr. Memb. Z.S.

(Plate I.)

1. Epomophorus labiatus, Temm., sp.

Since the publication of my monograph of the genus *Epomophorus* in the 'Proceedings' of the Society, the kindness of Prof. Schlegel has enabled me to examine the type specimens of the *Pachysoma labiatum* of M. Temminck in the Leyden Museum; and I find that the male, as I had supposed, is quite distinct from *E. macrocephalus*, although not differing from it so greatly as I formerly believed. It resembles the latter species in its general proportions and appearance, especially in the length of the head and face; but it has longer fur on all parts of the body, and that of the back is somewhat redder in colour. On the abdomen is an oval whitish patch rather more distinct than in *E. macrocephalus*, but less so than in *E. franqueti*. The specimen is nearly, if not quite adult, and has the following dimensions:—

	in.	lin.
Length of the head and body	4	9
—— of the head	1	10
—— of the ears	0	7
—— of the fore-arm	2	6
—— of the longest finger	4	6
—— of the fourth finger	3	6
—— of the thumb	1	1
—— of the tibia	1	1
—— of the foot and claws	0	9
—— from the nose to the ear	1	5
—— from the nose to the eye	0	9
Expanse of wings, about	17	0

The so-called female of *Pachysoma labiatum* contained in the same collection is quite a young example of some larger species with a less elongated muzzle, probably of *E. gambianus*.

2. E. crypturus, Peters.

In my account of *E. gambianus* I included the *E. crypturus* of Dr. Peters as a synonym; but the assertion of the identity of the two species had scarcely appeared before I saw in the Leyden Museum, a specimen which differed from *E. gambianus* in several respects. Shortly afterwards a specimen of an *Epomophorus* from Natal came into my hands, which I had no difficulty in recognizing